(12) STANDARD PATENT (11) Application No. **AU 2017320776 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Adenovirus armed with bispecific T cell activator

(51) International Patent Classification(s)
C07K 16/28 (2006.01) ***C07K 16/30*** (2006.01)
A61K 35/761 (2015.01) ***C07K 16/40*** (2006.01)
A61K 39/395 (2006.01) ***C12N 15/861*** (2006.01)

(21) Application No: **2017320776** (22) Date of Filing: **2017.08.29**

(87) WIPO No: **WO18/041838**

(30) Priority Data

(31) Number	(32) Date	(33) Country
1700663.6	**2017.01.13**	**GB**
1706219.1	**2017.04.19**	**GB**
1614607.8	**2016.08.29**	**GB**
1713765.4	**2017.08.28**	**GB**

(43) Publication Date: **2018.03.08**
(44) Accepted Journal Date: **2024.10.10**

(71) Applicant(s)
Akamis Bio Limited

(72) Inventor(s)
Champion, Brian Robert;Bromley, Alice Claire Noel;Freedman, Joshua David;Fisher, Kerry David;Seymour, Leonard William

(74) Agent / Attorney
AJ PARK, PO Box 949, Wellington, 6140, NZ

(56) Related Art
ALBERTO FAJARDO CARLOS ET AL: HUMAN GENE THE, MARY ANN LIEBERT, INC. PUBLISHERS, US, vol. 26, no. 9, 1 September 2015 (2015-09-01), pages A13 - A14, XP008180451, ISSN: 1043-0342

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
08 March 2018 (08.03.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/041838 A1

(51) International Patent Classification:
A61K 39/395 (2006.01) *C07K 16/30* (2006.01)
A61K 35/761 (2015.01) *C07K 16/40* (2006.01)
C07K 16/28 (2006.01) *C12N 15/861* (2006.01)

(21) International Application Number:
PCT/EP2017/071674

(22) International Filing Date:
29 August 2017 (29.08.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

1614607.8	29 August 2016 (29.08.2016)	GB
1700663.6	13 January 2017 (13.01.2017)	GB
1706219.1	19 April 2017 (19.04.2017)	GB
1713765.4	28 August 2017 (28.08.2017)	GB

(71) Applicant: **PSIOXUS THERAPEUTICS LIMITED** [GB/GB]; PsiOxus House, 4-10 The Quadrant, Abingdon, Oxfordshire OX14 3YS (GB).

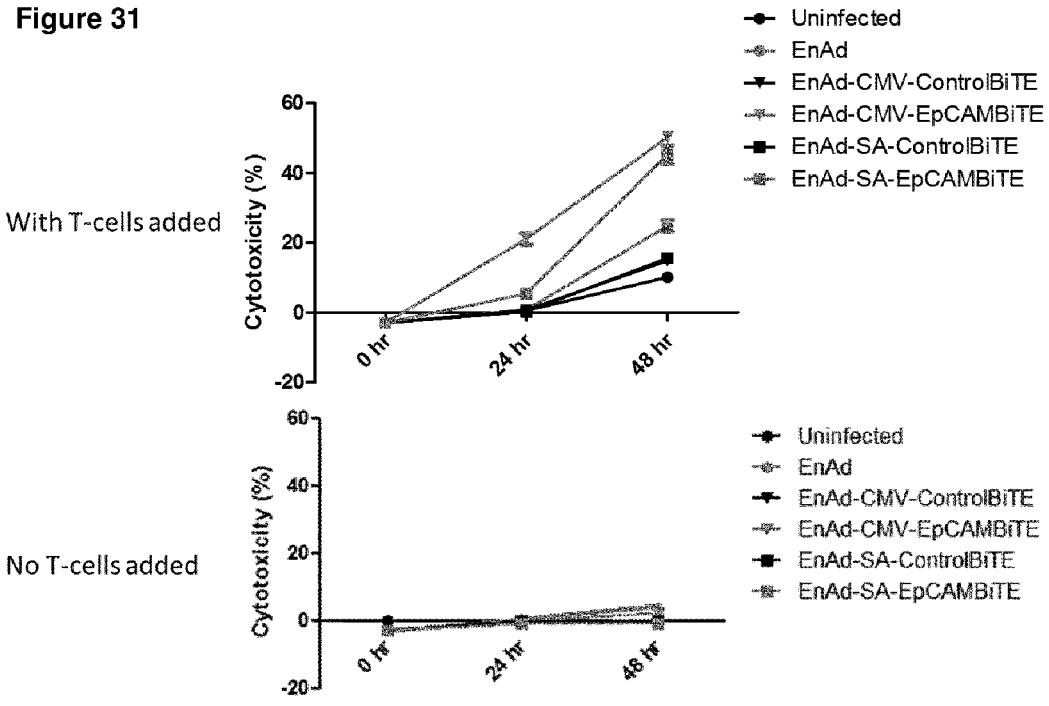
(72) Inventors: **CHAMPION, Brian, Robert**; PsiOxus Therapeutics Ltd, PsiOxus House, 4-10 The Quadrant, Barton Lane, Abingdon, Oxfordshire OX14 3YS (GB). **BROWN, Alice, Claire, Noel**; PsiOxus Therapeutics Ltd, PsiOxus House, 4-10 The Quadrant, Barton Lane, Abingdon, Oxfordshire OX14 3YS (GB). **FREEDMAN, Joshua, David**; 83 Manor Road, Chigwell IG7 5PH (GB). **FISHER, Kerry, David**; 11 Cassington Road Eynsham, Witney OX29 4LH (GB). **SEYMOUR, Leonard, William**; 5 Workhouse Yard Chapel Hill, Wootton by Woodstock OX20 1YD (GB).

(74) Agent: **STERLING IP LTD**; Orion House Bessemer Road, Welwyn Garden City, United Kingdom AL7 1HH (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,

(54) Title: ADENOVIRUS ARMED WITH BISPECIFIC T CELL ENGAGER (BITE)

Figure 31



(57) Abstract: A modified adenovirus, in particular Enadenotucirev (EnAd), armed with a bispecific T cell engager (BiTE) comprising at least two binding domains, wherein at least one of the domains is specific for a surface antigen on a T-cell of interest. Also provided are a composition, such as a pharmaceutical formulation comprising the virus, use of the virus and virus formulations for treatment, such as in the treatment of cancer. The disclosure also extends to processes for preparing the virus.

[Continued on next page]

WO 2018/041838 A1

OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *with sequence listing part of description (Rule 5.2(a))*

2017320776 18 Sep 2024

Adenovirus armed with bispecific T cell activator

The present disclosure relates to a modified adenovirus, in particular Enadenotucirev (EnAd), armed with a bispecific T cell activator comprising at least two binding domains, wherein at least one of the domains is specific for a surface antigen on a T-cell of interest. The disclosure further relates to a composition, such as a pharmaceutical formulation comprising the virus, use of the virus and virus formulations, particularly in treatment, especially in the treatment of cancer. The disclosure also extends to processes for preparing the virus and DNA encoding the same.

BACKGROUND

Cancer is still a huge social burden to society in terms of the hardship and suffering of patients and their loved ones, and also in terms of the high financial cost of treating, caring for and supporting patients.

A large variety of therapies have been developed for the treatment of cancer including chemotherapeutic agents, radiotherapy and more recently biologics such as antibodies. Antibody-based therapy for cancer has become established over the past 15 years and is now one of the most successful and important strategies for treating patients with haematological malignancies and solid tumours. Examples of monoclonal antibody based anti-cancer therapies currently in clinical use include rituximab, which targets CD20, bevacizumab which targets VEGF, cetuximab which targets EGFR and labetuzumab which targets CEA.

Amongst the various antibody formats developed, bispecific T-cell activators show much promise. These are relatively simple bi-specific molecules that are specific for the CD3ε subunit of the TCR complex of a T-cell and also a target an antigen of interest, such as a cancer antigen. Since bispecific T-cell activators are specific for the TCR complex, this enables bispecific T-cell activators to activate resident T-cells to kill cells expressing a particular target antigen on their cell surface, for example cancer cells. An important property of bispecific T-cell activators is their ability to make $CD4^+$ and non-activated $CD8^+$ T-cells target cancer cells. In other words, T-cells activated by bispecific T-cell activators can be made to kill cells independent of MHC expression on the cell surface. This is important because some tumour cells downregulate MHC which makes them resistant to agents such as CAR-T cells and immTACs.

Unfortunately, bispecific T-cell activators have poor circulation kinetics relative to full length antibodies. This means that when administered to the patient, a large proportion of the bispecific T-cell activators do not reach their target cells. In addition, the use of high affinity anti-CD3 ScFv as part of the BiTE can lead to strong binding to T-cells in the blood, which also interferes with delivery to the tumour. As a result, the bispecific T-cell activators are unable to reach their full potential as an anti-cancer therapy because they cannot be effectively delivered to the tumour cells.

The requirement for effective delivery of therapeutic agents such as bispecific T-cell activators to tumour cells has become increasingly important since it is becoming more apparent that solid tumours protect themselves *in vivo* in a number of ways, for example by developing stroma around the tumour. Progression to a carcinoma is associated with proliferation of epithelial cells (mitotic cells) along with the development of an activated tumour stroma. In this case, extracellular-matrix (ECM) components such as collagen bundles are degraded, because of increased turnover. The number of inflammatory cells increases and fibroblasts differentiate into myofibroblasts, resulting in their expression of growth factors, matrix

2017320776 18 Sep 2024

components and degrading proteases. Angiogenesis is maintained, resulting in a high number of leaky tumour vessels. Following activation of a tumour stroma with persistent angiogenesis, invasion by tumour cells begins through the degraded basement membrane, and blood vessels infiltrate the tumour tissue.

This stroma is a physical protection in that it may have a function of trapping immune cells sent to fight the tumour. In addition the stroma shields the hypoxic microenviroment of the tumour, which is permissive and optimised for the tumour's growth. There are some theories that cells in the stroma are a source of energy in the tumour.

A large component of tumour stroma are fibroblasts, which have been corrupted to serve the purpose of the cancer. Other cells that infiltrate the stroma are tumour associated macrophages (TAMs), which are type 2 (M2) macrophages that can promote tumour growth by secreting cytokines and chemokines, such as IL-10 that suppress immune responses.

It is especially difficult to target the tumour stroma because the cells that make the environment are "native" immune or connective tissue cells, which are found throughout the body. Thus targeting these cells with therapeutic agents can lead to serious off-target effects.

Hence, there is a need for an improved method of delivering a bispecific T-cell activator directly to tumour cells where it can provide maximal therapeutic benefit, in particular delivery to tumour cells surrounded by stromal fibroblasts. It is an object of the present invention to meet this need/these needs, or at least go some way to providing the public with a useful choice.

SUMMARY OF INVENTION

The present inventors believe that one of the most effective ways to deliver the therapeutic agents directly to the tumour is with an oncolytic adenovirus engineered to express agents that, for example activate T cells and target an antigen, such as in the stroma.

Accordingly, the present disclosure provides an adenovirus comprising a sequence of formula (**I**):

$$5'\text{ITR-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'\text{ITR}\ (\mathbf{I})$$

wherein:

B_1 is bond or comprises: E1A, E1B or E1A-E1B;

B_A comprises-E2B-L1-L2-L3-E2A-L4;

B_2 is a bond or comprises: E3;

B_X is a bond or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is a bond or comprises: E4;

wherein the adenovirus encodes a Bispecific T cell activator comprising at least two binding domains wherein at least one of the said domains is specific to a surface antigen on an immune cell of interst, such as a T cell of interest; and

wherein the adenovirus is EnAd or Ad11.

In a particular aspect, the present invention provides an oncolytic adenovirus comprising a sequence of formula (**I**):

$$5'\text{ITR-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'\text{ITR}\ (\text{I})$$

2017320776 18 Sep 2024

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises: L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position B_Y encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and one of the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

In another particular aspect, the present invention provides a A method of targeting tumour stromal cells comprising administering a therapeutically effective amount of an oncolytic adenovirus, wherein the adenovirus comprises a sequence of formula **(I)**:

$$5'\text{ITR-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'\text{ITR}\ \textbf{(I)}$$

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position B_Y encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and one the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

In a further particular aspect, the present invention provides use of an oncolytic adenovirus in the manufacture of a medicament for targeting tumour stromal cells, wherein the adenovirus comprises a sequence of formula **(I)**:

$$5'\text{ITR-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'\text{ITR}\ \textbf{(I)}$$

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position BY encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and one the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

The bispecific T-cell activator or bispecific T-cell activators according to the present disclosure do not comprise a transmembrane domain and so are not expressed on the cancer cell surface but rather comprises a signal sequence to facilitate release of the bispecific T-cell activator molecule from the cancer cell.

The following paragraphs are a summary of the present disclosure:

1. An adenovirus comprising a sequence of formula **(I)**:

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \quad (I)$$

wherein:

B_1 is bond or comprises: E1A, E1B or E1A-E1B;

B_A comprises-E2B-L1-L2-L3-E2A-L4;

B_2 is a bond or comprises: E3;

B_X is a bond or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is a bond or comprises: E4;

wherein the adenovirus encodes a Bispecific T cell activator comprising at least two binding domains wherein at least one of the said domains is specific to a surface antigen on an immune cell of interest, such as a T cell of interest; and

wherein the adenovirus is EnAd or Ad11.

2. An adenovirus according to paragraph 1, wherein the adenovirus is EnAd.
3. An adenovirus according to paragraph 1 or 2, wherein the surface antigen is a component of the T-cell receptor complex (TCR), such as CD3, TCR-α and TCR-β.
4. An adenovirus according to paragraph 3, wherein the surface antigen is CD3 such as CD3ε, CD3γ and CD3δ, in particular CD3ε.
5. An adenovirus according to any one of paragraphs 1 to 4, wherein one of the binding domains is specific to a tumour antigen such as CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3,

HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3.

6. An adenovirus according to paragraph 5, wherein one of the binding domains is specific to EpCAM, for example an EpCAM comprising an amino acid sequence as set forth in SEQ ID NO: 28.
7. An adenovirus according to any one of paragraphs 1 to 4, wherein one of the binding domains is specific to a tumour stromal antigen, for example fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.
8. An adenovirus according to paragraph 7, wherein one of the binding domains is specific to FAP, for example a FAP comprising an amino acid sequence as set forth in SEQ ID NO: 30.
9. A adenovirus according to paragraph 7 or 8, wherein the stromal antigen is an antigen is selected from a myeloid derived suppressor cell antigen, a tumor associated macrophage, and combinations thereof.
10. An adenovirus according to paragraph 9, wherein the antigen is selected from CD163, CD206, CD68, CD11c, CD11b, CD14, CSF1 Receptor, CD15, CD33, CD66b and a combination of two or more of the same.
11. An adenovirus according to any one of paragraphs 1 to 3 and 5 to 10, wherein one of the binding domains in the bispecific T-cell activator is specific to a non-TCR activating protein such as CD31, CD2 and CD277.
12. An adenovirus according to any one of paragraphs 1 to 11, wherein at least one of B_X or B_Y is not a bond.
13. An adenovirus according to any one of paragraphs 1 to 12, wherein the adenovirus is chimeric.
14. An adenovirus according to any one of paragraphs 1 to 13, wherein the adenovirus is oncolytic.
15. An adenovirus according to any one of paragraphs 1 to 14, wherein the adenovirus replication capable.
16. An adenovirus according to paragraph 13, wherein the adenovirus is replication competent.
17. An adenovirus according to any one of paragraph s 1 to 14, wherein the adenovirus is replication deficient.
18. An adenovirus according to any one of paragraphs 1 to 17, wherein B_X comprises one or more transgenes or a transgene cassette.
19. An adenovirus according to any one of paragraphs 1 to 16, wherein B_Y comprises one or more transgenes or a transgene cassette.
20. An adenovirus according to any one of paragraphs 1 to 19, wherein the one or more transgenes or transgene cassettes is under the control of an endogenous or exogenous promoter, such as an endogenous promotor.
21. An adenovirus according to paragraph 20, wherein the transgene or transgene cassette is under the control of an endogenous promoter selected from the group consisting of E4 promoter and major late promoter, in particular the major late promoter.
22. An adenovirus according to paragraph 19, wherein the transgene or transgene cassette is under the control of an exogenous promoter, such as CMV.

23. An adenovirus according to any one of paragraphs 1 to 22, wherein the transgene cassette further comprises a regulatory element independently selected from:
    a. a splice acceptor sequence,
    b. an internal ribosome entry sequence or a high self-cleavage efficiency A peptide,
    c. a Kozak sequence, and
    d. combinations thereof.
24. An adenovirus according to paragraph 23, wherein the transgene cassette comprises a Kozak sequence which is at the start of the protein coding sequence.
25. An adenovirus according to any one of claims 1 to 24, wherein the transgene cassette encodes a high self-cleavage efficiency A peptide.
26. An adenovirus according to any one of paragraphs 1 to 25, wherein the transgene cassette further comprises a polyadenylation sequence.
27. An adenovirus according to any one of paragraphs 1 to 26, wherein the transgene cassette further comprises a restriction site at the 'end of the DNA sequence and/or at the 'end of the DNA sequence.
28. An adenovirus according to any of paragraphs 1 to 27, wherein at least one transgene cassette encodes monocistronic mRNA.
29. An adenovirus according to any one of paragraphs 1 to 28, wherein the bispecific T-cell activator has short half-life, for example 48 hours or less.
30. An adenovirus according to any one of paragraphs 1 to 29, wherein the bispecific T-cell activator is encoded in a region selected from E1, E3, B_X, B_Y and combinations thereof.
31. An adenovirus according to paragraph 30, wherein the bispecific T-cell activator is encoded at least in position B_X, for example under the control of the major late promoter.
32. An adenovirus according to any one of paragraphs 1 to 29, wherein the adenovirus further encodes a second bispecific T-cell activator.
33. An adenovirus according to paragraph 32, wherein the first bispecific T-cell activator molecule is specific to a tumour antigen, for example a tumor antigen (for example as listed herein) and the second bispecific T-cell activator molecule is specific to a tumour stromal antigen, for example a stromal antigen (for example as listed herein).
34. An adenovirus according to any one of paragraphs 1 to 33, wherein the adenovirus further comprises a cytokine or chemokine or an immunomodulator (such as a cytokine or chemokine).
35. An adenovirus according to paragraph 34, wherein the cytokine or chemokine is selected from MIP1α, IL-1α, IL-1β, IL-6, IL-9, IL-12, IL-13, IL-17, IL-18, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-33, IL-35, IL-2, IL-4, IL-5, IL-7, IL-10, IL-15, IL-21, IL-25, IL-1RA, IFNα, IFNβ, IFNγ, TNFα, lymphotoxin α (LTA), Flt3L, GM-CSF, IL-8, CCL2, CCL3, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19, CCL21, (for example IL-1α, IL-1β, IL-6, IL-9, IL-12, IL-13, IL-17, IL-18, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-33, IL-35, IL-2, IL-4, IL-5, IL-7, IL-10, IL-15, IL-21, IL-25, IL-1RA, IFNα, IFNβ, IFNγ, TNFα, lymphotoxin α (LTA), GM-CSF, IL-8, CCL2, CCL3, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19, CCL21), such as IL-12, IL-18, IL-22, IL-7, IL-15, IL-21, IFNγ, TNFα, lymphotoxin α (LTA), CCL3, CCL5, CXCL9, CXCL10, CXCL12, CCL2, CCL19 and CCL21.

2017320776 18 Sep 2024

36. An adenovirus according to any one of paragraphs 1 to 35, wherein the adenovirus further comprises an immunomodulator, such as an antibody or antibody fragment, or protein or peptide ligand, specific to a checkpoint protein such as CTLA-4, PD-1, PD-L1, PD-L2, VISTA, B7-H3, B7-H4, HVEM, ILT-2, ILT-3, ILT-4, TIM-3, LAG-3, BTLA, LIGHT or CD160, for example CTLA-4, PD-1, PD-L1 and PD-L2, or to a co-stimulatory molecule, such as CD28, CD80, CD86, CD83, ICOS, B7H2, TL1A and 4-1BB.
37. An adenovirus according to any one of the paragraphs 1 to 36, wherein the bispecific T-cell activator comprises a VH domain comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 8, 13 or 18, or an amino acid sequence that is at least 95% identical thereto.
38. An adenovirus according to any one of paragraphs 1 to 37, wherein the bispecific T-cell activator comprises a VL domain comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 9, 12 or 17, or an amino acid sequence that is at least 95% identical thereto.
39. An adenovirus according to any one of paragraphs 1 to 36, wherein the bispecific T-cell activator comprises a scFv comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 7, 11 or 16, or an amino acid sequence that is at least 95% identical thereto.
40. An adenovirus according to any one of paragraphs 1 to 39, wherein the bispecific T-cell activator comprises an amino acid sequence set forth in SEQ ID NOs: 2 or 4, or an amino acid sequence that is at least 95% identical thereto, for example an amino acid sequence as set forth in SEQ ID NOs: 73 or 75.
41. An adenovirus according to any one of paragraphs 1 to 40, wherein the adenovirus comprises a DNA sequence set forth in any one of SEQ ID NOs: 34 to 37, or a DNA acid sequence that is at least 95% identical thereto, for example a DNA sequence as set forth in any one of SEQ ID NOs: 79 to 82.
42. A composition comprising an adenovirus according to any one of paragraphs 1 to 41 and a diluent or carrier.
43. A method of treating a patient comprising administering a therapeutically effective amount of an adenovirus of any one of paragraphs 1 to 41 or a composition of paragraph 42.
44. A method according to paragraph 43, for the treatment of cancer, in particular a solid tumour.

In one embodiment the adenovirus according to the present disclosure encodes at least one further transgene, for example 1, 2 ,3 or 4 further transgenes.

In one embodiment a different cleavage peptide is encoded between each of the genes.

In one embodiment all the transgenes are in one location in the virus, for example the are in in position B_Y.

Advantageously, the present inventors have discovered that arming an adenovirus with a bispecific T-cell activator molecule allows the bi-specific antibody fragment molecule to 'piggyback' on the ability of the adenovirus to selectively infect cancer cells, thereby enabling the targeted delivery of the bispecific T-cell activator to tumour cells.

Advantageously, bispecific T-cell activator are small and can be made in mammalian cells. Hence once infected by the adenoviruses of the present disclosure, the bispecific T-cell activator molecules are synthesized by tumour cells, secreted and can act locally, spreading beyond the immediate footprint of the virus. This therefore allows the bispecific T-cell activator to spread beyond the immediate site of infection

2017320776 18 Sep 2024

but at the same time limits the spread of the virus too far beyond the infected tumour cell nest. This minimises the risk of undesired off-target effects.

In one embodiment, the adenovirus is EnAd. EnAd has been shown to have an enhanced oncolytic activity compared to prior art adenoviruses. EnAd has also been shown to have a high selectivity for human epithelial-derived carcinoma cells, such as colon, lung, bladder and renal cancer cells. This makes it an ideal delivery vehicle for bispecific T-cell activator molecules because T-cells can be activated by the bispecific T-cell activator molecule to attack target cells whilst EnAd simultaneously infects and lyses cancer cells. This results in a two-pronged attack on the tumour which has a synergistic oncolytic effect.

In one embodiment the surface antigen is a component of the T-cell receptor complex (TCR), such as CD3, TCR-α and TCR-β.

In one embodiment the surface antigen is CD3 such as CD3ε, CD3γ and CD3δ, in particular CD3ε.

In one embodiment one of the binding domains is specific to a tumour antigen such as CEA, MUC-1, EpCAM, a HER receptor (such as HER1, HER2, HER3, HER4), PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3, in particular EpCAM.

In one embodiment one of the binding domains is specific to EpCAM, for example an EpCAM comprising an amino acid sequence as set forth in SEQ ID NO: 28 or a sequence at least 95% identical thereto.

In one embodiment at one of the binding domains is specific to a tumour stroma antigen, for example fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin. Advantageously, stromal cells (non-transformed cells) expressing these antigens are not subjected to the same level of mutation-resistance-selection process as transformed cells. Therefore, these cells are easier to target for cancer therapy since they are not a 'moving target'. Furthermore, the types of receptors found in stromal cells are often common across different types of cancer. Hence, targeting one of the above antigens is likely to be effective for multiple cancer types.

In one embodiment one of the binding domains is specific to FAP, for example a FAP comprising an amino acid sequence as set forth in SEQ ID NO: 30 or a sequence at least 95% indentical thereto. Advantageously, FAP is upregulated on tumour associated fibroblasts. Fibroblasts are a vital component of solid carcinomas supporting growth, invasion and recovery from interventions. They typically comprise 40-60% of the cells in advanced carcinomas. Advantageously, fibroblasts are genetically stable cells that are less likely to escape therapy than cancers cells. Activated fibroblasts are also relatively similar across a variety of tumour types. Thus, by activating T cells to target and kill FAP expressing tumour associated fibroblasts, the adenoviruses of the present disclosure can help to diminish a spectrum of immune suppressive pathways, such as those mediated by IL-10, TGFβ and IDO.

Other stromal targets, include tumor associated macrophages and myeloid derived suppressor cell antigen, for example CD163, CD206, CD68, CD11c, CD11b, CD14, CSF1 receptor, CD15, CD33, CD66b and combinations of two or more of the same.

In one embodiment one of the binding domains in the bispecific T-cell activator is specific to a non-TCR activating protein such as CD31, CD2 and CD277.

2017320776 18 Sep 2024

In one embodiment one of the binding domains is specific to a surface antigen on a T cell of interest, such as selected from CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma), TCR-α chain and TCR-β chain, and one binding domain is specific to a tumour antigen.

In one embodiment one of the binding domains is specific to CD3 and another binding domain is specific for a tumor antigen,f or example selected from the group consisting of: CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3.

In one embodiment one of the binding domains is specific to CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma) and another binding domain is specific to EpCAM.

In one embodiment one of the binding domains is specific to CD3ε and another binding domain is specific to EpCAM.

In one embodiment one of the binding domains is specific to a surface antigen on a T cell of interest, such as selected from CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma), TCR-α and TCR-β, and another binding domain is specific to a tumour stromal antigen.

In one embodiment one of the binding domains is specific to CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma) and another binding domain is specific to a tumour stromal antigen, for example selected from the group consisting of: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.

In one embodiment one of the binding domains is specific to CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma) and another binding domain is specific to FAP.

In one embodiment one of the binding domains is specific to CD3ε and another binding domain is specific to FAP.

In one embodiment one of the binding domains is specific to a surface antigen on a T cell of interest, such as CD3, TCR-α and TCR-β and another binding domain is specific to a non-TCR activating protein.

In one embodiment one of the binding domains is specific to a CD3 (such as CD3 delta, CD3 epsilon or CD3 gamma) and another binding domain is specific to a non-TCR activating protein selected from the group consisting of CD31, CD2 and CD277.

In one embodiment one of the binding domains is specific to CD3ε and another binding domain is specific to non-TCR activating protein selected from the group consisting of CD31, CD2 and CD277.

In one embodiment at least one of B_X or B_Y is not a bond.

In one embodiment B_X is not a bond.

In one embodiment B_Y is not a bond.

In one embodiment both B_X and B_Y are not bonds.

In one embodiment the adenovirus is chimeric.

In one embodiment the adenovirus is oncolytic.

In one embodiment the adenovirus is chimeric and oncolytic.

In one embodiment the adenovirus replication capable.

In one embodiment the adenovirus is chimeric, oncolytic and replication capable.

In one embodiment the adenovirus is replication competent.

2017320776 18 Sep 2024

In another embodiment the adenovirus is chimeric, oncolytic and replication competent.

In one embodiment the adenovirus is replication deficient, i.e. is a vector.

In one embodiment B_X comprises a transgene or transgene cassette, in particular a transgene cassette encoding a bispecific T-cell activator according to the the present disclosure.

In one embodiment B_Y comprises a transgene or transgene cassette, in particular a transgene cassette encoding a bispecific T-cell activator according to the the present disclosure.

In one embodiment B_Y comprises a transgene or transgene cassette, in particular a transgene cassette encoding a bispecific T-cell activator according to the the present disclosure and B_X represents a bond.

In one embodimeht both B_X and B_Y comprise a transgene or transgene cassette.

In one embodiment, the one or more transgenes or transgene cassettes is under the control of an endogenous or exogenous promoter, such as an endogenous promotor. Advantageously, when under the control of these promoters the virus remains replication competent and is also able to express the bispecific T-cell activator and/or other protein. Thus the bispecific T-cell activator of choice will be expressed by the cancer cell. Employing an exogenous promoter may be advantageous in some embodiments because it can strongly and constitutively express the antibody or fragment, which may be particularly useful in some situations, for example where the patient has very pervasive cancer. Employing an endogenous promoter may be advantageous because it reduces the size of the transgene cassette that needs to be incorporated to express the bispecific T-cell activator, i.e. the cassette can be smaller because no exogenous promoter needs to be included.

Accordingly, in one embodiment the transgene or transgene cassette is under the control of an endogenous promoter selected from the group consisting of E4 and major late promoter, in particular the major late promoter. Employing an endogenous promoter in the virus may also be advantageous in a therapeutic context because the transgene is only expressed when the virus is replicating in a cancer cell as opposed to a constitutive exogenous promoter which will continually transcribe the transgene and may lead to an inappropriate concentration of the antibody or fragment.

In one embodiment, the transgene or transgene cassette(for example encoding a bispecific T-cell activator) is under the control of an exogenous promoter, such as CMV. Advantageously, the use of a constitutive exogenous promoter results in continuous transcription of the transgene which may be desirable in certain instances.

In one embodiment one transgene or transgene cassette (for example encoding a bispecific T-cell activator) is under the control of an endogenous promoter and another transgene or transgene cassette (for example encoding a bispecific T-cell activator) is under the control of an exogenous promoter.

In one embodiment all of the transgenes or transgene cassettes (for example encoding a bispecific T-cell activator) in the virus is/are under the control of an endogenous promoter.

In another embodiment all of the transgenes or transgene cassettes (for example encoding a bispecific T-cell activator) in the virus is/are under the control of an exogenous promoter.

In one embodiment the transgene or transgene cassette further comprises a regulatory element independently selected from:

i) a splice acceptor sequence,

ii) an internal ribosome entry sequence or a high self-cleavage efficiency 2A peptide,

2017320776 18 Sep 2024

iii) a Kozak sequence, and

iv) combinations thereof.

Thus in one embodiment the transgene cassette comprises i) or ii) or iii) or iv).

In one embodiment the transgene cassette comprises i) and ii), or i) and iii), or i) and iv), or ii) and iii), or ii) and iv), or iii) and iv).

In one embodiment the transgene cassette comprises i) and ii) and iii), or i) and ii) and iv), or i) and iii) and iv), or ii) and iii) and iv).

In one embodiment, the transgene cassette comprises i) and ii) and iii) and iv).

In one embodiment, the transgene cassette comprises a Kozak sequence at the start of the protein (for example bispecific T-cell activator) coding sequence, which assists in the translation of mRNA.

In one embodiment, the transgene cassette encodes a high self-cleavage efficiency 2A peptide.

In one embodiment the transgene cassette further comprises a polyadenylation sequence.

In one embodiment the transgene cassette further comprises a restriction site at the 3'end of the DNA sequence and/or at the 5'end of the DNA sequence.

In one embodiment at least one transgene cassette encodes monocistronic mRNA.

In one embodiment the bispecific T-cell activator molecule has short half-life, for example 48 hours or less.

In one embodiment the bispecific T-cell activator molecule is encoded in a region selected from E1, E3, B_X, B_Y and combinations thereof. Advantageously, the present inventors have established that a variety of transgenes can be inserted into B_X and/or B_Y under the control of an exogenous or endogenous promoter, without adversely affecting the life cycle of the virus or the stability of the vector.

In one embodiment, the bispecific T-cell activator molecule is encoded at least in position B_X, for example under the control of the major late promoter. Advantageously, the transgene or transgene cassette allows the bispecific T-cell activator or any additional molecule to be expressed together with the adenovirus itself. Importantly, the present inventors successfully demonstrated that the expression of the bispecific T-cell activator did not significantly affect the ability of EnAd to replicate nor negatively impact its oncolytic activity.

In one embodiment, the bispecific T-cell activator molecule is encoded at least in position B_Y, for example under the control of the major late promoter. Advantageously, the transgene or transgene cassette allows the bispecific T-cell activator or any additional molecule to be expressed together with the adenovirus itself. Importantly, the present inventors successfully demonstrated that the expression of the bispecific T-cell activator did not significantly affect the ability of EnAd to replicate nor negatively impact its oncolytic activity.

In one embodiment, the adenovirus further encodes a second bispecific T-cell activator.

In one embodiment, the first bispecific T-cell activator molecule is specific to a tumour antigen, for example a tumor antigen as described above, and the second bispecific T-cell activator molecule is specific to a tumour stromal antigen, for example a stromal antigen as described above.

In one embodiment the first bispecific T-cell activator molecule is specific to a tumour antigen selected from the group consisting of: CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3 and the second bispecific T-cell activator molecule is

2017320776 18 Sep 2024

specific to a tumour stromal antigen selected from the group consisting of: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.

In one embodiment the first bispecific T-cell activator molecule is specific to EpCAM and the second bispecific T-cell activator molecule is specific to a tumour stromal antigen selected from the group consisting of: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.

In one embodiment the first bispecific T-cell activator molecule is specific to a tumour antigen selected from the group consisting of: CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3 and the second bispecific T-cell activator is specific to FAP.

In one embodiment the first bispecific T-cell activator molecule s specific to EpCAM and the second bispecific T-cell activator molecule is specific to FAP.

In another embodiment the first bispecific T-cell activator molecule is specific to a tumour antigen and the second bispecific T-cell activator molecule is specific to a non-TCR activating protein.

In one embodiment the first bispecific T-cell activator molecule is specific to a tumor antigen selected from the group consisting of: CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2 and ErbB3.

In one embodiment the first bispecific T-cell activator molecule is specific to EpCAM and the second bispecific T-cell activator molecule is specific to a non-TCR activating protein selected from the group consisting of: CD31, CD2 and CD277.

In one embodiment the first bispecific T-cell activator molecule is specific to a tumour stromal antigen and the second bispecific T-cell activator molecule is specific to a non-TCR activating protein.

In one embodiment the first bispecific T-cell activator molecule is specific to a tumour stromal antigen selected from the group consisting of: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin and the second bispecific T-cell activator molecule is specific to a non-TCR activating protein selected from the group consisting of: CD31, CD2 and CD277.

In one embodiment the first bispecific T-cell activator molecule is specific to FAP and the second bispecific T-cell activator molecule is specific to a non-TCR activating protein selected from the group consisting of: CD31, CD2 and CD277.

In one embodiment the adenovirus only comprises one bispecific T-cell activator.

In another embodiment the adenovirus comprises two bispecific T-cell activators.

In another embodiment the adenovirus comprises three bispecific T-cell activators.

In addition to encoding one two or three bispecific T-cell activators the virus may also encode a 1, 2, 3 or 4 further transgenes.

In one embodiment the adenovirus further encodes a cytokine or chemokine.

In one embodiment the adenovirus further encodes a cytokine.

In one embodiment the adenovirus further encodes a chemokine.

2017320776 18 Sep 2024

In another embodiment the adenovirus further encodes a cytokine and a chemokine.

In one embodiment the adenovirus comprises one bispecific T-cell activator and at least one cytokine or chemokine, for example 1, 2 or 3 cytokines, 1, 2 or 3 chemokines or a combination of 2 or 3 genes each gene independently encoding a cytokine of chemokine.

In another embodiment the adenovirus comprises two bispecific T-cell activators and at least one cytokine or chemokine for example 1 or 2 cytokines, 1 or 2 chemokines or a combination of a cytokine and a chemokine.

In another embodiment the adenovirus comprises three bispecific T-cell activators and at least one cytokine or chemokine.

In one embodiment the cytokine or chemokine is selected from IL-1α, IL-1β, IL-6, IL-9, IL-12, IL-13, IL-17, IL-18, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-33, IL-35, IL-2, IL-4, IL-5, IL-7, IL-10, IL-15, IL-21, IL-25, IL-1RA, IFNα, IFNβ, IFNγ, TNFα, lymphotoxin α (LTA) and GM-CSF, IL-8, CCL2, CCL3, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19, CCL21, for example IL-12, IL-18, IL-22, IL-7, IL-15, IL-21, IFNγ, TNFα, lymphotoxin α (LTA), CCL3, CCL5, CXCL9, CXCL12, CCL2, CCL19 and CCL21.

In one embodiment, the the encoded cytokine is selected from TNF alpha super family (TNFRSF includes TNF-alpha, TNF-C, OX40L, CD154, FasL, LIGHT, TL1A, CD70, Siva, CD153, 4-1BB ligand, TRAIL, RANKL, TWEAK, APRIL, BAFF, CAMLG, NGF, BDNF, NT-3, NT-4, GITR ligand, EDA-A, EDA-A2), TGF-beta superfamily, IL-1 family (i.e. IL-1 and IL-8), IL-2 family, IL-10 family, IL-17 family, interferon family.

In one embodiment the chemokine is selected from the group comprising MIP-1 alpha, RANTES, IL-8, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19 and CCL21.

In one embodiment, the adenovirus further comprises an immunomodulator, such as an antibody or antibody fragment, or protein or peptide ligand, specific to a checkpoint protein or co-stimulatory molecule, or specific binding ligands for such molecules.

In one embodiment the immunomodulator is an antibody or antibody fragment, or protein or peptide ligand, specific to a checkpoint protein such as CTLA-4, PD-1, PD-L1, PD-L2, VISTA, B7-H3, B7-H4, HVEM, ILT-2, ILT-3, ILT-4, TIM-3, LAG-3, BTLA, LIGHT or CD160, for example CTLA-4, PD-1, PD-L1 and PD-L2.

In one embodiment the immunomodulator is an inhibitor, for example a checkpoint inhibitor.

In one embodiment the immunomodulator is an agonist.

In another embodiment the immunomodulator is an antibody or antibody fragment, or protein or peptide ligand, specific to a co-stimulatory molecule such as CD28, CD80, CD86, CD83, ICOS, B7H2, TL1A and 4-1BB.

In one embodiment the adenovirus comprises a first antibody, antibody fragment, protein or peptide ligand specific to a checkpoint protein and a second antibody, antibody fragment, protein or peptide ligand specific to a co-stimulatory molecule.

In one embodiment the bispecific T-cell activator comprises a VH domain comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 8, 13 or 18, or an amino acid sequence that is at least 95% identical thereto.

2017320776 18 Sep 2024

In one embodiment the bispecific T-cell activator comprises a VL domain comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 9, 12 or 17, or an amino acid sequence that is at least 95% identical thereto.

In one embodiment the bispecific T-cell activator comprises a scFv comprising an amino acid sequence as set forth in any one of SEQ ID NOs: 7, 11 or 16, or an amino acid sequence that is at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a binding domain with a VH domain with a sequence shown in SEQ ID NO: 8 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 9 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a binding domain with a VH domain with a sequence shown in SEQ ID NO: 13 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 12 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a binding domain with a VH domain with a sequence shown in SEQ ID NO: 18 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 17 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a binding domain with a VH domain with a sequence shown in SEQ ID NO: 8 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 9 or a sequence at least 95% identical thereto, and a binding domain with a VH domain with a sequence shown in SEQ ID NO: 13 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 12 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a binding domain with a VH domain with a sequence shown in SEQ ID NO: 8 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 9 or a sequence at least 95% identical thereto, and a binding domain with a VH domain with a sequence shown in SEQ ID NO: 18 or a sequence at least 95% identical thereto, and a VL domain with a sequence shown in SEQ ID NO: 17 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a sequence shown in SEQ ID NO: 7, 11, 16 or a sequence at least 95% identical to any one of the same.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a sequence shown in SEQ ID NO: 7 or a sequence at least 95% identical thereto.

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a sequence shown in SEQ ID NO: 11 or a sequence at least 95% identical thereto.

2017320776 18 Sep 2024

In one embodiment, a bispecific T-cell activator employed in the present disclosure (i.e encoded by the adenovirus) comprises a sequence shown in SEQ ID NO: 16 or a sequence at least 95% identical thereto.

In one embodiment the bispecific T-cell activator comprises an amino acid sequence set forth in SEQ ID NOs: 2 or 4, or an amino acid sequence that is at least 95% identical thereto, for example an amino acid as set forth in SEQ ID NOs: 73 or 75.

In one embodiment the adenovirus according to the present disclosure comprises a DNA sequence set forth in any one of SEQ ID NOs: 34 to 37, or a DNA acid sequence that that hybridises thereto under stringent conditions.

In one embodiment the adenovirus according to the present disclosure comprises a DNA sequence set forth in any one of SEQ ID NOs: SEQ ID NOs: 79 to 82.

In one embodiment the adenovirus according to the present disclosure comprises a DNA sequence shown in any one of SEQ ID NO: 34, 35, 36, 37, 79, 80, 82, 96, 97, 98, 99, 100, 101, 102, 103, 120, 298 or a sequence encoding the same virus, or a sequence that hybrises to the any one of the same under stringent conditions.

In one embodiment the adenovirus according to the present disclosure comprises a DNA sequence shown in any one of SEQ ID NO: 34, 35, 36, 37, 79, 80, 82, 96, 97, 98, 99, 100, 101, 102, 103, 120 or 298.

The skilled person is aware that there is reduncy in the DNA code, thus the present disclosure extends to EnAd or Ad11 encoding a bispecific T-cell activator with an amino acid disclosed herein.

The C-terminal deca-His (HHHHHHHHHH SEQ ID NO: 24) affinity tag is useful for purification of the bispecific T-cell activator or adenovirus. However, it is optional and may be excluded for example in the end product. The skilled person would also be aware that other affinity tags other than deca-His can be used and likewise may be excluded without affecting the biological function of the bispecific T-cell activator or adenovirus. Accordingly, in one embodiment the bispecific T-cell activator comprises an amino acid sequence as set forth in any one of SEQ ID NOs: 2 or 4 but excludes the deca-His affinity tag at the C-terminal end of the sequence, for example as set forth in SEQ ID NOs: 73 or 75. In another embodiment, the adenovirus comprises a DNA sequence set forth in any one of SEQ ID NOs: 34 to 37 but excludes the deca-His affinity tag, for example a DNA sequence as set forth in any one of SEQ ID NOs: 79 to 82.

The exclusion of the deca-His affinity tag further extends to all other sequences disclosed herein comprising the deca-His affinity tag, i.e. the present disclosure includes the same amino acid or DNA sequences lacking the C-terminal deca-His tag (HHHHHHHHHH or CATCACCATCACCATCACCACCATCACCAT), for example as set forth in any one of SEQ ID NOs: 72 to 82.

In one embodiment the bispecific T-cell activator encoded by the virus of the present disclosure is under the control of an exogenous promoter, for example the CMV promoter. The exogenonus may be placed between the MPL and the encoded transgene when the transgene is between L5 and E4 regions.

The exogenonus may be placed between the encoded transgene and L5 when the transgene is between L5 and E3 regions.

In one aspect there is provided a composition comprising an adenovirus as described herein and a diluent or carrier.

2017320776 18 Sep 2024

In one aspect, there is provided a method of treating a patient comprising administering a therapeutically effective amount of an adenovirus or a composition as described herein.

In one embodiment the method is for the treatment of cancer, for example an epithelial cancer, in particular a solid tumour.

In one embodiment there is provide a method of treatment comprising administering a virus according to the present disclosure in combination with a checkpoint inhibitor (such as a PD-1 or PDL1 inhibitor), in particular wherein the checkpoint inhibitor is encoding in the virus.

In one embodiment there is provide a method of treatment comprising administering a virus according to the present disclosure which is NOT in combination with a checkpoint inhibitor (for example as listed elsewhere herein such as a PD-1 or PDL1 inhibitor), in particular wherein the checkpoint inhibitor is not encoding in the virus.

The bispecific T-cell activators encoded by the virus as per the present disclosure have the ability to potentiate the cytotoxicity of the virus.

Surprisingly the bispecific T-cell activators encoded by a virus as *per* the present disclosure can activate CD4+ cells and/or CD8+ cells, for example even cells in the suppressive environment of the tumor, including T cells in the fluid environment, such as ascites, of the tumor.

Advantageously the bispecific T-cell activators encoded by a virus as *per* the present disclosure can activate cytotoxic T cells, for example even T cells in the suppressive environment of the tumor, including T cells in the fluid environment, such as ascites, of the tumor.

Even more surprisingly the bispecific T-cell activators encoded by a virus as *per* the present disclosure are capable of stimulating (activating) T cell proliferation.

The viruses encoding bispecific T-cell activators according to the present disclosure seem to be able to by-pass, overcome or reverse the immune suppressive microenvironment of the tumor.

In one embodiment the activation of T cells results in upregulation of a T cell marker, for example CD25.

In one embodiment a binding of a bispecific T-cell activator in a virus according to the present disclosure is specific to a neoantigen.

The disclosure also extends to novel sequences, disclosed herein.

In this specification where reference has been made to patent specifications, other external documents, or other sources of information, this is generally for the purpose of providing a context for discussing the features of the invention. Unless specifically stated otherwise, reference to such external documents is not to be construed as an admission that such documents, or such sources of information, in any jurisdiction, are prior art, or form part of the common general knowledge in the art.

In the description in this specification reference may be made to subject matter which is not within the scope of the appended claims. That subject matter should be readily identifiable by a person skilled in the art and may assist in putting into practice the invention as defined in the appended claims.

DETAILED DESCRIPTION

Immune cell as employed herein is a cell with a funcational role in the immune system, including (but not limited to), macrophages, neutrophils, dendritic cells, NK cells, lymphocytes, such as T lymphocytes (in particular T cells and NKT cells).

2017320776 18 Sep 2024

The term antibody as used herein refers to an immunoglobulin molecule capable of specific binding to a target antigen, such as a carbohydrate, polynucleotide, lipid, polypeptide, peptide etc., via at least one antigen recognition site (also referred to as a binding site herein), located in the variable region of the immunoglobulin molecule. Unless the context indicates otherwise the term extends to full length antibodies and multi-specific antibody molecules comprising full length antibodies.

As used herein "antibody molecule" includes antibodies and binding fragments thereof and multi-specific formats of any one of the same.

Antigen binding site as employed herein refers to a portion of the molecule, which comprises a pair of variable regions, in particular a cognate pair that interact specifically with the target antigen.

Specifically, as employed herein, is intended to refer to a binding site that only recognises the antigen to which it is specific or a binding site that has significantly higher binding affinity to the antigen to which is specific compared to affinity to antigens to which it is non-specific, for example 5, 6, 7, 8, 9, 10 times higher binding affinity.

Binding fragments or antibody binding fragments as employed herein refer to antibody binding fragments and multi-specific antibody molecules comprising antibody binding fragments including but not limited to Fab, modified Fab, Fab', modified Fab', $F(ab')_2$, Fv, single domain antibodies, scFv, bi, tri or tetra-valent antibodies, Bis-scFv, diabodies, triabodies, tetrabodies and epitope-binding fragments of any of the above (see for example Holliger and Hudson, 2005, Nature Biotech. 23(9):1126-1136; Adair and Lawson, 2005, Drug Design Reviews - Online 2(3), 209-217). The methods for creating and manufacturing these antibody fragments are well known in the art (see for example Verma et al., 1998, Journal of Immunological Methods, 216:165-181). Other antibody fragments for use in the present disclosure include the Fab and Fab' fragments described in International patent applications WO05/003169, WO05/003170 and WO05/003171. Multi-valent antibodies may comprise multiple specificities e.g. bispecific or may be monospecific (see for example WO92/22853 and WO05/113605).

In one embodiment the adenovirus comprises a multi-specific antibody molecule.

Multi-specific antibody molecule as employed herein refers to an antibody molecule which has two or more antigen binding domains, for example two (bispecific) or three (tri-specific) or four (tetra-specific) binding domains.

Multi-specific antibody molecules of the present disclosure may be constructed from various antibody fragments such as those described above. For example a diabody is a bispecific antibody molecule composed of a non-covalent dimer of ScFv fragments, whilst a $F(ab')_2$ is a bispecific antibody molecule composed of 2 Fab fragments linked by a hinge region. The skilled person will therefore be aware that different antibody fragments can be arranged in various combinations in order to produce a bi- or multi-specific antibody molecule.

Examples of tri-specific or tetra-specific antibody formats include but are not limited to Fab_3, triabody, tetrabody, tribody, DVD-Ig, IgG-scFv, $ScFv_2$-Fc, tandAbs and DNL-Fab3.

Bi-specific antibody molecule as employed herein refers to a molecule with two antigen binding domains, which may bind the same or different antigens. A bispecific T-cell activator is a subclass of bispecific antibody molecules.

The domains may bind different antigens.

[FOLLOWED BY PAGE 17a]

2017320776 18 Sep 2024

Alternatively, the domains may all bind the same antigen, including binding the same epitope on the antigen or binding different epitopes on the same antigen.

Examples of bispecific antibody formats include but are not limited to bispecific T cell activator , $F(ab')_2$, F(ab')-ScFv2, di-scFv, diabody, minibody, scFv-Fc, DART, TandAb, ScDiabody, ScDiabody-CH3, Diabody-CH3, triple body, miniantibody, minibody, TriBi minibody, ScFv-CH3 KIH (knobs in holes), Fab-ScFv, SCFv-CH-CL-scFv, scFv-KIH, Fab-scFv-Fc, Tetravalent HCAb, scDiabody-Fc, Diabody-Fc, intrabody, dock and lock antibodies, ImmTAC, HSAbody, ScDiabody-HAS, humabody and Tandem ScFv-toxic (see for example Christoph Spiess et al, Molecular Immunology 67 (2015) page 95-106).

The adenovirus of the present disclosure comprises a bispecific T-cell activator which is specific for at least a surface antigen on a T cell of interest. Examples of T cell surface antigens include but are not limited to: CD3, CD2, VLA-1, CD8, CD4, CCR6, CXCR5, CD25, CD31, CD45RO, CD197, CD127, CD38, CD27, CD196, CD277 and CXCR3, particularly CD2, CD3, CD31 and CD277.

Bispecific T cell activator as used herein refers to a class of artificial bispecific monoclonal antibodies comprising 2 scFvs of different antibodies or amino acid sequences from 4 different genes on a single peptide chain of about 55 KDa. One of the scFvs is specific for an immune cell, such as a T cell antigen, such as the CD3 receptor, expressed on the surface of T cells. The other scFv typically binds to a tumour cell via a tumour-specific molecule. Accordingly, bispecific T-cell activators are able to form a link between T cells and tumour cells by virtue of their specificities for an antigen on the T cell and an antigen on the tumour cell. This leads to activation of the T-cells and triggers the T cells to exert their cytotoxic effects on tumour cells, independently of MHC I or co-stimulatory molecules. Examples of bispecific T-cell activator based therapies currently approved or undergoing clinical trials include for example Blinatumomab (Blyncyto®) which targets CD19 and is for the treatment of non-Hodkin's lymphoma and acute lymphoblastic leukemia and Solitomab which targets EpCAM and is for treating gastrointestinal and lung cancers.

In one embodiment the immune cell engager (such as T cell engager) is arranged is the format VL1-linker1-VH1-linker2-VH2-linker3-VL2, for example employing linkers independently selected from linker sequences disclosed herein, for example.

In one embodiment linkers in a bispecific T-cell activator according to the present disclosure are independently selected from SEQ ID NO: 10, 14, 23, 124 to 162 and 166 to 297.

In one embodiment linker1 and linker3 have the same sequence, for example a sequence shown in any one of SEQ ID NOs: 10, 14, 23, 124 to 162 and 166 to 296, in particular 10, 14 and 23.

In one embodiment linker1 and linker3 have different amino acid sequence, for example independently selected from SEQ ID NOs: 10, 14, 23, 124 to 162 and 166 to 296, in particular 10, 14 and 23.

In one embodiment Linker1 is SEQ ID NO: 10.

In one embodiment Linker1 is SEQ ID NO: 14.

In one embodiment Linker3 is SEQ ID NO: 10.

In one embodiment Linker3 is SEQ ID NO: 14.

In one embodment Linker1 and Linker3 are SEQ ID NO: 10.

[FOLLOWED BY PAGE 17b]

2017320776 18 Sep 2024

In one embodment Linker1 and Linker3 are SEQ ID NO: 14.

In one embodiment Linker1 is SEQ ID NO: 10 and Linker 3 is SEQ ID NO: 14.

In one embodment Linker1 is SEQ ID NO: 14 and Linker3 is SEQ ID NO: 10.

In one embodiment Linker2 is different to both Linker 1 and Linker3.

In one embodimemnt Linker 2 is selected from any one of SEQ ID NOs: 10, 14, 23, 124 to 162 and 166 to 297, such as SEQ ID NO: 297.

In one embodiment Linker1 is in the range 10 to 30 amino acids in length, such as 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 or 30.

In one embodiment Linker3 is in the range 10 and 30 amino acids in length, such as 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 or 30.

[FOLLOWED BY PAGE 18]

In one embodiment Linker 2 is in the range 2 to 10 amino acids in length, such as 2, 3, 4, 5, 6, 7, 8, 9 or 10.

In one embodiment VH1 & VL1 are specific to a T cell antigen according to the present disclosure, such as CD3.

In one embodiment VH2 & VL2 are specific to an immune cell antigen, such as a T cell antigen, according to the present disclosure, such as CD3.

In one embodiment VH1 & VL1 are specific to an antigen or interest, such as a cancer antigen or stromal antigen, etc.

In one embodiment VH2 & VL2 are specific to an antigen or interest, such as a cancer antigen or stromal antigen, etc.

Stroma or stromal antigen as employed herein refers to an antigen therapeutic target in the stroma, including expressed in the molecular structure of the stroma matrix, such as connective tissue molecules or molecules associated with this matrix or antigens associated with the cellular components of the stroma, for example expressed on fibroblasts, tumour-associated macrophages, dendritic cells, NK cells and/or T-cells which have infiltrated the stroma. Examples of stroma antigens include but are not limited to FAP, TGFβ, TREM1, IGFBP7, FSP-1, fibroblast associated antigen, NG2, endosialin (CD248), platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.

Fibroblasts may be targeted by employing the antigen fibroblast activation protein (FAP), in particular an antibody specific to FAP which does not bind CD26, (see US2012/0258119 incorporated herein by reference).

FAP was originally identified as a serine protease on reactive stromal fibroblasts. Subsequent molecular cloning revealed that FAP is identical to seprase, a 170 kDa membrane associated gelatinase that is expressed by melanoma cell lines. Full length cDNA encoded a type H transmembrane protease of 760 amino acids (aa) highly homologous to dipeptidyl peptidase IV (DPPIV) with a 52% aa identity over the entire sequence and almost 70% identity in the catalytic domain. US5,587,299, incorporated herein by reference, describes nucleic acid molecules encoding FAP and applications thereof.

FAP and DPPIV have similar gene sizes and are chromosomally adjacent to each other at 2q24, suggesting a gene duplication event (Genebank accession number U09278). Both proteins are members of the prolyl peptidase family. This class of enzymes is inducible, active on the cell surface or in extracellular fluids, and uniquely capable of cleaving N-terminal dipeptides from polypeptides with proline or alanine in the penultimate position. DPPIV, also termed CD26, is constitutively expressed by several cell types including fibroblasts, endothelial and epithelial cells, leukocyte subsets like NK-cells, T-lymphocytes and macrophages. A small proportion of DPPIV circulates as soluble protein in the blood. In contrast to DPPIV, FAP is typically not expressed in normal adult tissue and its proteolytically active soluble form is termed a2-Antiplasmin Cleaving Enzyme (APCE). Marked FAP expression occurs in conditions associated with activated stroma, including wound healing, epithelial cancers, osteoarthritis, rheumatoid arthritis, cirrhosis and pulmonary fibrosis.

The FAP structure has been solved (PDB ID 1Z68) and is very similar to that of DPPIV. FAP is anchored in the plasma membrane by an uncleaved signal sequence of approximately 20 amino

acids and has a short, amino terminal, cytoplasmic domain of six amino acids. The major part of the protein, including the catalytic domain, is exposed to the extracellular environment. The FAP glycoprotein is a homodimer consisting of two identical 97-kDa subunits. Each FAP-monomer subunit consists of two domains, an αβ hydrolase domain (aa 27-53 and 493-760) and an eight-blade β propeller domain (aa 54-492) that enclose a large cavity. A small pocket within this cavity at the interface of both domains contains the catalytic triad (Ser624, Asp702 and His734). FAP gains its enzymatic activity upon homodimerization of the subunits and beside its dipeptidyl peptidase activity, FAP also has collagen type I specific gelatinase and endopeptidase activity. The β propeller acts as scaffolding for protein-protein interactions and determines substrate and extracellular matrix (ECM) binding. Furthermore, the β propeller is involved in forming supra-molecular complexes of FAP with other prolyl peptidases or with other membrane-bound molecules. The formation of heteromeric or tetrameric complexes of FAP and DPPIV were found to be associated with invadopodia of migrating cells on a collagen substrate. Type I collagen induces a close association of FAP with β1 integrins, thereby playing major organizational roles in the formation and adhesion of invadopodia. Although the involved mechanisms are not understood in detail, the formation of such proteinase-rich membrane domains at the cellular invasion front contributes to directed pericellular ECM degradation. This indicates that FAP and ECM interactions may be closely related to invasive cell behaviour by influencing cell adhesion, migration, proliferation and apoptosis through integrin pathways and supports o role of FAP in disease pathogenesis and progression. In summary, FAP is recognized as a multifunctional protein that executes its biological functions in a cell dependent manner through a combination of its protease activity and its ability to form complexes with other cell-surface molecules. Over-expression of FAP in epithelial and fibroblastic cell lines promotes malignant behaviour, pointing to the clinical situation, where cellular expression levels of FAP are correlated with worse clinical outcome.

Through paracrine signaling molecules, cancer cells activate stromal fibroblasts and induce the expression of FAP, which in turn, affects the proliferation, invasion and migration of the cancer cells. Recent studies have demonstrated that TGF-β is the dominant factor in promoting FAP protein expression (Chen, H et al (2009) Exp and Molec Pathology, doi: 10.1016/j.yexmp. 2009.09.001). FAP is heavily expressed on reactive stromal fibroblasts in 90% of human epithelial carcinomas, including those of the breast, lung, colorectum and ovary (Garin-Chesa, P et al (1990) PNAS USA 87: 7236-7239). Chen *et al* have recently shown that FAPα influences the invasion, proliferation and migration of HO-8910PM ovarian cancer cells (Chen, H *et al* (2009) Exp and Molec Pathology, doi: 10.1016/j.yexmp. 2009.09.001).

FAP may be targeted by binding said antigen and sterically blocking its interaction with biologically relevant molecules. Alternatively, or additionally cross-linking the FAP molecule with another FAP molecule or a different molecule, for example an antigen on the surface of a cancer cell may be achieved employing a multispecific, such as a bispecific antibody molecule. This cross linking raised the visibility of the cells bearing the antigens to the immune systems, which then may be activated to neutral or destroy the same.

Tumour associated macrophages (TAMs) are thought to express TREM1, CD204, CD68 (alone or in combination with CD163 or CD206). These markers can be used to target the TAMs.

2017320776 18 Sep 2024

The adenovirus of the present disclosure has the ability to infect tumour cells, and in particular is chosen to preferentially infect tumour, cells. The oncolytic virus infection causes death and lysis of the cancer cell with release of newly generated virus particles. Incorporated transgenes encoding antibodies, bispecific T-cell activators and other "payloads" are newly synthesized and actively secreted by the tumor cells prior to their death, and some molecules will also be released upon cell lysis.

Antibody molecules with a short half-life may be particularly suitable for use in the present disclosure because this minimises off-target effects because the body rapidly clears the molecules if they become systemically available.

NKT cells have the ability to target and destroy tumour associated macrophages. However, their activity seems to be inhibited by the hypoxic environment of the tumour. This activity can be restored by providing the NKT cells with IL-2 and/or IL-15, for example encoded in the virus of the present disclosure.

Thus, in one embodiment the virus according to the present disclosure further encodes a cytokine to activate and NKT cells, for example selected from IL-2, IL-15 and combinations thereof. The gene encoding the cytokine may be in the same location or a different location to the gene encoding the antibody molecule, for example independently selected from E1, E3, E4, B_X and B_Y.

Thus, the adenovirus according to the present disclosure has at least two or three mechanisms for attacking the tumour, including indirect mechanisms which undermine the tumour stroma.

Transgene as employed herein refers to a gene that has been inserted into the genome sequence, which is a gene that is unnatural to the virus (exogenous) or not normally found in that particular location in the virus. Examples of transgenes are given below. Transgene as employed herein also includes a functional fragment of the gene that is a portion of the gene which when inserted is suitable to perform the function or most of the function of the full-length gene.

Transgene and coding sequence are used interchangeably herein in the context of inserts into the viral genome, unless the context indicates otherwise. Coding sequence as employed herein means, for example a DNA sequence encoding a functional RNA, peptide, polypeptide or protein. Typically, the coding sequence is cDNA for the transgene that encodes the functional RNA, peptide, polypeptide or protein of interest. Functional RNA, peptides, polypeptide and proteins of interest are described below.

Clearly the virus genome contains coding sequences of DNA. Endogenous (naturally occurring genes) in the genomic sequence of the virus are not considered a transgene, within the context of the present specification unless then have been modified by recombinant techniques such as that they are in a non-natural location or in a non-natural environment.

In one embodiment transgene, as employed herein refers to a segment of DNA containing a gene or cDNA sequence that has been isolated from one organism and is introduced into a different organism i.e. the virus of the present disclosure. In one embodiment, this non-native segment of DNA may retain the ability to produce functional RNA, peptide, polypeptide or protein.

Thus, in one embodiment the transgene inserted encodes a human or humanised protein, polypeptide or peptide.

In one embodiment, the transgene inserted encodes a non-human protein, polypeptide or peptide (such as a non-human mammalian protein, polypeptide or peptide) or RNA molecule, for example from a mouse, rat, rabbit, camel, llama or similar. Advantageously, the viruses of the present disclosure allow the transgenes to be transported inside the cancerous cell. Thus, responses generated by the human patient to a non-human sequence (such as a protein) can be minimised by this intra-cellular delivery.

A DNA sequence may comprise more than one transgene, for example, 1, 2, 3 or 4 transgenes, such as 1 or 2.

A transgene cassette may comprise more than one transgene, for example, 1, 2, 3 or 4 transgenes, such as 1 or 2.

In one or more embodiments, the cassette is arranged as shown in the one or more of the Figures or the examples.

Transgene cassette as employed herein refers to a DNA sequence encoding one or more transgenes in the form of one or more coding sequences and one or more regulatory elements.

A transgene cassette may encode one or more monocistronic and/or polycistronic mRNA sequences.

In one embodiment, the transgene or transgene cassette encodes a monocistronic or polycistronic mRNA, and for example the cassette is suitable for insertion into the adenovirus genome at a location under the control of an endogenous promoter or exogenous promoter or a combination thereof.

Monocistronic mRNA as employed herein refers to an mRNA molecule encoding a single functional RNA, peptide, polypeptide or protein.

In one embodiment, the transgene cassette encodes monocistronic mRNA.

In one embodiment the transgene cassette in the context of a cassette encoding monocistronic mRNA means a segment of DNA optionally containing an exogenous promoter (which is a regulatory sequence that will determine where and when the transgene is active) or a splice site (which is a regulatory sequence determining when a mRNA molecule will be cleaved by the spliceosome) a coding sequence (i.e. the transgene), usually derived from the cDNA for the protein of interest, optionally containing a polyA signal sequence and a terminator sequence.

In one embodiment, the transgene cassette may encode one or more polycistronic mRNA sequences.

Polycistronic mRNA as employed herein refers to an mRNA molecule encoding two or more functional RNA, peptides or proteins or a combination thereof. In one embodiment the transgene cassette encodes a polycistronic mRNA.

In one embodiment transgene cassette in the context of a cassette encoding polycistronic mRNA includes a segment of DNA optionally containing an exogenous promoter (which is a regulatory sequence that will determine where and when the transgene is active) or a splice site (which is a regulatory sequence determining when a mRNA molecule will be cleaved by the spliceosome) two or more coding sequences (i.e. the transgenes), usually derived from the cDNA for the protein or peptide of interest, for example wherein each coding sequence is separated by either

an IRES or a 2A peptide. Following the last coding sequence to be transcribed, the cassette may optionally contain a polyA sequence and a terminator sequence.

In one embodiment, the transgene cassette encodes a monocistronic mRNA followed by a polycistronic mRNA. In another embodiment the transgene cassette a polycistronic mRNA followed by a monocistronic mRNA.

In one embodiment, the adenovirus is a human adenovirus. "Adenovirus", "serotype" or adenoviral serotype" as employed herein refers to any adenovirus that can be assigned to any of the over 50 currently known adenoviral serotypes, which are classified into subgroups A-F, and further extends to any, as yet, unidentified or unclassified adenoviral serotypes. See, for example, Strauss, "Adenovirus infections in humans," in The Adenoviruses, Ginsberg, ea., Plenum Press, New York, NY, pp. 451-596 (1984) and Shenk, "Adenoviridae: The Viruses and Their Replication," in Fields Virology, Vol.2, Fourth Edition, Knipe, 35ea., Lippincott Williams & Wilkins, pp. 2265-2267 (2001), as shown in Table 1.

Table 1

SubGroup	Adenoviral Serotype
A	12,18,31
B	3,7,11,14,16,21,34,35,51
C	1,2,5,6
D	8-10,13,15,17,19,20,22-30,32,33,36-39,42-49,50
E	4
F	40,41

The adenoviruses of the present disclosure are subgroup B virues, namely, Ad11, in particular Ad11p (the Slobitski strain) and derivatives thereof, such as EnAd.

Adenoviruses are designated to their groups/serotypes based on the capsid, such as the hexon and/or fibre

The adenovirus of the present disclosure is not a group A, C, D, E or F virus. The viruses of the present disclosure do not comprise an adenovirus death protein.

In one embodiment, the adenovirus of the present disclosure is chimeric. When an adenovirus is chimeric then the characteristics of the outer capsid will be employed to determine the serotype. Chimeric as employed herein refers to a virus that comprises DNA from at least two different virus serotypes, including different serotypes within the same group.

In one embodiment, the oncolytic virus has a fibre, hexon and penton proteins from the same serotype, for example Ad11, in particular Ad11p, for example found at positions 30812-31789, 18254-21100 and 13682-15367 of the genomic sequence of the latter wherein the nucleotide positions are relative to genbank ID 217307399 (accession number: GC689208).

In one embodiment, the adenovirus is enadenotucirev (also known as EnAd and formerly as EnAd). Enadenotucirev as employed herein refers the chimeric adenovirus of SEQ ID NO: 38. It is a replication competent oncolytic chimeric adenovirus which has enhanced therapeutic properties compared to wild type adenoviruses (see WO2005/118825). EnAd has a chimeric E2B region, which

2017320776 18 Sep 2024

features DNA from Ad11p and Ad3, and deletions in E3/E4. The structural changes in enadenotucirev result in a genome that is approximately 3.5kb smaller than Ad11p thereby providing additional "space" for the insertion of transgenes.

Enadenotucirev (EnAd) is a chimeric oncolytic adenovirus, formerly known as EnAd (WO2005/118825), with fibre, penton and hexon from Ad11p, hence it is a subgroup B virus. It has a chimeric E2B region, which comprises DNA from Ad11p and Ad3. Almost all of the E3 region and part of the E4 region is deleted in EnAd. Therefore, it has significant space in the genome to accommodate additional genetic material whilst remaining viable. Furthermore, because EnAd is a subgroup B adenovirus, pre-existing immunity in humans is less common than, for example, Ad5. Other examples of chimeric oncolytic viruses with Ad11 fibre, penton and hexon include OvAd1 and OvAd2 (see WO2006/060314).

EnAd seems to preferentially infect tumour cells, replicates rapidly in these cells and causes cell lysis. This, in turn, can generate inflammatory immune responses thereby stimulating the body to also fight the cancer. Part of the success of EnAd is hypothesised to be related to the fast replication of the virus *in vivo*.

Whilst EnAd selectively lyses tumour cells, it may be possible to introduce further beneficial properties, for example increasing the therapeutic activity of the virus or reducing side-effects of the virus by arming it with transgenes, such as a transgene which encodes a cell signalling protein or an antibody, or a transgene which encodes an entity which stimulates a cell signalling protein(s).

Advantageously arming a virus, with DNA encoding certain proteins, such as a bispecific T-cell activator, that can be expressed inside the cancer cell, may enable the body's own defences to be employed to combat tumour cells more effectively, for example by making the cells more visible to the immune system or by delivering a therapeutic gene/protein preferentially to target tumour cells.

Furthermore, the ability to insert transgenes that are reporters into the genome can aid clinical or pre-clinical studies.

It is important that expression of the transgenes does not adversely affect the replication or other advantageous properties of the virus. Thus, the gene or genes must be inserted in a location that does not compromise the replication competence and other advantageous properties of the virus. In addition, the genome of adenoviruses is tightly packed and therefore it can be difficult to find a suitable location to insert transgenes. This also limits the size of transgenes that can be accommodated.

OvAd1 and OvAd2 are also chimeric adenoviruses similar to enadenotucirev, which also have additional "space" in the genome (see WO2008/080003). Thus in one embodiment the adenovirus is OvAd1 or OvAd2.

In one embodiment, the adenovirus is oncolytic. Oncolytic adenovirus as employed herein means an adenovirus that preferentially kills cancer cells as compared with non-cancer cells.

In one embodiment, the oncolytic virus is apoptotic. That is, it hastens programmed cell death.

In one embodiment, the oncolytic virus is cytolytic. The cytolytic activity of oncolytic adenoviruses of the disclosure can be determined in representative tumour cell lines and the data converted to a measurement of potency, for example with an adenovirus belonging to subgroup C,

such as Ad5, being used as a standard (i.e. given a potency of 1). A suitable method for determining cytolytic activity is an MTS assay (see Example 4, Figure 2 of WO2005/118825 incorporated herein by reference).

In one embodiment the oncolytic virus is necrolytic. That is, it causes or hastens cell necrosis or immunogenic cell death. In one embodiment necrolytic cell death is advantageous because it triggers, induces the patients (host) immune responses.

Unless the context indicates otherwise, adenovirus as employed herein refers to a replication capable virus (such as a replication competent virus) and also replication deficient viral vectors.

Replication capable as employed herein refers to a replication competent virus or a virus whose replication is dependent on a factor in the cancer cells, for example an upregulated factor, such as p53 or similar.

In one embodiment the virus is replication competent. Replication competent in the context of the present specification refers to a virus that possesses all the necessary machinery to replicate in cells *in vitro* and *in vivo*, i.e. without the assistance of a packaging cell line. A viral vector, for example deleted in the E1 region, capable of replicating in a complementary packaging cell line is not a replication competent virus in the present context.

Viral vectors are replication deficient and require a packaging cell to provide a complementary gene to allow replication.

Adenovirus genome as employed herein means the DNA sequence encoding the structural proteins and elements relevant to the function/life cycle of an adenovirus.

All human adenovirus genomes examined to date have the same general organisation i.e., the genes encoding specific functions are located at the same position in the viral genome (referred to herein as structural elements). Each end of the viral genome has a short sequence known as the inverted terminal repeat (or ITR), which is required for viral replication. The viral genome contains five early transcription units (E1A, E1B, E2, E3, and E4), three delayed early units (IX, IVa2 and E2 late) and one late unit (major late) that is processed to generate five families of late mRNAs (L1-L5). Proteins encoded by the early genes are primarily involved in replication and modulation of the host cell response to infection, whereas the late genes encode viral structural proteins. Early genes are prefixed by the letter E and the late genes are prefixed by the letter L.

The genome of adenoviruses is tightly packed, that is, there is little non-coding sequence, and therefore it can be difficult to find a suitable location to insert transgenes. The present inventors have identified two DNA regions where transgenes are tolerated, in particular the sites identified are suitable for accommodating complicated transgenes, such as those encoding antibodies. That is, the transgene is expressed without adversely affecting the virus' viability, native properties such as oncolytic properties or replication.

In one embodiment the oncolytic or partial oncolytic virus according to the disclosure may be as a result of deletion in the E4 and/or E3 region, for example deleted in part of the E4 region or fully deleted in the E3 region, or alternatively deleted in part of the E4 region (such as E4orf4) and fully deleted in the E3 region, for example as exemplified in the sequences disclosed herein.

2017320776 18 Sep 2024

In one embodiment the oncolytic virus of the disclosure is chimeric. Chimeric as employed herein refers to virus that comprises DNA from two or more different serotypes and has oncolytic virus properties.

In one embodiment the oncolytic virus is EnAd or an active derivate thereof which retains the essential beneficial properties of the virus. EnAd is disclosed in WO2005/118825 (incorporated herein by reference) and the full sequence for the virus is provided herein SEQ ID NO: 38. The chimeric E2B region is disclosed herein as SEQ ID NO: 71.

Alternative oncolytic viruses include OvAd1 and OvAd2, which are respectively disclosed as SEQ ID NO: 2 and 3 in WO2008/080003 and incorporated herein by reference.

Advantageously, the adenoviruses of the present disclosure exhibit similar virus activity, for example replication and/or infectivity, profiles to EnAd following infection of a variety of different colon cancer cell lines *in vitro*.

STRUCTURAL ELEMENTS OF ADENOVIRUSES

The present disclosure also relates to the novel sequences of viruses or viral components/constructs, such as plasmids, disclosed herein.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(I)**

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \qquad \textbf{(I)}$$

wherein: B_1 comprises E1A, E1B or E1A-E1B; B_A comprises E2B-L1-L2-L3-E2A-L4; B_2 is a bond or comprises E3; B_X is a bond or a DNA sequence comprising a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an exogenous promoter) or both; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter) or both; B_3 is a bond or comprises E4; wherein at least one of B_X and B_Y is not a bond and comprises a transgene or a restriction site or both; and encodes a multispecific antigen molecule comprising at least two binding domains and at least one of the said domains is specific for a surface antigen on a T cell of interest. In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(I)** wherein B_1 B_X is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(I)** wherein: B_Y is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ia)**:

$$5'ITR\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \qquad \textbf{(Ia)}$$

wherein: B_A comprises E2B-L1-L2-L3-E2A-L4; B_2 is a bond or comprises E3; B_X is a bond or a DNA sequence comprising a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an exogenous promoter) or both; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter) or both; B_3 is a bond or

comprises E4; wherein at least one of B_X and B_Y is not a bond and at least one comprises a transgene or a restriction site, such as a transgene.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ia)** whereinB_X is a bond.

In one embodiment the adenovirus comprises a genome comprising the sequence of formula **(Ia)** wherein B_Y is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ib)**:

5'ITR-B_A-B_X-B_B-B_Y-B_3-3'ITR **(Ib)**

wherein: B_A comprises E2B-L1-L2-L3-E2A-L4; B_X is a bond or a DNA sequence comprising a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an exogenous promoter) or both; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter) or both; B_3 is a bond or comprises E4; wherein at least one of B_X and B_Y is not a bond and comprises a transgene or a restriction site or both, such as a transgene.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ib)** whereinB_X is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ib)** wherein B_Y is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ic)**:

5'ITR-B_A-B_2-B_X-B_B-B_Y-3'ITR **(Ic)**

wherein: B_A comprises E2B-L1-L2-L3-E2A-L4; B_2 is E3; B_X is a bond or a DNA sequence comprising a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an exogenous promoter)or both; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter) or both; wherein at least one of B_X and B_Y is not a bond and comprises a transgene or a restriction site or both, such as a transgene.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ic)** wherein B_X is a bond.

In one embodiment, the adenovirus comprises a genome comprising the sequence of formula **(Ic)** whereinB_Y is a bond.

In one embodiment the adenovirus comprises a genome comprising the sequence of formula **(Id)**:

5'ITR-B_1-B_A-B_X-B_B-B_Y-B_3-3'ITR **(Id)**

wherein: B_1 comprises E1A, E1B or E1A-E1B; B_A comprises E2B-L1-L2-L3-E2A-L4; B_X is a bond or a DNA sequence comprising a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control

2017320776 18 Sep 2024

of an exogenous promoter) or both; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: a restriction site, one or more transgenes (in particular a transgene encoding at least one bispecific T-cell activator according to the present disclosure, for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter) or both; B_3 is a bond or comprises E4; wherein at least one of B_X and B_Y is not a bond and comprises a transgene a restriction site or both.

In one embodiment the adenovirus comprises a genome comprising the sequence of formula **(Id)** wherein B_X is a bond.

In one embodiment the adenovirus comprises a genome comprising the sequence of formula **(Id)** where inB_Y is a bond.

In one embodiment the adenovirus comprises a genome comprising the sequence of formula **(Ie)**:

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}\ B_B\text{-}B_Y\text{-}3'ITR \qquad \textbf{(Ie)}$$

wherein: B_1 comprises E1A, E1B or E1A-E1B; B_A comprises E2B-L1-L2-L3-E2A-L4; B_2 comprises E3;; B_B comprises L5; B_Y is a bond or a DNA sequence comprising: one or more transgenesencoding at least one bispecific T-cell activator according to the present disclosure (for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as the CMV promoter); wherein at least one of B_X and B_Y is not a bond and comprises a transgene a restriction site or both.

In one embodiment there is provided a compound of formula (I), (Ia), (Ib), (Ic), (Id) or (Ie) wherein B_X and B_Y is not a bond and comprises a transgene a restriction site or both, such as B_X and B_Y are both a transgene.

In one embodiment of formula (I), (Ia), (Ib), (Ic) or (Id) only B_X encodes one or two bispecific T-cell activators, for example one bispecific T-cell activator (and B_Y does not encode a bispecific T-cell activator), in particular said bispecific T-cell activator or bispecific T-cell activators are under the control of an exogenous promoter, such as the CMV promoter. In one embodiment of formula (I), (Ia), (Ib), (Ic) or (Id) only B_Y encodes one or two bispecific T-cell activators, for example one bispecific T-cell activator (and B_X does not encode a bispecific T-cell activator), in particular said bispecific T-cell activator or bispecific T-cell activators are under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter, such as a CMV promoter. In one embodiment of formula (I), (Ia), (Ib), (Ic) or (Id) B_X encodes a bispecific T-cell activator (for example under the control of an exogenous promoter such as a CMV promoter) and B_Y encodes a bispecific T-cell activator (for example under the control of an endogenous promoter, such as the MPL or under the control of an exogenous promoter such as a CMV promoter).

A bond refers to a covalent bond connecting one DNA sequence to another DNA sequence, for example connecting one section of the virus genome to another. Thus when a variable in formula (I) (Ia), (Ib), (Ic), (Id) or (Ie) herein represents a bond the feature or element represented by the bond is absent i.e. deleted.

As the structure of adenoviruses is, in general, similar the elements below are discussed in terms of the structural elements and the commonly used nomenclature referring thereto, which are known to the

2017320776 18 Sep 2024

skilled person. When an element is referred to herein then we refer to the DNA sequence encoding the element or a DNA sequence encoding the same structural protein of the element in an adenovirus. The latter is relevant because of the redundancy of the DNA code. The viruses' preference for codon usage may need to be considered for optimised results.

Any structural element from an adenovirus employed in the viruses of the present disclosure may comprise or consist of the natural sequence or may have similarity over the given length of at least 95%, such as 96%, 97%, 98%, 99% or 100%. The original sequence may be modified to omit 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2% or 1% of the genetic material. The skilled person is aware that when making changes the reading frames of the virus must be not disrupted such that the expression of structural proteins is disrupted.

In one embodiment the given element is a full-length sequence i.e. the full-length gene.

In one embodiment the given element is less than a full-length and retains the same or corresponding function as the full-length sequence.

In one embodiment for a given element which is optional in the constructs of the present disclosure, the DNA sequence may be less than a full-length and have no functionality.

The structural genes encoding structural or functional proteins of the adenovirus are generally linked by non-coding regions of DNA. Thus there is some flexibility about where to "cut" the genomic sequence of the structural element of interest (especially non-coding regions thereof) for the purpose of inserting a transgene into the viruses of the present disclosure. Thus for the purposes of the present specification, the element will be considered a structural element of reference to the extent that it is fit for purpose and does not encode extraneous material. Thus, if appropriate the gene will be associated with suitable non-coding regions, for example as found in the natural structure of the virus.

Thus in one embodiment an insert, such as DNA encoding a restriction site and/or transgene, is inserted into a non-coding region of genomic virus DNA, such as an intron or intergenic sequence. Having said this some non-coding regions of adenovirus may have a function, for example in alternative splicing, transcription regulation or translation regulation, and this may need to be taken into consideration.

The sites identified herein, that are associated with the L5 region (for example between L5 and the E4 region), are suitable for accommodating a variety of DNA sequences encoding complex entities such as RNAi, cytokines, single chain or multimeric proteins, such as antibodies, such as a bispecific T-cell activator.

Gene as employed herein refers to coding and any non-coding sequences associated therewith, for example introns and associated exons. In one embodiment a gene comprises or consists of only essential structural components, for example coding region.

Below follows a discussion relating to specific structural elements of adenoviruses.

The Inverted Terminal Repeat (ITR) sequences are common to all known adenoviruses and were so named because of their symmetry, and are the viral chromosome origins of replication. Another property of these sequences is their ability to form a hairpin.

The 5'ITR as employed herein refers to part or all of an ITR from the 5' end of an adenovirus, which retains the function of the ITR when incorporated into an adenovirus in an appropriate location. In one embodiment the 5'ITR comprises or consists of the sequence from about 1bp to 138bp of SEQ ID NO: 38 or a sequence 90, 95, 96, 97, 98 or 99% identical thereto along the whole length, in particular the sequence consisting of from about 1bp to 138bp of SEQ ID NO: 38.

The 3'ITR as employed herein refers to part or all of an ITR from 3' end of an adenovirus which retains the function of the ITR when incorporated into an adenovirus in an appropriate location. In one embodiment the 3'ITR comprises or consists of the sequence from about 32189bp to 32326bp of SEQ ID NO: 38 or a sequence 90, 95, 96, 97, 98 or 99% identical thereto along the whole length, in particular the sequence consisting of from about 32189bp to 32326bp of SEQ ID NO: 38.

B_1 as employed herein refers to the DNA sequence encoding: part or all of an E1A from an adenovirus, part or all of the E1B region of an adenovirus, and independently part or all of E1A and E1B region of an adenovirus.

When B_1 is a bond then E1A and E1B sequences will be omitted from the virus. In one embodiment B_1 is a bond and thus the virus is a vector.

In one embodiment B_1 further comprises a transgene. It is known in the art that the E1 region can accommodate a transgene which may be inserted in a disruptive way into the E1 region (i.e. in the "middle" of the sequence) or part or all of the E1 region may be deleted to provide more room to accommodate genetic material.

E1A as employed herein refers to the DNA sequence encoding part or all of an adenovirus E1A region. The latter here is referring to the polypeptide/protein E1A. It may be mutated such that the protein encoded by the E1A gene has conservative or non-conservative amino acid changes, such that it has: the same function as wild-type (i.e. the corresponding non-mutated protein); increased function in comparison to wild-type protein; decreased function, such as no function in comparison to wild-type protein; or has a new function in comparison to wild-type protein or a combination of the same as appropriate.

E1B as employed herein refers to the DNA sequence encoding part or all of an adenovirus E1B region (i.e. polypeptide or protein), it may be mutated such that the protein encoded by the E1B gene/region has conservative or non-conservative amino acid changes, such that it has: the same function as wild-type (i.e. the corresponding non-mutated protein); increased function in comparison to wild-type protein; decreased function, such as no function in comparison to wild-type protein; or has a new function in comparison to wild-type protein or a combination of the same as appropriate.

Thus B_1 can be modified or unmodified relative to a wild-type E1 region, such as a wild-type E1A and/or E1B. The skilled person can easily identify whether E1A and/or E1B are present or (part) deleted or mutated.

Wild-type as employed herein refers to a known adenovirus. A known adenovirus is one that has been identified and named, regardless of whether the sequence is available.

In one embodiment B_1 has the sequence from 139bp to 3932bp of SEQ ID NO: 38.

B_A as employed herein refers to the DNA sequence encoding the E2B-L1-L2-L3-E2A-L4 regions including any non-coding sequences, as appropriate. Generally this sequence will not comprise a transgene. In one embodiment the sequence is substantially similar or identical to a contiguous sequence from a known adenovirus, for example a serotype shown in Table 1, in particular a group B virus, for example Ad3, Ad7, Ad11, Ad14, Ad16, Ad21, Ad34, Ad35, Ad51 or a combination thereof, such as Ad3, Ad11 or a combination thereof. In one embodiment is E2B-L1-L2-L3-E2A-L4 refers to comprising these elements and other structural elements associated with the region, for example B_A will generally include the sequence encoding the protein IV2a, for example as follows: IV2A IV2a-E2B-L1-L2-L3-E2A-L4

In one embodiment the E2B region is chimeric. That is, comprises DNA sequences from two or more different adenoviral serotypes, for example from Ad3 and Ad11, such as Ad11p. In one embodiment the E2B region has the sequence from 5068bp to 10355bp of SEQ ID NO: 38 or a sequence 95%, 96%, 97%, 98% or 99% identical thereto over the whole length.

In one embodiment the E2B in component B_A comprises the sequences shown in SEQ ID NO: 71 (which corresponds to SEQ ID NO: 3 disclosed in WO2005/118825).

In one embodiment B_A has the sequence from 3933bp to 27184bp of SEQ ID NO: 38.

E3 as employed herein refers to the DNA sequence encoding part or all of an adenovirus E3 region (i.e. protein/polypeptide), it may be mutated such that the protein encoded by the E3 gene has conservative or non-conservative amino acid changes, such that it has the same function as wild-type (the corresponding unmutated protein); increased function in comparison to wild-type protein; decreased function, such as no function in comparison to wild-type protein or has a new function in comparison to wild-type protein or a combination of the same, as appropriate.

In one embodiment the E3 region is form an adenovirus serotype given in Table 1 or a combination thereof, in particular a group B serotype, for example Ad3, Ad7, Ad11 (in particular Ad11p), Ad14, Ad16, Ad21, Ad34, Ad35, Ad51 or a combination thereof, such as Ad3, Ad11 (in particular Ad11p) or a combination thereof.

In one embodiment the E3 region is partially deleted, for example is 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10%, 5% deleted.
In one embodiment B_2 is a bond, wherein the DNA encoding the E3 region is absent.

In one embodiment the DNA encoding the E3 region can be replaced or interrupted by a transgene. As employed herein "E3 region replaced by a transgene as employed herein includes part or all of the E3 region is replaced with a transgene.

In one embodiment the B_2 region comprises the sequence from 27185bp to 28165bp of SEQ ID NO: 38.

In one embodiment B_2 consists of the sequence from 27185bp to 28165bp of SEQ ID NO: 38.

B_X as employed herein refers to the DNA sequence in the vicinity of the 5' end of the L5 gene in B_B. In the vicinity of or proximal to the 5' end of the L5 gene as employed herein refers to: adjacent (contiguous) to the 5' end of the L5 gene or a non-coding region inherently associated herewith i.e.

abutting or contiguous to the 5' prime end of the L5 gene or a non-coding region inherently associated therewith. Alternatively, in the vicinity of or proximal to may refer to being close the L5 gene, such that there are no coding sequences between the B_X region and the 5' end of L5 gene.

Thus in one embodiment B_X is joined directly to a base of L5 which represents, for example the start of a coding sequence of the L5 gene.

Thus in one embodiment B_X is joined directly to a base of L5 which represents, for example the start of a non-coding sequence, or joined directly to a non-coding region naturally associated with L5. A non-coding region naturally associated L5 as employed herein refers to part of all of a non-coding regions which is part of the L5 gene or contiguous therewith but not part of another gene.

In one embodiment B_X comprises the sequence of SEQ ID NO: 39. This sequence is an artificial non-coding sequence wherein a DNA sequence, for example comprising a transgene (or transgene cassette), a restriction site or a combination thereof may be inserted therein. This sequence is advantageous because it acts as a buffer in that allows some flexibility on the exact location of the transgene whilst minimising the disruptive effects on virus stability and viability.

The insert(s) can occur anywhere within SEQ ID NO: 39 from the 5' end, the 3' end or at any point between bp 1 to 201, for example between base pairs 1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9, 9/10, 10/11, 11/12, 12/13, 13/14, 14/15, 15/16, 16/17, 17/18, 18/19, 19/20, 20/21, 21/22, 22/23, 23/24, 24/25, 25/26, 26/27, 27/28, 28/29, 29/30, 30/31, 31/32, 32/33, 33/34, 34/35, 35/36, 36/37, 37/38, 38/39, 39/40, 40/41, 41/42, 42/43, 43/44, 44/45, 45/46, 46/47, 47/48, 48/49, 49/50, 50/51, 51/52, 52/53, 53/54, 54/55, 55/56, 56/57, 57/58, 58/59, 59/60, 60/61, 61/62, 62/63, 63/64, 64/65, 65/66, 66/67, 67/68, 68/69, 69/70, 70/71, 71/72, 72/73, 73/74, 74/75, 75/76, 76/77, 77/78, 78/79, 79/80, 80/81, 81/82, 82/83, 83/84, 84/85, 85/86, 86/87, 87/88, 88/89, 89/90, 90/91, 91/92, 92/93, 93/94, 94/95, 95/96, 96/97, 97/98, 98/99, 99/100, 100/101, 101/102, 102/103, 103/104, 104/105, 105/106, 106/107, 107/108, 108/109, 109/110, 110/111, 111/112, 112/113, 113/114, 114/115, 115/116, 116/117, 117/118, 118/119, 119/120, 120/121, 121/122, 122/123, 123/124, 124/125, 125/126, 126/127, 127/128, 128/129, 129/130, 130/131, 131/132, 132/133, 133/134, 134/135, 135/136, 136/137, 137/138, 138/139, 139/140, 140/141, 141/142, 142/143, 143/144, 144/145, 145/146, 146/147, 147/148, 148/149, 150/151, 151/152, 152/153, 153/154, 154/155, 155/156, 156/157, 157/158, 158/159, 159/160, 160/161, 161/162, 162/163, 163/164, 164/165, 165/166, 166/167, 167/168, 168/169, 169/170, 170/171, 171/172, 172/173, 173/174, 174/175, 175/176, 176/177, 177/178, 178/179, 179/180, 180/181, 181/182, 182/183, 183/184, 184/185, 185/186, 186/187, 187/188, 189/190, 190/191, 191/192, 192/193, 193/194, 194/195, 195/196, 196/197, 197/198, 198/199, 199/200 or 200/201.

In one embodiment B_X comprises SEQ ID NO: 39 with a DNA sequence inserted between bp 27 and bp 28 or a place corresponding to between positions 28192bp and 28193bp of SEQ ID NO: 38.

In one embodiment the insert is a restriction site insert. In one embodiment the restriction site insert comprises one or two restriction sites. In one embodiment the restriction site is a 19bp restriction site insert comprising 2 restriction sites. In one embodiment the restriction site insert is a 9bp restriction site insert comprising 1 restriction site. In one embodiment the restriction site

insert comprises one or two restriction sites and at least one transgene, for example one or two transgenes. In one embodiment the restriction site is a 19bp restriction site insert comprising 2 restriction sites and at least one transgene, for example one or two transgenes. In one embodiment the restriction site insert is a 9bp restriction site insert comprising 1 restriction site and at least one transgene, for example one, two or three transgenes, such as one or two. In one embodiment two restriction sites sandwich one or more, such as two transgenes (for example in a transgene cassette). In one embodiment when B_X comprises two restrictions sites the said restriction sites are different from each other. In one embodiment said one or more restrictions sites in B_X are non-naturally occurring in the particular adenovirus genome into which they have been inserted. In one embodiment said one or more restrictions sites in B_X are different to other restrictions sites located elsewhere in the adenovirus genome, for example different to naturally occurring restrictions sites and/or restriction sites introduced into other parts of the genome, such as a restriction site introduced into B_Y. Thus in one embodiment the restriction site or sites allow the DNA in the section to be cut specifically.

Advantageously, use of "unique" restriction sites provides selectivity and control over the where the virus genome is cut, simply by using the appropriate restriction enzyme.

Cut specifically as employed herein refers to where use of an enzyme specific to the restriction sites cuts the virus only in the desired location, usually one location, although occasionally it may be a pair of locations. A pair of locations as employed herein refers to two restrictions sites in proximity of each other that are designed to be cut by the same enzyme (i.e. cannot be differentiated from each other).

In one embodiment the restriction site insert is SEQ ID NO: 50.

In one embodiment B_X has the sequence from 28166bp to 28366bp of SEQ ID NO: 38.

In one embodiment B_X is a bond.

In one embodiment B_X comprises a restriction site, for example 1, 2, 3 or 4 restriction sites, such as 1 or 2. In one embodiment B_X comprises at least one transgene, for example 1 or 2 transgenes. In one embodiment B_X comprises at least one transgene, for example 1 or 2 transgenes and one or more restriction sites, for example 2 or 3 restriction sites, in particular where the restrict sites sandwich a gene or the DNA sequence comprising the genes to allow it/them to be specifically excised from the genome and/or replaced. Alternatively, the restriction sites may sandwich each gene, for example when there are two transgenes three different restriction sites are required to ensure that the genes can be selectively excised and/or replaced. In one embodiment one or more, for example all the transgenes are in the form a transgene cassette. In one embodiment B_X comprises SEQ ID NO: 39. In one embodiment SEQ ID NO: 39 is interrupted, for example by a transgene. In embodiment SEQ ID NO: 39 is uninterrupted. In one embodiment B_X does not comprise a restriction site. In one embodiment B_X is a bond. In one embodiment Bx comprises or consists of one or more transgenes.

In one embodiment B_Y comprises a restriction site, for example 1, 2, 3 or 4 restriction sites, such as 1 or 2. In one embodiment B_Y comprises at least one transgene, for example 1 or 2 transgenes. In one embodiment B_Y comprises at least one transgene, for example 1 or 2 transgenes and one or more restriction sites, for example 2 or 3 restriction sites, in particular where the restrict

sites sandwich a gene or the DNA sequence comprising the genes to allow it/them to be specifically excised from the genome and/or replaced. Alternatively the restriction sites may sandwich each gene, for example when there are two transgenes three different restriction sites are required to ensure that the genes can be selectively excised and/or replaced. In one embodiment one or more, for example all the transgenes are in the form a transgene cassette. In one embodiment B_Y comprises SEQ ID NO: 40. In one embodiment SEQ ID NO: 40 is interrupted, for example by a transgene. In embodiment SEQ ID NO: 40 is uninterrupted. In one embodiment B_Y does not comprise a restriction site. In one embodiment B_Y is a bond. In one embodiment B_Y comprises or consists of one or more transgenes.

In one embodiment B_X and B_Y each comprises a restriction site, for example 1, 2, 3 or 4 restriction sites, such as 1 or 2. In one embodiment B_X and B_Y each comprises at least one transgene, for example 1 or 2 transgenes. In one embodiment B_X and B_Y each comprises at least one transgene, for example 1 or 2 transgenes and one or more restriction sites, for example 2 or 3 restriction sites, in particular where the restriction sites sandwich a gene or the DNA sequence comprising the genes to allow it to be specifically excised from the genome and/or replaced. Alternatively the restriction sites may sandwich each gene, for example when there are two transgenes three different restriction sites are required to ensure that the genes can be selectively excised and/or replaced. In one embodiment one or more, for example all the transgenes are in the form a transgene cassette. In one embodiment B_X and B_Y comprises SEQ ID NO: 39 and SEQ ID NO: 40 respectively. In one embodiment B_X and B_Y do not comprise a restriction site. In one embodiment B_X is a bond and B_Y is not a bond. In one embodiment B_Y is a bond and B_X is not a bond.

B_B as employed herein refers to the DNA sequence encoding the L5 region. As employed herein the L5 region refers to the DNA sequence containing the gene encoding the fibre polypeptide/protein, as appropriate in the context. The fibre gene/region encodes the fibre protein which is a major capsid component of adenoviruses. The fibre functions in receptor recognition and contributes to the adenovirus' ability to selectively bind and infect cells.

In viruses of the present disclosure the fibre can be from any adenovirus strain of serotype 11, such as Ad11p.

In one embodiment B_B has the sequence from 28367bp to 29344bp of SEQ ID NO: 38.

DNA sequence in relation to B_Y as employed herein refers to the DNA sequence in the vicinity of the 3' end of the L5 gene of B_B. In the vicinity of or proximal to the 3' end of the L5 gene as employed herein refers to: adjacent (contiguous) to the 3' end of the L5 gene or a non-coding region inherently associated therewith i.e. abutting or contiguous to the 3' prime end of the L5 gene or a non-coding region inherently associated therewith (i.e. all or part of an non-coding sequence endogenous to L5). Alternatively, in the vicinity of or proximal to may refer to being close the L5 gene, such that there are no coding sequences between the B_Y region and the 3' end of the L5 gene.

Thus, in one embodiment B_Y is joined directly to a base of L5 which represents the "end" of a coding sequence.

Thus, in one embodiment B_Y is joined directly to a base of L5 which represents the "end" of a non-coding sequence, or joined directly to a non-coding region naturally associated with L5.

Inherently and naturally are used interchangeably herein. In one embodiment B_Y comprises the sequence of SEQ ID NO: 40. This sequence is a non-coding sequence wherein a DNA sequence, for example comprising a transgene (or transgene cassette), a restriction site or a combination thereof may be inserted. This sequence is advantageous because it acts a buffer in that allows some flexibility on the exact location of the transgene whilst minimising the disruptive effects on virus stability and viability.

The insert(s) can occur anywhere within SEQ ID NO: 40 from the 5' end, the 3' end or at any point between bp 1 to 35, for example between base pairs 1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9, 9/10, 10/11, 11/12, 12/13, 13/14, 14/15, 15/16, 16/17, 17/18, 18/19, 19/20, 20/21, 21/22, 22/23, 23/24, 24/25, 25/26, 26/27, 27/28, 28/29, 29/30, 30/31, 31/32, 32/33, 33/34, or 34/35.

In one embodiment B_Y comprises SEQ ID NO: 40 with a DNA sequence inserted between positions bp 12 and 13 or a place corresponding to 29356bp and 29357bp in SEQ ID NO: 38. In one embodiment the insert is a restriction site insert. In one embodiment the restriction site insert comprises one or two restriction sites. In one embodiment the restriction site is a 19bp restriction site insert comprising 2 restriction sites. In one embodiment the restriction site insert is a 9bp restriction site insert comprising 1 restriction site. In one embodiment the restriction site insert comprises one or two restriction sites and at least one transgene, for example one or two or three transgenes, such as one or two transgenes. In one embodiment the restriction site is a 19bp restriction site insert comprising 2 restriction sites and at least one transgene, for example one or two transgenes. In one embodiment, the restriction site insert is a 9bp restriction site insert comprising 1 restriction site and at least one transgene, for example one or two transgenes. In one embodiment two restriction sites sandwich one or more, such as two transgenes (for example in a transgene cassette). In one embodiment when B_Y comprises two restrictions sites the said restriction sites are different from each other. In one embodiment said one or more restrictions sites in B_Y are non-naturally occurring (such as unique) in the particular adenovirus genome into which they have been inserted. In one embodiment said one or more restrictions sites in B_Y are different to other restrictions sites located elsewhere in the adenovirus genome, for example different to naturally occurring restrictions sites or restriction sites introduced into other parts of the genome, such as B_X. Thus, in one embodiment the restriction site or sites allow the DNA in the section to be cut specifically.

In one embodiment, the restriction site insert is SEQ ID NO: 51.

In one embodiment B_Y has the sequence from 29345bp to 29379bp of SEQ ID NO: 38.

In one embodiment B_Y is a bond.

In one embodiment, the insert is after bp 12 in SEQ ID NO: 40.

In one embodiment ,the insert is at about position 29356bp of SEQ ID NO: 38.

In one embodiment, the insert is a transgene cassette comprising one or more transgenes, for example 1, 2 or 3, such as 1 or 2.

E4 as employed herein refers to the DNA sequence encoding part or all of an adenovirus E4 region (i.e. polypeptide/protein region), which may be mutated such that the protein encoded by the E4 gene has conservative or non-conservative amino acid changes, and has the same function as wild-type (the corresponding non-mutated protein); increased function in comparison to wild-type

protein; decreased function, such as no function in comparison to wild-type protein or has a new function in comparison to wild-type protein or a combination of the same as appropriate. In one embodiment the E4 region has E4orf4 deleted.

In one embodiment the E4 region is partially deleted, for example is 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10% or 5% deleted. In one embodiment the E4 region has the sequence from 32188bp to 29380bp of SEQ ID NO: 38.

In one embodiment B_3 is a bond, i.e. wherein E4 is absent.

In one embodiment B_3 has the sequence consisting of from 32188bp to 29380bp of SEQ ID NO: 38.

As employed herein number ranges are inclusive of the end points.

The skilled person will appreciate that the elements in the formulas herein, such as formula (I), (Ia), (Ib), (Ic), (Id) and (Ie) are contiguous and may embody non-coding DNA sequences as well as the genes and coding DNA sequences (structural features) mentioned herein. In one or more embodiments, the formulas of the present disclosure are attempting to describe a naturally occurring sequence in the adenovirus genome. In this context, it will be clear to the skilled person that the formula is referring to the major elements characterising the relevant section of genome and is not intended to be an exhaustive description of the genomic stretch of DNA.

E1A, E1B, E3 and E4 as employed herein each independently refer to the wild-type and equivalents thereof, mutated or partially deleted forms of each region as described herein, in particular a wild-type sequence from a known adenovirus.

"Insert" as employed herein refers to a DNA sequence that is incorporated either at the 5' end, the 3' end or within a given DNA sequence reference segment such that it interrupts the reference sequence. The latter is a reference sequence employed as a reference point relative to which the insert is located. In the context of the present disclosure inserts generally occur within either SEQ ID NO: 10 or SEQ ID NO: 11. An insert can be either a restriction site insert, a transgene cassette or both. When the sequence is interrupted the virus will still comprise the original sequence, but generally it will be as two fragments sandwiching the insert.

In one embodiment the transgene or transgene cassette does not comprise a non-biased inserting transposon, such as a TN7 transposon or part thereof. Tn7 transposon as employed herein refers to a non-biased insertion transposon as described in WO2008/080003.

In one embodiment one or more restrictions sites in B_X and B_Y are independently selected from a restriction site specific to an enzyme described herein, for example *Not*I, *Fse*I, *AsiS*I, *Sgf*I and *Sbf*I, in particular the restriction sites inserted are all different, such as sites specific for *Not*I and sites specific for *Fse*I located in B_X and *Sgf*I and *Sbf*I located in B_Y.

As discussed above in one embodiment the region B_X and/or B_Y do not comprise a restriction site. Advantageously, the viruses and constructs of the present disclosure can be prepared without restriction sites, for example using synthetic techniques. These techniques allow a great flexibility in the creation of the viruses and constructs. Furthermore, the present inventors have established that the properties of the viruses and constructs are not diminished when they are prepared by synthetic techniques.

Promoters

Promoter as employed herein means a region of DNA that initiates transcription of a particular gene or genes. Promoters are generally located proximal to the genes they transcribe, on the same strand and upstream (i.e. 5') on the DNA. Proximal as employed in this context means sufficiently close to function as a promoter. In one embodiment, the promoter is within 100 bp of the transcription start site. Thus, endogenous promoter as employed herein refers to a promoter that naturally occurs in (i.e. is native to) the adenovirus (or construct) into which the transgene, is being inserted. In one or more embodiments, the endogenous promoter employed is the naturally occurring promoter in the virus in its original location in the virus genome, in particular this is the primary or only promoter employed in the expression of the transgene or transgenes. In one embodiment the endogenous promoter used to promote the translation and optionally the transcription of the transgene is one resident, i.e. is one integrated in the genome of the adenovirus and not previously introduced by recombinant techniques.

Under the control of an endogenous promoter as employed herein refers to where the transgene/transgene cassette is inserted in the appropriate orientation to be under the control of said endogenous promoter. That is, where the promoter is generally on the antisense strand, the cassette is inserted, for example in the antisense orientation.

Having said this, genes can be expressed in one of two orientations. However, generally one orientation provides increased levels of expression over the other orientation, for a given (particular) transgene.

In one embodiment, the cassette is in the sense orientation. That is, is transcribed in a 5' to 3' direction. In one embodiment, the cassette is in the antisense orientation. That is, transcribed in the 3' to 5' orientation.

The endogenous promoters in the virus can, for example, be utilised by employing a gene encoding a transgene and a splice acceptor sequence. Thus in one embodiment the cassette will comprise a splice acceptor sequence when under the control of an endogenous promoter. Thus in one embodiment the coding sequence, for example the sequence encoding the antibody or antibody binding fragment further comprises a splice acceptor sequence.

In one embodiment the transgene, transgenes, or transgene cassette are under the control of an E4 promoter or a major late promoter, such as the major late promoter (ML promoter).

Under the control of as employed herein means that the transgene is activated, i.e. transcribed, when a particular promoter dictates.

The Major Late Promoter (ML promoter or MLP) as employed herein refers to the adenovirus promoter that controls expression of the "late expressed" genes, such as the L5 gene. The MLP is a "sense strand" promoter. That is, the promoter influences genes that are downstream of the promoter in the 5'-3' direction. The major late promoter as employed herein refers the original major late promoter located in the virus genome.

E4 promoter as employed herein refers to the adenovirus promoter of the E4 region. The E4 region is an antisense region; therefore the promoter is an antisense promoter. That is, the promoter is upstream of the E4 region in the 3'-5' direction. Therefore any transgene cassette under control of the E4 promoter may need to be oriented appropriately. In one embodiment the cassette under

2017320776 18 Sep 2024

the control of the E4 promoter is in the antisense orientation. In one embodiment the cassette is under the control of the E4 promoter in the sense orientation. The E4 promoter as employed herein refers to the original E4 promoter located in the virus genome.

Thus in one embodiment there is provided a replication competent oncolytic adenovirus serotype 11 (such as Ad11p) or virus-derivative thereof wherein the fibre, hexon and capsid are serotype 11 (such as Ad11p), wherein the virus genome comprises a DNA sequence encoding a therapeutic antibody or antibody-binding fragment (such as a bispecific T-cell activator), wherein said DNA sequence under the control of a promoter endogenous to the adenovirus selected from consisting of E4 and the major late promoter (i.e. the E4 promoter or the major late promoter), such that the transgene does not interfere with virus replication, for example is associated with the L5 region (i.e. before or after said region), such as located after L5 in the virus genome, in particular located between L5 and the E4 region.

In one embodiment, an endogenous promoter is introduced into the viral genome at a desired location by recombinant techniques, for example is introduced in the transgene cassette. However, in the context of the present specification this arrangement will generally be referred to as an exogenous promoter.

In one embodiment, the transgene cassette comprises an exogenous promoter. Exogenous promoter as employed herein refers to a promoter that is not naturally occurring in the adenovirus into which the transgene is being inserted. Typically, exogenous promoters are from other viruses or are mammalian promoters. Exogenous promoter as employed herein means a DNA element, usually located upstream of the gene of interest, that regulates the transcription of the gene.

In one embodiment, the regulator of gene expression is an exogenous promoter, for example CMV (cytomegalovirus promoter), CBA (chicken beta actin promoter) or PGK (phosphoglycerate kinase 1 promoter), such as CMV promoter.

In one embodiment, the CMV exogenous promoter employed has the nucleotide sequence of SEQ ID NO: 52. In one embodiment the PGK exogenous promoter employed has the nucleotide sequence of SEQ ID NO: 53. In one embodiment the CBA exogenous promoter employed has the nucleotide sequence of SEQ ID NO: 54.

In one embodiment there is provided a replication competent oncolytic adenovirus serotype 11 (such as Ad11p) or virus-derivative thereof wherein the fibre, hexon and capsid are serotype 11 (such as Ad11p), wherein the virus genome comprises a DNA sequence encoding a therapeutic antibody or antibody-binding fragment (such as a bispecific T-cell activator according to the present disclosure) located in a part of the virus genome which is expressed late in the virus replication cycle and such that the transgene does not interfere with virus replication, wherein said DNA sequence under the control of a promoter exogenous to the adenovirus (for example the CMV promoter). In one embodiment the DNA sequence encoding an antibody or fragment (such as a bispecific T-cell activator according to the present disclosure) is associated with the L5 region as described elsewhere herein, in particular located between L5 and E4 region.

In one embodiment, the exogenous promoter is an antigen-presenting cell promoter. Antigen-presenting cell promoter as employed herein refers to a promoter for a gene that is selectively expressed by antigen-presenting cells, such as dendritic cells or macrophages. Such

genes include but are not limited to: FLT-3, FLT-3 ligand, TLRs, CD1a, CD1c, CD11b, CD11c, CD80, CD83, CD86, CD123, CD172a, CD205, CD207, CD209, CD273, CD281, CD283, CD286, CD289, CD287, CXCR4, GITR Ligand, IFN-α2, IL-12, IL-23, ILT1, ILT2, ILT3, ILT4, ILT5, ILT7, TSLP Receptor, CD141, CD303, CADM1, CLEC9a, XCR1 or CD304; antigen processing and presentation mediators such as CTIIA or GILT. Thus in one embodiment the exogenous promoter is suitable for selective expression of transgenes in said antigen-presenting cells.

Other Regulatory Sequences

"Regulator of gene expression" (or regulator/regulatory element) as employed herein refers to a genetic feature, such as a promoter, enhancer or a splice acceptor sequence that plays a role in gene expression, typically by initiating or enhancing transcription or translation.

"Splice acceptor sequence", "splice acceptor" or "splice site" as employed herein refers to a regulatory sequence determining when an mRNA molecule will be recognised by small nuclear ribonucleoproteins of the spliceosome complex. Once assembled the spliceosome catalyses splicing between the splice acceptor site of the mRNA molecule to an upstream splice donor site producing a mature mRNA molecule that can be translated to produce a single polypeptide or protein.

Different sized splice acceptor sequences may be employed in the present invention and these can be described as short splice acceptor (small), splice acceptor (medium) and branched splice acceptor (large).

SSA as employed herein means a short splice acceptor, typically comprising just the splice site, for example 4 base pairs. SA as employed herein means a splice acceptor, typically comprising the short splice acceptor and the polypyrimidine tract, for example 16 bp. bSA as employed herein means a branched splice acceptor, typically comprising the short splice acceptor, polypyrimidine tract and the branch point, for example 26 base pairs.

In one embodiment, the splice acceptor employed in the constructs of the disclosure are shown in SEQ ID NO: 55 to 57. In one embodiment, the SSA has the nucleotide sequence of SEQ ID NO: 55. In one embodiment the SA has the nucleotide sequence of SEQ ID NO: 56. In one embodiment the bSA has the nucleotide sequence of SEQ ID NO: 57. In one embodiment the splice acceptor sequence is independently selected from the group comprising: TGCTAATCTT CCTTTCTCTC TTCAGG (SEQ ID NO: 57), CCTTTCTCTCTT CAGG (SEQ ID NO: 56), and CAGG (SEQ ID NO: 55).

In one embodiment the splice site is immediately proceeded (i.e. followed in a 5' to 3' direction) by a consensus Kozak sequence comprising CCACC. In one embodiment the splice site and the Kozak sequence are interspersed by up to 100 or less base pairs. In one embodiment the Kozak sequence has the nucleotide sequence of SEQ ID NO: 58.

Typically, when under the control of an endogenous or exogenous promoter (such as an endogenous promoter), the coding sequence will be immediately preceded by a Kozak sequence. The start of the coding region is indicated by the initiation codon (AUG), for example is in the context of the sequence (gcc)gccRcc**AUG**g [SEQ ID NO: 59] the start of the "start" of the coding sequences is indicated by the bases in bold. A lower case letter denotes common bases at this position (which can nevertheless vary) and upper case letters indicate highly-conserved bases, *i.e.* the 'AUGG'

2017320776 18 Sep 2024

sequence is constant or rarely, if ever, changes; 'R' indicates that a purine (adenine or guanine) is usually observed at this position and the sequence in brackets (gcc) is of uncertain significance. Thus in one embodiment the initiation codon AUG is incorporated into a Kozak sequence.

Internal Ribosome Entry DNA Sequence as employed herein refers to a DNA sequence encoding an Internal Ribosome Entry Sequence (IRES). IRES as employed herein means a nucleotide sequence that allows for initiation of translation a messenger RNA (mRNA) sequence, including initiation starting within an mRNA sequence. This is particularly useful when the cassette encodes polycistronic mRNA. Using an IRES results in a polycistronic mRNA that is translated into multiple individual proteins or peptides. In one embodiment the Internal Ribosome Entry DNA sequence has the nucleotide sequence of SEQ ID NO: 60. In one embodiment a particular IRES is only used once in the genome. This may have benefits with respect to stability of the genome.

"High self-cleavage efficiency 2A peptide" or "2A peptide" as employed herein refers to a peptide which is efficiently cleaved following translation. Suitable 2A peptides include P2A, F2A, E2A and T2A. The present inventors have noted that once a specific DNA sequence encoding a given 2A peptide is used once, the same specific DNA sequence may not be used a second time. However, redundancy in the DNA code may be utilised to generate a DNA sequence that is translated into the same 2A peptide. Using 2A peptides is particularly useful when the cassette encodes polycistronic mRNA. Using 2A peptides results in a single polypeptide chain being translated which is modified post-translation to generate multiple individual proteins or peptides.

In one embodiment the encoded P2A peptide employed has the amino acid sequence of SEQ ID NO: 61. In one embodiment the encoded F2A peptide employed has the amino acid sequence of SEQ ID NO: 62. In one embodiment the encoded E2A peptide employed has the amino acid sequence of SEQ ID NO: 63. In one embodiment the encoded T2A peptide employed has the amino acid sequence of SEQ ID NO: 64.

In one embodiment an mRNA or each mRNA encoded by a transgene(s) comprise a polyadenylation signal sequence, such as typically at the end of an mRNA sequence, for example as shown in SEQ ID NO: 65. Thus one embodiment the transgene or the transgene cassette comprises at least one sequence encoding a polyadenylation signal sequence.

"PolyA", "Polyadenylation signal" or "polyadenylation sequence" as employed herein means a DNA sequence, usually containing an AATAAA site, that once transcribed can be recognised by a multiprotein complex that cleaves and polyadenylates the nascent mRNA molecule.

In one embodiment the polyadenylation sequence has the nucleotide sequence of SEQ ID NO: 65.

In one embodiment the construct does not include a polyadenylation sequence. In one embodiment the regulator of gene expression is a splice acceptor sequence.

In one embodiment the sequence encoding a protein/polypeptide/peptide, such as an antibody or antibody fragment (such as a bispecific T-cell activator according to the present disclosure) further comprises a polyadenylation signal.

2017320776 18 Sep 2024

Molecules encoded by transgene

As described herein the at least one transgene in the virus encodes a bispecific T-cell activator, wherein one binding domain is specific for T cell surface antigen. The second binding domain may target and suitable antigen, for example a pathogen antigen, a cancer antigen, a stromal antigen.

Cancer antigens (also referred to as tumor antigens) are one category of particular interest and include for example selected from CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2, ErbB3, WT1, MUC1, LMP2, idiotype, HPV E6&E7, EGFRvIII, HER-2/neu, MAGE A3, p53 nonmutant, p53 mutant, NY-ESO-1, GD2, PSMA, PCSA, PSA, MelanA/MART1, Ras mutant, proteinase3 (PR1), bcr-abl, tyrosinase, survivin, PSA, hTERT, particularly WT1, MUC1, HER-2/neu, NY-ESO-1, survivin and hTERT.

Stromal antigens include fibroblast antigens for example those described herein such as FAP, tumor associated macrophage antigens, and myeloid derived suppressor cell antigens, for example include CD163, CD206, CD68, CD11c, CD11b, CD14, CSF1 receptor, CD15, CD33 and CD66b.

The targets list below may, if appropriate, be encoded in bispecific T-cell activator according to the present disclore or alternatively may be provided as a further therapeutic transgene, or both.

In one embodiment, the transgene or transgenes independently encode a protein, peptide, RNA molecule, such as an RNA molecule. Advantageously the transgene can be delivered intra-cellularly and can subsequently be transcribed and if appropriate translated. Examples of genetic material encoded by a transgene include, for example antibodies or binding fragments thereof, chemokines, cytokines, immunmodulators, enzymes (for example capable of converting pro-drug in the active agent) and an RNAi molecule.

Peptide as employed herein refers to an amino acid sequence of 2 to 50 residues, for example 5 to 20 residues. Polypeptide as employed herein refers to an amino acid sequence of more than 50 residues without tertiary structure, in particular without secondary and tertiary structure. Protein refers to an amino acid sequence of more than 50 residues, with secondary and/or tertiary structure, in particular with second and tertiary structure.

In one embodiment, the coding sequence encodes a therapeutic RNA, therapeutic peptide, therapeutic polypeptide or therapeutic protein (i.e. is a therapeutic gene).

Immunomodulator gene or transgene as employed here means a gene that encodes a peptide or protein molecule that can qualitatively or quantitatively modify an activity or activities of cells of the immune system.

Therapeutic gene as employed herein means a gene that encodes an entity that may be useful in the treatment, amelioration or prevention of disease, for example the gene expresses a therapeutic protein, polypeptide, peptide or RNA, which at least slows down, halts or reverses the progression of a disease, such as cancer.

In one embodiment the entity encoded by the transgene when transcribed or translated in a cell, such as a cancer cell, increases production of danger signals by the cell. "Danger signals" as employed herein refers to a variety of molecules produced by cells undergoing injury, stress or non-apoptotic death that act as alarm signals, for example by stimulating cells of the innate immune system to respond directly as well as serving to enhance activation of cells of the adaptive immune system.

2017320776 18 Sep 2024

It is known that the microenvironment of tumours often changes such that natural human immune responses are down regulated. Thus the ability to re-start the immune responses from within the tumour is potentially very interesting in the treatment of cancer.

In one embodiment the encoded therapeutic peptide or protein is designed to be secreted into the extracellular environment. In one embodiment the functional RNA, peptide, polypeptide or protein, such as the antibody is released into the external microenvironment of the cell, for example into the culture supernatant, or *in vivo*: tissue, stroma, circulation, blood and/or lymphatic system.

In one embodiment the peptide, polypeptide or protein (including a bispecific T-cell activator according to the present disclosure), encoded by the transgene, comprises a signal sequence. Signal peptide as employed herein refers to a short 13-36 residue peptide sequence located at the N-terminal of proteins which assist the entry of the protein into the secretory pathway for secretion or membrane expression. In one embodiment, the leader sequence (signal peptide) has the amino acid sequence of SEQ ID NO: 66 or 67.

In another embodiment the encoded therapeutic peptide or protein, such as an antibody is designed to be expressed as a membrane-anchored form in the surface membrane of the cell, for example by including encoding a transmembrane domain in the protein or a site for attachment of a lipid membrane anchor. Generally the bispecific T-cell activator or bispecific T-cell activators of the present disclosure are not expressed as a cell surface anchor format.

In one embodiment the functional RNA, peptide, polypeptide or protein, such as an antibody is released from the cell infected by the adenovirus, for example by active secretion or as a result of cell lysis. Thus in one embodiment the adenovirus lyses the cell, thereby releasing the functional RNA, peptide, polypeptide or protein, such as the antibody.

In another embodiment the encoded further therapeutic peptide or protein, such as an antibody is designed to be retained within the intact cell.

Advantageously, functional RNA, peptide, polypeptide or protein, such as antibodies expressed by adenoviruses of the present disclosure can be detected in tissue *in vivo* as both mRNA and antibody protein. Furthermore, the expressed functional RNA, peptide or protein, such as the antibody can bind its ligand in ELISA. Yet further, the functional RNA, peptide, polypeptide or protein, such as the antibody is detectable early (e.g. within 3 days of infection) and the expression is sustained over several weeks.

In one embodiment adenoviruses of the present disclosure express functional RNA, peptide, polypeptide or protein, such as antibodies within about 3 days or more of infection, such as within about 36, 48, 60 or 72 hours, or such as 2, 3, 4, 5 or 6 days.

In one embodiment adenoviruses of the present disclosure express functional RNA, peptide, polypeptide or protein, such as antibodies for several weeks, such as about 1, 2, 3, 4, 5 or 6 weeks. Such as 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 or 42 days.

Advantageously, functional RNA, peptide or protein expression, such as antibody expression is sufficiently high to be able to detect the functional RNA, peptide, polypeptide or protein, such as the antibody in the blood.

2017320776 18 Sep 2024

In one embodiment, functional RNA, peptide or protein, such as antibodies expressed by the adenovirus of the present disclosure enter the blood stream and/or lymphatic system.

In one embodiment, the adenovirus of the present disclosure is an oncolytic virus which has an enhanced therapeutic index for cancer cells.

In one embodiment, the coding sequence further encodes functional RNA, for example therapeutic RNA.

Functional RNA as employed herein refers to RNA which has a function other than to encode a protein or peptide and includes for examples include RNA constructs suitable for inhibiting or reducing gene activity, including RNAi, such as shRNA and miRNA. shRNA as employed herein refers to short hairpin RNA which is a sequence of RNA that makes a tight hairpin turn that can be used to silence target gene expression via RNA interference (RNAi). miRNA (microRNA) as employed herein refers to a small non-coding RNA molecule (containing about 22 nucleotides) which functions, via base-pairing with complementary sequences within mRNA molecules, to regulate gene expression at the transcriptional or post-transcriptional level. mRNA strands bound by miRNA are silenced because they can no longer be translated into proteins by ribosomes, and such complexes are often actively disassembled by the cell.

In one embodiment, the transgene encodes a protein. Protein as employed herein includes a protein ligand, a protein receptor, or an antibody molecule.

Protein ligand as employed herein refers to cell surface membrane or secreted proteins binding fragments thereof, that bind to or otherwise engage with the cellular receptors to influence the function of the cell, for example by stimulating intracellular signalling and modulating gene transcription within the cell. In one embodiment the protein expressed is engineered to be expressed on the surface of the cell and/or secreted from the cell.

In one embodiment the protein encoded is a bi-specific antibody, such as a bispecific T-cell activator.

In one embodiment the transgene further encodes an enzyme, for example an enzyme that assists in degrading the extra-cellular matrix of the tumour, for example a DNAse, a collagenase, a matrix metalloproteinase (such as MMP2 or 14) or similar.

Suitable antibodies and antibody fragments may be agonistic or antagonistic and include those with anticancer activity and those which modify host cell responses to the cancer, for example: an agonist or antagonistic antibody or antibody fragment may decrease vascularization or normalise vascularization of the tumour. In one embodiment agonistic antibodies or other encoded proteins may render the host cell more visible to the host's innate and adaptive immune responses, for example by expressing antigens, danger signals, cytokines or chemokines to attract and activate the same, or by binding to co-stimulatory or checkpoint pathway molecules to enhance adaptive immune responses.

Therapeutic antibody or antibody-binding fragment as employed herein refers to antibody or antibody-binding fragment which, when inserted in to the oncolytic virus, has a beneficial impact on a pathology in the patient, for example on the cancer being treated.

Beneficial impact as employed herein refers to a desirable and/or advantageous effect of the antibody being expressed *in vivo*.

Classes of therapeutic antibodies and antibody-binding fragments include: anti-EGF antibodies, anti-VEGF antibodies, anti-PDGF antibodies, anti-CTLA antibodies, anti-PD1 antibodies, anti-PDL1 antibodies and anti-FGF antibodies.

Registered therapeutic antibodies suitable for incorporation into viruses of the present disclosure include: abciximab, adalimumab, alemtzumab, basiliximab, belimumab, bevacizumab, brentuximab vedotin, canakinumab, cetuximab, certolzumab, daclizumab, denosumab, eculzumab, efalixumab, gemtuzumab, golimumab, ibritumomab tiuxetan, infliximab, ipilimumab, muromonab-CD3, ofatumumab, palivizumab, panitumumab, ranibizumab, rituximab, tocilizumab, tositumomab and trastuzumab.

In one embodiment, the antibody variable region sequences of an antibody or antibody fragment employed are between 95 and 100% similar or identical to the variable regions of bevacizumab (also known as Avastin®), such as 96, 97, 98 or 99% similar or identical.

Also suitable for incorporation into viruses of the present disclosure are the coding sequences for those antibodies and binding fragments thereof which are approved for a cancer indications, for example trastuzumab, tositumomab, rituximab, panitumumab, ofatumumab, ipilimumab, ibritumomab tiuxetan, gemtuzumab, denosumab, cetuximab, brentuximab vedotin, avastin and adalimumab.

In one embodiment, the antibody variable region sequences of an antibody or antibody fragment employed are between 95 and 100% similar or identical to the variable regions of a known antibody or an antibody disclosed herein.

As used herein "antibody molecule" includes antibodies and binding fragments thereof.

Antibody as employed herein generally refers to a full length antibody and bispecific or multi-specific formats comprising the same.

Antibody-binding fragments includes an antibody fragment able to target the antigen with the same, similar or better specificity to the original "antibody" from which it was derived. Antibody fragments include: Fab, modified Fab, Fab', modified Fab', $F(ab')_2$, Fv, single domain antibodies (e.g. VH or VL or VHH), scFv, bi, tri or tetra-valent antibodies, Bis-scFv, diabodies, triabodies, tetrabodies and epitope-binding fragments of any of the above (see for example Holliger and Hudson, 2005, Nature Biotech. 23(9):1126-1136; Adair and Lawson, 2005, Drug Design Reviews - Online 2(3), 209-217). The methods for creating and manufacturing these antibody fragments are well known in the art (see for example Verma et al., 1998, Journal of Immunological Methods, 216, 165-181). Other antibody fragments for use in the present invention include the Fab and Fab' fragments described in international patent applications WO2005/003169, WO2005/003170 and WO2005/003171. Multi-valent antibodies may comprise multiple specificities e.g. bispecific or may be monospecific (see for example WO 92/22853, WO05/113605, WO2009/040562 and WO2010/035012).

Specific as employed herein is intended to refer to an antibody or fragment that only recognises the antigen to which it is specific or to an antibody or fragment that has significantly higher binding affinity to the antigen to which is specific in comparison to its binding affinity to antigens to which it is not specific, for example 5, 6, 7, 8, 9, 10 times higher binding affinity.

Known antibodies or antibody-binding fragments can be employed to generate alternative antibody formats with the same CDRs or the same variable regions, for example, a full-length antibody can readily be converted into a Fab, Fab' or scFv fragment.

A wide range of different forms of antibody may be employed in constructs of the present disclosure including antibody molecules from non-human animals, human antibody molecules, humanised antibody molecules and chimeric antibody molecules.

In one embodiment, the antibody or binding fragment is monoclonal. Monoclonal antibodies may be prepared by any method known in the art such as the hybridoma technique (Kohler & Milstein, 1975, Nature, 256:495-497), the trioma technique, the human B-cell hybridoma technique (Kozbor *et al.,* 1983, Immunology Today, 4:72) and the EBV-hybridoma technique (Cole *et al.,* Monoclonal Antibodies and Cancer Therapy, pp77-96, Alan R Liss, Inc., 1985).

In one embodiment, the antibody or binding fragment is non-human, i.e. completely from non-human origin. This is possible because the antibodies and fragments can be delivered inside the cancer cell by the virus.

In one embodiment the antibody is chimeric, for example has human constant region(s) and non-human variable regions.

In one embodiment, the antibody or binding fragment is human, i.e. from completely human origin.

In one embodiment, the antibody or binding fragment is humanised. Humanised antibodies (which include CDR-grafted antibodies) are antibody molecules having one or more complementarity determining regions (CDRs) from a non-human species and a framework region from a human immunoglobulin molecule (see, for example US 5,585,089; WO91/09967). It will be appreciated that it may only be necessary to transfer the specificity determining residues of the CDRs rather than the entire CDR (see for example, Kashmiri *et al.*, 2005, Methods, 36, 25-34). Humanised antibodies may optionally further comprise one or more framework residues derived from the non-human species, for example from which the CDRs were derived.

In one embodiment, the coding sequence encodes an antibody heavy chain an antibody light chain or an antibody fragment. Heavy chain (HC) as employed herein refers to the large polypeptide subunit of an antibody. Light chain (LC) as employed herein refers to the small polypeptide subunit of an antibody. In one embodiment, the antibody light chain comprises a CL domain, either kappa or lambda.

Antibodies for use in the present disclosure may be obtained using any suitable a method known in the art. The antigen polypeptide/protein including fusion proteins, including cells (recombinantly or naturally) expressing the polypeptide (such as activated T cells) can be used to produce antibodies which specifically recognise the antigen. The polypeptide may be the 'mature' polypeptide or a biologically active fragment or derivative thereof.

Screening for antibodies can be performed using assays to measure binding to antigen and/or assays to measure the ability to antagonise the receptor. An example of a binding assay is an ELISA, in particular, using a fusion protein (optionally comprising a reporter), which is immobilized on plates, and employing a conjugated secondary antibody to detect anti-antigen antibody bound to the fusion protein.

2017320776 18 Sep 2024

The constant region domains of the antibody molecule of the present invention, if present, may be selected having regard to the proposed function of the antibody molecule, and in particular the effector functions which may be required. For example, the constant region domains may be human IgA, IgD, IgE, IgG or IgM domains. In particular, human IgG constant region domains may be used, especially of the IgG1 and IgG3 isotypes when the antibody molecule is intended for therapeutic uses and antibody effector functions are required. Alternatively, IgG2 and IgG4 isotypes may be used when the antibody molecule is intended for therapeutic purposes and antibody effector functions are not required, e.g. for simply agonising activity or for target neutralization. It will be appreciated that sequence variants of these constant region domains may also be used. For example IgG4 molecules in which the serine at position 241 has been changed to proline as described in Angal *et al.*, Molecular Immunology, 1993, 30 (1), 105-108 may be used.

For certain antibody functions, for example for delivering activation signals to cells bearing the antibody's target molecule, such as cells of the immune system, it may be advantageous to use membrane-anchored versions of the antibody such that the antibody will be expressed on the surface of the expressing cell. Such cell surface expressed binding molecules enable efficient multimeric interactions between the target signalling molecule on the surface of another cell which enhances delivery of activation signals from the target molecule into the recipient cell.

Advantageously, the adenoviruses of the present disclosure can express full length antibodies, antibody fragments such as scFvs, multispecific antibodies, in particular bispecific antibodies such as bispecific T-cell activators as described herein.

In one embodiment the sequence encoding the antibody or antibody fragment (such as a bispecific T-cell activator according to the present disclosure) comprise or further comprises an internal ribosome entry sequence. Internal ribosome entry sequence (IRES) as employed herein means a nucleotide sequence that allows for translation initiation in the middle of a messenger RNA (mRNA) sequence.

In one embodiment the encoded therapeutic proteins or peptides are target specific proteins, polypeptides or peptides.

Target specific proteins or peptides as employed herein refers to either the target proteins themselves, or different proteins or peptides that directly bind (for example are specific to the target) to or otherwise modify the levels of the target proteins or peptides. An example of the former would be a cytokine, whilst an example of the latter would be an antibody against that cytokine.

Targets of interest generally relate to particular cells, cellular products, antigens or signalling pathways associated with disease, particularly cancer. Target, depending on the context, also relates to mRNA or similar transcribed from the gene encoding the protein or polypeptide, which for example can be inhibited by RNAi type technology. Thus, in the context of RNA, such as RNAi technology the target is the mRNA which is encoded by the gene of the target.

Examples of targets of interest include, but are not limited to, stimulatory T-cell co-receptors and ligands thereto, checkpoint inhibitory T-cell co-receptor molecules and ligands thereto, receptors and ligands thereto expressed by regulatory T-cells, myeloid derived suppressor cells and immunosuppressive immune cells, dendritic cell and antigen-presenting cell receptors and ligands thereto, antigen processing and presentation mediators, cytokines and cytokine receptors, chemokines and chemokine receptors, transcription factors and regulators of transcription,

intracellular trafficking molecules and regulators of cell function, tumour cell and tumour microenvironmental receptors and products, intracellular tumour cell enzymes such as IDO, antigens for recognition by immune cells.

Thus in one embodiment target as employed herein refers to a protein or polypeptide which can, for example be inhibited, neutralised or activated by, for example an antibody or binding fragment there, as appropriate. Target in the context of cytokines refers to a cytokine per se or an antibody or binding fragment thereof specific to the cytokine. Thus, the virus may encode and express the cytokine itself as release of thereof may stimulate "host" immune responses. In the context of ligands, mutated forms of the ligand can be encoded by the virus which compete with the natural ligand to bind the receptor. The mutated ligand may have increased binding affinity for the receptor, for example such that it has a slow off-rate thereby occupying the receptor and increasing or decreasing signalling therefrom. Alternatively, the activity of the mutated ligand may be reduced in comparison to the wild-type ligand, thereby reducing the binding and overall activity through the receptor from the natural ligand.

In one embodiment, the virus or construct according to the present disclosure encodes a pro-drug, an immunomodulator and/or an enzyme.

Pro-drug as employed herein means a molecule that is administered as an inactive (or less than fully active) derivative that is subsequently converted to an active pharmacological agent in the body, often through normal metabolic processes. A pro-drug serves as a type of precursor to the intended drug. A pro-drug converting enzyme serves as the enzyme that converts a pro-drug to its pharmacologically active form.

Immunomodulator as employed herein means a modulator of immune response. Immunomodulators function in adjustment of the immune response to a desired level, as in immunopotentiation, immunosuppression, or induction of immunologic tolerance.

T cells require two signals to become fully activated. A first signal, which is antigen-specific, is provided through the T cell receptor which interacts with peptide-MHC molecules on the membrane of antigen presenting cells (APC). A second signal, the co-stimulatory signal, is antigen nonspecific and is provided by the interaction between co-stimulatory molecules expressed on the membrane of APC and the T cell. Thus, co-stimulatory molecule as employed herein means a molecule that provides a complementary signal to the antigen-specific signal required by T cells for activation, proliferation and survival. Examples of co-stimulatory molecules include but are not limited to CD28, CD80, CD86, CD83 and 4-1BB.

Enzyme as employed herein means a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process.

The following is a non-exhaustive discussion of exemplary target peptides/polypeptides and proteins.

In one embodiment the target is a checkpoint protein, such as an immune checkpoint or cell cycle checkpoint protein. Examples of checkpoint proteins include but are not limited to: CTLA-4, PD-1, PD-L1, PD-L2, VISTA, B7-H3, B7-H4, HVEM, ILT-2, ILT-3, ILT-4, TIM-3, LAG-3, BTLA, LIGHT or CD160, for example CTLA-4, PD-1, PD-L1 and PD-L2. In one embodiment there is provided an antibody or binding fragment thereof which is specific to one of the same. Thus in one embodiment

2017320776 18 Sep 2024

a transgene or transgene cassette encodes an antibody or antibody fragment specific to CTLA-4, PD-1, PD-L1 or PD-L2. In one embodiment, the adenovirus expresses an antibody or antibody fragment specific to CTLA-4, PD-1, PD-L1 or PD-L2.

In one embodiment, the antibody is a checkpoint inhibitor antibody, for example anti-PD-L1. In one embodiment, the adenovirus expresses full length anti-human PD-L1 antibody. In one embodiment, the expression of full length anti-human PD-L1 antibody is under the control of an endogenous promoter, such as the major late promoter (MLP), in particular in position B_Y. In one embodiment, the adenovirus expresses the scFv form of anti-human PD-L1 antibody. In one embodiment, the expression of a scFv form of anti-human PD-L1 antibody is under the control of an endogenous promoter, such as the Major late promoter, in particular in position B_Y.

In one embodiment, there is provided a virus or construct according to the present disclosure encoding an antibody or binding fragment thereof, for a full-length antibody or scFv specific to CTLA-4, for example as exemplified herein.

In one embodiment the target, is one or more independently selected from the group comprising CD16, CD25, CD33, CD332, CD127, CD31, CD43, CD44, CD162, CD301a, CD301b and Galectin-3. In one embodiment, there is provided an antibody or binding fragment thereof specific thereto, for example a full-length antibody or a scFv.

In one embodiment the target, for example which may be targeted by an antibody or binding fragment, is one or more independently selected from the group comprising: FLT-3, FLT-3 ligand, TLRs, TLR ligands, CCR7, CD1a, CD1c, CD11b, CD11c, CD80, CD83, CD86, CD123, CD172a, CD205, CD207, CD209, CD273, CD281, CD283, CD286, CD289, CD287, CXCR4, GITR Ligand, IFN-α2, IL-12, IL-23, ILT1, ILT2, ILT3, ILT4, ILT5, ILT7, TSLP Receptor, CD141, CD303, CADM1, CLEC9a, XCR1 and CD304.

In one embodiment the target, of a bispecific T-cell activator employed in the present disclosure, is a tumour cell antigen.

In one embodiment, the target is one or more independently selected from the group comprising: CEA, MUC-1, EpCAM, HER receptors HER1, HER2, HER3, HER4, PEM, A33, G250, carbohydrate antigens Le^y, Le^x, Le^b, PSMA, TAG-72, STEAP1, CD166, CD24, CD44, E-cadherin, SPARC, ErbB2, ErbB3.

In one embodiment the target, of a bispecific T-cell activator employed in the present disclosure, is a tumour stroma antigen.

In one embodiment, the target of a bispecific T-cell activator employed in the present disclosure is one or more independently selected from the group comprising: FAP, TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin.

In one embodiment the target, for example which may be targeted by an antibody or binding fragment (such as a bispecific T-cell activator), is a cancer target.

In one embodiment, the target is one or more independently selected from the group comprising: OX40, OX40 ligand, CD27, CD28, CD30, CD40, CD40 ligand, TL1A, CD70, CD137, GITR, 4-1BB, ICOS or ICOS ligand, for example CD40 and CD40 ligand.

In one embodiment the transgene cassette encodes a ligand comprising CD40 or CD40 ligand, or an antibody, antibody fragment or shRNA targeted to CD40 or CD40 ligand. In one embodiment the adenovirus expresses a ligand comprising CD40 or CD40 ligand, or an antibody, antibody fragment or shRNA targeted to (specific to) CD40 or CD40 ligand.

In one embodiment the target is one or more cytokines independently selected from the group comprising: IL–1α, IL-1β, IL-6, IL-9, IL-12, IL-13, IL-17, IL-18, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-33, IL-35. Interleukin-2 (IL-2), IL-4, IL-5, IL-7, IL-10, IL-15, IL-21, IL-25, IL-1RA, IFNα, IFNβ, IFNγ, TNFα, TGFβ, lymphotoxin α (LTA) and GM-CSF.

In one embodiment the transgene cassette encodes an antibody or antibody fragment specific to IL-12, IL-18, IL-22, IL-7, IL-15, IL-21, IFNα, IFNγ, TNFα, TGFβ or lymphotoxin α (LTA). In one embodiment the adenovirus expresses IL-12, IL-18, IL-22, IL-7, IL-15, IL-21, IFNα, IFNγ, TNFα, TGFβ or lymphotoxin α (LTA).

In one embodiment, the amino acid sequence of IFNγ is SEQ ID NO: 68. In one embodiment the amino acid sequence of IFNα is SEQ ID NO: 69. In one embodiment the amino acid sequence of TNFα is SEQ ID NO: 70.

In one embodiment, the target is a chemokine, for example one or more independently selected from the group comprising: IL-8, CCL3, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19, CCL21, CXCR2, CCR2, CCR4, CCR5, CCR6, CCR7, CCR8, CXCR3, CXCR4, CXCR5 and CRTH2.

In one embodiment, the transgene cassette encodes an antibody or antibody fragment specific to CCL5, CXCL9, CXCL12, CCL2, CCL19, CCL21, CXCR2, CCR2, CCR4 or CXCR4. In the context of the chemokines target includes where the viruses encodes and expresses the chemokine, for example to induce or augment host immune responses to the cancer.

In one embodiment, the adenovirus expresses an antibody or antibody fragment specific to CCL5, CXCL9, CXCL12, CCL2, CCL19, CCL21, CXCR2, CCR2, CCR4 or CXCR4.

In one embodiment, the target is one or more independently selected from the group comprising: STAT3, STAT1, STAT4, STAT6, CTIIA, MyD88 and NFκB family members, for example the protein is targeted with an inhibitor, for example an antibody or bind fragment thereof, or mRNA transcribed from the relevant gene is inhibited by a mechanism, such as RNAi.

In one embodiment, the target is HSp70 or a regulator of cell survival and death such as survivin, for example the protein is targeted with an inhibitor, for example an antibody or bind fragment thereof, or mRNA transcribed from the relevant gene is inhibited by a mechanism, such as RNAi.

In one embodiment, the target is one or more independently selected from the group comprising: amphiregulin, BTC, NRG1a, NRG1b, NRG3, TGFα, LRIG1, LRIG3, EGF, EGF-L6, Epigen, HB-EGF, EGFR, Her2, Her3 and Her4, for example the protein is targeted with an inhibitor, for example an antibody or bind fragment thereof, or mRNA transcribed from the relevant gene is inhibited by a mechanism, such as RNAi.

In one embodiment, the target is a ligand or receptor for one or more independently selected from the group comprising: hedgehog, FGF, IGF, Wnt, VEGF, TNF, TGFβ, PDGF and Notch.

2017320776 18 Sep 2024

In one embodiment the adenovirus expresses an antibody or antibody fragment specific to VEGF. In one embodiment the antibody is an anti-VEGF antibody. For example, such as an antibody having the amino acid sequence of the antibody Bevacizumab or equivalent thereto. In one embodiment the adenovirus expresses full length anti-human VEGF antibody. In one embodiment, the expression of full length anti-human VEGF antibody is under the control of an endogenous promoter, such as the Major late promoter (MLP), in particular in position B_Y. In one embodiment, the adenovirus expresses the scFv form of anti-human VEGF antibody. In one embodiment, the expression of the scFv form of anti-human VEGF antibody is under the control of an endogenous promoter, such as the Major late promoter, in particular in position B_Y.

In one embodiment, the target is IDO.

In one embodiment the target is an antigen for recognition by immune cells (such as a T cell engaged by a bispecific T-cell activator) is one or more proteins or peptides independently selected from the group comprising: immunogenic proteins from infectious organisms, such as cytomegalovirus antigens, influenza antigens, hepatitis B surface and core antigens, diphtheria toxoid, Crm197, tetanus toxoid; peptides derived from such antigens which are known T-cell or antibody epitopes, or genetically engineered composites or multimers of such antigens; tumour-derived proteins as antigens; peptides derived from such antigens which are known T-cell or antibody epitopes; and genetically engineered composites or multimers of such antigens for example WT1, MUC1, LMP2, idiotype, HPV E6&E7, EGFRvIII, HER-2/neu, MAGE A3, p53 nonmutant, p53 mutant, NY-ESO-1, GD2, PSMA, PCSA, PSA, gp100, CEA, MelanA/MART1, Ras mutant, proteinase3 (PR1), bcr-abl, tyrosinase, survivin, PSA, hTERT, particularly WT1, MUC1, HER-2/neu, NY-ESO-1, survivin or hTERT.

The skilled person will appreciate that many possibilities exist for nucleic acid sequences that encode a given amino acid sequence due to codon redundancy, that silent nucleic acid base pair mutations are tolerated and all nucleic acid sequences that encode a given amino acid sequence as defined in any of the SEQ ID NO's are envisioned by the present disclosure.

In one embodiment the peptide, polypeptide or protein encoded by a transgene is a mimotope. As employed herein a mimotope is a molecule, often a peptide, which mimics the structure of an epitope. The latter property causes an antibody response similar to the one elicited by the epitope. An antibody for a given epitope antigen will recognize a mimotope which mimics that epitope. Mimotopes are commonly obtained from phage display libraries through biopanning. Vaccines utilizing mimotopes are being developed. Thus antibodies of known specificity may be used to screen libraries (e.g peptide libraries in phage display – for example Ab sequence libraries or non-antibody peptide libraries, particularly those optimized for producing peptides with more stable 3D conformations) – Generation of mimotopes is well described in the art (see Tribbick G, Rodda S. Combinatorial methods for discovery of peptide ligands which bind to antibody-like molecules. J Mol Recognit. 2002 15(5):306-10; Masuko T, Ohno Y, Masuko K, Yagi H, Uejima S, Takechi M, Hashimoto Y. Towards therapeutic antibodies to membrane oncoproteins by a robust strategy using rats immunized with transfectants expressing target molecules fused to green fluorescent protein. Cancer Sci. 2011 102(1):25-35).

In one embodiment, a mimotope or other designed vaccine antigens are encoded by a transgene and expressed in order to induce an antibody response in the recipient patient, wherein the antibodies induced have the desired therapeutic effect. In one embodiment GFP-peptide fusion proteins, with peptide

2017320776 18 Sep 2024

sequences from desired human ligand, are used to induce anti-self target antibody responses, for example a peptide region of PD-L1 that is known to be important for binding to target molecule PD-1 may be genetically linked with GFP or other highly immunogenic foreign carrier proteins such that an immune antibody response to the peptide includes antibodies that cross-react with the native PDL1 molecule and thus serve to block PD-L1:PD-1 interactions in the same way as directly encoding an anti-PDL1 antibody would. Concepts for vaccines inducing ant-self therapeutic antibody responses are well described in the art (see Spohn G, Bachmann MF. Therapeutic vaccination to block receptor-ligand interactions. Expert Opin Biol Ther. 2003 3(3):469-76; Link A, Bachmann MF. Immunodrugs: breaking B- but not T-cell tolerance with therapeutic anticytokine vaccines. Immunotherapy 2010 2(4):561-74; Delavallée L, Assier E, Semerano L, Bessis N, Boissier MC. Emerging applications of anticytokine vaccines. Expert Rev Vaccines. 2008 7(10):1507-17).

In one or more embodiments, the transgene employed encodes a sequence shown in any one of SEQ ID NOs: 2, 4, 7, 11 or 16.

In another embodiment, the transgene employed encodes a sequence which excludes the deca-His affinity tag at the C-terminal end for example as shown in a virus set forth in any one of SEQ ID NOs: 72 to 78.

Advantageously adenoviruses of the present disclosure express and release antibody forms (such as a bispecific T-cell activator) and other proteins, such as cytokines, encoded by a transgene therein into the culture supernatant *in vitro* or into tumour tissue stroma *in vivo*. Leader sequences may assist the encoded proteins/polypeptide or peptide exiting the cancer cell. Therefore, in one embodiment the encoded "protein" comprises a leader sequence. Leader sequence as employed herein refers to a polynucleotide sequence located between the promoter sequence and the coding region which can regulate gene expression at the level of transcription or translation.

In one embodiment the coding sequence encodes a peptide. Peptide as employed herein refers to an amino acid chain which is not a complete functional protein. Typically, a fragment which retains some or all of the function of the protein that it is a fragment of, or can be recognized by the immune system, for example peptides of 8 or more amino acids that can be recognized by T-cells.

In one embodiment, the transgene is a reporter gene encoding, for example an imaging agent including bioluminescent, fluorescent imaging agents (including activatable fluorescent imaging agents), such as luciferase, GFP or eGFP or red fluorescent protein.

Reporter gene or reporter sequence as employed herein means a gene or DNA sequence that produces a product easily detected in eukaryotic cells and may be used as a marker to determine the activity of another gene with which its DNA has been closely linked or combined. Reporter genes confer characteristics on cells or organisms expressing them that are easily identified and measured, or are selectable markers. Reporter genes are often used as an indication of whether a certain gene has been taken up by or expressed in the cell or organism population. Examples of common reporter genes include, but are not limited to, LacZ, luciferase, GFP, eGFP, neomycin phosphotransferase, chloramphenicol acetyltransferase, sodium iodide symporter (NIS), nitroreductase (e.g. NfsA, NfsB) intracellular metalloproteins, HSV1-tk or oestrogen receptor.

In one embodiment the genetic material (in particular the transgene) does not encode or express a reporter gene such as an imaging agent, luciferase, GFP or eGFP.

Viruses according to the present disclosure can be investigated for their preference for a specific tumour type by examination of its lytic potential in a panel of tumour cells, for example colon tumour cell lines include HT-29, DLD-1, LS174T, LS1034, SW403, HCT116, SW48, and Colo320DM. Any available colon tumour cell lines would be equally useful for such an evaluation.

Prostate cell lines include DU145 and PC-3 cells. Pancreatic cell lines include Panc-1 cells. Breast tumour cell lines include MDA231 cell line and ovarian cell lines include the OVCAR-3 cell line. Hemopoietic cell lines include, but are not limited to, the Raji and Daudi B-lymphoid cells, K562 erythroblastoid cells, U937 myeloid cells, and HSB2 T-lymphoid cells. Other available tumour cell lines are equally useful.

The present disclosure also extends to novel sequences disclosed herein. In one embodiment the virus is shown in any one of sequences disclosed herein, for example any one of SEQ ID NOs: 34 to 37 or a sequence at least 95% identical thereto, for example as set forth in any one of SEQ ID NOs: 79 to 82.

Formulations

The present disclosure relates also extends to a pharmaceutical formulation of a virus as described herein.

In one embodiment there is provided a liquid parenteral formulation, for example for infusion or injection, of a replication capable oncolytic according to the present disclosure wherein the formulation provides a dose in the range of $1x10^{10}$ to $1x10^{14}$ viral particles per volume of dose.

Parenteral formulation means a formulation designed not to be delivered through the GI tract. Typical parenteral delivery routes include injection, implantation or infusion. In one embodiment the formulation is provided in a form for bolus delivery.

In one embodiment the parenteral formulation is in the form of an injection. Injection includes intravenous, subcutaneous, intra-tumoural or intramuscular injection. Injection as employed herein means the insertion of liquid into the body via a syringe. In one embodiment, the method of the present disclosure does not involve intra-tumoural injection.

In one embodiment the parenteral formulation is in the form of an infusion.

Infusion as employed herein means the administration of fluids at a slower rate by drip, infusion pump, syringe driver or equivalent device. In one embodiment, the infusion is administered over a period in the range of 1.5 minutes to 120 minutes, such as about 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 15, 16, 17, 18, 19 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 65, 80, 85, 90, 95, 100, 105, 110 or 115 minutes.

In one embodiment one dose of the formulation less than 100mls, for example 30mls, such as administered by a syringe driver. In one embodiment one dose of the formulation is less than 10 mls, for example 9, 8, 7, 6, 5, 4, 3, 2 or 1 mls. In one embodiment one dose of the formulation is less than 1 ml, such as 0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2 or 0.1 mls.

In one embodiment, the injection is administered as a slow injection, for example over a period of 1.5 to 30 minutes.

In one embodiment, the formulation is for intravenous (i.v.) administration. This route is particularly effective for delivery of oncolytic virus because it allows rapid access to the majority of the organs and tissue and is particular useful for the treatment of metastases, for example established metastases especially those located in highly vascularised regions such as the liver and lungs.

Therapeutic formulations typically will be sterile and stable under the conditions of manufacture and storage. The composition can be formulated as a solution, microemulsion, liposome, or other parenteral formulation suitable for administration to a human and may be formulated as a pre-filled device such as a syringe or vial, particular as a single dose.

The formulation will generally comprise a pharmaceutically acceptable diluent or carrier, for example a non-toxic, isotonic carrier that is compatible with the virus, and in which the virus is stable for the requisite period of time.

The carrier can be a solvent or dispersion medium containing, for example, water, ethanol, polyol (for example, glycerol, propylene glycol, and liquid polyethylene glycol, and the like), and suitable mixtures thereof. The proper fluidity can be maintained, for example, by the use of a dispersant or surfactant such as lecithin or a non-ionic surfactant such as polysorbate 80 or 40. In dispersions the maintenance of the required particle size may be assisted by the presence of a surfactant. Examples of isotonic agents include sugars, polyalcohols such as mannitol, sorbitol, or sodium chloride in the composition.

In one embodiment, parenteral formulations employed may comprise one or more of the following a buffer, for example 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid, a phosphate buffer and/or a Tris buffer, a sugar for example dextrose, mannose, sucrose or similar, a salt such as sodium chloride, magnesium chloride or potassium chloride, a detergent such as a non-ionic surfactant such as briji, PS-80, PS-40 or similar. The formulation may also comprise a preservative such as EDTA or ethanol or a combination of EDTA and ethanol, which are thought to prevent one or more pathways of possible degradation.

In one embodiment, the formulation will comprise purified oncolytic virus according to the present disclosure, for example $1x10^{10}$ to $1x10^{14}$ viral particles per dose, such as $1x10^{10}$ to $1x10^{12}$ viral particles per dose. In one embodiment the concentration of virus in the formulation is in the range 2×10^{8} to 2×10^{14} vp/mL, such as 2×10^{12} vp/ml.

In one embodiment, the parenteral formulation comprises glycerol.

In one embodiment, the formulation comprises oncolytic adenovirus as described herein, HEPES (N-2-hydroxyethylpiperazine-N´-2-ethanesulfonic acid), glycerol and buffer.

In one embodiment, the parenteral formulation consists of virus of the disclosure, HEPES for example 5mM, glycerol for example 5-20% (v/v), hydrochloric acid, for example to adjust the pH into the range 7-8 and water for injection.

In one embodiment 0.7 mL of virus of the disclosue at a concentration of 2×10^{12} vp/mL is formulated in 5 mM HEPES, 20% glycerol with a final pH of 7.8.

A thorough discussion of pharmaceutically acceptable carriers is available in Remington's Pharmaceutical Sciences (Mack Publishing Company, N.J. 1991).

In one embodiment, the formulation is provided as a formulation for topical administrations including inhalation.

Suitable inhalable preparations include inhalable powders, metering aerosols containing propellant gases or inhalable solutions free from propellant gases. Inhalable powders according to the disclosure will generally contain a virus as described herein with a physiologically acceptable excipient.

These inhalable powders may include monosaccharides (e.g. glucose or arabinose), disaccharides (e.g. lactose, saccharose, maltose), oligo- and polysaccharides (e.g. dextranes), polyalcohols (e.g. sorbitol, mannitol, xylitol), salts (e.g. sodium chloride, calcium carbonate) or mixtures of these with one another. Mono- or disaccharides are suitably used, the use of lactose or glucose, particularly but not exclusively in the form of their hydrates.

Particles for deposition in the lung require a particle size less than 10 microns, such as 1-9 microns for example from 0.1 to 5 µm, in particular from 1 to 5 µm. The particle size of the carrying the virus is of primary importance and thus in one embodiment the virus according to the present disclosure may be adsorbed or absorbed onto a particle, such as a lactose particle of the given size.

The propellant gases which can be used to prepare the inhalable aerosols are known in the art. Suitable propellant gases are selected from among hydrocarbons such as n-propane, n-butane or isobutane and halohydrocarbons such as chlorinated and/or fluorinated derivatives of methane, ethane, propane, butane, cyclopropane or cyclobutane. The above-mentioned propellant gases may be used on their own or in mixtures thereof.

Particularly suitable propellant gases are halogenated alkane derivatives selected from among TG 11, TG 12, TG 134a and TG227. Of the abovementioned halogenated hydrocarbons, TG134a (1,1,1,2-tetrafluoroethane) and TG227 (1,1,1,2,3,3,3-heptafluoropropane) and mixtures thereof are particularly suitable.

The propellant gas-containing inhalable aerosols may also contain other ingredients, such as cosolvents, stabilisers, surface-active agents (surfactants), antioxidants, lubricants and means for adjusting the pH. All these ingredients are known in the art.

The propellant gas-containing inhalable aerosols according to the invention may contain up to 5 % by weight of active substance. Aerosols according to the invention contain, for example, 0.002 to 5 % by weight, 0.01 to 3 % by weight, 0.015 to 2 % by weight, 0.1 to 2 % by weight, 0.5 to 2 % by weight or 0.5 to 1 % by weight of active ingredient.

Alternatively topical administrations to the lung may also be by administration of a liquid solution or suspension formulation, for example employing a device such as a nebulizer, for example, a nebulizer connected to a compressor (e.g., the Pari LC-Jet Plus(R) nebulizer connected to a Pari Master(R) compressor manufactured by Pari Respiratory Equipment, Inc., Richmond, Va.).

The virus of the invention can be delivered dispersed in a solvent, e.g. in the form of a solution or a suspension, for example as already described above for parenteral formulations. It can be suspended in an appropriate physiological solution, e.g., saline or other pharmacologically acceptable solvent or a buffered solution. Buffered solutions known in the art may contain 0.05 mg to 0.15 mg disodium edetate, 8.0 mg to 9.0 mg NaCl, 0.15 mg to 0.25 mg polysorbate, 0.25 mg to 0.30

mg anhydrous citric acid, and 0.45 mg to 0.55 mg sodium citrate per 1 ml of water so as to achieve a pH of about 4.0 to 5.0.

The therapeutic suspensions or solution formulations can also contain one or more excipients. Excipients are well known in the art and include buffers (e.g., citrate buffer, phosphate buffer, acetate buffer and bicarbonate buffer), amino acids, urea, alcohols, ascorbic acid, phospholipids, proteins (e.g., serum albumin), EDTA, sodium chloride, liposomes, mannitol, sorbitol, and glycerol. Solutions or suspensions can be encapsulated in liposomes or biodegradable microspheres. The formulation will generally be provided in a substantially sterile form employing sterile manufacture processes.

This may include production and sterilization by filtration of the buffered solvent/solution used for the formulation, aseptic suspension of the antibody in the sterile buffered solvent solution and dispensing of the formulation into sterile receptacles by methods familiar to those of ordinary skill in the art.

Nebulisable formulation according to the present disclosure may be provided, for example, as single dose units (e.g., sealed plastic containers or vials) packed in foil envelopes. Each vial contains a unit dose in a volume, e.g., 2 mL, of solvent/solution buffer.

Treatment

In a further aspect, the present disclosure extends to a virus or a formulation thereof as described herein for use in treatment, in particular for the treatment of cancer.

In one embodiment, the method of treatment is for use in the treatment of a tumour, in particular a solid tumour.

Tumour as employed herein is intended to refer to an abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive, also called a neoplasm. Tumours may be either benign (not cancerous) or malignant. Tumour encompasses all forms of cancer and metastases.

In one embodiment, the tumour is a solid tumour. The solid tumour may be localised or metastasised.

In one embodiment, the tumour is of epithelial origin.

In one embodiment, the tumour is a malignancy, such as colorectal cancer, hepatoma, prostate cancer, pancreatic cancer, breast cancer, ovarian cancer, thyroid cancer, renal cancer, bladder cancer, head and neck cancer or lung cancer.

In one embodiment, the tumour is a colorectal malignancy.

Malignancy as employed herein means cancerous cells.

In one embodiment, the oncolytic adenovirus is employed in the treatment or prevention of metastasis.

In one embodiment, the method or formulation herein is employed in the treatment of drug resistant cancers.

In one embodiment, the virus is administered in combination with the administration of a further cancer treatment or therapy.

In one embodiment, there is provided a virus or formulation according to the present disclosure for use in the manufacture of a medicament for the treatment of cancer, for example a cancer described above.

In a further aspect, there is provide a method of treating cancer comprising administering a therapeutically effective amount of a virus or formulation according to the present disclosure to a patient in need thereof, for example a human patient.

In one embodiment, the oncolytic virus or formulation herein is administered in combination with another therapy.

"In combination" as employed herein is intended to encompass where the oncolytic virus is administered before, concurrently and/or post cancer treatment or therapy.

Cancer therapy includes surgery, radiation therapy, targeted therapy and/or chemotherapy. Cancer treatment as employed herein refers to treatment with a therapeutic compound or biological agent, for example an antibody intended to treat the cancer and/or maintenance therapy thereof.

In one embodiment, the cancer treatment is selected from any other anti-cancer therapy including a chemotherapeutic agent, a targeted anticancer agent, radiotherapy, radio-isotope therapy or any combination thereof.

In one embodiment, the virus of the present disclosure such as an oncolytic adenovirus may be used as a pre-treatment to the therapy, such as a surgery (neoadjuvant therapy), to shrink the tumour, to treat metastasis and/or prevent metastasis or further metastasis. The oncolytic adenovirus may be used after the therapy, such as a surgery (adjuvant therapy), to treat metastasis and/or prevent metastasis or further metastasis.

Concurrently as employed herein is the administration of the additional cancer treatment at the same time or approximately the same time as the oncolytic adenovirus formulation. The treatment may be contained within the same formulation or administered as a separate formulation.

In one embodiment, the virus is administered in combination with the administration of a chemotherapeutic agent.

Chemotherapeutic agent as employed herein is intended to refer to specific antineoplastic chemical agents or drugs that are selectively destructive to malignant cells and tissues. For example, alkylating agents, antimetabolites, anthracyclines, plant alkaloids, topoisomerase inhibitors, and other antitumour agents. Other examples of chemotherapy include doxorubicin, 5-fluorouracil (5-FU), paclitaxel, capecitabine, irinotecan, and platins such as cisplatin and oxaliplatin. The preferred dose may be chosen by the practitioner based on the nature of the cancer being treated.

In one embodiment the therapeutic agent is ganciclovir, which may assist in controlling immune responses and/or tumour vascularisation.

In one embodiment one or more therapies employed in the method herein are metronomic, that is a continuous or frequent treatment with low doses of anticancer drugs, often given concomitant with other methods of therapy.

Subgroup B oncolytic adenoviruses, in particular Ad11 and those derived therefrom such as EnAd may be particularly synergistic with chemotherapeutics because they seem to have a mechanism of action that is largely independent of apoptosis, killing cancer cells by a predominantly

necrolytic mechanism. Moreover, the immunosuppression that occurs during chemotherapy may allow the oncolytic virus to function with greater efficiency.

Therapeutic dose as employed herein refers to the amount of virus, such as oncolytic adenovirus that is suitable for achieving the intended therapeutic effect when employed in a suitable treatment regimen, for example ameliorates symptoms or conditions of a disease. A dose may be considered a therapeutic dose in the treatment of cancer or metastases when the number of viral particles may be sufficient to result in the following: tumour or metastatic growth is slowed or stopped, or the tumour or metastasis is found to shrink in size, and/or the life span of the patient is extended. Suitable therapeutic doses are generally a balance between therapeutic effect and tolerable toxicity, for example where the side-effect and toxicity are tolerable given the benefit achieved by the therapy.

In one embodiment, a virus or therapeutic construct according to the present disclosure (including a formulation comprising same) is administered weekly, for example one week 1 the dose is administered on day 1, 3, 5, followed by one dose each subsequent week.

In one embodiment, a virus or therapeutic construct according to the present disclosure (including a formulation comprising same) is administered bi-weekly or tri-weekly, for example is administered in week 1 one on days 1, 3 and 5, and on week 2 or 3 is also administered on days 1, 3 and 5 thereof. This dosing regimen may be repeated as many times as appropriate.

In one embodiment, a virus or therapeutic construct according to the present disclosure (including a formulation comprising same) is administered monthly.

In one embodiment, the viruses and constructs of the present disclosure are prepared by recombinant techniques. The skilled person will appreciate that the armed adenovirus genome can be manufactured by other technical means, including entirely synthesising the genome or a plasmid comprising part of all of the genome. The skilled person will appreciate that in the event of synthesising the genome the region of insertion may not comprise the restriction site nucleotides as the latter are artefacts following insertion of genes using cloning methods.

In one embodiment the armed adenovirus genome is entirely synthetically manufactured, for example as per SEQ ID NOs: 34 to 37.

The disclosure herein further extends to an adenovirus of formula (I) or a subformula thereof, obtained or obtainable from inserting a transgene or transgene cassette.

“Is” as employed herein means comprising.

In the context of this specification "comprising" is to be interpreted as "including".

Embodiments of the invention comprising certain features/elements are also intended to extend to alternative embodiments "consisting" or "consisting essentially" of the relevant elements/features.

Where technically appropriate, embodiments of the invention may be combined.

Technical references such as patents and applications are incorporated herein by reference.

Any embodiments specifically and explicitly recited herein may form the basis of a disclaimer either alone or in combination with one or more further embodiments.

2017320776 18 Sep 2024

The present application claims priority from GB1614607.8, GB1700663.6, GB1706219.1 and GB1713765.4 incorporated herein by reference. These documents may be employed to correct errors in the present specification, in particular an error in the sequence listing.

The present invention is further described by way of illustration only in the following examples, which refer to the accompanying Figures, in which:

DESCRIPTION OF THE FIGURES

Figure 1 **(A)** schematic representation of a bispecific T-cell activator antibody of the present disclosure comprising or lacking an optional decahistidine affinity tag. Ig SP: signal peptide; 10His: decahistidine affinity tag; L: GS linker; V_L: variable light domain; V_H variable heavy domain. **(B)** plasmid map for pSF-CMV-EpCAMbispecific T-cell activator. **(C)** plasmid map for pSF-CMV-FAPbispecific T-cell activator. **(D)** plasmid map for pSF-CMV-Controlbispecific T-cell activator.

Figure 2 **(A)** dot blot showing the quantification of the recombinant bispecific T-cell activators. **(B)** shows a graph showing the ELISA results for FAP. **(C)** graph showing the ELISA results for EpCAM.

Figure 3 shows a graph showing the expression levels of CD69 **(A)** and CD25 **(B)** for T cells co-cultured alone or with NHDF cells in the presence of FAP bispecific T-cell activator and control bispecific T-cell activator measured using flow cytometry.

Figure 4 **(A)** graph showing the levels of IFN γ expression for T cells co-cultured alone or with NHDF cells in the presence of FAP bispecific T-cell activator and control bispecific T-cell activator measured by intracellular cytokine staining. Graphs **(B)** & **(C)** show the expression levels of CD69 and CD25 for T cells co-cultured alone or with DLD cells in the presence of EpCAM bispecific T-cell activator and control bispecific T-cell activator measured using flow cytometry.

Figure 5 **(A)** graph showing the levels of IFN γ expression for T cells co-cultured with DLD cells in the presence of EpCAM bispecific T-cell activator and control bispecific T-cell activator measured by intracellular cytokine staining. Graphs **(B)** & **(C)** showing the levels of CD69 and CD25 for PBMCs co-cultured with DLD cells in the presence of EpCAM bispecific T-cell activator and control bispecific T-cell activator measured by flow cytometry.

Figure 6 **(A)** graph showing the results of a LDH assay showing the cytoxicity of NHDF cells which have been co-cultured with T cells and FAP bispecific T-cell activator or control bispecific T-cell activator. **(B)** graph showing the results of a LDH assay showing the cytoxicity of BTC100 cells which have been co-cultured with T cells and FAP bispecific T-cell activator or control bispecific T-cell activator. **(C)** Images of NHDF cells after co-culture with T cells and FAP bispecific T-cell activator vs control bispecific T-cell activator.

Figure 7 **(A)** scatter plots showing FAP expression in multiple patient-derived cells. **(B)** graph showing the % of cells expressing EpCAM and FAP across multiple cells and cell lines.

Figure 8 **(A)** graph showing the NHDF dose response for FAP bispecific T-cell activator with increasing bispecific T-cell activator concentration. Graph **(B)** & **(C)** showing the results

2017320776 18 Sep 2024

of a LDH assay showing the cytoxicity of DLD cells which have been co-cultured with T cells and EpCAM bispecific T-cell activator or control bispecific T-cell activator.

Figure 9 **(A)** graph showing the results of a LDH assay showing the cytoxicity of SKOV cells which have been co-cultured with T cells and EpCAM bispecific T-cell activator or control bispecific T-cell activator. **(B)** graph showing the results of a LDH assay showing the cytoxicity of MCF7 cells which have been co-cultured with T cells and EpCAM bispecific T-cell activator or control bispecific T-cell activator.

Figure 10 shows a graph showing the NHDF dose response for EpCAM bispecific T-cell activator with increasing bispecific T-cell activator concentration.

Figure 11 **(A)** graph showing FAP expression in CHO cells determined by FAP or isotope control antibody and analysed by flow cytometry. **(B)** shows a graph showing the results of a LDH assay showing the cytoxicity of CHO or CHO-FAP cells which have been co-cultured with T cells and FAP bispecific T-cell activator or control bispecific T-cell activator.

Figure 12 shows a graph showing T-cell activation (based onCD69 and CD25 expression levels) by CHO vs CHO-FAP cells, analysed using flow cytometry.

Figure 13 **(A)** graphs showing EpCAM expression of the parental cell lines vs stable transfected variant determined by staining with EpCAM or isotope control antibody and analysed using flow cytometry. **(B)** graph showing the results of a LDH assay showing the cytoxicity of CHO or CHO-EpCAM cells which have been co-cultured with T cells and EpCAM bispecific T-cell activator or control bispecific T-cell activator.

Figure 14 shows graph showing T-cell activation (based onCD69 and CD25 expression levels) by CHO vs CHO-EpCAM cells, analysed using flow cytometry.

Figure 15 **(A)** graph showing the ability of FAP bispecific T-cell activator to activate CD4+ or CD8+ T-cells (based on CD69 and CD25 expression levels), analysed using flow cytometry. **(B)** graph showing the results of a LDH assay showing the cytoxicity of NHDF cells which have been co-cultured with CD4+ or CD8+ T cells and FAP bispecific T-cell activator or control bispecific T-cell activator.

Figure 16 **(A)** graph showing CD4+ and CD8+ T-cell activation (based on CD69 and CD25 expression levels) by DLD cells in the presence of EpCAM or control bispecific T-cell activator analysed using flow cytometry. **(B)** graph showing the results of a LDH assay showing the cytoxicity of DLD cells which have been co-cultured with CD4+ or CD8+ T cells and EpCAM bispecific T-cell activator or control bispecific T-cell activator.

Figure 17 **(A)** graph showing the number of CD3+ T cells from ascites cultured with control or FAP bispecific T-cell activator. **(B)** graph showing the CD25 expression levels of T cells from ascites cultured with control or FAP bispecific T-cell activator. **(C)** graph showing the number of FAP+ cells from ascites cultured with control or FAP bispecific T-cell activator.

Figure 18 **(A)** schematic representation of the genome of the adenoviruses of the present disclosure. **(B)** graphs comparing the kinetics of CMV vs SA promoter driven expression.

Figure 19 **(A)** graph showing the quantification of the number of detected virus genomes per cell for NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 and EnAd. **(B)** graphs showing

2017320776 18 Sep 2024

the oncolytic activity of NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 or EnAd assessed by infection of A549 cells.

Figure 20 **(A)** graphs showing T-cell activation (based on CD69 and CD25 expression levels) by NG-601, NG-602, NG-605 and NG-606 when co-cultured with CHO-FAP, analysed using flow cytometry. **(B)** graphs showing T-cell activation (based on CD69 and CD25 expression levels) by NG-601, NG-602, NG-605 and NG-606 when co-cultured with CHO-EpCAM, analysed using flow cytometry.

Figure 21 shows graphs showing the results of experiments to determine the quantity of FAP bispecific T-cell activator produced from NG-605 and NG-606.

Figure 22 shows graphs showing the results of experiments to determine the quantity of EpCAMbispecific T-cell activator produced from NG-601 and NG-602.

Figure 23 shows microscopy images of Ad293 cells infected with NG-607, NG-608, NG-609 and NG-610.

Figure 24 **(A)** graph indicating the cytotoxicity of DLD cells infected with EnAd, analysed using XCELLigence. **(B)** graph indicating the cytotoxicity of SKOV cells infected with EnAd, analysed using XCELLigence. **(C)** graph indicating the cytotoxicity of NHDF cells infected with EnAd, analysed using XCELLigence.

Figure 25 **(A)** graph indicating the ability of NG-603, NG-604, NG-605, NG-606 and EnAd to kill NHDF cells, analysed using XCELLigence. **(B)** graph indicating the ability of NG-603, NG-604, NG-605, NG-606 and EnAd to kill NHDF cells, analysed using an LDH assay.

Figure 26 shows graphs showing T-cell activation (based on CD69 and CD25 expression levels) by NG-603, NG-604, NG-605, NG-606 co-cultured with NHDF cells, SKOV and T cells, analysed using flow cytometry.

Figure 27 **(A)** graph showing T-cell activation (based on CD69 and CD25 expression levels) by NG-603, NG-604, NG-605, NG-606 co-cultured with NHDF and SKOV cells vs. SKOV alone, analysed using flow cytometry. **(B)** graph indicating the cytotoxicity of NHDF cells infected with NG-605 and NG-606, analysed using an LDH assay

Figure 28 shows still frame images from timelapse videos of lysis of NHDF cells by recombinant FAP bispecific T-cell activator, EnAd, NG-603 or NG-605.

Figure 29 shows still frame images from timelapse videos of lysis of NHDF cells by NG-607, NG-608, NG-609 or NG-610.

Figure 30 shows a graph indicating the cytotoxicity of DLD cells infected with EnAd, NG-601, NG-602, NG-603 and NG-604 in the presence of T cells or absence of T cells, analysed using XCELLigence.

Figure 31 shows a graph indicating the cytotoxicity of DLD cells infected with EnAd, NG-601, NG-602, NG-603 and NG-604 in the presence of T cells or absence of T cells, analysed using an LDH assay.

Figure 32 shows a graph showing T-cell activation (based on CD69 and CD25 expression levels) by EnAd, NG-601, NG-602, NG-603 and NG-604, analysed by flow cytometry.

2017320776 18 Sep 2024

Figure 33 shows the results of experiments to determine the ability of NG-601 to kill DLD tumour cells at varying multiplicity of infection (MOI) in the presence or absence of $CD3^+$ T-cells, assessed using xCELLigence.

Figure 34 shows graphs indicating the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill SKOV tumour cells in the presence or absence of $CD3^+$ T-cells, assessed using xCELLigence.

Figure 35 shows graphs indicating the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill SKOV tumour cells in the presence or absence of $CD3^+$ T-cells, assessed using an LDH assay.

Figure 36 shows a graph showing T-cell activation (based on CD69 and CD25 expression levels) by EnAd, NG-601, NG-602, NG-603 and NG-604 co-cultured with SKOV tumour cells, analysed using flow cytometry.

Figure 37 shows a graph showing T-cell activation (based on CD69 and CD25 expression levels) by EnAd, NG-601, NG-602, NG-603 and NG-604 co-cultured with ascites cells, analysed using flow cytometry.

Figure 38 shows still frame images from timelapse videos of lysis of NHDF cells by EpCAM bispecific T-cell activator, EnAd, NG-601 or NG-603.

Figure 39 shows microscopy images of ascites cells obtained from a patient, infected with viruses of the present disclosure and stained with EnAd-CMV-GFP and EnAd-SA-GFP as a reporters to determine infection and late stage viral gene expression.

Figure 40 **(A)** graph indicating the expression levels of CD25 on CD3+ T cells in ascites samples which were infected with viruses of the present disclosure. **(B)** graph indicating the number of FAP+ cells in ascites samples which were infected with viruses of the present disclosure.

Figure 41 shows microscopy images of ascites cells obtained from a cancer patient, infected with viruses of the present disclosure and stained with EnAd-CMV-GFP and EnAd-SA-GFP as a reporters to determine infection and late stage viral gene expression.

Figure 42 shows a graph indicating the number of CD3+ T cells in ascites samples obtained from a cancer patient and infected with viruses of the present disclosure.

Figure 43 shows a graph indicating the CD25 expression levels on CD3+ T cells in ascites samples obtained from a cancer patient and infected with viruses of the present disclosure.

Figure 44 shows a graph indicating the number of FAP+ cells in ascites samples obtained from a cancer patient and infected with viruses of the present disclosure.

Figure 45 **Characterisation of EpCAM bispecific T-cell activator and its effects on PBMC-derived T cells**

(A) Schematic of the structure of the EpCAM-targeted bispecific T-cell activator and non-specific control bispecific T-cell activator. The VL and VH domains are connected with flexible peptide linkers (L) rich in serine and glycine for flexibility and solubility. Ig SP, Light chain immunoglobulin signal peptide; 10His, decahistidine affinity tag. **(B)** Induction of activation markers CD69 and (**C**) CD25 on CD3-purified PBMC cultured alone or with DLD cells (5:1) in the presence of bispecific T-cell activator-containing

2017320776 18 Sep 2024

supernatants. CD69 and CD25 were measured by flow cytometry after 24 h of co-culture. Significance was assessed versus IgG isotype **(D)** Percent of IFNγ-positive T-cells after 6 h in co-culture with DLD cells (5:1) and bispecific T-cell activator-containing supernatants. **(E)** Proliferation, represented by division index and percentage of parental T cell population entering proliferation, of CFSE-stained T-cells in co-culture with DLD cells (5:1) and bispecific T-cell activator-containing supernatants. Fluorescence was measured by flow cytometry 5 days after co-culture. Division index was modelled using FlowJo proliferation tool. **(F)** Degranulation of T-cells, measured by CD107a externalisation, in co-culture with DLD cells (5:1) and bispecific T-cell activator-containing supernatants. Externalisation was assessed by co-culture with a CD107a-specific antibody for 6 h followed by flow cytometry analysis. **(G)** Cytokine levels were measured by LEGENDplex human Th cytokine panel using supernatants from co-cultures of T-cells with DLD cells (5:1) in the presence of bispecific T-cell activator-containing supernatants for 48 h. Each condition was measured in biological triplicate and data represented as mean ± SD. Significance was assessed versus untreated unless stated otherwise using a one-way ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 46 **Characterisation of recombinant EpCAM bispecific T-cell activator**

(A) Dot blot to estimate the quantity of EpCAM bispecific T-cell activator produced by transfected HEK293A cells. **(B)** ELISA measuring the level of EpCAM binding by controls or recombinant EpCAM or non-specific bispecific T-cell activator. Significance was assessed by comparison to empty vector control sample using a one-way ANOVA test with Tukey's Post Hoc analysis, ***p<0.001

Figure 47 **Assessment of antigen-specificity of EpCAM bispecific T-cell activator-mediated T cell cytotoxicity**

(A) Induction of activation marker CD25 on CD3+ T-cells in co-culture with CHO or CHO-EpCAM cells (5:1) and bispecific T-cell activator-containing supernatants, measured by FACS analysis after 24 h of co-culture. **(B)** Cytotoxicity of CHO or CHO-EpCAM cells cultured with bispecific T-cell activator-containing supernatants alone or in coculture with T-cells. Cytotoxicity was assessed by release of LDH into the culture supernatants after 24 h of incubation. **(C)** Cytotoxicity of multiple EpCAM-positive carcinoma cells after 24 h in co-culture with T-cells (1:5) and bispecific T-cell activator-containing supernatants. Viability was measured by MTS assay after 24 h of co-culture. **(D)** Levels of EpCAM expression (N=1) assessed by FACS analysis of EpCAM-positive cell lines in (C), compared to background fluorescence measured by using an isotype control antibody. (AC) Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed versus untreated or T-cell only controls using a one-way ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 48 **Cytotoxicity of EnAd-expressing EpCAM bispecific T-cell activator in SKOV3 cells**

2017320776 18 Sep 2024

SKOV3 cells were incubated with EnAd or recombinant viruses in the absence **(A)** or presence **(B)** of T cells and cytotoxicity was measured by LDH release at the specified time-points. Significance was assessed by comparison to uninfected control wells using a one-way ANOVA test with Tukey's Post Hoc analysis, ***p<0.001

Figure 49 **Identification of which T cells are responsible for bispecific T-cell activator-mediated cytotoxicity**

(A) Bispecific T-cell activator-mediated T-cell activation of CD4 and CD8 cells 24 h after co-culture of CD3 T-cells with DLD cells (5:1) and bispecific T-cell activator-containing supernatant. Activation was assessed by surface expression of CD69 and CD25 and measured by flow cytometry. **(B)** Proliferative response of CFSE-stained CD4 and CD8 T-cells in co-culture with DLD cells and incubated with T-cell activator-containing supernatants. Fluorescence was measured after 5 days incubation, by FACS analysis. **(C)** Degranulation of CD4 and CD8 cells following 6 h co-culture with DLD cells and bispecific T-cell activator-containing supernatants. A CD107a-specific antibody is added to the culture media for the duration of the co-culture and degranulation is assessed by flow cytometry. **(D)** Cytotoxicity by either the CD4 or CD8 T-cell subset is assessed by LDH release into supernatant, following 24 h incubation of DLD cells with CD4- or CD8-purified T-cells (1:5) and bispecific T-cell activator containing supernatant. Each condition was measured in biological triplicate and represented as mean ± SD. EpCAM bispecific T-cell activator treatment was compared to control bispecific T-cell activator unless stated otherwise and significance was assessed using a one-way ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 50 **Cytotoxicity and T cell activation by EnAd-expressing EpCAM bispecific T-cell activator in DLD cells**

Cytotoxicity for infected DLD cells in absence **(A)** or presence of T-cells **(B)**. DLD cells were infected and co-cultured with T-cells and cytotoxicity was measured by LDH release at the specified timepoints. **(C-D)** T-cells from (B) were harvested and stained for activation markers CD69 **(C)** or CD25 **(D)** and analysed via flow cytometry. **(E-F)** Quantification of EpCAM bispecific T-cell activator-produced from DLD cells infected with recombinant viruses. Standard curve of LDH released (Abs) of DLD in co-culture with CD3+ cells and varying known quantities of recombinant EpCAM bispecific T-cell activator **(E)**. In parallel, co-cultures were incubated with diluted supernatants (10,000-fold) from 3 day infected DLD cells **(F)**. Standard curve allowed the approximate determination of EpCAM bispecific T-cell activator produced at 165 µg and 50 µg per million DLD cells for EnAd-CMV-EpCAMbispecific T-cell activator and EnAd-SA-EpCAMbispecific T-cell activator, respectively. Significance was assessed by comparison to uninfected control wells using a one-way ANOVA test with Tukey's Post Hoc analysis, ***p<0.001

Figure 51 **Characterisation of oncolytic virus EnAd expressing EpCAM bispecific T-cell activator using cell lines and PBMC derived T cells**

20173207776 18 Sep 2024

(A) DLD cells were infected with parental EnAd or recombinant virus (100 vp/cell) and wells harvested at 24 or 72 h. Replication was assessed by measuring genomes using qPCR against viral hexon. **(B)** Cytotoxicity of DLD cells infected with EnAd or recombinant virus at increasing concentrations of virus. Cytotoxicity was measured by MTS assay after 5 days infection. **(C)** Supernatants from day 3 uninfected or virus-infected HEK293A cells were assessed for transgene expression by immunoblot analysis and probed with an anti-His antibody. **(D)** Induction of activation marker CD25 of CD3-positive T-cells cultured with CHO or CHO-EpCAM (E:T 5:1) and diluted HEK293A supernatants from (D). Activation was measured by surface expression of CD25 by flow cytometry. **(E)** Cytotoxicity of CHO or CHO-EpCAM cells incubated with HEK293A supernatants from (D) alone or in co-culture with CD3-purified PBMC (E:T 5:1). HEK293A supernatants were diluted 300-fold. Cytotoxicity was assessed by LDH released into the supernatant after 24 h incubation. Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed using a one-way ANOVA test with Tukey's Post Hoc analysis with each condition compared to untreated, *p<0.05, **p<0.01, ***p<0.001.

Figure 52 **Cellular composition of the malignant exudates**

(A) Representative image (pleural effusion sample, Patient 3 from Figure 57) demonstrating screening of ascites and exudate fluids for their cellular composition, as assessed by flow cytometry. (**B**) Absolute number of each cell type (in 10,000 cell sample size) is documented in the table.

Figure 53 **Superior potency of EnAd expressing EpCAM bispecific T-cell activator in partially EnAd-resistant cancer cell line**

(A-B) Viability of SKOV3 cells were monitored in real-time over 160 h by xCELLigence-based cytotoxicity assay. SKOV3 cells were seeded and infected with EnAd or bispecific T-cell activator-armed EnAd viruses at 0 h, with uninfected cells serving as a negative control. In **(B)** CD3-purified PBMC (5:1) were added 2 h post-infection and impedance was measured at 15 min intervals. **(C-D)** CD3-purified PBMC were cultured with SKOV3 cells (5:1) that were infected with parental EnAd or recombinant armed viruses. At each time-point, T cells were harvested and analysed for surface expression of CD69 **(C)** or CD25 **(D)** by flow cytometry. **(E)** Time-lapse sequences showing co-cultures of SKOV3 carcinoma cells (unstained), NHDF fibroblasts (red) and CD3-purified PBMC (blue), infected with EnAd, EnAd-CMVEpCAMbispecific T-cell activator or uninfected. Apoptosis was visualised using CellEvent Caspase 3/7 detection reagent (green). Images were taken on a Nikon TE 2000-E Eclipse inverted microscope at intervals of 15 min covering a period of 96 h. Representative images were recorded at the times displayed; original magnification ×10; scale bar 100 μm. (A-D) Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed by comparison to uninfected control using a oneway ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

2017320776 18 Sep 2024

Figure 54 **Expression of PD1 and the effect of PD1 antibodies on bispecific T-cell activator-mediated T cell activation**

(A) The expression of PD1 by endogenous T cells following their initial isolation from pleural effusions was assessed by flow cytometry. **(B-D)** Unpurified total cells from pleural effusions (from three different patients) were incubated in 100% fluid from the same pleural exudate in the presence of free bispecific T-cell activator, EnAd or recombinant virus. After 5 days, the total cell population was harvested, and the number of **(B)** CD3+ T cells and those which were **(C)** CD25+ were quantified. **(D)** The number of EpCAM+ cells was measured using flow cytometry. Significance was assessed by comparison to untreated control wells using a one-way ANOVA test with Tukey's Post Hoc analysis, ***p<0.001

Figure 55 **EnAd expressing EpCAM bispecific T-cell activator can selectively kill primary human tumour cells from chemotherapy-pretreated patients**

(A) Cytotoxicity of EpCAM+ cells or **(B)** FAP+ fibroblasts, first isolated from three patients' ascites and expanded ex vivo, then incubated with recombinant bispecific T-cell activator, or infected with EnAd or recombinant virus. Cytotoxicity was measured by flow cytometry after 5 days. **(C)** Induction of activation marker CD25 on CD3-positive T-cells cultured with ascites derived EpCAM+ and FAP+ cells from **(A+B)**. Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed by comparison to untreated using a one-way ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 56 **EpCAM bispecific T-cell activator can overcome immune suppressive effects of ascites fluid and activate endogenous T cells**

(A-B) PBMC-derived T cells were incubated with anti-CD3 antibodies in RPMI culture medium or the presence of 100% peritoneal ascites fluid from five ovarian cancer patients. **(A)** At 24 h induction of T cell activation markers CD69 and CD25 were analysed, and **(B)** degranulation of T-cells measured by CD107a externalisation, using flow cytometry. **(C)** Viability of MCF7 cells were monitored in real-time over 60 h by xCELLigence-based cytotoxicity assay. MCF7 cells were seeded and incubated with control or EpCAM bispecific T-cell activator at 25 h, in the presence of RPMI medium or 100% ascites fluid #1 or #2. Untreated cells served as a negative control. CD3-purified PBMC (5:1) were added at the same time and impedance was measured at 15 min intervals. **(D)** Endogenous unpurified total cells from peritoneal ascites were incubated in 100% ascites fluid in the presence of free EpCAM or control bispecific T-cell activator. After 24 h, the total cell population was harvested, and the number of CD3+/CD69+ and CD3+/CD25+ cells measured by flow cytometry. Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed by comparison to RPMI (A+B), untreated (D) or control bispecific T-cell activator (E) using a oneway ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 57 **EnAd expressing EpCAM bispecific T-cell activator can activate endogenous T cells to kill endogenous tumour cells within malignant pleural exudates**

2017320776 18 Sep 2024

Unpurified total cells from pleural effusions (from four different patients) were incubated in 100% fluid from the same pleural exudate in the presence of free bispecific T-cell activator, EnAd or recombinant virus. After 5 days, the total cell population was harvested, and the number of **(A)** CD3+ T cells and those which were **(B)** CD25+ were quantified. **(C)** The number of EpCAM+ cells was measured using flow cytometry. **(D)** Representative images (magnification ×10; scale bar 100 μm) and flow cytometry analysis of pleural effusion cells of Patient 3 (cancer cells and lymphocytes) following treatment with EnAd or EnAd-CMVEpCAM bispecific T-cell activator. **(E)** At 5 days cytokine levels were measured by LEGENDplex human Th cytokine panel using pleural effusion cultures following incubation with free recombinant bispecific T-cell activator or infection with EnAd or recombinant virus. Each condition was measured in biological triplicate and represented as mean ± SD. Significance was assessed by comparison to untreated control samples using a one-way ANOVA test with Tukey's Post Hoc analysis, *p<0.05, **p<0.01, ***p<0.001.

Figure 58 shows quantity of IL-10 measured in normal serum (NS) or patient malignant exudate fluids (A: peritoneal ascites, P: pleural effusions) using Human IL-10 ELISA MAX kit (Biolegend, 430604).

Figure 59 shows CD3/28 bead-mediated PBMC T-cell activation (based on CD69/CD25 levels) in patient fluids vs normal serum measured by flow cytometry. A: patient exudate fluid, P: pleural fluid.

Figure 60 shows CD3/28 bead-mediated PBMC T-cell degranulation (based on CD107a expression) in patient fluids. A: ascites, P: pleural fluid.

Figure 61 shows the correlation between IL-10 levels in patient fluids and CD3/CD28 bead-mediated T-cell dengranulation.

Figure 62 shows EpCAM bispecific T-cell activator bead-mediated PBMC T-cell activation (based on CD69/CD25 expression) in patient fluids. A: ascites, P: pleural fluid.

Figure 63 shows EpCAM bispecific T-cell activator bead-mediated PBMC T-cell degranulation (based on CD107a expression) in patient fluids. A: ascites, P: pleural fluid.

Figure 64 shows EpCAM bispecific T-cell activator bead-mediated cytotoxicity of SKOV3 in patient fluids. A: ascites, P: pleural fluids.

Figure 65 shows EpCAM bispecific T-cell activator-mediated T-cell activation (based on CD25/CD69 expression) in RPMI media vs ascites fluid.

Figure 66 shows the ability of EnAd-SA-EpCAMbispecific T-cell activator and EnAd-SA-Controlbispecific T-cell activator to induce T cell-mediated target cell lysis in RPMI media vs ascites fluid. **((A)** number of CD3+. **(B)** CD25 expression of T-cells. **(C)** number of EpCAM+ cells determined by flow cytometry.

Figure 67 shows the ability of EnAd-SA-EpCAMbispecific T-cell activator and EnAd-SA-Controlbispecific T-cell activator to induce T cell-mediated target cell lysis in ascites fluid (7 patient samples).

(A) number of CD3+. **(B)** CD25 expression of T-cells. **(C)** number of EpCAM+ cells determined by flow cytometry. See Figure 67A for legend.

2017320776 18 Sep 2024

Figure 68 shows a comparison of activation of T-cell cytokine production by recombinant FAP bispecific T-cell activator protein in the presence of human fibroblasts and by polyclonal activation with anti-CD3/CD28 beads. **(A)** IFNγ levels measured by ELISA. **(B)** Cytokine levels measured by cytokine bead array.

Figure 69 **FAP-targeted bispecific T-cell activator induces T-cell degranulation and specific cytotoxicity of FAP+ cells**

(A) Degranulation of T-cells in culture with NHDF cells (5:1) and **(B)** bispecific T-cell activator-containing supernatants. Degranulation was assessed by externalisation of CD107a following 6 h culture with a CD107a-specific antibody and measured by flow cytometry. CD3/CD28 Dynabeads were used as a positive control. **(C)** Cytotoxicity of NHDF cells after 24 h in co-culture with T-cells (1:5) and 10-fold serial dilutions of bispecific T-cell activator-containing supernantants. Cytotoxicity was assessed by release of LDH into culture supernatants. **(D)** Lysis of NHDF by LDH release (left) and CD25 induction on T-cells (right) was assessed after 24 h co-culture with PBMC-derived T-cells (1:5) from six healthy donors and bispecific T-cell activator-containing supernatants.

Figure 70 **EnAd expressing FAP bispecific T-cell activator selectively kills FAP$^+$ fibroblasts and decreases TGFb in peritoneal ascites samples**

(A,B) Number of of FAP$^+$ fibroblasts **(A)** and EpCAM$^+$ tumour cells **(B)** after 72 h culture with PBMC-derived T-cells and EnAd or recombinant viruses. Ascites cells were first isolated from three patients ascites and expanded *ex vivo*. Cell number was measured at 72 h post-infection by flow cytometry. **(C)** Induction of activation marker CD25 on PBMC-derived CD3 cells from **(A)** was measured at 72 h post-infection. **(D)** Levels of TGFb were measured by ELISA using supernatants harvested from **(A).**

Figure 71 shows the activation of endogenous tumor associated T-cells and associated killing of FAP+ cells in patient malignant ascites biopsy samples by FAP bispecific T-cell activator protein and EnAd-FAPbispecific T-cell activator viruses. **(A)** T cell activation measured by CD25 expression. **(B)** residual number of FAP+ cells measured by flow cytometry.

Figure 72 **Effect of PD-L1 blocking antibodies on bispecific T-cell activator-mediated T cell activation in patient sample**

(A) Expression of PD1 by endogenous T cells and PD-L1 on FAP+ cells following their initial isolation from peritoneal ascites was assessed by flow cytometry. **(B)** Unpurified total cells from peritoneal ascites were incubated in 50% fluid from the same exudate in the presence of free bispecific T-cell activator, EnAd or recombinant virus, with or without anti-PD-L1 blocking antibody. After 2 days, the total cell population was harvested, and the number of CD25+ T-cells was quantified by flow cytometry. **(C)** Quantity of interferon gamma in culture supernatants from **(B, D)** measured by ELISA. **(D)** The number of residual FAP+ cells in (B) was measured using flow cytometry.

Figure 73 **EnAd expressing bispecific T-cell activators activate and redirect T-cells from patient biopsy samples to lyse NHDF fibroblasts**

2017320776 18 Sep 2024

(A) The expression of PD-1 by endogenous T cells following isolation from healthy donors or malignant exudate cancer biopsy samples. PD-1 expression was measured by flow cytometry. **(B)** The proportion of $CD3^+$ cells within the unpurified cell population of PBMC and cancer biopsy samples as measured by flow cytometry. **(C)** Levels of interferon gamma measured by ELISA in culture supernatants harvested from **(B)** at 120 h post-treatment. **(D)** Viability of NHDF fibroblasts were monitored in real time over 130 h by xCELLigence cytotoxicity assay in co-culture with PBMC or total cancer biopsy cells (1:5) and bispecific T-cell activator-containing supernatant.

Figure 74 shows the effect of immunosuppressive ascites fluid samples on FAP bispecific T-cell activator- and anti-CD3/CD28 bead-mediated activation of PBMC T-cells. **(A)** PBMC T cells activated with anti-CD3/Cd28 Dynabeads. **(B)** PBMC T cells activated with control or FAP bispecific T-cell activators in the presence of NHDF cells. NS: normal serum, A: peritoneal ascites.

Figure 75 **FAP bispecific T-cell activator expressing EnAd polarises $CD11b^+$ macrophage in patient ascites to a more inflammatory phenotype**

(A) Unpurified total cells from ascites sample were incubated in 50% ascites fluid in the presence of free bispecific T-cell activator or bispecific T-cell activator expressing virus. Interferon gamma treatment was used as a positive control. After 3 days, the total cell population was harvested and the induction of activation marker CD25 on $CD3^+$ cells was measured by flow cytometry. **(B)** Levels of interferon gamma in culture supernatants from **(A)** were measured by ELISA. **(C)** At 3 days, the expression levels of CD68, CD86, CD206 and CD163 on CD11b+ cells from **(A)** were measured by flow cytometry. Representative flow cytometry spectra from triplicates is shown alongside the complete data set.

Figure 76 **Characterisation of architecture and cellular composition of solid prostate tumour**

(A) EpCAM staining, **(B)** CD8 staining, **(C)** FAP staining. **(D)** Representative immunohistochemistry images of CD25 induction within prostate tumour slices following treatment with bispecific T-cell activator expressing viruses. Tumour cores were sliced at 300 uM thickness with a Leica vibratome, cultured and infected in inserts and harvested after 7 days treatment. **(E)** Levels of IFNg in tissue slice culture medium measured by ELISA. Supernatants were harvested from slices cultures of malignant and benign tissue at the specified time-point. **(F)** Levels of IL-2 in tissue culture medium of malignant and benign tissue measured by ELISA.

Figure 77A-C shows a schematic representation of the transgene cassettes used in Example 33.

Figure 77D shows a graph indicating the number of viral genomes detected per cell in NG-611, NG-612 and NG-617 treated tumour cells.

Figure 78 shows the percentage of T cells expressing CD69 **(a)**, CD25 **(b)** HLA-DR **(c)**, CD40L **(d)** or cell surface CD107a **(e)** following co-culture with EpCam expressing SKOV cells and supernantants harvested from A549 cells at 24, 48 or 72hrs post-treatment with NG-611 viurs particles compared to NG-612, enadenotucirev or untreated control supernatants.

2017320776 18 Sep 2024

Figure 79 shows the percentage of T cells expressing CD69 **(a)**, CD25 **(b)** HLA-DR **(c)**, CD40L **(d)** or cell surface CD107a **(e)** following co-culture with FAP expressing MRC-5 cells and supernatants harvested from A549 cells at 24, 48, or 72hrs post-treatment with NG-612 virus particles compared to NG-611, enadenotucirev or untreated control supernatants.

Figure 80 shows the percentage of MRC-5 cells that express EpCAM and FAP

Figure 81 shows IFNγ expression in the supernatants of T cell co-cultures with SKOV cells (A) or MRC-5 cells (B) incubated with supernatants harvested from A549 cells at 24, 48 or 72hrs post-treatment with NG-611, NG-612 or enadenotucirev virus particles, or untreated control supernatants.

Figure 82 shows anti-tumour efficacy and immune activation of bispecific T-cell activator expressing viruses in vivo. **(a)** tumour volume in mice treated with saline, enadenotucirev or NG-611. **(b)** Ratio of CD8 to CD4 T cells in NG-611 treated tumours compared to enadenotucirev treated or untreated controls.

Figure 83 shows schematic representation of transgene cassettes. **(a)** NG-615, **(b)** NG-640, **(c)** NG-641.

Figure 84 shows a graph indicating the number of viral genomes detected per cell in NG-612 and NG-615 treated tumour cells

Figure 85 shows the expression of IFNα, MIP1α and Flt3 L in the cellular supernatant of NG-615 vs the supernatant of enadenotucirev and untreated control tumour cells.

Figure 86 shows the number of T cells expressing CD69 **(a)**, CD25 **(b)** HLA-DR **(c)**, CD40L **(d)** or cell surface CD107a **(e)**) following co-culture with FAP expressing MRC-5 cells and supernantants harvested from A549 cells at 24, 48 or 72hrs post-treatment with NG-615 viurs particles compared to NG-612, enadenotucirev or untreated control supernatants.

Figure 87 shows IFNγ expression in the supernatants of T cell co-cultures with MRC-5 cells incubated with supernatants harvested from A549 cells at 24, 48 or 72hrs post-treatment with NG-612, NG-615 or enadenotucirev virus particles, or untreated control supernatants.

Figure 88 shows schematic representation of the NG-618 transgene cassette

Figure 89 shows the detection of surface FAP expression on MRC-5 cells (a) or EpCam expression on SKOV cells (b) following incubation with supernatants harvested from A549 cells at 72hrs post-treatment with NG-611, NG-612, NG-615 or enadenotucirev virus particles.

Figure 90 shows the percentage of T cells expressing CD24 **(a)**, CD40L **(b)** or cell surface CD107a **(c)** following co-culture with FAP expressing MRC-5 cells and supernatants harvested from A549 cells at 72hrs post-treatment with NG-618 virus particles compared to enadenotucirev or untreated controls.

Figure 91 shows the percentage of T cells expressing CD24 **(a)**, CD40L **(b)** or cell surface CD107a **(c)** following co-culture with EpCam expressing SKOV cells and supernatants harvested from A549 cells at 72hrs post-treatment with NG-618 virus particles compared to enadenotucirev or untreated controls.

Figure 92 shows the percentage of dead MRC-5 (a) or SKOV (b) cells following co-culture with T cells and supernatants harvested from A549 cells at 72hrs post-treatment with NG-618 virus paticles compared to enadenotucirev or untreated controls.

2017320776 18 Sep 2024

SEQUENCES

SEQ ID NO: 1	Anti-EpCAM bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 2	Anti-EpCAM bispecific T-cell activator protein sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 3	Anti-FAP bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 4	Anti-FAP bispecific T-cell activator amino acid sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 5:	Control (Anti-FHA) bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 6:	Control (Anti-FHA) bispecific T-cell activator amino acid sequence with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 7:	Anti-CD3 ScFv amino acid sequence
SEQ ID NO: 8:	Anti-CD3 VH
SEQ ID NO: 9:	Anti-CD3 VL
SEQ ID NO: 10:	Anti-CD3 ScFv linker sequence
SEQ ID NO: 11:	Anti-FAP ScFv
SEQ ID NO: 12:	Anti-FAP VL domain
SEQ ID NO: 13:	Anti-FAP VH domain
SEQ ID NO: 14:	Anti-FAP and Anti-EpCAM linker sequence
SEQ ID NO: 15:	bispecific T-cell activator leader sequence
SEQ ID NO: 16:	Anti-EpCAM ScFv
SEQ ID NO: 17:	Anti-EpCAM VL
SEQ ID NO: 18:	Anti-EpCAM VH
SEQ ID NO: 19:	Control bispecific T-cell activator (Anti-FHA)
SEQ ID NO: 20:	Control (Anti-FHA) ScFv
SEQ ID NO: 21:	Control (Anti-FHA) VL
SEQ ID NO: 22:	Control (Anti-FHA) VH
SEQ ID NO: 23:	Control (Anti-FHA) ScFv linker sequence
SEQ ID NO: 24:	Deca-His Tag sequence
SEQ ID NO: 25:	FAP bispecific T-cell activator-P2A-RFP (*ITALICS* = leader, **BOLD** = furin cleavage site, UNDERLINE = P2A sequence, lower case = RFP)
SEQ ID NO: 26:	Control (Anti-FHA) bispecific T-cell activator-P2A-RFP (*ITALICS* = leader, **BOLD** = furin cleavage site, UNDERLINE = P2A sequence, lower case = RFP)
SEQ ID NO: 27:	Human EpCAM DNA coding sequence
SEQ ID NO: 28:	Human EpCAM amino acid sequence
SEQ ID NO: 29:	Human FAP DNA coding sequence
SEQ ID NO: 30:	Human FAP amino acid sequence
SEQ ID NO: 31:	CMV promoter sequence
SEQ ID NO: 32:	SV40 late polyadenylation sequence

2017320776 18 Sep 2024

SEQ ID NO: 33:	Null sequence
SEQ ID NO: 34:	NG-601 (EnAd-CMV-EpCAMbispecific T-cell activator)
SEQ ID NO: 35:	NG-602 (EnAd-SA-EpCAMbispecific T-cell activator)
SEQ ID NO: 36:	NG-605 (EnAd-CMV-FAPbispecific T-cell activator)
SEQ ID NO: 37:	NG-606 (EnAd-SA-FAPbispecific T-cell activator)
SEQ ID NO: 38	EnAd genome
SEQ ID NO: 39	B_X DNA sequence corresponding to and including bp 28166-28366 of the EnAd genome
SEQ ID NO: 40	B_Y DNA sequence corresponding to and including bp 29345-29379 of the EnAd genome
SEQ ID NO: 41	HIS-Tag
SEQ ID NO: 42	Splice acceptor sequence.
SEQ ID NO: 43	SV40 poly Adenylation sequence
SEQ ID NO: 44	EpCam bispecific T-cell activator nucleic acid sequence (OKT3)
SEQ ID NO: 45	FAP bispecific T-cell activator nucleic acid sequence (OKT3)
SEQ ID NO: 46	FAP bispecific T-cell activator nucleic acid sequence (aCD3)
SEQ ID NO: 47	NG-611 Transgene cassette
SEQ ID NO: 48	NG-612 Transgene cassette
SEQ ID NO: 49	NG-613 Transgene cassette
SEQ ID NO: 50	Restriction site insert (B_X)
SEQ ID NO: 51	Restriction site insert (B_Y)
SEQ ID NO: 52	CMV promoter sequence
SEQ ID NO: 53	PGK promoter sequence
SEQ ID NO: 54	CBA promoter sequence
SEQ ID NO: 55	short splice acceptor (SSA) DNA sequence
SEQ ID NO: 56	splice acceptor (SA) DNA sequence
SEQ ID NO: 57	branched splice acceptor (bSA) DNA sequence
SEQ ID NO: 58	Kozak sequence (null sequence)
SEQ ID NO: 59	Example of start codon
SEQ ID NO: 60	Internal Ribosome Entry Sequence (IRES)
SEQ ID NO: 61	P2A peptide
SEQ ID NO: 62	F2A peptide
SEQ ID NO: 63	E2A peptide
SEQ ID NO: 64	T2A peptide
SEQ ID NO: 65	polyadenylation (polyA) sequence
SEQ ID NO: 66	Leader sequence
SEQ ID NO: 67	Leader sequence
SEQ ID NO: 68	IFNγ amino acid sequence
SEQ ID NO: 69	IFNα amino acid sequence
SEQ ID NO: 70	TNFα amino acid sequence

2017320776 18 Sep 2024

SEQ ID NO: 71	DNA sequence corresponding to E2B region of the EnAd genome (bp 10355-5068)
SEQ ID NO: 72:	Anti-EpCAM bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag
SEQ ID NO: 73:	Anti-EpCAM bispecific T-cell activator protein sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag
SEQ ID NO: 74:	Anti-FAP bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag
SEQ ID NO: 75:	Anti-FAP bispecific T-cell activator amino acid sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag
SEQ ID NO: 76:	Control (Anti-FHA) bispecific T-cell activator DNA coding sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag
SEQ ID NO: 77:	Control (Anti-FHA) bispecific T-cell activator amino acid sequence with N-terminal signal sequence without C-terminal deca-His affinity tag
SEQ ID NO: 78:	Control bispecific T-cell activator (Anti-FHA) without C-terminal deca-His affinity tag
SEQ ID NO: 79:	NG-601 (EnAd-CMV-EpCAMbispecific T-cell activator) without deca-His affinity tag
SEQ ID NO: 80:	NG-602 (EnAd-SA-EpCAMbispecific T-cell activator) without deca-His affinity tag
SEQ ID NO: 81:	NG-605 (EnAd-CMV-FAPbispecific T-cell activator) without deca-His affinity tag
SEQ ID NO: 82:	NG-606 (EnAd-SA-FAPbispecific T-cell activator) without deca-His affinity tag
SEQ ID NO: 83:	EpCam bispecific T-cell activator nucleic acid sequence (OKT3)
SEQ ID NO: 84:	Null sequence
SEQ ID NO: 85:	FAP bispecific T-cell activator nucleic acid sequence (OKT3)
SEQ ID NO: 86:	Null sequence
SEQ ID NO: 87:	FAP bispecific T-cell activator nucleic acid sequence (aCD3)
SEQ ID NO: 88:	NG-611 Transgene cassette
SEQ ID NO: 89:	NG-612 Transgene cassette
SEQ ID NO: 90:	NG-613 Transgene cassette
SEQ ID NO: 91:	NG-614 Transgene cassette
SEQ ID NO: 92:	NG-617 Transgene cassette
SEQ ID NO: 93:	EpCam bispecific T-cell activator amino acid sequence (OKT3)
SEQ ID NO: 94:	FAP bispecific T-cell activator amino acid sequence (OKT3)
SEQ ID NO: 95:	FAP bispecific T-cell activator amino acid sequence (aCD3)
SEQ ID NO: 96:	NG-611 Genome
SEQ ID NO: 97:	NG-612 Genome
SEQ ID NO: 98:	NG-613 Genome
SEQ ID NO: 99:	NG-614 Genome
SEQ ID NO: 100:	NG-617 Genome

2017320776 18 Sep 2024

SEQ ID NO: 101: NG-615 Genome
SEQ ID NO: 102: NG-640 Genome
SEQ ID NO: 103: NG-641 Genome
SEQ ID NO: 104: Null sequence
SEQ ID NO: 105: Flt3L nucleic acid sequence
SEQ ID NO: 106: Null sequence
SEQ ID NO: 107: MIP1α nucleic acid sequence
SEQ ID NO: 108: Flexible linker sequence
SEQ ID NO: 109: IFNα nucleic acid sequence
SEQ ID NO: 110: CXCL10 nucleic acid sequence
SEQ ID NO: 111: CXCL9 nucleic acid sequence
SEQ ID NO: 112: NG-615 Transgene cassette
SEQ ID NO: 113: NG-640 Transgene cassette
SEQ ID NO: 114: NG-641 Transgene cassette
SEQ ID NO: 115: FLT3L amino acid sequence
SEQ ID NO: 116: MIP1α amino acid sequence
SEQ ID NO: 117: IFNα amino acid sequence
SEQ ID NO: 118: CXCL9 amino acid sequence
SEQ ID NO: 119: CXCL10 amino acid sequence
SEQ ID NO: 120: NG-618 Genome
SEQ ID NO: 121: NG-618 EpCam bispecific T-cell activator nucleic acid sequence
SEQ ID NO: 122: NG-618 FAP bispecific T-cell activator nucleic acid sequence
SEQ ID NO: 123: NG-618 Transgene cassette
SEQ ID NO: 124 to 297 are linker sequences
SEQ ID NO: 298 NG-616 Genome

EXAMPLES

EXAMPLE 1

Recombinant bispecific T-cell activators were designed and proteins produced as described in this example.

Bispecific T-cell activator engineering

Bispecific T-cell activators are generated by joining two single chain antibody fragments (ScFv) of different specificities with a flexible Gly_4Ser linker. ScFv's are created by the joining of V_H and V_L domains from parental monoclonal antibodies by a linker. Each bispecific T-cell activator was designed with an N-terminal signal sequence for mammalian secretion and a C-terminal decahistidine affinity tag for detection and purification. Bispecific T-cell activators were engineered by standard DNA cloning techniques and inserted into protein expression vectors (Figure 1). The anti-EpCAM bispecific T-cell activator is that from patent WO 2005040220 (SEQ ID NO: 63 therein), with a signal sequence and affinity tag added. The anti-FAP bispecific T-cell activator was created de novo using the anti-FAP ScFv from patent WO2010037835A2 and the anti-CD3 ScFv from patent WO 2005040220 (SEQ ID 63 therein), with a signal sequence and affinity tag added. A control bispecific T-cell activator used the anti-FHA

2017320776 18 Sep 2024

(filamentous haemagglutinin from *Bordetella pertussis*) ScFv from Hussein et al, 2007 (Hussein AH et al (2007) "Construction and characterization of single-chain variable fragment antibodies directed against the Bordetella pertussis surface adhesins filamentous hemagglutinin and pertactin". Infect Immunity **75**, 5476-5482) and the anti-CD3 ScFv from patent WO 2005040220 (SEQ ID NO: 63 therein), with a signal sequence and affinity tag added. The DNA coding and amino acid sequences for these bispecific T-cell activators are SEQ ID NOs: 1-6.

Recombinant bispecific T-cell activator production

Recombinant bispecific T-cell activator proteins were produced by cloning the respective sequences into the pSF-CMV vector using a CMV promoter (SEQ ID NO: 31) to drive protein expression (Figure 1). The concentration of plasmid DNA for plasmids, pSF-CMV-EpCAMbispecific T-cell activator, pSF-CMV-FAPbispecific T-cell activator and pSF-CMV-Controlbispecific T-cell activator (Table 2), were measured via NanoDrop. Empty pSF-CMV vector is included as a negative control. 54.7 μg of each was diluted with 4 mL OptiMEM. 109.2 ug PEI (linear, MW 25000, Polysciences, USA) were diluted in 4 mL OptiMEM medium and mixed with the 4ml of diluted DNA to generate DNA-PEI complexes (DNA:PEI ratio of 1:2 (w/w)). After incubation at room temperature for 20 minutes, the complex mixture was topped up to 18 mL with OptiMEM and this transfection mixture was added to a T175 flask containing Ad293 cells at 90% confluency. After incubation of the cells with the transfection mix for 4 hrs at 37°C, 5% CO_2, 30 mL of cell media (DMEM high glucose with glutamine supplemented, phenol red-free) was added to the cells and the flasks was incubated 37°C, 5% CO_2 for 48 hours. Another flask of cells was transfected in parallel with pSF-CMV-GFP to ensure efficient transfection efficiency. In order to harvest secreted protein, the supernatant of transfected cells was collected and centrifuged at 350g at 4 °C for 5 minutes to remove cell components (Allegra X-15R, Beckman Coulter). Supernatants were transferred to 10k MWCO Amicon Ultra-15 Centrifugal Filter Units (Millipore). After spinning at 4750 rpm and 4 °C, the volume of the retentate was adjusted with the flow through to obtain a 50-fold higher concentration. Aliquots of concentrated protein were stored at -80°C.

Table 2

"p" employed as a prefix in naming constructs indicates that the construct is a plasmid.

Plasmid ID	**Coding Sequence SEQ ID NO:**	**[plasmid DNA] ng/ml**
pSF-CMV-EpCAMbispecific T-cell activator	SEQ ID NO: 1	3717
pSF-CMV-FAPbispecific T-cell activator	SEQ ID NO: 3	6700
pSF-CMV-Controlbispecific T-cell activator	SEQ ID NO: 5	5300
pSF-Lenti-EpCAM	SEQ ID NO: 27	2529.3
pSF-Lenti-FAP	SEQ ID NO: 29	659.6

Recombinant bispecific T-cell activator detection

To detect the bispecific T-cell activator, the C-terminal decahistidine affinity tag can be probed with an anti-His antibody using the technique of western blotting. Protein samples were adjusted with lysis buffer

2017320776 18 Sep 2024

to a final volume of 15 µL including 2,5 µL 6x Laemmli SDS Sample Buffer which contains β-mercaptoethanol and SDS. Samples were incubated for 5 minutes at 95 °C to denature proteins and loaded onto 15-well 10% precast polyacrylamide gels (Mini-PROTEAN TGX Precast Gels, BioRad, UK). Gels were run at 180 V for 45 minutes in 1 x running buffer within a Mini-PROTEAN Tetra System (BioRad, UK). Proteins from the SDS gels were transferred onto nitrocellulose membranes by wet electroblotting at 300 mA and 4 °C for 90 minutes in 1 x transfer buffer within a Mini Trans-Blot Cell (BioRad, UK). Transfer was performed in presence of an ice pack to limit heat. The nitrocellulose membrane was then blocked with 5% milk in PBS-T on a shaker for 1 hour at room temperature, and probed with anti-His (C-term) antibody (mouse α-6xHis, clone 3D5, Invitrogen, UK, #46-0693), diluted 1:5000 in PBS/5% milk. After incubation on a shaker overnight at 4°C, the membrane was washed and probed with HRP-labelled polyclonal secondary α-mouse-immunoglobulin-antibody (1:10.000 in PBS/5% milk, Dako, #P0161) for 1 hour at room temperature. For visualization, SuperSignal West Dura Extended Duration Substrate (Thermo Fisher Scientific, UK) was applied, following manufacturer's instructions and exposed to X-ray film and developed in an automatic film processor. The results demonstrated the expression and secretion of bispecific T-cell activator protein from Ad293 cells transfected with the bispecific T-cell activator expression plasmids, but not the parental vector.

Recombinant bispecific T-cell activator quantification

To measure the quantity of recombinant bispecific T-cell activator protein, the technique of dot blot was used to compare the bispecific T-cell activator signal to a His-tagged (C-term 10His) protein standard (10 x His-tagged human Cathepsin D, Biolegend, #556704). Two-fold serial dilutions of bispecific T-cell activator samples and protein standard were prepared, and 1.5 uL of each directly applied to a nitrocellulose membrane and air-dried for 20 minutes. The blocking and staining protocol described above for western blotting was then performed. The molar concentration of the protein standard was adjusted to represent a bispecific T-cell activator concentration of 250µg/mL. The results (Figure 2A) demonstrated the expression and secretion of bispecific T-cell activator protein from Ad293 cells transfected with the bispecific T-cell activator expression plasmids.

FAP binding ELISA

The FAP-binding activity of the FAP bispecific T-cell activator and control (anti-FHA) bispecific T-cell activator (SEQ ID NOs: 4 and 6) secreted from cells transfected with pSF-CMV-FAPbispecific T-cell activator or pSF-CMV-Controlbispecific T-cell activator was assessed by enzyme-linked immunosorbent assay (ELISA). Empty pSF-CMV vector supernatants were included as a negative control. ELISA plates (Nunc Immuno MaxiSorp 96 well microplate) were prepared by coating overnight at 4°C with human FAP/seprase protein (100ng/well, Sino Biological Inc, 10464-H07H-10) in PBS buffer. Plates were washed between all subsequent binding steps with PBS 0.05% Tween 20. The plates were blocked for 1 hour at room temperature with 5% BSA in PBS 0.05% Tween 20. Aliquots of bispecific T-cell activator protein, or protein harvested from empty pSF-CMV vector-transfected wells, were diluted 10-fold into PBS/5% BSA/0.05% Tween 20. All samples were added to the FAP coated plates and incubated for 2 hr at room temperature. The detection antibody, anti-His (C-term) antibody (mouse anti-6xHis, clone 3D5, Invitrogen, UK, #46-0693), was diluted 1:1000 and applied for 1 hour at room temperature. HRP conjugated anti-mouse-Fc (1:1000 in PBS/5% milk, Dako) was then applied for 1 hr at room temperature before HRP detection was performed with HRP substrate solution 3.3.5.5'-teramethylethylenediamine

2017320776 18 Sep 2024

(TMB, Thermo-Fisher). Stop solution was used for terminating the reaction and the developed colour was measured at 450nm on a plate reader. Absorbance at 450nm was plotted for FAP bispecific T-cell activator, control bispecific T-cell activator and empty vector supernatants, demonstrating specific binding of the FAP bispecific T-cell activator to FAP protein. The results (Figure 2B) show the specific binding of the FAP bispecific T-cell activator and not control bispecific T-cell activator to recombinant FAP protein.

EpCAM binding ELISA

The EpCAM-binding activity of the EpCAM bispecific T-cell activator and control bispecific T-cell activator (SEQ ID NOs: 2 and 6) secreted from cells transfected with pSF-CMV-EpCAMbispecific T-cell activator or pSF-CMV-Controlbispecific T-cell activator was assessed by enzyme-linked immunosorbent assay (ELISA). Empty pSF-CMV vector supernatants are included as a negative control. ELISA plates (A Nunc Immuno MaxiSorp 96 well microplate) were prepared by coating overnight at 4ºC with human EpCAM/TROP-1 protein (50ng/well, Sino Biological Inc, #10694-H02H-50) in PBS buffer. Plates were washed between all subsequent binding steps with PBS 0.05% Tween 20. The plates were blocked for 1 hour at room temperature with 5% BSA in PBS 0.05% Tween 20. Aliquots of bispecific T-cell activator protein, or protein harvested from empty pSF-CMV vector-transfected wells, were diluted 10-fold into PBS/5% BSA/0.05% Tween 20. All samples were added to the EpCAM coated plates and incubated for 2 hr at room temperature. The detection antibody anti-His (C-term) antibody (mouse anti-6xHis, clone 3D5, Invitrogen, UK, #46-0693) was diluted 1:5000 and applied for 1 hour at room temperature. HRP conjugated anti-mouse-Fc (1:1000 in PBS/5% milk, Dako,) was then applied for 1 hr at room temperature before HRP detection was performed with HRP substrate solution 3.3.5.5'-teramethylethylenediamine (TMB, Thermo-Fisher). Stop solution was used for terminating the reaction and the developed colour was measured at 450nm on a plate reader. Absorbance at 450nm was plotted for EpCAM bispecific T-cell activator, control bispecific T-cell activator and empty vector supernatants demonstrating specific binding of EpCAM bispecific T-cell activator to recombinant EpCAM. The results (Figure 2C) show the specific binding of the EpCAM bispecific T-cell activator and not control bispecific T-cell activator to recombinant EpCAM protein.

Example 2

The functional activities of recombinant bispecific T-cell activator proteins were assessed in a number of different assays prior to constructing bispecific T-cell activator transgene-bearing EnAd viruses.

Isolation of human peripheral blood mononuclear cells (PBMCs)

Human PBMCs were isolated by density gradient centrifugation either from fresh human blood samples of healthy donors or from whole blood leukocyte cones, obtained from the NHS Blood and Transplant UK in Oxford. In either case, the samples were diluted 1:2 with PBS and 25 mL of this mixture was layered onto 13 mL Ficoll (1.079g/mL, Ficoll-Paque Plus, GE Healthcare) in a 50 mL Falcon tube. Samples were centrifuged (Allegra X-15R, Beckman Coulter) at 1600 rpm for 30 minutes at 22 °C with the lowest deceleration setting to preserve phase separation. After centrifugation, 4 layers could be observed which included a plasma layer at the top, followed by an interface containing PBMCs, a Ficoll layer and a layer of red blood cells and granulocytes at the bottom. The PBMCs were collected using a Pasteur pipette and washed twice with PBS (1200 rpm for 10 minutes at room temperature) and re-suspended in RPMI medium supplemented with 10% FBS.

20173207776 18 Sep 2024

Isolation of CD3-positive T-cells

CD3-positive ($CD3^+$) T-cells were extracted from PBMCs by depletion of non-CD3 cells using a Pan T Cell Isolation Kit (Miltenyi Biotec, #130-096-535), according to the manufacturer's protocol.

Processing primary ascites samples

Primary human ascites samples were received from the oncology ward of the Churchill Hospital (Oxford University Hospitals) from patients with multiple indications, including but not limited to ovarian, pancreatic, breast and gastric cancer. Upon receipt, cellular and fluid fractions were separated, with aliquots of fluid frozen at -20°C for storage and future analysis. The cellular fraction was treated with red blood cell lysis buffer (Roche, #11814389001) to remove red blood cells, following the manufacturer's instructions. Cell types present in each sample was determined by staining for EpCAM, EGFR, FAP, CD45, CD11b, CD56, CD3, CD4, CD8, PD1 and CTLA4 and analysed by flow cytometry. Cells were then used fresh for *ex vivo* T-cell activation and target cell lysis experiments. In some cases, the cells were passaged in DMEM supplemented with 10% FBS for use in later experiments.

Cell line maintenance

All cell lines were maintained in DMEM (Sigma-Aldrich, UK) or RPMI medium (Sigma-Aldrich, UK) as specified in Table 3, supplemented with 10% (v/v) foetal bovine serum (FBS, Gibco™) and 1% (v/v) Penicillin/Streptomycin (10 mg/mL, Sigma-Aldrich, UK), in a humidified incubator (MCO-17AIC, Sanyo) at 37°C and 5% CO_2, unless otherwise specified. Cells were split every 2 to 3 days before reaching confluency by enzymatic dissociation with Trypsin/EDTA (0.05% trypsin 0,02% EDTA, Sigma-Aldrich, UK). In this process, culture medium was aspirated and cells were washed with 15 ml of PBS and subsequently cells were treated with 2 mL of Trypsin/EDTA for 2-10 minutes at 37 °C. Trypsin was neutralized with 10 mL of DMEM containing 10% FBS and a portion of the cells was transferred into new flasks containing fresh medium. For routine cell culture, media was supplemented with 10% FBS, for infections and virus plasmid transfections with 2% FBS and for recombinant bispecific T-cell activator plasmid transfections with no FBS supplement.

Table 3

Cell line	Origin of cells	Culturing Media	Source
Ascites-derived cell lines	Human primary ascites	DMEM	NHS Blood & Transplant UK
BTC100	Human primary lung cancer-associated fibroblasts (CAF)	DMEM	University of Oxford
CHO-K1	Chinese hamster ovary, adherent	RPMI	ATCC
CHO-K1 stable cell lines	Chinese hamster ovary, adherent	RPMI	-
DLD1	Human colorectal adenocarcinoma	RPMI	ATCC
HEK 293A	Human embryonic kidney, adherent	DMEM	ATCC
HEK 293A stable cell lines	Human embryonic kidney, adherent	DMEM	-

2017320776 18 Sep 2024

HEK 293T	Human embryonic kidney, adherent	DMEM	ATCC
MCF-7	Human, mammary gland, breast, adherent	DMEM	ATCC
Normal human dermal fibroblasts (NHDF)	Normal adult human primary dermal fibroblasts	DMEM	ATCC
SKOV3	Human ovarian adenocarcinoma	DMEM	ATCC

Statistics

In cases where two conditions were being compared, statistical analyses were performed using a t-test. In all other cases, statistical analyses were performed by using a One-way ANOVA.

Characterisation of human T-cell activation by recombinant FAP bispecific T-cell activator

The ability of the FAP bispecific T-cell activator to induce T-cell activation in the presence or absence of normal human dermal fibroblast (NHDF) cells was compared. Human $CD3^+$ T-cells (70,000 cells per well in 96-well U-bottom plates) were co-cultured alone or with NHDF cells (10:1 T:NHDF) in the presence of media alone or 300 ng/mL FAP or control bispecific T-cell activator. Cells were co-cultured for 24 hours at 37°C and subsequently harvested with enzyme-free cell dissociation buffer (Thermo, #13151014). The expression levels of CD69 (Figure 3A) and CD25 (Figure 3B) on $CD45^+$ T-cells were then analysed by antibody staining and flow cytometry and represented as geometric mean fluorescence (gMFI) values. Plate-immobilised anti-CD3 antibody (7.5 µg/mL) was used as positive control for T cell activation. The FAP bispecific T-cell activator selectively induced the expression of activation markers CD69 and CD25 on T-cells, indicating that it was able to activate T cells.

In a second similar experiment, T-cells were assessed by intracellular cytokine staining 6 hr after co-culture with NHDF cells (200,000 $CD3^+$ cells plus 40,000 NHDF in wells of a 96-well plate) and 300ng/mL FAP or control bispecific T-cell activator. $CD45^+$ T-cells were intracellularly stained for IFNγ expression with Brefeldin A added into the culture medium 5 hours before harvest. As a positive control, T-cells were stimulated with soluble PMA (10ng/mL) and ionomycin (1µg/mL). The results shown in Figure 4A indicate that the FAP bispecific T-cell activator in the presence of NHDF resulted in a significantly higher number of IFNγ expressing T-cells compared to the control bispecific T-cell activator.

Example 3

A similar set of experiments to those in example 2 were run to characterize the recombinant EpCAM bispecific T-cell activator protein.

Characterisation of human T-cell activation by recombinant EpCAM bispecific T-cell activator

The ability of the EpCAM bispecific T-cell activator to induce T-cell activation in the presence or absence of the EpCAM-positive DLD cell line was compared. Human $CD3^+$ T-cells (70,000 cells per well in 96-well U-bottom plates) were co-cultured alone or with DLD cells (10:1 T:DLD) in the presence of media alone or 600 ng/mL EpCAM or control bispecific T-cell activator. Cells were co-cultured for 24 hours at 37 °C and subsequently harvested with enzyme-free cell dissociation buffer. The expression levels of CD69 and CD25 on $CD45^+$ T-cells were then analysed by antibody staining and flow cytometry and data represented as geometric mean fluorescence (gMFI) values. Plate-immobilised anti-CD3 antibody

2017320776 18 Sep 2024

(7.5μg/mL) was used as positive control for T cell activation. The EpCAM bispecific T-cell activator selectively induced the expression of activation markers CD69 and CD25 on T-cells, indicating that it was able to activate T cells (Figure 4B & C).

In a similar experiment, T-cells were assessed by intracellular cytokine staining 6 hr after co-culture with DLD cells (200,000 $CD3^+$ T-cells plus 40,000 DLD cells per well of a 96-well plate) and 300ng/mL EpCAM or control bispecific T-cell activator. $CD45^+$ T-cells were intracellularly stained for IFNγ expression with Brefeldin A added into the culture medium 5 hours before harvest. As a positive control, T cells were stimulated with soluble PMA (10ng/mL) and ionomycin (1μg/mL). The results showed that the EpCAM bispecific T-cell activator in the presence of DLD resulted in a significantly higher number of IFNγ expressing T-cells compared to the control bispecific T-cell activator (Figure 5A).

In another similar experiment, PBMCs from 8 different blood donors were used to evaluate donor-dependent variations in bispecific T-cell activator-mediated T-cell activation. DLD (7,000 cells) were co-cultured with 100,000 PBMC in a U-bottom 96 well plate in the presence of media alone or 300ng/mL of control or EpCAM bispecific T-cell activator. Cells were co-cultured for 24 hours at 37°C and subsequently harvested. The expression levels of CD69 and CD25 on $CD45^+$ T-cells were then analysed by antibody staining and flow cytometry and data represented as geometric mean fluorescence (gMFI) values. The results showed that the EpCAM bispecific T-cell activator induced the expression of activation markers CD69 and CD25 in $CD3^+$ T-cells from all 8 donors (Figure 5B & C).

Example 4

In this example, the ability of recombinant FAP bispecific T-cell activator-activated T-cells to induce death of the fibroblast target cells was evaluated.

FAP bispecific T-cell activator induces T cell-mediated lysis of FAP-positive cell lines and primary cells

NHDF (7,000 cells) were co-cultured with 70,000 T-cells in wells of a U-bottom 96 well plate in the presence of media alone or 300 ng/mL of control or FAP bispecific T-cell activator. After 24 hours of co-culture, supernatants were harvested and cytotoxicity determined by LDH assay following the manufacturer's instructions. The results are in Figure 6A show that the FAP bispecific T-cell activator significantly increased lysis of NHDF cells.

In a similar experiment, 7,000 primary lung fibroblast cells (BTC100) were co-cultured with 70,000 $CD3^+$ T-cells with or without 300 ng/mL of control or FAP bispecific T-cell activator. After 24 hours of co-culture, supernatants were harvested and cytotoxicity determined by LDH assay. The results in Figure 6B & C show that the FAP bispecific T-cell activator significantly increased lysis of primary human cancer associated fibroblast (CAF) cells. Expression of FAP by these and other patient-derived cell lines is shown in Figure 7.

The dose-response relationship for FAP bispecific T-cell activator-mediated cell lysis was evaluated by co-culturing 8,000 NHDF cells with 40,000 T-cells and bispecific T-cell activator concentrations ranging from 2×10^3 to 2×10^{-2} ng/mL. After co-culture for 24 hours at 37°C, an LDH assay was performed on supernatants to determine target cell cytotoxicity. Dose response curves were fitted using a four parameter non-linear fit model integrated into GraphPad Prism, generating an EC50 value for the FAP bispecific T-cell activator of 3.2ng/mL. The results (Figure 8A) show a dose-dependent relationship between FAP bispecific T-cell activator concentration and cytotoxicity as measured by LDH assay (shown as Abs_{490}).

2017320776 18 Sep 2024

Example 5

Similar studies to those in example 4 were used to demonstrate the ability of recombinant EpCAM bispecific T-cell activator-activated T-cells to induce death of target tumour cells was evaluated.

EpCAM bispecific T-cell activator induces T cell-mediated lysis of EpCAM-positive cell lines

DLD tumour cells (7,000 cells) were co-cultured with 70,000 T-cells in wells of a U-bottom 96 well plate in the presence of media alone or 300ng/mL of control or EpCAM bispecific T-cell activator. After 24 hours of co-culture, supernatants were harvested and cytotoxicity determined by LDH assay. The results in Figure 8B show that the EpCAM bispecific T-cell activator significantly increased lysis of DLD cells (EpCAM expression on DLD cells is shown in Figure 8C).

In a similar experiment, 4,000 SKOV cells were co-cultured with 40,000 $CD3^+$ T-cells with or without 300 ng/mL of control or EpCAM bispecific T-cell activator. After 24 hours of co-culture, supernatants were harvested and cytotoxicity determined by LDH assay. The results in Figure 9A show that the EpCAM bispecific T-cell activator significantly increased lysis of SKOV cells.

In another similar experiment, 5,000 MCF7 cells were co-cultured with 50,000 $CD3^+$ T-cells with or without 300 ng/mL of control or EpCAM bispecific T-cell activator. After 24 hours of co-culture, supernatants were harvested and cytotoxicity determined by LDH assay. The results in Figure 9B show that the EpCAM bispecific T-cell activator also significantly increased lysis of MCF7 cells.

The dose-response relationship for EpCAM bispecific T-cell activator-mediated cell lysis was evaluated by co-culturing 8,000 DLD with 40,000 T-cells and EpCAM or control bispecific T-cell activator concentrations ranging from 2×10^{3} to 2×10^{-2} ng/mL. After co-culture for 24 hours at 37°C, an LDH assay was performed on supernatants to determine target cell cytotoxicity. Dose response curves were fitted using a four parameter non-linear fit model integrated into GraphPad Prism, generating an EC50 value for the EpCAM bispecific T-cell activator of 7.4ng/mL. The results in Figure 10 show a dose dependent relationship between EpCAM bispecific T-cell activator concentration and cytotoxicity.

In conclusion, the results of this example demonstrate that the EpCAM bispecific T-cell activator was able to induce T-cell mediated lysis of multiple EpCAM-positive tumour cell lines.

Example 6

Stable FAP expressing CHO and Ad293 cell lines were generated as a means to demonstrate the FAP antigen specificity of the FAP bispecific T-cell activator by comparing to parental untransfected cells.

Generation of FAP-expressing stable-transfected cell lines

The protein sequence of the FAP gene was obtained from the NCBI database (SEQ ID 30), reverse transcribed to generate a DNA coding sequence that was synthesised by Oxford Genetics Ltd (Oxford, UK). The FAP gene was cloned into pSF-Lenti vector by standard cloning techniques producing the pSF-Lenti-FAP vector. HEK293T cells were transfected with the lentivirus FAP expression vector alongside pSF-CMV-HIV-Gag-Pol, pSF-CMV-VSV-G, pSF-CMV-HIV-Rev. Lipofectamine 2000 was used as a transfection reagent and was added to the vector DNA at a DNA:lipofectamine ratio of 1:2, and incubated with the cells at 37°C. Supernatant containing lentivirus was harvested 48 hours later and mixed with polybrene (final concentration, 8μg/mL). The Lentivirus/polybrene mixture was added to seeded Ad293 or CHO cells and incubated at 37°C. On day 4, the supernatant was exchanged for media containing

2017320776 18 Sep 2024

puromycin (2μg/mL for Ad293 and 7.5μg/mL for CHO). Stable variants were then clonally selected and FAP expression of the parental cell lines or stable-transfected variant was determined by staining with FAP or isotope control antibody and analysed by flow cytometry (Figure 11A).

FAP bispecific T-cell activator-mediated target cell lysis is specific to FAP-expressing cells

CHO or CHO-FAP cells (7,000 cells) were co-cultured alone or with human T-cells (70,000) in the presence of media alone or 2μg/mL control or FAP bispecific T-cell activator in wells of a U-bottom 96-well plate. After 24 hours incubation, supernatants were harvested and target cell cytotoxicity measured by LDH cytotoxicity assay as described in example 4 (Figure 11B). T-cell activation was also determined by analysing the expression levels of CD69 and CD25 via flow cytometry (Figure 12). Cytotoxicity was only observed when CHO-FAP cells were cultured with T-cells and FAP bispecific T-cell activator. This indicates that FAP bispecific T-cell activator mediated T-cell activation and target cell lysis is highly specific and limited to FAP-expressing cells, and not the FAP-negative parental cell line.

Example 7

Stable EpCAM expressing CHO amd Ad293 cell lines were generated as a means to demonstrate the EpCAM antigen specificity of the EpCAM bispecific T-cell activator by comparing to parental untransfected cells.

Generation of EpCAM-expressing stable-transfected cell lines

The protein sequence of the EpCAM gene was obtained from NCBI database (SEQ ID 28), reverse transcribed to generate a DNA coding sequence that was synthesised by Oxford Genetics Ltd (Oxford, UK). The EpCAM gene was cloned into pSF-Lenti vector by standard cloning techniques producing the pSF-Lenti-EpCAM vector. HEK293T cells were transfected with lentivirus EpCAM expression vector alongside pSF-CMV-HIV-Gag-Pol, pSF-CMV-VSV-G, pSF-CMV-HIV-Rev. Lipofectamine 2000 was used as a transfection reagent and was added to the vector DNA at a DNA:lipofectamine ratio of 1:2, and incubated with the cells at 37°C. Supernatant containing lentivirus was harvested 48 hours later and mixed with polybrene (final concentration, 8μg/mL). The Lentivirus/polybrene mixture was added to seeded Ad293 or CHO cells and incubated at 37°C. On day 4, the supernatant was exchanged for media containing puromycin (2μg/mL for Ad293 and 7.5μg/mL for CHO). Stable variants were then clonally selected and EpCAM expression of the parental cell lines or stable-transfected variant was determined by staining with EpCAM or isotope control antibody and analysed by flow cytometry (Figure 13A).

EpCAM bispecific T-cell activator-mediated target cell lysis is specific to EpCAM-expressing cells

CHO or CHO-EpCAM cells (7,000 cells) were co-cultured alone or with human T-cells (70,000) in the presence of media alone or 2μg/mL control or EpCAM bispecific T-cell activator in wells of a U-bottom 96-well plate. After 24 hours incubation, supernatants were harvested and target cell cytotoxicity measured by LDH cytotoxicity assay (Figure 13B). T-cell activation was also determined by analysing the expressions levels of CD69 and CD25 via flow cytometry (Figure 14). Cytotoxicity was only observed when CHO-EpCAM cells were cultured with T-cells and EpCAM bispecific T-cell activator. This indicates that EpCAM bispecific T-cell activator mediated T-cell activation and target cell lysis is highly specific and limited to EpCAM-expressing cells, and not the EpCAM-negative parental cell line.

2017320776 18 Sep 2024

Example 8

In a further experiment, the ability of the recombinant FAP bispecific T-cell activator protein to activate CD4 or CD8 T-cells and the ability of each of these T-cell subsets to lyse NHDF cells was assessed. $CD3^+$ T-cells (35,000) were co-cultured with 7,000 NHDF cells in the presence of 300ng/mL control or FAP bispecific T-cell activator in wells of a U-bottom 96 well plate, and incubated at 37°C for 24 hours. Cells were harvested and stained with antibodies to CD4 or CD8 and CD69 and CD25, and analysed by flow cytometry. The results (Figure 15A) demonstrated that the FAP bispecific T-cell activator induced an increase in activation markers CD69 and CD25 in both $CD4^+$ and $CD8^+$ T-cells.

In a similar experiment, the ability of each T-cell subset (CD4 and CD8) to kill target cells was assessed. $CD4^+$ T-cells were extracted from CD3-purified cells by positive selection using a CD4 T Cell Isolation Kit (Miltenyi Biotec, #130-045-101), according to the manufacturer's protocol, with the CD8 cells within non-isolated flow-through. In wells of a U-bottom 96-well plate, 7,000 NHDF were co-cultured with 35,000 $CD4^+$ or $CD8^+$ T-cells together with 300ng/mL of control or FAP bispecific T-cell activator and incubated at 37°C. After 24 hours, supernatants were harvested and target cell cytotoxicity measured by LDH cytotoxicity assay. The results (Figure 15B) show that the FAP bispecific T-cell activator induced both $CD4^+$ and $CD8^+$ T-cells to kill NHDF cells.

Example 9

The ability of the EpCAM bispecific T-cell activator to activate $CD4^+$ or $CD8^+$ T-cells and the ability of each subset to lyse DLD tumour cells was assessed. $CD3^+$ T-cells (35,000) were co-cultured with 7,000 DLD cells in the presence of 300ng/mL control or EpCAM bispecific T-cell activator in wells of a U-bottom 96 well plate, and incubated at 37°C for 24 hours. Cells were harvested and stained with antibodies for CD4 or CD8 and CD69 and CD25, and analysed by flow cytometry. The results (Figure 16A) demonstrated that the EpCAM bispecific T-cell activator induced an increase in activation markers CD69 and CD25 in both $CD4^+$ and $CD8^+$ T-cells.

In a similar experiment, the ability of each T-cell subset (CD4 and CD8) to kill target cells was assessed. $CD4^+$ T-cells were extracted from CD3-purified cells by positive selection using CD4 T Cell Isolation Kit according to the manufacturer's protocol, with the CD8 cells within non-selected flow-through. In wells of a U-bottom 96-well plate, 7,000 DLD were co-cultured with 35,000 $CD4^+$ or $CD8^+$ T-cells with 300ng/mL of control or EpCAM bispecific T-cell activator and incubated at 37°C. After 24 hours, supernatants were harvested and target cell cytotoxicity measured by LDH cytotoxicity assay (Figure 16B). The results show that the EpCAM bispecific T-cell activator induced both $CD4^+$ and $CD8^+$ T-cells to kill DLD cells.

Example 10

Characterising FAP bispecific T-cell activator-mediated activation of autologous tumour-associated lymphocytes from primary malignant ascites

To evaluate the activity of bispecific T-cell activator proteins using cancer patient derived cells, samples of primary malignant ascetic fluids containing both $CD3^+$ T-cells and FAP^+ cells were obtained for testing. Unpurified ascites cells (therefore unchanged from when received) were seeded at 250,000 cells per well

2017320776 18 Sep 2024

of a U-bottom 96-well plate in either 100% ascites fluid or medium supplemented with 1% human serum in the presence of 500 ng/mL control or FAP bispecific T-cell activator. Untreated wells served as negative controls. After incubation at 37°C for 5 days, the total cell population was harvested and the numbers of $CD3^+$ T-cells (Figure 17A) and expression levels of CD25 on $CD3^+$ T-cells were determined (Figure 17B). Total cell numbers per well were determined using precision counting beads. The results demonstrate that the FAP bispecific T-cell activator resulted in significant increase in T-cell activation of the tumour-associated T-cells from cancer patients.

As an extension of the experiment above, replicate wells were harvested and the number of FAP^+ cells determined by flow cytometry (Figure 17C). Total cell numbers per well were determined using precision counting beads. The results show that the FAP bispecific T-cell activator resulted in a significant decrease in numbers of autologous FAP-expressing cells in the ascites sample.

Example 11

Recombinant bispecific T-cell activator-expressing EnAd viruses were engineered, produced and purified using the methods described below.

Generation of bispecific T-cell activator-expressing Enadenotucirev

EnAd is a replication competent chimeric group B adenovirus that contains frequent non-homologous nucleotide substitutions of Ad3 for Ad11p in the E2B region, a nearly complete E3 deletion and a smaller E4 deletion mapped to E4orf4 (Kuhn et al, Directed evolution generates a novel oncolytic virus for the treatment of colon cancer, PLoS One, 2008 Jun 18; 3(6): e2409). A schematic representation of the genome of the adenoviruses used in this study is shown in Figure 18A.

The plasmid pEnAd2.4 was used to generate the plasmids pEnAd2.4-CMV-EpCAMbispecific T-cell activator, pEnAd2.4-SA-EpCAMbispecific T-cell activator, pEnAd2.4-CMV-FAPbispecific T-cell activator, pEnAd2.4-SA-FAPbispecific T-cell activator, pEnAd2.4-CMV-Controlbispecific T-cell activator, pEnAd2.4-SA-Controlbispecific T-cell activator (Table 4) by direct insertion of a cassette encoding the EpCAM bispecific T-cell activator (SEQ ID NO: 1), FAP bispecific T-cell activator (SEQ ID NO: 3) or Control bispecific T-cell activator (SEQ ID NO: 5). The transgene cassette contained a 5' short splice acceptor sequence (SEQ ID NO: 33) or an exogenous CMV promoter (SEQ ID NO: 31), the EpCAM, FAP or control bispecific T-cell activator cDNA sequence and a 3' polyadenylation sequence (SEQ ID NO: 32). Construction of the plasmid was confirmed by DNA sequencing. The exogenous CMV promoter is constitutively active and thus leads to early expression of transgenes. The splice acceptor sequence drives expression under the control of the viral major late promoter and leads to later transgene expression following initiation of virus genome replication. The kinetics of this promotor-driven expression can be observed in Figure 18B, in which GFP was used as the transgene.

Table 4

Plasmid ID	**[plasmid DNA] ng/ml**
pEnAd2.4-CMV-EpCAMbispecific T-cell activator	205.3
pEnAd2.4-SA-EpCAMbispecific T-cell activator	325.2
pEnAd2.4-CMV-FAPbispecific T-cell activator	1322.8
pEnAd2.4-SA-FAPbispecific T-cell activator	3918.3

2017320776 18 Sep 2024

pEnAd2.4-CMV-Controlbispecific T-cell activator	189.1
pEnAd2.4-SA-Controlbispecific T-cell activator	236.2
pEnAd2.4-CMV-FAPbispecific T-cell activator-RFP	1599
pEnAd2.4-SA-FAPbispecific T-cell activator-RFP	1872
pEnAd2.4-CMV-Controlbispecific T-cell activator-RFP	1294
pEnAd2.4-SA-Controlbispecific T-cell activator-RFP	2082

Virus Production and characterisation

The plasmids EnAd2.4-CMV-EpCAMbispecific T-cell activator, pEnAd2.4-SA-EpCAMbispecific T-cell activator, pEnAd2.4-CMV-FAPbispecific T-cell activator, pEnAd2.4-SA-FAPbispecific T-cell activator, pEnAd2.4-CMV-Controlbispecific T-cell activator, pEnAd2.4-SA-Controlbispecific T-cell activator were linearised by restriction digestion with the enzyme AscI to produce the liner virus genome. Digested DNA was purified by isopropanol extraction and precipitated for 16hrs, -20ºC in 300µl >95% molecular biology grade ethanol and 10µl 3M Sodium Acetate. The precipitated DNA was pelleted by centrifuging at 14000rpm, 5 mins and was washed in 500µl 70% ethanol, before centrifuging again, 14000rpm, 5mins. The clean DNA pellet was air dried and resuspended in 100µL water. 6.25 □g DNA was mixed with 15.6µL lipofectamine transfection reagent in OptiMEM and incubated for 20 mins, RT. The transfection mixture was then added to a T-25 flask containing Ad293 cells grown to 80% confluency. After incubation of the cells with the transfection mix for 4hrs at 37ºC, 5% CO_2 4mls of cell media (DMEM high glucose with glutamine supplemented with 10% FBS) was added to the cells and the flasks was incubated 37ºC, 5% CO_2. The transfected Ad293 cells were monitored every 24hrs and were supplemented with additional media every 48-72hrs. The production of virus was monitored by observation of a significant cytopathic effect (CPE) in the cell monolayer. Once extensive CPE was observed the virus was harvested from Ad293 cells by three freeze-thaw cycles. Single virus clones were selected by serial diluting harvested lysate and re-infecting Ad293 cells, and harvesting wells containing single plaques. Serial infections of Ad293 cells were performed once an infection had reached full CPE in order to amplify the virus stocks. Viable virus production during amplification was confirmed by observation of significant CPE in the cell monolayer.

Virus Purification

Once potent virus stocks were amplified the viruses were purified by double caesium chloride density gradient centrifugation (banding) to produce NG-601, NG-602, NG-603, NG-604, NG-605 and NG-606 virus stocks. These stocks were titred by micoBCA assay (Life Technologies), following manufacturer's instructions (Table 5).

Table 5

EnAd ID	**NG ID NO:**	**Virus Genome SEQ ID**	**vp/mL**	**TCID50/mL**
EnAd-CMV-EpCAMbispecific T-cell activator	NG-601	SEQ ID NO: 34	$2.2494x10^{12}$	$1.26x10^{11}$
EnAd-SA-EpCAMbispecific T-cell activator	NG-602	SEQ ID NO: 35	$4.21746x10^{12}$	$1.58x10^{11}$

2017320776 18 Sep 2024

EnAd-CMV-Controlbispecific T-cell activator	NG-603		$1.42607x10^{12}$	$5.01x10^{10}$
EnAd-SA-Controlbispecific T-cell activator	NG-604		$3.31073x10^{12}$	$2.00x10^{11}$
EnAd-CMV-FAPbispecific T-cell activator	NG-605	SEQ ID NO: 36	$1.64653x10^{12}$	$1.58x10^{11}$
EnAd-SA-FAPbispecific T-cell activator	NG-606	SEQ ID NO: 37	$1.28148x10^{12}$	$3.98x10^{10}$
EnAd-CMV-Controlbispecific T-cell activator-P2A-RFP	NG-607		$5.963x10^{12}$	$1.26x10^{9}$
EnAd-SA-Controlbispecific T-cell activator-P2A-RFP	NG-608		$1.51848x10^{12}$	$6.31x10^{9}$
EnAd-CMV-FAPbispecific T-cell activator-P2A-RFP	NG-609		$1.57517x10^{12}$	$7.94x10^{9}$
EnAd-SA-FAPbispecific T-cell activator-P2A-RFP	NG-610		$7.74881x10^{11}$	$5.01x10^{10}$

Example 12

The activities of NG-601, NG-602, NG-603, NG-604, NG-605 and NG-606 viruses were characterised using the methods described below.

Characterisation of bispecific T-cell activator encoding EnAd activity compared to EnAd in carcinoma cell lines

The ability NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 or EnAd to replicate was analysed by infection of A549 lung carcinoma cells and assessed by qPCR. A549 cells were seeded in wells of a 24-well plate at a cell density of $2x10^5$ cells/well. Plates were incubated for 18 hrs, 37ºC, 5% CO_2, before cells were either infected with 100 virus particles per cell (ppc) or were left uninfected. Wells were harvested 24, 48 or 72 hrs post infection and DNA purified using PureLink genomic DNA mini kit (Invitrogen) according to the manufacturer's protocol. Total viral genomes were quantified by qPCR with each extracted sample or standard using an EnAd hexon gene specific primer-probe set in the reaction mix detailed in Table 6. qPCR was performed as per the programme in Table 7.

Table 6

Reagent	**Volume/well (µl)**
2 × qPCRBIO Probe Mix (PCRBiosystems)	10
EnAd Forward primer	0.08
EnAd Reverse primer	0.08
EnAd Probe	0.8
NFW	4.04
Sample	5
Well Volume	20

2017320776 18 Sep 2024

Table 7

No. Cycles	Temperature (°C)	Duration (secs)
1	95	120
40	95 60-65	5 20-30

Quantification of the number of detected virus genomes per cell demonstrated that NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 and EnAd virus replication were comparable in the A549 cell line (Figure 19A).

Oncolytic activity of NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 or EnAd was assessed by infection of A549 (Figure 19B). A549 cells were seeded in 96-well plate at a cell density of $1.5x10^4$ cells/well. Plates were incubated for 18 hrs, 37°C, 5% CO_2, before cells were infected with increasing ppc of virus (5-fold serial dilution, $4.1x10^{-7}$ to 5000 virus ppc) or were left uninfected. A549 cytotoxicity was measured on day 5 by CellTiter 96® AQueous One Solution Cell Proliferation Assay (MTS) (Promega, # G3582). Dose response curves were fitted using a four parameter non-linear fit model integrated into GraphPad Prism. IC50 values generated for each virus demonstrated that the oncolytic activities of NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 and EnAd was comparable for each virus.

Confirmation of functional bispecific T-cell activator transgene expression from NG-601, NG-602, NG-603, NG-604, NG-605, NG-606

To determine whether the viruses NG-601, NG-602, NG-605, NG-606 produced functional bispecific T-cell activators, T-cell activation assays using CHO, CHO-EpCAM and CHO-FAP cell lines as target cells were performed. 10,000 target cells were co-cultured with 50,000 $CD3^+$ T-cells in wells of a U-bottom 96-well plate with Ad293 viral supernatants diluted 100-fold in culture medium and incubated for 24 hrs, 37°C, 5% CO_2. T-cells were harvested and stained with antibodies specific for CD25 and CD69 and analysed by flow cytometry. The results (Figures 20A and 20B) indicated that the viruses NG-601 and NG-602 expressed a functional bispecific T-cell activator transgene that activated T cells when co-cultured with CHO-EpCAM cells, and NG-605 and NG-606 expressed a functional bispecific T-cell activator transgene that activated T cells when co-cultured with CHO-FAP cells, but not when co-cultured with CHO cells.

Quantification of bispecific T-cell activator expression in a colon carcinoma cell line

The quantity of bispecific T-cell activator expression by NG-601, NG-602, NG-605, NG-606 infection of the human colon carcinoma cell line DLD was assessed. DLD cells were seeded in 6 well culture plates at a density of $1.2x10^6$ cells per well. 18 hrs post-seeding, DLD cells were infected with EnAd, NG-601, NG-602, NG-603, NG-604, NG-605, NG-606 at 100 ppc. Cells were cultured for 72 hrs before the supernatants were collected from the wells and centrifuged for 5 mins, 1200rpm to remove cell debris. The clarified supernatants were then used for a killing assay, with cytotoxicity compared to a standard curve generated with a recombinant bispecific T-cell activator of known concentration, allowing determination of quantity of bispecific T-cell activator in viral supernatants.

To determine the quantity of FAP bispecific T-cell activator produced from NG-605 and NG-606, a cytotoxicity assay was performed in which 8,000 NHDF were co-cultured with 40,000 $CD3^+$ T-cells and

2017320776 18 Sep 2024

DLD viral supernatants diluted 1 in10^3, 1 in 10^4 and 1 in 10^5. A standard curve was generated by incubating NHDF and CD3$^+$ T-cells with FAP or control bispecific T-cell activator at 10-fold serial dilutions from 3333 to $3.33x10^{-4}$ ng/μL. Supernatants were harvested 24 hour post-treatment and cytotoxicity measured by LDH assay. Quantity of bispecific T-cell activator expressed was determined by comparing cytotoxicity of viral supernatants to that of the recombinant bispecific T-cell activator standard curve. The results (Figure 21) indicated that the viruses NG-605 and NG-606 produced 9.8 and 49.2 μg FAP bispecific T-cell activator per million DLD cells, respectively.

To determine the quantity of EpCAM bispecific T-cell activator produced from NG-601 and NG-602, a cytotoxicity assay was performed in which 8,000 DLD cells were co-cultured with 40,000 CD3$^+$ T-cells and DLD viral supernatants diluted 1 in10^3, 1 in 10^4 and 1 in 10^5. A standard curve was generated by incubating DLD and CD3$^+$ T-cells with EpCAM or control bispecific T-cell activator at 10-fold serial dilutions from 3333 to $3.33x10^{-4}$ ng/μL. Supernatants were harvested 24 hour post-treatment and cytotoxicity measured by LDH assay (Figure 22). Quantity of bispecific T-cell activator expressed was determined by comparing cytotoxicity of viral supernatants to that of the recombinant bispecific T-cell activator standard curve. The results indicated that the viruses NG-601 and NG-602 produced 165 and 50.3 μg EpCAM bispecific T-cell activator per million DLD cells, respectively.

Example 13

In addition to encoding a FAP or Control bispecific T-cell activator, the NG-607, NG-608, NG-609, NG-610 viruses also carry a red fluorescent protein (RFP) transgene for visualization of infected cells using fluorescent microscopy methods (SEQ ID NOS: 25 & 26, Table 4). The functional activities of these viruses were characterised using the methods described below.

Confirmation of transgene expression from NG-607, NG-608, NG-609, NG-610

The ability of viruses NG-607, NG-608, NG-609 and NG-610 to produce their bispecific T-cell activator transgene was assessed by infection of Ad293 cells. Ad293 cells were plated in a 6-well plate at $1x10^6$ cells/well. Plates were incubated for 24 hrs, 37°C, 5% CO_2, before cells were infected with viruses at 100 ppc or were left uninfected. At 48 hours post-infection, plaques were irradiated with a fluorescent mercury lamp and photographed (Figure 23). The results suggested that the viruses NG-607, NG-608, NG-609 and NG-610 express the RFP transgene.

Example 14

In the next series of experiments, the ability of EnAd and FAP or control bispecific T-cell activator viruses NG-603, NG-604, NG-605, NG-606, NG-607, NG-608, NG-609, NG-610 to kill target cells, including tumour cells and fibroblasts, was evaluated.

In the first study, the ability of EnAd to kill DLD cells was assessed using xCELLigence technology. DLD cells were plated in a 48-well E-plate at $1.2x10^4$ cells/well and incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with 100 EnAd ppc or were left uninfected. XCELLigence was used to measure target cell cytotoxicity every 15 minutes over an 8 day incubation period. The results (Figure 24A) suggest that EnAd was able to kill DLD cells effectively over the time period.

In a similar experiment, the ability of EnAd to kill SKOV cells was assessed using xCELLigence technology. SKOV cells were plated in a 48-well E-plate at $1x10^4$ cells/well and incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with 100 EnAd ppc or were left uninfected. xCELLigence

2017320776 18 Sep 2024

was used to measure target cell cytotoxicity every 15 minutes for a period of 8 days. The results (Figure 24B) suggest that SKOV cells are resistant to EnAd-mediated cytotoxicity over this time frame.

In a similar experiment, the ability of EnAd to kill NHDF cells was also assessed using xCELLigence technology. NHDF cells were plated in a 48-well E-plate at $4x10^3$ cells/well and incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with 100 EnAd ppc or were left uninfected. xCELLigence was used to measure target cell cytotoxicity every 15 minutes over the same time period as for A549 and SKOV cells. The results (Figure 24C) suggest that EnAd is unable to kill NHDF cells in the period of time observed.

In a similar experiment, the ability of NG-603, NG-604, NG-605, NG-606 and EnAd to kill NHDF cells was assessed in co-culture with SKOV tumour cells and $CD3^+$ T-cells using xCELLigence. NHDF cells and SKOV cells were seeded in a 48-well E-plate at $4x10^3$ and $1x10^3$ cells/well, respectively. Plates were incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with 100 ppc of EnAd, of NG-603, NG-604, NG-605 or NG-606 or were left uninfected. After 2 hour incubation, 37,500 $CD3^+$ T-cells were added to each well. xCELLigence was used to measure target cell cytotoxicity every 15 minutes. The results (Figure 25A) demonstrate that the FAP bispecific T-cell activator-expressing viruses NG-605 and NG606, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce lysis of NHDF cells, with kinetics dependent on the promoter used for bispecific T-cell activator expression (faster with CMV promoter).

In a similar experiment, the ability of NG-603, NG-604, NG-605, NG-606 and EnAd to kill NHDF cells, was assessed in co-culture with SKOV and $CD3^+$ T-cells using LDH cytotoxicity assay. NHDF cells and SKOV cells were seeded in a 96-well U-bottom plate at $8x10^3$ and $2x10^3$ cells/well, respectively, and either infected with 100 ppc of EnAd, of NG-603, NG-604, NG-605 or NG-606 or were left uninfected. After 2 hour incubation, 75,000 $CD3^+$ T-cells were added to each well and plates were incubated at 37°C, 5% CO_2. Supernatants were harvested at 0, 24, 48 and 96 hours post-treatment and cytotoxicity measured by LDH cytotoxicity assay. The results (Figure 25B) demonstrate that the FAP bispecific T-cell activator-expressing viruses NG-605 and NG606, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce lysis of NHDF cells, with kinetics dependent on the promoter used for bispecific T-cell activator expression.

As an extension of the LDH experiment above, the cells were also harvested at 0, 24, 48 and 96 hours post-treatment, stained with antibodies for CD45, CD69 and CD25 and analysed by flow cytometry. The results (Figure 26) demonstrate that the FAP bispecific T-cell activator-expressing viruses NG-605 and NG-606, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce T-cell activation, with kinetics dependent on the promoter used for bispecific T-cell activator expression.

In a similar experiment, the dependence on FAP to induce FAP bispecific T-cell activator-mediated T-cell activation was evaluated. In a 96-well U-bottom plate, SKOV cells were seeded at $2x10^3$ cells/well alone or in combination with NHDF cells at $8x10^3$ cells/well. Viral particles were added to each well at 100 ppc, and plates incubated at 37°C, 5% CO_2. After two hours, 75,000 $CD3^+$ T-cells were added and plates incubated further. At 96-hours post-infection, cells were harvested and stained for CD45 and CD25 and analysed by flow cytometry (Figure 27A). The results demonstrate that the FAP bispecific T-cell activator-

2017320776 18 Sep 2024

expressing viruses NG-605 and NG-606, only induced T-cell activation in the presence of FAP-positive NHDF cells.

In a similar experiment, the specificity of promoter (CMV or virus MLP/SA)-driven bispecific T-cell activator expression in NG-605 and NG-606 was investigated further. In a 96-well U-bottom plate, NHDF cells were seeded at $4x10^3$ cells/well. 100 viral particles per cell were added to each well, and plates incubated at 37°C, 5% CO_2. After two hours, 40,000 CD3 cells were added and plates incubated further. At 72-hours post-infection, supernatants were harvested and cytotoxicity measured by LDH cytotoxicity assay. The results (Figure 27B) demonstrate that the CMV-driven virus NG-605, but not SA-driven NG-606, was able to mediate killing of NHDF cells upon infection of NHDF cells alone.

The results indicate that NG-605 and NG-606 were both able to induce T cell activation and target cell lysis, although the kinetic profile was slightly different depending on the promoter used.

Timelapse videos were obtained to observe viral or T cell-mediated lysis of target cells by recombinant FAP bispecific T-cell activator, EnAd, NG-603 or NG-605. NHDF cells were stained with CellTracker Orange CMTMR Dye (Life Tech, #C2927) and $CD3^+$ T-cells were stained with CellTrace Violet Cell Proliferation Kit (Life Tech, #C34557) following manufacturer's protocols. Dyed NHDF were plated in a 24-well plate at $7.5x10^3$ cells/well in co-culture with $1.35x10^4$ DLD or SKOV tumour cells. Plates were incubated for 18 hrs, 37°C, 5% CO_2. Cells were then treated with 300 ng/mL FAP bispecific T-cell activator or infected with 100 ppc of EnAd, NG-603, and NG-605 or left untreated. After two hours incubation, 100,000 dyed $CD3^+$ T-cells were added to necessary wells, in addition to 1.5 μM CellEvent Caspase 3-7 reagent (Life Tech, #C10423). Videos were obtained on a Nikon TE 2000-E Eclipse inverted microscope, with images captured every 15 minutes for 96 hours. Frames from the videos are shown in Figure 28. The results show that the recombinant FAP bispecific T-cell activator and NG-605, but not EnAd or NG-603, were able to induce rapid lysis of NHDF cells.

In a similar experiment, NHDF cells were stained with CellTracker Green CMFDA Dye (Life Tech, #C2925) and $CD3^+$ T-cells were stained with CellTrace Violet Cell Proliferation Kit (Life Tech, #C34557) following manufacturer's protocols. Dyed NHDF were plated in a 24-well plate at $7.5x10^3$ cells/well in co-culture with $1.35x10^4$ DLD or SKOV tumour cells. Plates were incubated for 18 hrs, 37°C, 5% CO_2. Cells were then infected with 100 ppc of NG-607, NG-608, NG-609 or NG-610 or left uninfected. After two hours incubation, 100,000 dyed $CD3^+$ T-cells were added to necessary wells. Videos were obtained on a Nikon TE 2000-E Eclipse inverted microscope, with images captured every 15 minutes for 96 hours. Frames from the videos are shown in Figure 29. The results show that all viruses lead to tumour cell infection (RFP, red fluorescence, positive), but only NG-609 and NG-610 were able to induce rapid lysis of the co-cultured NHDF cells.

Example 15

In this series of experiments, the ability of EnAd and EpCAM or control bispecific T-cell activator viruses NG-601, NG-602, NG-603 and NG-604 to kill target cells, including tumour cells and fibroblasts, was evaluated.

Characterisation of human T-cell activation and EpCAM-positive target cell lysis by EnAd, NG-601, NG-602, NG-603 and NG-604

2017320776 18 Sep 2024

The ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill DLD tumour cells in the presence or absence of $CD3^+$ T-cells was assessed using xCELLigence technology. DLD cells were plated in 48-well E-plate at $1.2x10^4$ cells/well. Plates were incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with EnAd at 100 ppc or were left uninfected. Two hours after infection, 75,000 $CD3^+$ T-cells were added to the necessary wells. XCELLigence was used to measure target cell cytotoxicity every 15 minutes. The results (Figure 30) demonstrate that NG-601 and NG-602 lead to significantly more rapid DLD cytotoxicity in a T cell-dependent manner.

In a similar experiment, the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill DLD tumour cells in the presence or absence of $CD3^+$ T-cells was assessed using LDH cytotoxicity assay. DLD cells were plated in a 96-well U-bottom plate at $2x10^4$ cells/well and either infected with 100 ppc EnAd or were left uninfected. Two hours after infection, 150,000 $CD3^+$ T-cells were added to the necessary wells. Plates were incubated at 37°C, 5% CO_2 and supernatant harvested and analysed by LDH cytotoxicity assay at 0, 24, 48 and 72 hours post-infection. The results (Figure 31) demonstrate that NG-601 and NG-602 lead to more rapid DLD cytotoxicity in a T cell-dependent manner.

As an extension of the LDH experiment above, the cells were also harvested at 0, 24, 48 and 96 hours post-treatment, stained with antibodies for CD45, CD69 and CD25 and analysed by flow cytometry to determine activation status of the $CD3^+$ T-cells. The results (Figure 32) demonstrate that the EpCAM bispecific T-cell activator-expressing viruses NG-601 and NG-602, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce T-cell activation, with kinetics dependent on the promoter used for bispecific T-cell activator expression.

In another experiment, the ability of NG-601 to kill DLD tumour cells at varying multiplicity of infection (MOI) in the presence or absence of $CD3^+$ T-cells was assessed using xCELLigence technology. DLD cells were plated in 48-well E-plate at $2x10^4$ cells/well. Plates were incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with NG-601 at MOI (ppc) varying from 0.001 to 10 or left uninfected. Two hours after infection, 150,000 $CD3^+$ T-cells were added to the necessary wells. xCELLigence was used to measure target cell cytotoxicity every 15 minutes. The results (Figure 33) demonstrate that NG-601 lead to more rapid DLD cytotoxicity in a T cell-dependent manner at MOI's as low as 0.001.

In a similar experiment, the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill SKOV tumour cells in the presence or absence of $CD3^+$ T-cells was assessed using xCELLigence technology. SKOV cells were plated in 48-well E-plate at $1x10^4$ cells/well. Plates were incubated for 18 hrs, 37°C, 5% CO_2, before cells were either infected with EnAd (100 ppc) or were left uninfected. Two hours after infection, 50,000 $CD3^+$ T-cells were added to the necessary wells. xCELLigence was used to measure target cell cytotoxicity every 15 minutes. The results (Figure 34) suggest that SKOV cells are resistant to EnAd-mediated cytotoxicity over the timeframe of this study, however NG-601 and NG-602 were able to induce rapid lysis of SKOV cells in the presence of $CD3^+$ T-cells.

In a similar experiment, the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to kill SKOV cells in the presence or absence of $CD3^+$ T-cells was assessed using LDH cytotoxicity assay. SKOV cells were plated in 96-well U-bottom plates at $2x10^4$ cells/well and either infected with EnAd (100 ppc) or were left uninfected. Two hours after infection, 150,000 $CD3^+$ T-cells were added to the necessary wells. Plates were incubated at 37°C, 5% CO_2 and supernatant harvested and analysed by LDH cytotoxicity assay at 0, 24, 48 and 72 hours post-infection. The results (Figure 35) are consistent with previous data and

2017320776 18 Sep 2024

suggest that SKOV cells are resistant to EnAd-mediated cytotoxicity over this time frame, however NG-601 and NG-602 are able to induce rapid lysis of SKOV cells in the presence of $CD3^+$ T-cells.

As an extension of the LDH experiment above, the cells were also harvested at 0, 24, 48 and 96 hours post-treatment, stained with antibodies for CD45, CD69 and CD25 and analysed by flow cytometry to determine activation status of $CD3^+$ T-cells (Figure 36). The results demonstrate that the EpCAM bispecific T-cell activator-expressing viruses NG-601 and NG-602, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce T-cell activation, with kinetics dependent on the promoter used for bispecific T-cell activator expression.

In a similar experiment, the ability of EnAd and NG-601, NG-602, NG-603 and NG-604 to activate cancer patient-derived $CD3^+$ T-cells from a $CD3^+$ EpCAM-negative primary ascites sample was assessed. EpCAM-positive DLD cells were plated at $1x10^4$ cells per well in a 96-well U-bottom plate and co-cultured with 100,000 ascites cells (unchanged from when received). Cells were infected with viral particles at 100 ppc or were left uninfected. After incubation at 37°C for 48 hours, the total cell population was harvested and the expression level of CD25 on $CD3^+$ T-cells determined by flow cytometry. The results (Figure 37) demonstrate that the EpCAM bispecific T-cell activator-expressing viruses NG-601 and NG-602, but not EnAd or control bispecific T-cell activator-expressing viruses NG-603 and NG-604, were able to induce T-cell activation of patient-derived $CD3^+$ T-cells.

The results indicate that both EpCAM bispecific T-cell activator viruses NG-601 and NG-602 were able to induce T cell activation and target cell lysis, although the kinetic profile was slightly different depending on the promoter used.

Timelapse videos were obtained to observe viral or T cell-mediated lysis of target cells by recombinant EpCAM bispecific T-cell activator, EnAd, NG-601 or NG-603. NHDF cells were stained with CellTracker Orange CMTMR Dye (Life Tech, #C2927) and $CD3^+$ T-cells were stained with CellTrace Violet Cell Proliferation Kit (Life Tech, #C34557) following manufacturer's protocols. Dyed NHDF were plated in a 24-well plate at $7.5x10^3$ cells/well in co-culture with $1.35x10^4$ DLD or SKOV tumour cells. Plates were incubated for 18 hrs, 37°C, 5% CO_2. Cells were then treated with 300ng/mL EpCAM bispecific T-cell activator or infected with EnAd, NG-601 or NG-603 at 100 ppc or left untreated. After two hours incubation, 100,000 dyed $CD3^+$ T-cells were added to necessary wells, in addition to 1.5µM CellEvent Caspase 3-7 reagent (Life Tech, #C10423). Videos were obtained on Nikon TE 2000-E Eclipse inverted, with images captured every 15 minutes for 96 hours. Frames from the videos are shown in Figure 38. The results show that the recombinant EpCAM bispecific T-cell activator and NG-605 lead to rapid lysis of both DLD and SKOV target cells, but NHDF remained unaffected.

Example 16

In this example, the activation of autologous tumour-associated lymphocytes from FAP^+ primary malignant ascites from cancer patients by EnAd, NG-603, NG-604, NG-605 and NG-606 was evaluated. Patient samples considered suitable for further analysis were those containing $CD3^+$ T-cells and FAP^+ cells.

In the first experiment, unpurified (therefore unchanged from when received) ascites cells from a patient were seeded at 250,000 cells per well of a U-bottom 96-well plate in 100% ascites fluid. Cells were infected with viruses at 100 ppc, with untreated wells serving as negative controls. EnAd-CMV-GFP and EnAd-

2017320776 18 Sep 2024

SA-GFP were also included in the experiment as a reporter to determine infection and late stage viral gene expression, respectively, with micrographs shown in Figure 39. After incubation at 37°C for 5 days, the total cell population was harvested and the expression level of CD25 on $CD3^+$ T-cells (Figure 40A) was determined. Total cell numbers per well were determined using precision counting beads. The results demonstrate that the FAP bispecific T-cell activator viruses NG-605 and NG-606 resulted in significant increases in T-cell activation of tumour-associated lymphocytes.

As an extension of the experiment above, replicate wells were harvested and the number of endogenous FAP^+ cells determined by flow cytometry. Total cell numbers per well were determined using precision counting beads. The results (Figure 40B) show that NG-605 and NG-606 resulted in a significant decrease in numbers of autologous FAP-expressing cells in the ascites samples, suggesting some FAP^+ cells had been killed by the activated T-cells.

In a second experiment, unpurified (therefore unchanged from when received) ascites cells from a cancer patient were seeded at 250,000 cells per well of a U-bottom 96-well plate in either 100% ascites fluid or medium supplemented with 1% human serum. Cells were infected with viruses at 100 ppc, with untreated wells serving as negative controls. EnAd-CMV-GFP and EnAd-SA-GFP were also included as a reporter to determine infection and late stage viral gene expression, respectively, with micrographs shown in Figure 41. After incubation at 37°C for 5 days, the total cell population was harvested and the number of $CD3^+$ T-cells (Figure 42) and expression level of CD25 on $CD3^+$ T-cells (Figure 43) was determined. Total cell numbers per well were determined using precision counting beads. The results demonstrate that for this patient recombinant FAP bispecific T-cell activator and NG-605, but not NG-606, resulted in significant increase in T-cell activation of tumour-associated lymphocytes in media. Neither virus led to activation in ascites fluid.

As an extension of the experiment above, replicate wells were harvested and the number of FAP^+ cells was determined by flow cytometry (Figure 44). Total cell numbers per well were determined using precision counting beads. The results demonstrate that recombinant FAP bispecific T-cell activator and NG-605, but not NG-606, resulted in a significant decrease in numbers of autologous FAP-expressing cells in media. Neither virus led to a reduction in FAP^+ cells in ascites fluid.

Example 17 - Materials and Methods

Cell lines

HEK293A, DLD, SKOV3, MCF7, A431, A549 and PC3 cells (ATCC) were cultured in Dulbecco's Modified Eagle's Medium (DMEM, Sigma-Aldrich, UK) and CHO cells (ATCC) in Roswell Park Memorial Institute (RPMI-1640, Sigma-Aldrich, UK). Growth media was supplemented with 10% (v/v) fetal bovine serum (FBS, Gibco, UK) and 1% (v/v) penicillin/streptomycin (10 mg/mL, Sigma-Aldrich) and cells maintained in humidified atmosphere at 37°C and 5% CO2. For virus infections and virus plasmid transfections cells were maintained in DMEM supplemented with 2% FBS. For recombinant bispecific T-cell activator plasmid transfections cells were maintained in DMEM without FBS. EpCAM expression of target cell lines was determined by flow cytometry.

Generation of EpCAM-expressing stable cell lines

The protein sequence of the EpCAM gene (ID: 4072) was obtained from NCBI database and DNA

2017320776 18 Sep 2024

synthesised by Oxford Genetics Ltd (Oxford, UK). The EpCAM gene was cloned into pSF-Lenti vector by standard cloning techniques producing the pSF-Lenti-EpCAM vector. HEK293T cells were transfected using Lipofectamine 2000 with lentivirus EpCAM expression vector alongside pSF-CMVHIV-Gag-Pol, pSF-CMV-VSV-G, pSF-CMV-HIV-Rev (Oxford Genetics Ltd). Supernatants containing lentivirus were harvested 48 h later and mixed with polybrene (8 μg/mL). Lentivirus/polybrene mixtures were added to CHO cells and incubated at 37°C. On day 4, the supernatant was exchanged for media containing 7.5 μg/mL puromycin. Stable variants were then clonally selected and EpCAM expression of the parental cell lines or stable-transfected variant was determined by antibody staining with EpCAM or isotope control antibody and analysed by flow cytometry. Positive clones were expanded and used in further experiments.

Preparation of peripheral blood mononuclear cells (PBMC) and T cell isolation

PBMCs were isolated by density gradient centrifugation (Boyum, 1968) from whole blood leukocyte cones obtained from the NHS Blood and Transplant UK (Oxford, UK). Blood was diluted 1:2 with PBS and layered onto Ficoll (1,079g/mL, Ficoll-Paque Plus, GE Healthcare) before centrifugation at 400 g for 30 min at 22°C with low deceleration. After centrifugation, PBMCs were collected and washed twice with PBS (300 g for 10 min at room temperature) and resuspended in RPMI-1640 medium supplemented with 10% FBS. For extraction of CD3-positive T-cells from PBMCs, non-CD3 cells were depleted using Pan T Cell Isolation Kit (Miltenyi Biotec, #130-096-535), according to the manufacturer's protocol. For further isolation of CD4- and CD8-positive T-cells, CD3 T-cells underwent another round of purification using CD4+ Microbeads (Miltenyi Biotec, #130-045-101).

Processing primary ascites and pleural effusions

Primary human malignant ascites and pleural effusion samples were received from the Churchill Hospital, Oxford University Hospitals (Oxford, UK) following informed consent from patients with multiple indications of advanced carcinoma, including but not limited to ovarian, pancreatic, breast and lung. This work was approved by the research ethics committee of the Oxford Centre for Histopathology Research. Upon receipt, cellular and fluid fractions were separated and fluid used immediately or aliquots stored at -20°C for future analysis. The cellular fraction was treated with red blood cell lysis buffer (Roche, UK) following manufacturer's instructions. Cell number and viability was determined by trypan blue stain. Cell types present in each sample were determined by antibody staining for EpCAM, EGFR, FAP, CD45, CD11b, CD56, CD3, CD4, CD8, PD1 and CTLA4 and analysed by flow cytometry. For ex vivo T-cell activation and target cell lysis experiments fresh cells and fluid were used. In some cases, the adherent cells were passaged in DMEM supplemented with 10% FBS and expanded for later use.

Bispecific T-cell activator engineering and production

Bispecific T-cell activators were generated by joining two scFvs of different specificities with a flexible GS linker. Each scFv is created by the joining of VH and VL domains from parental monoclonal antibodies by a linker. Each bispecific T-cell activator possessed an immunoglobulin light chain (Ig) N-terminal signal sequence for mammalian secretion and a C-terminal decahistidine affinity tag for detection and purification. bispecific T-cell activators were engineered by standard DNA cloning techniques and inserted into a protein expression vector (pSFCMV- Amp) for cytomegalovirus (CMV) promoter-driven constitutive protein expression and secretion. pSF-CMV-EpCAMbispecific T-cell activator or pSF-CMV-Controlbispecific T-cell activator plasmid DNA were transfected into HEK293A cells using polyethylenimine (PEI, linear, MW 25000, Polysciences, USA) under the following conditions, 55 μg of

2017320776 18 Sep 2024

plasmid DNA:110 µg PEI (DNA:PEI ratio of 1:2 (w/w)) was added to cells, incubated at 37°C for 4 h, then replaced with fresh serum-free DMEM and further incubated at 37°C, 5% CO2 for 48 h. Cells were transfected in parallel with pSF-CMV-GFP to ensure transfection efficiency. To harvest secreted protein, the supernatant of transfected cells was collected and centrifuged at 350 g, 4°C for 5 min to remove cell components. Supernatants were transferred to 10,000 MWCO Amicon Ultra-15 Centrifugal Filter Units (Millipore). After centrifugation at 4750 g and 4°C, the volume of the retentate was adjusted with the flow through to obtain a 50-fold higher concentration. Aliquots of concentrated protein were stored at -80 °C.

Generation of bispecific T-cell activator-expressing EnAdenotucirev

The plasmids pEnAd2.4-CMV-EpCAMbispecific T-cell activator, pEnAd2.4-SA-EpCAMbispecific T-cell activator, pEnAd2.4-CMV-Controlbispecific T-cell activator, pEnAd2.4-SA-Controlbispecific T-cell activator were generated by direct insertion of the transgene cassette encoding the EpCAM bispecific T-cell activator or control bispecific T-cell activator into the basic EnAd plasmid pEnAd2.4 using Gibson assembly technology. The transgene cassette contained a 5' short splice acceptor sequence or an exogenous CMV promoter, followed downstream by the EpCAM or control bispecific T-cell activator cDNA sequence and a 3' polyadenylation sequence. A schematic of the inserted transgene cassette is shown in Figure 18. Correct construction of the plasmid was confirmed by DNA sequencing. The plasmids EnAd2.4-CMV-EpCAMbispecific T-cell activator, pEnAd2.4-SA-EpCAMbispecific T-cell activator, pEnAd2.4-CMV-Controlbispecific T-cell activator and pEnAd2.4-SA-Controlbispecific T-cell activator were linearised by restriction digest with the enzyme AscI prior to transfection in HEK293A cells. The production of virus was monitored by observation of cytopathic effect (CPE) in the cell monolayer. Once extensive CPE was observed the virus was harvested from HEK293A cells by three freeze-thaw cycles. Single virus clones were selected by serially diluting harvested lysate and re-infecting HEK293A cells, and harvesting wells containing single plaques. Serial infections of HEK293A cells were performed once an infection had reached full CPE in order to amplify the virus stocks. Once potent virus stocks were amplified the viruses were purified by double caesium chloride banding to produce EnAd-CMVEpCAMbispecific T-cell activator, EnAd-SA-EpCAMbispecific T-cell activator, EnAd-CMV-Controlbispecific T-cell activator, EnAd-SA-Controlbispecific T-cell activator virus stocks. These stocks were titred by TCID50 and picogreen assay (Life Technologies), following manufacturer's instructions.

Preparation of supernatants

To evaluate bispecific T-cell activator-mediated cytokine release, DLD cells (20,000) were plated with 100,000 CD3+ T-cells in 96-well flat bottom plate alone or with 2 ng/µL EpCAM or control bispecific T-cell activator. After 48 h incubation at 37°C and 5% CO2, supernatants were collected, cell components removed by centrifugation and aliquots stored at -20°C. To assess bispecific T-cell activator transgene expression from recombinant viruses, HEK293A (1e6) or DLD cells (1.2e6) were infected with EnAd-CMV-EpCAMbispecific T-cell activator, EnAd-SA-EpCAMbispecific T-cell activator, EnAd-CMVControlbispecific T-cell activator, EnAd-SA-Controlbispecific T-cell activator or EnAd at 100 vp/cell. Cells were cultured for 72 h at which point the cytopathic effect (CPE) was advanced. Supernatants were collected and centrifuged for 5 min, 300 g to remove cell debris and stored at -20°C for future analysis.

2017320776 18 Sep 2024

Immunoblotting

Dot blot was used to measure the concentration of recombinant bispecific T-cell activator produced from plasmid transfections. Two-fold serial dilutions of each bispecific T-cell activator and of a protein standard (10 x His-tagged (Cterminus) human Cathepsin D, Biolegend, #556704) were prepared. The molar concentration of the protein standard was adjusted to represent a bispecific T-cell activator concentration of 100 µg/mL. Two µL of each sample and protein standard was directly applied onto a nitrocellulose membrane. The membrane was airdried, blocked and probed with α-6xHis (C-terminus) antibody (1:5000, clone 3D5, Invitrogen, UK, #46- 0693) for detection of C-terminally His-tagged proteins, followed by washing and incubation with antimouse secondary antibody (1:10000, Dako, #P0161) and detected by application of SuperSignal West Dura Extended Duration Substrate (Thermo Fisher, #34075) according to manufacturer's instructions. Supernatants of virus-infected HEK293A cells were analysed by Western blotting for bispecific T-cell activator expression. Supernatants were fractionated by SDS-PAGE and transferred to a nitrocellulose membrane according to manufacturer's protocols (Bio-Rad). Membranes were further treated identically to that of dot blot protocol above.

Enzyme-linked immuno-sorbent assay (ELISA)

To assess EpCAM binding, ELISA plates were prepared by coating overnight at 4°C with human EpCAM/TROP-1 protein (50 ng/well, Sino Biological Inc, #10694-H02H-50). Plates were blocked for 1 h at ambient temperature with 5% BSA, followed by incubation with diluted EpCAM bispecific T-cell activator-, Control bispecific T-cell activator- and empty pSF-CMV vector-transfected HEK293A supernatants (2 h, room temperature). Plates were washed three times with PBS-T and subsequently after every future binding step. Plates were incubated with anti-His (C-term) antibody (1:5000, clone 3D5, #46-0693, Invitrogen, UK) for 1 h, room temperature, followed by HRP conjugated anti-mouse-Fc (1:1000 in PBS/5% milk, Dako) for 1 h at room temperature. HRP detection was performed using 3.3.5.5'-teramethylethylenediamine (TMB, Thermo-Fisher) and stop solution was used for terminating the reaction. Absorbance at 450 nm was measured on a Wallac 1420 plate reader (Perkin Elmer).

Flow Cytometry

Flow cytometry analysis was performed on a FACSCalibur flow cytometer (BD Biosciences) and data processed with FlowJo v10.0.7r2 software (TreeStar Inc., USA). For classification of different cellular populations, antibodies specific for CD45 (HI30, Biolegend), CD11b (ICRF44, Biolegend), EpCAM (9C4, Biolegend) and FAP (427819, R&D Systems) were used. For analysis of T-cell populations, the following antibody clones coupled to different fluorophores were used: CD69 (FN50, Biolegend), CD25 (BC96, Biolegend), IFNγ (4S.B3, Biolegend), αCD107a antibody (H4A3, Biolegend), CD3 (HIT3a, Biolegend), CD4 (OKT4, Biolegend), CD8a (HIT8a, Biolegend), PD1 (H4A3, Biolegend). In each case, the appropriate isotype control antibody was used.

Characterisation of human T-cell activation

CD69 and CD25 expression levels

The ability of the recombinant EpCAM bispecific T-cell activator or EpCAM bispecific T-cell activator viruses to induce T-cell activation was assessed by surface expression of CD69 and CD25. Human CD3 cells (75,000 cells/well in 96-well flatbottom plates) from PBMC or ascites samples were cultured alone or with DLD, SKOV, CHO, CHOEpCAM or ascites target cells (15,000) in the presence of media alone,

2017320776 18 Sep 2024

EpCAM or control bispecific T-cell activator protein (2 ng/μL) or recombinant virus (100 vp/cell). In some cases, anti-PD1 (Invivogen, #hpd1ni-mab7) antibody was added at a final concentration of 2.5 μg/mL. CD3 cells were incubated with CD3/CD28 Dynabeads (Thermo Fisher, #11131D) as positive control for T cell activation. Cells were cultured medium for 24 h at 37°C unless stated otherwise and subsequently harvested with enzyme free cell dissociation buffer (Gibco, #13151014). Total cells were stained with antibodies for surface expression of CD69, CD25, CD3, CD4 or CD8 and analysed by flow cytometry. The effect of ascites fluid on T-cell activation (CD69, CD25) was investigated by polyclonally activating CD3-purified PBMC (100,000) by incubating with plate-immobilised CD3 antibody (7.5 μg/mL, HIT3a, Biolegend, #300313) in RPMI-1640 or fluids isolated from the malignant ascites samples.

IFNγ expression

The ability of the EpCAM bispecific T-cell activator to induce T-cell activity was assessed by IFNγ expression, by co-culture of T-cells for 6 h with DLD cells (200,000 CD3 cells/well, 40,000 DLD cells/well in a flat-bottom 96 well plate) and 2 ng/μL recombinant EpCAM or control bispecific T-cell activator. As a positive control, T cells were stimulated with soluble PMA/ionomycin cell activation cocktail (Biolegend, #423301). Brefeldin A (GolgiPlug, BD Biosciences) was added into the culture medium 5 h before harvest, at which point CD3+ T-cells were harvested and intracellularly stained for IFNγ expression and analysed by flow cytometry.

T cell proliferation

To study T cell proliferation, 100,000 CFSE-labelled (CellTrace CFSE kit, Invitrogen, #C34554) CD3+ T cells were incubated with 20,000 DLD cells in 96 well plate format, with 2 ng/μL EpCAM or control bispecific T-cell activator. Five days after co-culture, cells were stained for CD3, CD4 or CD8 and CFSE fluorescence of viable CD3+ T-cells were measured by flow cytometry, with total cell number normalised using precision counting beads (5000/well, Biolegend, #424902). Fluorescence data was analysed and modelled using the proliferation function of FlowJo v7.6.5 software. Data is presented as the percentage of original cells that entered a proliferation cycle (%divided) or the average number of cell divisions that a cell in the original population has undergone (Division Index).

CD107a degranulation

DLD cells (15,000 cells/well) were co-cultured with 75,000 CD3+ T-cells in a flat-bottom 96 well plate in the presence of media alone or 2 ng/μL of control or EpCAM bispecific T-cell activator. αCD107a or isotype control antibodies were added directly to the culture medium. Monensin (GolgiStop, BD Biosciences) was added after 1 h of incubation at 37°C and 5% CO2, followed by 5 h of further incubation. Cells were subsequently harvested, stained for CD3, CD4 or CD8 and analysed by flow cytometry.

Cytokine release

Cytokines within supernatants harvested from cultures of DLD/PBMC or pleural effusion cells were quantified using the LEGENDplex Human T Helper Cytokine panel (Biolegend, #740001) and flow cytometry following the manufacturer's instructions. Cytokines included in the analysis are IL-2, IL-4, IL-5, IL-6, IL-9, IL-10, IL-13, IL-17A, IL-17F, IL-21, IL-22, IFNγ and TNFα.

***In vitro* target cell cytotoxicity assay**

Target cell cytotoxicity mediated by recombinant bispecific T-cell activator or viruses was assessed by LDH release or MTS assay. Target cells (DLD, SKOV, HT-29, A431, A549, PC3, CHO, CHO-EpCAM) were co-cultured with CD3, CD4 or CD8 T-cells (E:T 5:1) in a flat-bottom 96 well plate in the presence

2017320776 18 Sep 2024

of media alone, diluted supernatants or virus (100 vp/cell). After 24 h of co-culture (unless stated otherwise), supernatants and cells were harvested and cytotoxicity determined by LDH assay (CytoTox 96 Non-Radioactive Cytotoxicity Assay, Promega, #G1780) or MTS viability assay (CellTiter 96 Cell Proliferation Assay, Promega, #G3580) as per manufacturer's instructions. Quantity of bispecific T-cell activator produced from virus-infected DLD cells was determined by comparing cytotoxicity induced by diluted viral supernatants to that of a standard curve generated using recombinant bispecific T-cell activator.

To evaluate oncolytic activity of the viruses, DLD cells were seeded in 96-well plate (25,000 cells/well) for 18 h at 37°C and 5% CO2, before infection with increasing vp/cell (5-fold serial dilution, 100 to 5.12e-5 vp/cell) or left uninfected. DLD cytotoxicity was measured on day 5 by MTS viability assay. Dose response curves were fitted and IC50 determined using a four parameter non-linear fit model integrated into Prism 7 software (GraphPad Software). Cell viability was monitored in real-time using xCELLigence RTCA DP technology (Acea Biosciences). DLD, SKOV3 or MCF7 cells were plated in 48-well E-plate at 12,000 cells/well. Plates were incubated for 18 h, 37°C, 5% CO2, before cells were either treated with bispecific T-cell activator (2 ng/μL) or infected with virus (100 vp/cell) or left untreated. Two hours after infection, 75,000 CD3+ cells were added to the necessary wells. Cell impedance was measured every 15 min for a duration of up to 160 h. For *ex vivo* cytotoxicity assays, unpurified cells from ascites or pleural effusion samples were resuspended in ascites fluid and plated (1.5e5/well) in flat bottom 96-well plates. After incubation for the stated duration at 37°C, 5% CO2, supernatants were analysed by LDH assay or total cells were harvested by cell-dissociation buffer, stained for CD3, CD25 and EpCAM, and analysed by flow cytometry. For PD1 blocking experiments, anti-PD1 antibody (2.5 μg/mL, Invivogen, #hpd1ni-mab7) antibody was included.

Viral genome replication and qPCR

The ability of EnAd-CMV-EpCAMbispecific T-cell activator, EnAd-SA-EpCAMbispecific T-cell activator, EnAd-CMV-Controlbispecific T-cell activator, EnAd-SAControlbispecific T-cell activator or EnAd to replicate their genomes was analysed by seeding DLD cells in 24-well plate (150,000 cells/well) for 18 h, 37°C, 5% CO2, before infection with 100 vp/cell. Wells were harvested 24 and 72 h post infection, and DNA purified using PureLink genomic DNA mini kit (Invitrogen, #K182001) according to the manufacturer's protocol. Total viral genomes were quantified by qPCR against EnAd hexon using specific primer-probe set (primers: TACATGCACATCGCCGGA/CGGGCGAACTGCACCA, probe: CCGGACTCAGGTACTCCGAAGCATCCT).

Microscopy

Brightfield and fluorescence images were captured on a Zeiss Axiovert 25 microscope. Time lapse videos were obtained to observe viral or T cell-mediated lysis of target cells by EnAd or EnAd-CMVEpCAMbispecific T-cell activator. Uninfected cells were used as a negative control. NHDF cells were stained with CellTracker Orange CMTMR Dye (Life Technologies, #C2927) and CD3+ cells were stained with CellTrace Violet Cell Proliferation Kit (Life Technologies, #C34557) following manufacturer's protocols. Dyed NHDF were plated in a 24-well plate at 7,500 cells/well in co-culture SKOV3 at 13,500 cell/well. Plates were incubated for 18 h, 37°C, 5% CO2. Cells were then treated with 300 ng/mL EpCAM bispecific T-cell activator or infected with 100 vp/cell of EnAd or EnAd2.4-CMV-EpCAMbispecific T-cell activator or left untreated. After 2 h incubation, 100,000 dyed CD3+ were added

2017320776 18 Sep 2024

to necessary wells, in addition to 1.5 uM CellEvent Caspase 3-7 reagent (Life Technologies, #C10423). Images were captured on a Nikon TE 2000-E Eclipse inverted microscope (10× optical objective) at intervals of 15 min covering a period of 96 h. Time-lapse videos (12 frames/second) were generated using ImageJ software.

Statistics

In all cases of more than two experimental conditions being compared, statistical analysis was performed using a One-way ANOVA test with Tukey's Post Hoc analysis. All data is presented as mean ± SD. The significant levels used were P = 0.01 - 0.05 (*), 0.001 – 0.01 (**), 0.0001-0.001 (***). All *in vitro* experiments were performed in triplicate, unless stated otherwise.

Example 18 - Generation and production of a bispecific T-cell activator targeting EpCAM

A bispecific T-cell activator targeting EpCAM was engineered by joining two scFv specific for CD3ε and EpCAM with a flexible glycine-serine (GS) linker. A control bispecific T-cell activator, recognising CD3ε and an irrelevant antigen (the filamentous haemagglutinin adhesin (FHA) of Bordetella pertussis) was also produced. Both bispecific T-cell activators were engineered to contain an N-terminal signal sequence for mammalian secretion and a C- terminal decahistidine affinity tag for detection and purification (Figure 45A). To characterise the functionality of the recombinant bispecific T-cell activators, they were cloned into expression vectors under transcriptional control of the CMV immediate early promoter (pSF-CMV-EpCAMbispecific T-cell activator and pSF-CMV-Controlbispecific T-cell activator, respectively).

Adherent HEK293 cells (HEK293A) were transfected with the expression vectors and supernatants harvested and concentrated 50-fold for further analysis. To estimate the amount of bispecific T-cell activator produced, samples were serially diluted and evaluated, using anti-His, in a dot blot using decahistidine-tagged cathepsin D as a standard. In this way it was possible to estimate the level of bispecific T-cell activators produced into the supernatant to be approximately 20 μg/mL at 48 h post transfection (of 1.8e7 HEK293A cells)

(Figure 46A). Specific binding of the EpCAM bispecific T-cell activator and not the control bispecific T-cell activator to recombinant EpCAM protein was demonstrated by ELISA (Figure 46B).

Example 19 - Characterisation of human T-cell activation by recombinant EpCAM bispecific T-cell activator

The ability of recombinant EpCAM bispecific T-cell activator protein to activate PBMC-derived T cells was evaluated by adding unstimulated human primary CD3+ cells to a culture of human DLD colorectal carcinoma cells, which are known to express EpCAM on their surface (Karlsson et al, 2008). Addition of 2.5 ng/ml EpCAM bispecific T-cell activator (as supernatant from transduced HEK293A cells) led to a significant increase in T cell activation markers CD69 and CD25 (Figure 45B & C), whereas the control bispecific T-cell activator had no effect.

Exposure of CD3 cells to the EpCAM bispecific T-cell activator in the absence of tumour cells gave a very modest increase in CD69 and CD25, and this indicates that antibody-mediated clustering of CD3 is essential for full activation by this anti-CD3 binding. T cells stimulated by the EpCAM bispecific T-cell activator in the presence of tumour cells also showed a significant increase in the production of gamma interferon (Figure 45D) and cell proliferation (Figure 45E) whereas the control Bispecific T-cell activator

2017320776 18 Sep 2024

had no effect. The aim of T cell activation is to cause degranulation-mediated cytotoxicity, and expression of surface CD107a/LAMP1 (indicating degranulation, *Aktas et al.*) was strongly upregulated by the EpCAM bispecific T-cell activator but not by control (Figure 45F).

The release of cytokines following EpCAM bispecific T-cell activator-mediated activation of PBMC-derived T cells in the presence of DLD cells was characterised by flow cytometry using a cytokine bead array. As before the control bispecific T-cell activator showed little activity, although the EpCAM bispecific T-cell activator triggered release of several cytokines, including high levels of IL-2, IL-6, IL-10, IL-13, gamma interferon and TNF (Figure 45G). Production of IL-2, gamma interferon and TNF are generally associated with a Th1 response, whereas IL-6 and IL-10 are more often linked to a Th2 response (Mosmann & Sad, 1996).

Example 20 - Specificity of recombinant EpCAM bispecific T-cell activator

Most human epithelial cells express EpCAM, so to assess whether the effect of the EpCAM bispecific T-cell activator was

antigen-specific, Chinese Hamster Ovary cells (CHO cells) were engineered using a lentiviral vector to express human EpCAM on their surface. In the presence of EpCAM bispecific T-cell activator and CHO-EpCAM cells, exogenously added PBMC-derived T cells showed strong activation (assessed by CD25 expression see Figure 47A) and associated cytotoxicity (Figure 47B) that was not seen with parental CHO control cells or control bispecific T-cell activators. This indicates that the cytotoxicity of the EpCAM bispecific T-cell activator is antigen-specific.

We then assessed whether the EpCAM bispecific T-cell activator would kill a range of tumour cells, and whether the level of EpCAM bispecific T-cell activator-mediated cytotoxicity observed was dependent on the density of EpCAM expression. Cytotoxicity of T cells in the presence of the EpCAM bispecific T-cell activator was measured in six different carcinoma cell lines, with greatest cytotoxicity observed in DLD and A431, and least in A549 and PC3 (Figure 47C). This showed a loose association with the surface levels of EpCAM (determined by flow cytometry), where A549 and PC3 cells showed the lowest levels and DLD the highest (Figure 47D). This suggests that the presence and level of EpCAM expression do influence the degree of cytotoxicity, although other factors (perhaps the intrinsic resistance of cells to granzyme-mediated apoptosis) also play a role in determining the overall level of cell killing.

Example 21 - Bispecific T-cell activator mediated activation of CD4+ and CD8+ T cell subsets

To determine which T cell types are activated by the EpCAM bispecific T-cell activator, PBMC-derived T cells were incubated with DLD cells and activated using the bispecific T-cell activator prior to flow analysis. Both CD4+ and CD8+ cells showed high levels of expression of CD69 and CD25 (Figure 49A), although the percentage of activated CD4 cells was generally slightly greater. EpCAM bispecific T-cell activator-mediated T cell proliferation was assessed using CFSE stain (Figure 49B), and degranulation by expression of CD197a/LAMP1 (Figure 49C) and again similar levels of activation were seen for both CD4+ and CD8+ cells. Finally, levels of tumour cell cytotoxicity achieved were compared using EpCAM bispecific T-cell activator to activate purified CD4+ and CD8+ subsets. All T cell preparations showed similar cytotoxicity (Figure 49D), indicating that both CD4+ and CD8+ cells can contribute to the bispecific T-cell activator-mediated cytotoxicity observed.

2017320776 18 Sep 2024

Example 22 - Expression of the EpCAM bispecific T-cell activator from oncolytic adenovirus, EnAdenotucirev

EnAdenotucirev (EnAd) is an oncolytic adenovirus, a chimera of group B type 11 and type 3 adenovirus with a mosaic E2B region, a nearly complete E3 deletion and a smaller E4 deletion mapped to E4orf4 (Kuhn 2008). Currently undergoing several early phase clinical trials for treatment of cancer, the virus combines good systemic pharmacokinetics and promising clinical activity with the possibility to encode and express transgenes (Calvo 2014, Boni 2014). The EpCAM bispecific T-cell activator was encoded within EnAd immediately downstream of the fibre gene, using a shuttle vector inserted into the virus backbone by Gibson assembly (Figure 18). The bispecific T-cell activator was placed either under transcriptional control of a CMV immediate early promoter (EnAd-CMV-EpCAM bispecific T-cell activator), or was placed downstream of a splice acceptor site for the adenovirus major late promoter (MLP; EnAd-SA-EpCAM bispecific T-cell activator). In the former configuration the bispecific T-cell activator should be expressed whenever the virus successfully infects a cell, whereas expression from the MLP splice acceptor site will only occur when the MLP is activated in cells that are permissive to virus replication. A control bispecific T-cell activator (recognising CD3 and FHA) was also introduced to create two corresponding control viruses.

The viruses were cloned, rescued in HEK293A cells, and a large batch of each was prepared in a hyperflask and purified twice by caesium chloride banding. Infection of DLD with parental EnAd and the recombinant bispecific T-cell activator viruses yielded similar amounts of viral genomes (measured by qPCR) at all timepoints tested, indicating the bispecific T-cell activator transgene does not interfere with the viral replication kinetics (Figure 51A). Next we investigated the replication and oncolytic properties of the viruses in the absence of human T-cells. DLD cells were infected with virus batches at increasing virus particles (vp)/cell, and the cytotoxicity measured by MTS assay on day 5. All of the recombinant viruses, including those with EpCAM and control bispecific T-cell activators, regulated by the CMV promoter or splice acceptor, showed cytotoxic activity indistinguishable from the parental virus, showing that the genetic modification had not changed the intrinsic oncolytic activity of the virus (Figure 51B).

To assess bispecific T-cell activator expression and secretion, the bispecific T-cell activator-expressing EnAd viruses were used to infect HEK293A cells, and 72 h supernatants were examined by western blotting using an anti-His antibody. As shown in Figure 51C, all four viruses (two expressing the control bispecific T-cell activator and two expressing the EpCAM bispecific T-cell activator) showed similar levels of bispecific T-cell activator secreted into the supernatant.

Example 23 - Selective killing of EpCAM positive cells by virally produced EpCAM bispecific T-cell activator

The supernatants from EnAd-EpCAM bispecific T-cell activator-infected HEK293A cells were added to cultures of CHO and CHO-EpCAM cells, either with or without PBMC-derived T cells; T cell activation and cytotoxicity to the CHO/CHO-EpCAM cells was measured after 24 h. In the case of CHO cells, there was no increase in T cell expression of CD25 (Figure 51D) nor any cytotoxicity observed with any treatment (Figure 51E). However, T cells I incubated with the CHO-EpCAM cells showed substantial increases in CD25 expression using supernatants from HEK293A cells that had been infected with either EnAd-CMV-EpCAM bispecific T-cell activator or EnAd-SA-EpCAM bispecific T-cell activator viruses

2017320776 18 Sep 2024

(Figure 51D). As expected this translated into selective cytotoxicity to CHO-EpCAM cells only when T cells were added in the presence of supernatant from 293A cells that had been infected with either EnAd-CMV-EpCAM bispecific T-cell activator or EnAd-SA-EpCAM bispecific T-cell activator viruses (Figure 51E). Crucially there was no cytotoxicity in the absence of T cells, or when using supernatants from HEK293A that cells had been infected with EnAd expressing the control bispecific T-cell activator.

Example 24 - Superior cytotoxicity of EnAd expressing EpCAM bispecific T-cell activator

EnAd kills most carcinoma cells quickly by direct oncolysis (Kuhn 2008), although some cells – notably SKOV3 ovarian carcinoma cells – are partially resistant and killed more slowly. We therefore reasoned that the consequences of arming End to secrete EpCAM bispecific T-cell activator, leading to cytotoxic activation of T cells might be particularly evident in SKOV3 cells. Cells were therefore exposed to virus (100 vp/cell) 24 h after seeding and cell death monitored by xCELLigence system. PBMC-derived T cells were added (or not) to the SKOV3 cell culture 2 h later. In the absence of T cells, the tumour cells grew for approximately 72 h (manifest by the increasing Cell Index signal in Figure 53A) but cell growth then reached a plateau and remained stable, independent of virus infection, up until at least 160 h). All tested viruses, including parental EnAd, induced no observable target cell cytotoxicity during the time measured. However, when co-cultured with PBMC-derived T cells, both the CMV- and SA- EpCAM bispecific T-cell activator-armed viruses induced rapid SKOV3 lysis, with CMV-driven induced lysis within 16 h, and SA within 44 h following addition of T cells (Figure 53B). Importantly, parental EnAd or the non-specific bispecific T-cell activator control viruses demonstrated no target cell lysis in this time frame even with the addition of Tcells. This result was confirmed by LDH assay, in which co-cultures identical to above were set up, with cytotoxicity measured at 24, 48 and 96 h post-infection (Figure 48). These results are further supported by similar findings in DLD cells in which EpCAM bispecific T-cell activator expressing viruses induced cytotoxicity at a significantly quicker rate than the control bispecific T-cell activator viruses (Figure 50A+B).

To confirm that target cell cytotoxicity is mediated via T cell activation, CD3 cells were harvested at each timepoint and activation status determined by CD69 and CD25 expression, demonstrating similar kinetics of expression as observed for cytotoxicity (Figure 53C & D, Figure 50C & D). The approximate quantity of EpCAM bispecific T-cell activator produced from infected DLD cells was determined by comparing cytotoxicity (Abs490) induced by infected DLD supernatants to the cytotoxicity induced by known quantities of recombinant bispecific T-cell activator (i.e. creation of a standard curve (Abs490)). DLD in co-culture with CD3-purified PBMC (1:5) were incubated with recombinant bispecific T-cell activator (Figure 50E) or infected DLD supernatant (Figure 50F) and LDH release was measured at 24 h, This allowed us to determine that EpCAM bispecific T-cell activator was produced at 165 μg and 50 μg per million DLD for EnAd-CMV-EpCAMbispecific T-cell activator and EnAd-SAEpCAMbispecific T-cell activator, respectively. The EC50 for the EpCAM bispecific T-cell activator is 7.4 ng/ml (Figure 50E & F), and therefore EpCAM bispecific T-cell activator is produced by the recombinant virus at levels that are likely to reach therapeutic doses.

Cytotoxicity of EpCAM bispecific T-cell activator-expressing EnAd was visualised by time lapse video microscopy. SKOV3 tumour cells (unlabelled) were co-incubated with normal human fibroblasts (EpCAM-negative, labelled red, serving as non-target control cells) and PBMC-derived T cells (labelled

2017320776 18 Sep 2024

blue) in the presence of a caspase stain (CellEvent Caspase 3-7 reagent produces a green stain when caspases are activated). Again the combination of EpCAM bispecific T-cell activator-expressing EnAd, combined with exogenous T cells, gave dramatic cytotoxicity to the SKOV3 tumour cells, which showed strong induction of apoptosis when infected with EnAd-CMV-EpCAMbispecific T-cell activator, but not parental EnAd. Importantly, the EpCAM-negative NHDF in co-culture remained viable throughout. Representative fluorescent images at different time points from the SKOV3 videos are shown in Figure 53E. Equivalent time lapse videos showing DLD cells (which are intrinsically more sensitive to the virus) cocultured with NHDF are also shown.

Example 25 - EpCAM bispecific T-cell activator can overcome immune suppression, activate endogenous T cells and kill endogenous tumour cells within malignant peritoneal ascites

Three clinical samples of malignant peritoneal ascites samples containing EpCAM-positive tumour cells and primary fibroblasts (as control, non EpCAM-expressing cells) were expanded *ex vivo* and the mixed primary cell populations were incubated with PBMC-derived T-cells and treated with free bispecific T-cell activator or 100 vp/cell EnAd-EpCAMbispecific T-cell activator in culture medium. After 72 h, the level of EpCAM-positive target cells (Figure 55A) or non-target fibroblast activation protein (FAP)-positive fibroblasts (Figure 55B) were measured by flow cytometry. Activation of T cells was analysed by measuring CD25 expression (Figure 55C). The free EpCAM bispecific T-cell activator and the EpCAM bispecific T-cell activator-expressing viruses induced T-cell activation, leading to a depletion of EpCAM-positive tumour cells, with primary FAP-positive (EpCAM-negative) fibroblasts showing no change in numbers. This was observed in all the patients' samples, and none of the other treatments showed any significant effects. This demonstrates that the EpCAM bispecific T-cell activator (or oncolytic virus encoding it) can mediate activation and selective cytotoxicity by PBMC-derived T cells to human ovarian ascites tumour cells.

Malignant exudates likely represent an environment of potential immune tolerance with suppressed immune responses commonly observed in patients with late-stage metastatic cancer. To test this hypothesis we polyclonally stimulated PBMC-derived T cells with anti-CD3 antibodies in culture media or the presence of 100% ascites fluid from five patients with peritoneal malignancies. Whereas in RPMI medium the anti-CD3 antibody gave approximately 50% of T cells positive for both CD25 and CD69, the presence of ascites fluid appeared to attenuate the activation of T-cells as determined by decreased antibody-mediated elevation of CD69/CD25 expression, and this was particularly noticeable for patient fluid #2 (Figure 56A). This supports our notion that components of ascites fluid may exert an immune suppressive or tolerising effect. However, this attenuation in the increase of activation markers did not correlate with a suppression of T-cell degranulation, with CD107a externalisation in ascites fluid similar to that in culture medium (Figure 56B). It follows that bispecific T-cell activators may be able to bypass tumour microenvironment-associated mechanisms of T-cell immunosuppression (Nakamura & Smyth, 2016).

We therefore investigated the ability of PBMC-derived T cells and EpCAM bispecific T-cell activator to mediate target cell cytotoxicity in the presence of immunosuppressive ascites fluid. T-cells incubated with ascites fluid 1 and 2 induced similar lysis of the human breast adenocarcinoma MCF7 cell line as when in RPMI culture medium (measured using xCELLigence), although the cytotoxicity showed a delay of about 8 h in the presence of patient ascites fluid #2 (Figure 56C). In addition to the immune suppressive fluid

2017320776 18 Sep 2024

and tumour cells present, ascites contain tumour-associated lymphocytes and supporting cells of the tumour stroma, providing a unique tumour-like model system to test bispecific T-cell activator-mediated activation of endogenous patient-derived T-cells. Following a 24 h incubation of total endogenous cells and the ascites fluid with the free recombinant bispecific T-cell activator, activation of patient T cells was assessed (Figure 56D). In this highly clinically-relevant setting the EpCAM bispecific T-cell activator (but not the control counterpart) induced CD69 and CD25 expression, albeit CD25 at lower levels when the experiment was performed in 100% ascites fluid than in simple medium. These data suggest that the EpCAM bispecific T-cell activator can overcome at least some of the immune suppressive effects of peritoneal ascites fluid to activate endogenous T cells. Cytotoxicity was assessed by measuring release of LDH, and the bispecific T-cell activator caused a significant rise both when the experiment was performed in medium and also in 100% ascites fluid. This indicates that some of the ascites cells had been killed by bispecific T-cell activator-mediated cytotoxicity, although given the multiple cell types present in primary ascites it is not possible to define what proportion of tumour cells are killed.

Example 26 - EnAd expressing EpCAM bispecific T-cell activator can activate endogenous T cells to kill endogenous tumour cells within malignant pleural exudates

To study the effects of the EpCAM bispecific T-cell activator-expressing viruses in another clinically relevant setting, we obtained several samples of pleural exudates from patients with a range of malignancies. At initial screening (an example is shown in Figure 52), samples considered suitable for further analysis were those containing CD3 and EpCAM-positive cells. We also assessed the expression of PD1 by endogenous T cells following their initial isolation, and whereas only 10% of PBMC-derived T cells expresses PD1, all the malignant effusion samples T cells were at least 40% positive for PD1 and reached sometimes as high as 100% (Figure 54). Unpurified total cells (isolated by centrifugation and resuspended) were incubated at fixed concentrations in 100% pleural effusion fluid in the presence of 500 ng/mL free EpCAM bispecific T-cell activator or 100 vp/cell virus encoding bispecific T-cell activator. After 5 days, the total cell population was harvested, and the total number of CD3+ cells (Figure 57A) was measured.

Compared to untreated controls, only samples receiving the free EpCAM bispecific T-cell activator or EnAd encoding EpCAM bispecific T-cell activator showed T cell proliferation. This confirms that the EpCAM bispecific T-cell activator was binding to the EpCAM target and crosslinking CD3 to stimulate endogenous T cells. The expression level of CD25 on CD3 cells was also determined (Figure 57B). The free EpCAM bispecific T-cell activator induced significant T-cell activation of tumourassociated lymphocytes (assessed by CD25 expression) in all patients' samples, even within the likely immune-tolerising environment of the pleural effusion fluid. The addition of an anti-PD1 blocking antibody had no effect on EpCAM bispecific T-cell activator mediated activation of T cells in this setting (Figure 54B & C). There was noticeable variation between patients (although little between samples from the same patient), with activation ranging from 50% to 90% dependent on the donor. Similarly, samples treated with EnAd expressing the EpCAM bispecific T-cell activator showed high activation in some patients (ranging from 10-20% up to 80%, for both EnAd-CMV-EpCAM bispecific T-cell activator and EnAd-SA-EpCAM bispecific T-cell activator).

2017320776 18 Sep 2024

Interestingly, the patient showing the lowest bispecific T-cell activator-mediated activation also showed the lowest level of background T cell activation. Parental EnAd, or EnAd expressing control bispecific T-cell activators, or free control bispecific T-cell activators caused no stimulation above background.

We assessed the ability of the bispecific T-cell activator-expressing viruses to mediate EpCAM-targeted cytotoxicity by measuring residual levels of EpCAM positive cells by flow cytometry at the end of the five day incubation (Figure 57C). The free EpCAM bispecific T-cell activator, and the two viruses encoding EpCAM bispecific T-cell activator, caused a marked depletion of autologous EpCAM-expressing cells in every case, whereas the other treatments had little or no effect on the level of EpCAM-positive cells. In the case of Sample #1 there is a slightly decreased viability with all EnAd based viruses compared to the untreated control, and this is likely to represent the effects of direct viral oncolysis. In conjunction with the lack of influence of the PD1 blocking antibody on T cell activation, it had no effect on EpCAM bispecific T-cell activator mediated killing of target cells, with near complete cytotoxity of EpCAM+ cells (patients 2, 3 & 4) in the absence of the PD1 blocker

(Figure 54D).

The different effects of parental EnAd and EnAd-CMV-EpCAM bispecific T-cell activator are shown by microscopy in Figure 57D, where expression of the bispecific T-cell activator decreases the presence of tumour cells and expands the T cell population. The associated flow cytometry plots confirm the substantial expansion and activation of T cells following treatment with the EpCAM bispecific T-cell activator-expressing virus.

Finally the effects of the various treatments were characterised by measuring the levels of key cytokines produced using a LEGENDplex protein array (Figure 57E). By far the greatest fold increases were in gamma interferon, which rose nearly 1000-fold following treatment with the free EpCAM bispecific T-cell activator or EnAd encoding EpCAM bispecific T-cell activator. These two treatments also caused approximately 10-fold increases in expression of IL-5, IL-13, tumour necrosis factor (TNF), IL17A and IL17F, characteristic of activated T cells. EnAd alone (or expressing the control bispecific T-cell activator) also caused a 10-fold rise in gamma interferon, but otherwise no treatments caused any appreciable changes in cytokine expression.

Example 27 - Discussion

Oncolytic viruses offer an intriguing new strategy to combine several therapeutic modalities within a single targeted, self-amplifying, agent (Keller & Bell, 2016; Seymour & Fisher, 2016). As they replicate selectively within cancer cells and spread from cell to cell, some oncolytic viruses are thought to mediate cell death by non-apoptotic death pathways (Ingemarsdotter et al, 2010; Li et al, 2013), as part of the process allowing virus particles to escape from dying cells. EnAd, in particular, kills cells by a pro-inflammatory process known as oncosis or ischemic cell death (Dyer, 2017). This non-apoptotic death mechanism causes release of several pro-inflammatory cellular components, such as ATP, HMGB1 and exposure of calreticulin (known as damage-associated molecular patterns,

DAMPs)(Weerasinghe & Buja, 2012), and is likely pivotal to the ability of the virus to promote an effective anticancer immune response. In addition to the consequences of direct lysis, however, viruses offer the potential to encode and express other anticancer biologics, obviating delivery challenges and ensuring the biologic achieves its highest concentration within the tumour microenvironment. Imlygic encodes GM-

2017320776 18 Sep 2024

CSF, however the potential for arming viruses is virtually limitless and provides many exciting opportunities to design multimodal therapeutic strategies with additive or synergistic anticancer effects (de Gruijl et al, 2015; Hermiston & Kuhn, 2002).

Encoding bispecific T-cell activators within oncolytic viruses provides a powerful means to activate tumour infiltrating lymphocytes to become cytotoxic and lyse antigen-positive target cells, providing a completely separate therapeutic modality from the effects of direct viral lysis. In this study we have shown that bispecific T-cell activator-targeted cytotoxicity is fully antigen-specific, can be mediated by both CD4 and CD8 T cells (Brischwein et al, 2006) and can be incorporated into an oncolytic adenovirus and expressed only in cells that allow virus replication. In addition the current study shows, for the first time, that endogenous T cells within liquid cancer biopsies can be activated by bispecific T-cell activators and virus-encoded bispecific T-cell activators and can kill endogenous tumour cells without any additional stimulation or reversal of immune suppression. Importantly, this can happen even in the primary fluids that comprise the microenvironment of peritoneal ascites or pleural effusions, as surrogates for the immune suppressive microenvironment of solid tumours.

Arming oncolytic viruses to express bispecific T-cell activators combines two quite distinct therapeutic mechanisms, with the former providing lytic death of tumour cells that are permissive for virus infection, and the latter targeting T cell cytotoxicity via a specific, chosen, antigen. This provides considerable flexibility in the design of a therapeutic approach, perhaps using the bispecific T-cell activators to deliver cytotoxicity to tumour-associated cells that are relatively resistant to kill by the virus directly. For example, while we have exemplified the technology here using a bispecific T-cell activator that recognises a carcinoma-associated antigen (EpCAM), it is also possible to use the bispecific T-cell activator approach to target cytotoxicity to tumour-associated fibroblasts or other stromal cells. Indeed, even when the targets for bispecific T-cell activator-recognition are not restricted to expression in the tumour microenvironment, by linking bispecific T-cell activator production to virus replication allows expression of the bispecific T-cell activator to be spatially restricted to the tumour, minimising systemic toxicities. This is important, as bispecific T-cell activators administered intravenously show relatively short circulation kinetics (Klinger et al, 2012) and are often associated with considerable on-target off-tumour toxicities (Teachey et al, 2013).

The possibility to encode bispecific T-cell activators within oncolytic viruses has been previously explored using an oncolytic vaccinia virus with an Ephrin A2-targeting bispecific T-cell activator. This agent showed that the Ephrin bispecific T-cell activator could mediate activation of PBMCs and antigen-targeted killing of tumour cells both *in vitro* and *in vivo*. Intriguingly, although the bispecific T-cell activator could activate T cells it did not lead to T cell proliferation without the addition of exogenous IL-2, whereas the bispecific T-cell activator used in the current study led to extensive proliferation both of PBMC *in vitro* and of tumour-associated lymphocytes using the clinical biopsy samples *ex vivo*.

We believe that the differences observed may reflect the different bispecific T-cell activator design, the different oncolytic virus used or perhaps depend on the antigen density giving sufficient crosslinking of CD3 on the T cells.

One central aim of oncolytic virus therapy is to create an anticancer T cell response that recognises patient specific neoantigens as well as "public" tumour associated antigens. Lytic viruses may do this by stimulating improved antigen presentation by lysing tumour cells in the context of DAMPs alongside virus-related pathogen-associated molecular patterns (PAMPs). Immunohistochemical staining of resected colon

2017320776 18 Sep 2024

tumours, following intravenous delivery of EnAd, suggest the virus promotes a strong influx of CD8+ T cells into tumour tissue (Garcia-Carbonero, 2017). However, while this is potentially a very powerful approach, adaptive T cell responses are ultimately dependent on the expression of MHC class I antigens by tumour cells, to allow targeted killing. Loss of MHC expression is a well documented immune evasion strategy for tumours (Garrido et al, 2016).

It is noteworthy that both cytotoxic strategies that are immediately engaged by bispecific T-cell activator-armed oncolytic viruses operate independently of MHC class I by the tumour cells, and therefore can be employed to kill cancer cells even when tumour cells have lost MHC expression.

The present study thus demonstrates that encoding bispecific T-cell activators within EnAd provides a particularly promising strategy to achieve targeted expression in disseminated tumours, exploiting the known blood-stability and systemic bioavailability of the virus, which has now been studied in several early phase clinical trials. Notably, in a study where the virus is given intravenously a few days prior to resection of primary colon cancer, subsequent immunohistological assessment of tumour sections showed that the virus had reached to regions through the tumours and gave strong intranuclear hexon signals, indicating successful infection and virus replication selectively in tumour cells. This confirms preclinical data (Di et al, 2014; Illingworth, 2017) indicating that this virus is stable in 100% human blood and should be capable of tumourtargeted infection of disseminated and metastatic malignancies in human patients.

bispecific T-cell activators could be encoded by EnAd without any loss of oncolytic virulence (Figure 51B), reflecting the considerable transgene packaging capacity of the virus. The presence of the transgene will not affect the physicochemical properties of the virus particles, hence the modified viruses should exhibit exactly the same clinical pharmacokinetics as the parental agent, and should be capable of expressing the encoded bispecific T-cell activator selectively within tumours throughout the body. This provides an exciting and potentially very effective new approach to systemically targeted cancer immunotherapy that should now be prioritised for clinical assessment.

Example 28

Immunosuppression of human T-cell activation and target cell cytotoxicity by patient malignant exudate fluids

Malignant exudates represent an environment of potential immune tolerance with suppressed immune responses commonly observed in patients with late-stage metastatic cancer. The quantity of IL-10, considered to be an anti-inflammatory cytokine, was measured in normal serum or patient malignant exudate fluids (A, peritoneal ascites; P, pleural effusion) using Human IL-10 ELISA MAX kit (Biolegend, 430604). IL-10 levels in the exudates (88.1 – 633.4 pg/mL) were far in excess of those measured in normal serum (7.2 – 10 pg/mL). See Figure 58.

The ability of CD3/CD28 beads (Gibco, 11161D) to activate PBMC T-cells in the presence of normal serum, ascites or pleural fluid was investigated. Human PBMC T-cells (100,000 cells per well in 96 well plate) were treated with CD3/CD28 beads (following manufacturers instructions) in normal serum or patient exudate fluid (50%). T-cells were left untreated in each fluid as negative control. After 24 hours of culture, cells were harvested and the expression levels of CD69 and CD25 on CD3+ T-cells were then analysed by antibody staining and flow cytometry represented as percentage of dual positive (CD69+CD25+ cells) (Figure 59). In normal serum the anti-CD3/CD28 beads gave approximately 60% of

2017320776 18 Sep 2024

T cells dual positive for both CD25 and CD69, whereas the presence of ascites fluid attenuated T cell activation in 6/12 fluids.

In a similar experiment, 100,000 T-cells were treated with CD3/CD28 beads in the presence of normal serum, ascites or pleural fluid (50%). Anti-CD107a or isotype control antibody were added directly to culture medium. After 1 hour, monensin was added (BD Golgistop, BD Biosciences) according to manufacturers instructions. After 5 further hours, cells were harvested and analysed by flow cytometry to determine degranulation (Figure 60). In normal serum the anti-CD3/CD28 beads gave approximately 22.5% of T cells degranulated, whereas the presence of ascites fluid attenuated T cell activation in 10/12 fluids. The level of degranulation was significantly correlative (Pearson co-efficient, r = -0.7645; p = 0.0038) with quantity of IL-10 in each fluid (Figure 61).

In a similar experiment, 75,000 T-cells were co-cultured with 15,000 SKOV3 and EpCAM in the presence of normal serum, ascites or pleural fluid (50%). T-cells were treated with control bispecific T-cell activator in each fluid as negative control. After 24 hours of culture, cells were harvested and the expression levels of CD69 and CD25 on CD3+ T-cells were then analysed by antibody staining and flow cytometry represented as percentage of dual positive (CD69+CD25+ cells) (Figure 62). In normal serum the EpCAM bispecific T-cell activator gave approximately 67.6% of T cells dual positive for both CD25 and CD69, whereas the presence of ascites fluid attenuated T cell activation in 0/12 fluids, and slightly induced activation in 4/10 fluids.

In a similar experiment, 75,000 T-cells were co-cultured with 15,000 SKOV3 and EpCAM in the presence of normal serum, ascites or pleural fluid (50%). T-cells were treated with control bispecific T-cell activator in each fluid as negative control. Anti-CD107a or isotype control antibody were added directly to culture medium. After 1 hour, monensin was added (BD Golgistop, BD Biosciences) according to manufacturers instructions. After 5 further hours, cells were harvested and analysed by flow cytometry to determine degranulation (Figure 63). In normal serum the EpCAM bispecific T-cell activator beads gave approximately 41.4% of T cells degranulated, whereas the presence of ascites fluid attenuated T cell activation in 2/12 fluids.

The ability of EnAd-SA-EpCAMbispecific T-cell activator and EnAd-SA-Controlbispecific T-cell activator to induce T cell-mediated target cell lysis in malignant exudate fluids was assessed using xCELLigence technology. SKOV cells were plated in 48-well E-plate at 1e4 cells/well respectively. Plates were incubated for 18 hrs, 37ºC, 5% CO2, before cells were either infected with 100 virus particles per cell (ppc) or were left uninfected. After two hours, PBMC T-cells (5:1) in normal serum or patient exudate fluid (final, 50%) were added. xCELLigence was used to measure target cell cytotoxicity every 10 minutes (Figure 64). The results suggest that bispecific T-cell activator-mediated SKOV3 lysis by T-cells is independent of fluid used.

Unpurified ascites cells (therefore unchanged from when received) are seeded at 100,000 cells per well of a flat-bottom 96-well plate in RPMI media or ascites fluid. Cells were treated with EpCAM or control bispecific T-cell activator, with untreated wells serving as a negative control. After incubation at 37C for 24 hours, cells were harvested, and the expression level of CD25 and CD69 on CD3 cells determined (Figure 65). The results demonstrate that EpCAM bispecific T-cell activator resulted in significant increase in T-cell activation (CD69/CD25 dual positive) of tumour-associated lymphocytes, slightly increased by ascites fluid.

2017320776 18 Sep 2024

In a similar experiment, unpurified ascites cells (therefore unchanged from when received) are seeded at 100,000 cells per well of a flat-bottom 96-well plate in RPMI media or ascites fluid. Cells were treated with EpCAM, control bispecific T-cell activator or recombinant bispecific T-cell activator viruses (100 vp/cell), with untreated wells serving as a negative control (Figure 66). After incubation at 37C for 5 days, the total cell population was harvested, and the number of CD3+ cells (Figure 66A) and expression level of CD25 on CD3 cells determined (Figure 66B) and the number of endogenous EpCaM + cells determined by flow cytometry (Figure 66C). Total cell numbers per well were determined using precision counting beads. The results demonstrate that EpCAM bispecific T-cell activator and EnAd expressing EpCAM bispecific T-cell activator resulted in significant increase in T-cell activation (CD3 number, CD25) of tumour-associated lymphocytes and cytotoxicity of EpCAM+ cells in both RPMI media and ascites fluid. As an extension of the experiment above, six more patient exudate samples (for a total of 7) were treated identically in ascites fluid (Figure 67) and number of CD3+ (Figure 67A), CD25 expression of T-cells (Figure 67B) and number of EpCAM+ cells (Figure 67C) determined by flow cytometry. The results show that EpCAM bispecific T-cell activator and EnAd expressing EpCAM bispecific T-cell activator resulted in significant increase in T-cell activation (CD3 number, CD25) of tumour-associated lymphocytes and cytotoxicity of EpCAM+ cells reproducibly in a range of exudate biopsy samples.

Example 29

FAP bispecific T-cell activator mediate activation of T-cells and killing of FAP+ cells by diferent donor T-cells

In other experiments, methods described in Example 2 were used to further evaluate the T-cell activating properties of recombinant FAP bispecific T-cell activator protein tested in co-cultures of NHDF and T-cells, comparing to control bispecific T-cell activator and polyclonal T-cell activation using anti-CD3/CD28 Dynabeads.

Supernatants taken after 24 hours of culture were tested by ELISA for IFN□ (Figure 68A) and by cytokine bead array (LEGENDplex human T helper cytokine panel, BioLegend #74001) for a panel of cytokines (Figure 68B). The control bispecific T-cell activator induced no significant change in any cytokine, however the FAP-bispecific T-cell activator led to strong increases in gamma interferon, IL-2, TNF□, IL-17 and IL-10, consistent with different subsets of T-cells being stimulated, and production of IFN□ was far greater than that triggered by anti-CD3/CD28.

Stimulation with the FAP bispecific T-cell activator, but not control bispecific T-cell activator, in the presence of NHDF cells also induced rapid degranulation (within 6 hr) of T-cells, both CD4+ and CD8+ subsets, as determined by the externalisation of CD107a/LAMP1 on the T-cell surface (as assessed by flow cytometry), which is strongly correlative with their ability to kill target cells (Figure 69A&B). This induction of degranulation by the FAP bispecific T-cell activator translated to potent fibroblast lysis (Figure 69C), as measured by LDH release after 24 h co-culture with PBMC T-cells (EC_{50} of ~2.5 ng/mL) with induced T-cell activation and cytotoxicity observed using 6/6 donor T-cells (Figure 69D). No cytotoxicity was induced by the control bispecific T-cell activator, consistent with T-cells remaining in an inactivated state.

2017320776 18 Sep 2024

Example 30

Effect of FAP bispecific T-cell activator and EnAd-FAP bispecific T-cell activator viruses on cells in primary malignant ascites samples from different ancer patients

As a follow-on to studies described in Example 16, fresh primary malignant peritoneal ascites from further cancer patients were obtained for study of EnAd FAP bispecific T-cell activator virus activities. Three patient samples containing both $EpCAM^+$ tumour cells and FAP^+ fibroblasts were expanded *ex vivo*, and the mixed (adherent) cell populations were cultured with PBMC-derived T-cells and unmodified or bispecific T-cell activator expressing EnAd viruses. After 72 h, total cells were harvested and the number of FAP^+ (Figure 70A) and $EpCAM^+$ cells (Figure 70B) determined by flow cytometry. Additionally, the activation status of T-cells (by CD25 expression) was measured (Figure 70C). Infection with both EnAd-CMV-FAPbispecific T-cell activator and EnAd-SA-FAPbispecific T-cell activator induced T-cell activation and FAP^+ cell depletion in all patient samples, with no significant change in levels of EpCAM+ tumour cells. Parental EnAd or the control viruses induced no observable T cell activation, with FAP^+ cell numbers remaining similar to the uninfected control.

Importantly, this depletion in FAP+ fibroblasts consistenly led to a strong reduction in levels of the immunosuppressive cytokine TGFβ detected in supernatants (Figure 70D).

In a second series of experiments, total (and unpurified) cells from five patient biopsy samples were evaluated to assess the activity of endogenous tumour-associated T-cells in the samples. Cells were plated in 50% ascites fluid and treated with recombinant control or FAP bispecific T-cell activator proteins, or 100 vp/cell of EnAd or EnAd-bispecific T-cell activator viruses. After 5 days incubation, T-cell activation (by CD25 expression) and residual number of FAP^+ cells was measured by flow cytometry (Figure 71A&B). In all 3 patient samples, recombinant FAP-bispecific T-cell activator and EnAd-CMV-FAP bispecific T-cell activator induced strong T-cell activation, with up to ~80% of patient-derived T-cells activated, which caused a marked depletion FAP^+ fibroblasts. Interestingly, EnAd-SA-FAP-bispecific T-cell activator induced CD25 expression in 2/3 samples, with no observable activation or FAP^+ cell depletion in patient 1. This is probably due to insufficient tumour cells being present for infection by the virus and production of bispecific T-cell activator protein (no $EpCAM^+$ tumour cells were detected in this sample by flow cytometry), consistent with the requirement for tumour cells for MLP (SA)-driven transgene expression (this likely also explains the lack of T-cell activation and FAP+ cell depletion by EnAd-SA-FAP-bispecific T-cell activator virus with the patient ascites sample illustrated in Figs 42-44). Collectively, the data shows that EnAd expressing FAP-bispecific T-cell activator can, following infection of tumor cells, reproducibly lead to activation of tumour-associated T-cells to kill endogenous fibroblasts.

Another experiment investigated whether FAP-bispecific T-cell activator activity could be improved by blocking the PD-1 checkpoint, using a patient biopsy sample in which T-cells were 73.6% PD-1 positive and FAP^+ cells were 62.9% PDL1-positive (Figure 72A). Co-cultures similar to those described above were set up in the presence or absence of a purified blocking mouse IgG2b antibody to human PDL1 (BioLegend, clone 29E.2A3) at a final concentration of 2.5 μg/mL. After 2 days of culture, total cells were harvested and residual FAP+ cells and T-cell activation was measured. The inclusion of the blocking anti-PDL1 antibody led to a modest increase in CD25 induction (Figure 72B) and a two-fold higher IFNγ production (Figure 72C), without altering the depletion of FAP+ cells (Figure 72D) with near complete lysis by day 2 in either setting.

2017320776 18 Sep 2024

Tumour-associated lymphocytes (TALs) isolated from ovarian cancer patient ascites are reported to have enriched expression of PD-1 and impaired effector functions – including cytotoxicity and IFNg production. Consistent with this, PD-1 expression was 2-fold higher on $CD3^+$ cells from six cancer patient ascites biopsies than on those in peripheral blood mononuclear cells (PBMCs) from three healthy donors (Figure 73A). To evaluate the functionality of the T-cells within these cancer biopsy samples, NHDF cells and unpurified PBMC or ascites cells (the % CD3+ cells for each of the samples is shown in Figure 73B) were co-cultured with control or FAP bispecific T-cell activator-containing supernatants, and supernatants were harvested 5 days later and tested for IFNγ by ELISA (Figure 73C). No IFNγ was induced by the control bispecific T-cell activator. Three of the ascites cell samples produced IFNγ at a similar level to that of the PBMC samples, while the other three had an attenuated response to the FAP bispecific T-cell activator. We next investigate the ability of these T-cells to induce bispecific T-cell activator-mediated lysis of the NHDF cells. NHDF were plated, and PBMC or ascites cells added along with bispecific T-cell activator-containing supernatants and the viability of cells in the culture monitored in real-time using the xCELLigence cytotoxicity assay system. Despite the variability in IFNγ production, all ascites samples induced full cytotoxicity of NHDF cells when added with the FAP bispecific T-cell activator, with an overall similar rate of bispecific T-cell activator-mediated NHDF lysis to that seen with when effected by PBMCs (Figure 73D).

To investigate whether the FAP bispecific T-cell activator can mediate T-cell activation in the presence patient malignant exudate samples (all at 50%), PBMC T-cells were activated with control or FAP bispecific T-cell activators in the presence of NHDF cells, or activated with anti-CD3/CD28 Dynabeads, either in 50% normal human serum (NS) or different (cell-free) malignant exudate samples. Whereas in normal serum 74% of T-cells were activated (dual-positive for both CD25 and CD69) at 24 h following stimulation with the anti-CD3/CD28 beads, 3/5 tested ascites fluid significantly attenuated T-cell activation compared to the response in NS (Figure 74A). However, when PBMCs were cultured with NHDF and stimulated with the FAP bispecific T-cell activator, there was no observable suppression of T-cell activation in the presence of any of the exudate fluids (Figure 74B), demonstrating that the FAP bispecific T-cell activator can overcome immunosuppressive mechanisms to activate T-cells.

Example 31

EnAd-FAPbispecific T-cell activator-mediated oncolysis and T cell stimulation polarise CD11b+ TAMs in patient ascites to a more activated phenotype

To investigate whether the production of Th1 cytokines, including IFNγ, TNFα and IL-2, by FAP bispecific T-cell activator-mediated activation of T-cells, and the subsequent elimination of FAP^+ fibroblasts (and associated reduction in TGFβ1 was associated other shifts in the tumour microenvironment from immunosuppressive and pro-oncogenic towards anti-tumour activity, the effect on tumour-associated macrophages (TAMs) in an unseparated ascites cell sample was evaluated. Total unpurified patient ascites cells were plated in 50% ascites fluid and treated with free control or FAP bispecific T-cell activator or infected with EnAd-SA-control bispecific T-cell activator or EnAd-SA-FAPbispecific T-cell activator virus (at 100 vp/cell). In parallel, some cells were treated in with IFNγ to induce an activated CD11b myeloid cell phenotype. After 3 days incubation, the activation status of T-cells was first measured; CD25+ cells measured by flow cytometry and IFNγ secretion by ELISA.

2017320776 18 Sep 2024

Treatment with FAP bispecific T-cell activator and EnAd-SA-FAPbispecific T-cell activator led to approximately 60% of $CD3^+$ T-cells becoming CD25+ (Figure 75A) and large quantities of IFNγ in culture supernatants (Figure 75B). No increase above background by the control bispecific T-cell activator or control virus was observed for CD25 expression or IFNγ. To evaluate TAM polarisation, the expression levels of CD64 and CD86 (M1 or 'activated' macrophage markers) and CD206 and CD163 (M2 or TAM markers) were measured on CD11b+ cells by flow cytometry (Figure 75C). Treatment with free FAP bispecific T-cell activator or EnAd expressing FAP bispecific T-cell activator induce a more activated phenotype, manifested by significant increases in CD64 expression, and strong decreases CD206 and CD163 – similar to that observed when IFNγ was spiked into the cultures.

While treatment with free FAP bispecific T-cell activator or control virus induced no clear change in CD86 above background in this experiment, the EnAd expressing FAP bispecific T-cell activator induced a large increase in CD86 expression, indicating that EnAd virus infection and FAP bispecific T-cell activator activity may synergize to activate primary myeloid cells within a suppressive tumour microenvironment such as the malignant ascetic fluid samples tested here. In this study, IFNγ treatment induced a modest decrease in CD86, indicating that the strong increase in CD86 observed by EnAd-SA-FAPbispecific T-cell activator may be via an IFNγ-independent mechanism.

Example 32

EnAd-FAPbispecific T-cell activator activates tumour-infiltrating lymphocytes and induces cytotoxicity in solid prostate tumour biopsies ex vivo

Tissue slice cultures provide one of the most realistic preclinical models of diverse tissues, organs and tumours. To evaluate the activity of the FAP bispecific T-cell activator expressing viruses in this highly clinically-relevant setting, several paired punch biopsies of malignant and benign prostate tissue from resected human prostates were studies. At initial screening, prostate tissue was reproducibly shown to have circular rings of EpCAM+ tumour cells (Figure 76A) interspersed between large regions of stroma containing scattered CD8 T-cells (Figure 76B). FAP staining was found on fibroblasts adjacent to tumour regions (Figure 76C).

Cores were sliced by a vibratome to 300μm thickness and slice cultures established in the presence of virus (1.5e9 vp/slice), or left uninfected. After 7 days, slices were fixed, paraffin-embedded, sectioned and T-cell activation status was assessed by immunohistochemistry (IHC) by staining for CD25 expression (Figure 76D). Only samples receiving EnAd-CMV-FAPbispecific T-cell activator or EnAd-SA-FAPbispecific T-cell activator showed activation of tumour-infiltrating T-cells, manifest by strong CD25 staining. Neither untreated or control virus-treated had detectable CD25-positive cells. Supernatants from these slice cultures taken at 4 and 7 days post-infection were tested for IFNγ and IL-2 by ELISA, with increases in IFNγ detected from malignant, but not benign, prostate slice cultures infected with either FAP bispecific T-cell activator virus (Figure 76E) and IL-2 detected in cultures with EnAd-SA-FAPbispecific T-cell activator virus (Figure 76F). The EnAd-SA-FAPbispecific T-cell activator induced higher quantities of IFNγ, which were detectable earlier, than the CMV-driven FAPbispecific T-cell activator virus.

2017320776 18 Sep 2024

Example 33 - EnAd viurses expressing EpCAM or FAP bispecific T-cell activators

Five viruses (NG-611, NG-612, NG-613, NG-614, NG-617) were generated that encode a single bispecific T-cell activator (Table 8).

Table 8

Virus ID	Transgene Cassette
NG-611 (SEQ ID NO: 96)	SSA[1]-EpCambispecific T-cell activator[2]-His[3]-PA[4]
NG-612 (SEQ ID NO: 97)	SSA[1]-FAPbispecific T-cell activator[5]-His[3]-PA[4]
NG-613 (SEQ ID NO: 98)	SA[6]-FAPbispecific T-cell activator[5]-His[3]-PA[4]
NG-614 (SEQ ID NO: 99)	SA[6]-FAPbispecific T-cell activator[7]-His[3]-PA[4]
NG-617 (SEQ ID NO: 100)	SSA[1]-FAPbispecific T-cell activator[5]-PA[4]

[1]SEQ ID NO. 55; [2]SEQ ID NO. 83; [3]SEQ ID NO. 84; [4]SEQ ID NO. 65; [5]SEQ ID NO. 85; [6]SEQ ID NO. 86; [7]SEQ ID NO. 87;

In each transgene cassette, the cDNA encoding the bispecific T-cell activator was flanked at the 5' end with either a short splice acceptor sequence (SSA, SEQUENCE ID NO: 55) or a longer splice acceptor sequence (SA, SEQUENCE ID NO: 86). At the 3' end of the bispecific T-cell activator, a SV40 late poly(A) sequence (PA, SEQUENCE ID NO: 65) was encoded preceded by either a Histidine tag (HIS, SEQ ID NO. 41) or no tag. In viurses NG-611, NG-612, NG-613 and NG-617 the anti-CD3 portion of the bispecific T-cell activator molecule used a single chain variant of the mouse anti-human CD3ε monoclonal antibody OKT3.

Virus Production

The plasmid pEnAd2.4 was used to gerneate the plasmids pNG-611, pNG-612, pNG-613, pNG-614 and pNG-617 by direct insertion of synthesised transgene cassettes (SEQ ID NOs: 88-92, respectively). The pNG-611 transgene cassette encodes for an EpCam targeting bispecific T-cell activator (SEQ ID NO. 93), the pNG-612, pNG-613 and pNG-617 transgene cassettes encode a FAP targeting bispecific T-cell activator of SEQ ID NO. 94 and the pNG-614 transgene cassette encodes a FAP targeting bispecific T-cell activator of SEQ ID NO. 95. Schematics of the transgene cassettes are shown in Figure 77A to C. Construction of plasmid DNA was confirmed by restriction analysis and DNA sequencing.

The plasmids, pNG-611, pNG-612, pNG-613, pNG-614 and pNG-617, were linearised by restriction digest with the enzyme AscI to produce the virus genomes. The viruses were amplified and purified according to methods given below.

Digested DNA was purified by phenol/chloroform extraction and precipitated for 16hrs, -20ºC in 300µl >95% molecular biology grade ethanol and 10µl 3M Sodium Acetate. The precipitated DNA was pelleted by centrifuging at 14000rpm, 5 mins and was washed in 500µl 70% ethanol, before centrifuging again, 14000rpm, 5mins. The clean DNA pellet was air dried, resuspended in 500µl OptiMEM containing 15µl lipofectamine transfection reagent and incubated for 30 mins, RT. The transfection mixture was then added drop wise to a T-25 flask containing 293 cells grown to 70% confluency. After incubation of the cells with the transfection mix for 2hrs at 37ºC, 5% CO_2 4mls of cell media (DMEM high glucose with glutamine supplemented with 2% FBS) was added to the cells and the flasks was incubated 37ºC, 5% CO_2. The transfected 293 cells were monitored every 24hrs and were supplemented with additional media every 48-72hrs. The production of virus was monitored by observation of a significant cytopathic effect (CPE)

2017320776 18 Sep 2024

in the cell monolayer. Once extensive CPE was observed the virus was harvested from 293 cells by three freeze-thaw cycles. The harvested viruses were used to re-infect 293 cells in order to amplify the virus stocks. Viable virus production during amplification was confirmed by observation of significant CPE in the cell monolayer. Once CPE was observed the virus was harvested from 293 cells by three freeze-thaw cycles. The amplified stocks of viruses were used for further amplification before the viruses were purified by double caesium chloride banding to produce purified virus stocks.

Virus activity assessed by qPCR

A549 cells, either infected for 72 hrs with 1ppc NG-611, NG-612, NG-617, enadenotucirev or left uninfected, were used for quantification of viral DNA by qPCR. Cell supernatants were collected and clarified by centrifuging for 5 mins, 1200rpm. DNA was extracted from 45µL of supernatant using the Qiagen DNeasy kit, according to the manufacturer's protocol. A standard curve using enadenotucirev virus particles (2.5e10-2.5e5vp) was also prepared and extracted using the DNeasy kit. Each extracted sample or standard was analysed by qPCR using a virus gene specific primer-probe set to the early gene E3.

Quantification of the number of detected virus genomes per cell demonstrated that NG-611, NG-612, and NG-617 showed significant genome replication in A549 cell lines (Figure 77D). This was similar for all viruses tested including the parental virus enadenotucirev, indicating that inclusion of the bispecific T-cell activator transgene does not impact virus replicative activity. No virus genomes could be detected in uninfected cells (data not shown).

T cell activation and degranulation mediated by bispecific T-cell activator expressing viruses.

Carcinoma cell infection

A549 cells were seeded into 24 well plates at a density of 2.5e5 cells/well. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before cells were either infected with 1ppc of NG-611, NG-612, enadenotucirev or were left uninfected. At 24, 48 or 72hrs post-infection supernatants were harvested from the cells, clarified by centrifuging for 5 mins, 1200rpm and snap frozen.

T cell Assay

FAP expressing lung fibroblast cell lines MRC-5, or EpCam expressing ovarian carcinoma cells, SKOV3 were seeded into 48 well plates at densities of 5.7e4 cells/well and 1.2e5 cells/well, respectively. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before media was replaced with 150µL/well of thawed supernatant harvested from the A549 plates. Purified CD3 T cells isolated form human PBMC donors were then also added to the plates to give a ratio of T cells to MRC-5 or SKOV3 of 2 to 1. The co-cultures were incubated for 16hrs, 37°C, 5% CO_2 before cellular supernatants were collected for ELISA analysis and T cells harvested for flow cytometry analysis. Culture media containing non-adherent cells was removed from co-culture wells and centrifuged (300xg). The supernatant was carefully removed, diluted 1 in 2 with PBS 5% BSA and stored for ELISA analysis. The adherent cell monolayers were washed once with PBS and then detached using trypsin. The trypsin was inactivated using 10% FBS RPMI media and the cells were added to the cell pellets that had been collected from the culture supernatants. The cells were centrifuged (300xg), the supernatant discarded and the cell pellet washed in 200µL of PBS. The cells were centrifuged again then resuspended in 50µL of PBS containing Live/Dead Aqua (Life tech) for 15 minutes at RT. The

2017320776 18 Sep 2024

cells were washed once in FACs buffer before staining with panels of directly conjugated antibodies: anti-CD3 conjugated to AF700; anti-CD25 conjugated to BV421; anti-HLA-DR conjugated to PE/CY5; anti-CD40L conjugated to BV605; anti-CD69 conjugated to PE and anti-CD107a conjugated to FITC. A sample of cells from each co-culture condition was also stained with relevant isotype control antibodies. All staining was carried out in FACs buffer in a total volume of 50µL/well for 15 minutes, 4°C. Cells were then washed twice with FACs buffer (200µL) before resuspension in 200µL of FACs buffer and analysis by Flow cytometry (Attune).

Upregulation of T cell activation markers

Flow cytometry analysis of T cell activation was assessed by expression of the T cell activation markers CD25, CD69, HLA-DR and CD40L or the T cell degranulation marker, CD107a on live, single cells. These data showed that when co-cultured with $EpCam^+$ SKOV3 cells the number of T cells expressing CD25, CD69, HLA-DR, CD40L or cell surface CD107a was significantly increased when NG-611 supernantants were added to the cells compared to NG-612, enadenotucirev or untreated control supernatants (Figure 78). For all these markers little T cell activation was stimulated by supernatants from A549 cells infected for 24hrs however, by 48 hrs post-infection, supernatants stimulated significant T cell activation across all markers. This was also the case at 72hrs post-infection.

When co-cultured with FAP^+ MRC-5 cells the number of T cells expressing CD25, CD69, HLA-DR, CD40L or cell surface CD107a was significantly increased when NG-612 supernantants were added to the cells compared to NG-611, enadenotucirev or untreated control supernatants (Figure 79). Some T cell activation could also be observed with the NG-611 virus, which was likely due to low but detectable expression of EpCam (~5%) on the MRC-5 cell lines engaging the EpCam bispecific T-cell activator expressed by the NG-611 virus (Figure 80). For all these markers, little T cell activation was stimulated by supernatants from A549 cells infected for 24hrs however, by 48 hrs post-infection, supernatants stimulated significant T cell activation across all markers. CD25 and CD69 markers were also upregulated following incubation with supernatants harvested 72hrs post-infection, however, activation markers, HLA-DR, CD40L and CD107a were detected at lower levels with supernatants harvested 72hrs post-infection than 48hrs post-infection. This could be due to high levels of bispecific T-cell activator present at this later stage of infection leading to rapid and potent T cell activation that means the effector functions need to measured at timepoints earlier than 16 hrs post-incbuation with the supernatants.

For detection of IFNγ expression, co-culture supernatants were diluted into 5% BSA/PBS assay buffer (in a range of 1:10 to 1:1000) and ELISA was carried out using the Human IFN gamma Quantikine ELISA kit (R&D systems) according to the manufacturer's protocol. The concentration of secreted IFNγ was determined by interpolating from the standard curve. Expression of IFNγ could only be detected in the supernatants of co-cultures using NG-611 on SKOV3 cells Figure 81A) or NG-611, NG-612 on MRC-5 cells (Figure 81B).

2017320776 18 Sep 2024

Example 34: Immune activation and anti-tumour efficacy of bispecific T-cell activator expressing viruses in vivo

NSG mice humanised CD34+ haematopoietic stem cells (from Jackson Labs) were implanted with HCT116 tumour cells subcutaneously on both flanks at 18 weeks post engraftment. Once tumours reached 80-400mm^3 mice were grouped such that each treatment arm had an equivalent distribution of tumour volumes, 7 mice per group. Mice were injected intratumourally with either saline, enadenotucirev or NG-611 at 5x10^9 particles per injection, 2 injections per tumour. Tumours on both flanks were treated. Tumour volume was measured 3-4 times per week and demonstrated that NG-611 treatment resulted in a significant anti-tumour response out to 20 days post-dosing compared to enadenotucirev or untreated controls (Figure 82a). After the 20 days post-dosing one tumour from 4 mice in each group was processed for flow cytometry while remaining tumours were frozen on dry ice.

Flow cytometry

Tumour samples were mechanically disaggregated immediately following resection in a small volume of RPMI media. Disaggregated tumours were then passed through a 70µm cell strainer and centrifuged at 300g for10 minutes. Cell pellets were resuspended in 100µL of PBS containing Live/Dead Aqua (Life tech) for 15 minutes on ice. The cells were washed once in FACs buffer (5% BSA PBS) before staining with a panel of directly conjugated antibodies: anti-CD8 (RPA-T8, AF700); anti-CD4 (RPA-T4, PE); anti-CD45 (2D1, APC-Fire 750); anti-CD3 (OKT3, PerCP-Cy5.5); anti-CD25 (M-A251, PE-Dazzle 594); anti-CD69 (FN50, APC); anti-HLA-DR (L243, BV605); anti-CD107a (H4A3, FITC). A pool of tumour cell suspensions was also stained with relevant isotype control antibodies. All staining was carried out in FACs buffer in a total volume of 50µL/well for 20 minutes at 4°C. Cells were washed three times with FACs buffer (200µL) before resuspension in 200µL of FACs buffer and analysis by Flow cytometry (Attune). FACs analysis demonstrated that the ratio of CD8 to CD4 T cells in the tumour was significantly increased in NG-611 treated tumours compared to enadenotucirev treated or untreated controls (Figure 82b).

Example 35 – EnAd viruses co-expressing FAP bispecific T-cell activators and immune-modulatory cytokines and chemokines

Three viruses (NG-615, NG-640 and NG-641) were generated that encoded a FAP bispecific T-cell activator and immunomodulatory proteins (Table 9).

Table 9

Virus ID	Transgene Cassette
NG-615 (SEQ ID NO: 101)	SSA[1]-FAPbispecific T-cell activator[2]-E2A[3]-Flt3L[4]-P2A[5]-MIP1α[6]-T2A[7]-IFNα[8]-PA[9]
NG-640 (SEQ ID NO: 102)	SSA[1]-FAPbispecific T-cell activator[2]-P2A[5]-CXCL10[10]-T2A[7]-CXCL9[11]-PA[6]
NG-641 (SEQ ID NO: 103)	SSA[1]-FAPbispecific T-cell activator[5]-P2A[5]-CXCL10[10]-T2A[7]-CXCL9[11]-E2A[3]-IFNα[8]-PA[6]
NG-615 (SEQ ID NO: 298)	SA[12]-FAPbispecific T-cell activator[2]-E2A[3]-Flt3L[4]-P2A[5]-MIP1α[6]-T2A[7]-IFNα[8]-PA[9]

2017320776 18 Sep 2024

[1]SEQ ID NO. 55; [2]SEQ ID NO. 87; [3]SEQ ID NO. 63; [4]SEQ ID NO. 105; [5]SEQ ID NO. 61; [6]SEQ ID NO. 107; [7]SEQ ID NO. 64; [8]SEQ ID NO. 109; [9]SEQ ID NO. 65; [10]SEQ ID NO. 110; [11]SEQ ID NO. 111; [12]SEQ ID NO. 86

Virus Production

The plasmid pEnAd2.4 was used to gerneate the plasmids pNG-615, pNG-616, pNG-640 and pNG-641 by direct insertion of synthesised transgene cassettes (SEQ ID NOs: 112-114, respectively). NG-615 and NG-616 contain four transgenes encoding for a FAP-targeting bispecific T-cell activator (SEQ ID NO: 94), Flt3L (SEQ ID NO. 115), MIP1α SEQ ID NO. 116) and IFNα (SEQ ID NO. 117). NG-640 and NG-641 encode for a FAP targeting bispecific T-cell activator (SEQ ID NO. 94), CXCL9 (SEQ ID NO. 118) and CXCL10 (SEQ ID NO. 119), NG-641 also contains a fourth transgene encoding IFNα (SEQ ID NO. 117) Schematics of the transgene cassettes are shown in Figure 83A to C. Construction of plasmid DNA was confirmed by restriction analysis and DNA sequencing.

The plasmids, pNG-615, pNG-616, pNG-640 and pNG-641, were linearised by restriction digest with the enzyme AscI to produce the virus genomes. The viruses were amplified and purified according to methods detailed in Example 33.

Virus activity assessed by qPCR and transgene ELISA

Carcinoma cell infection

A549 cells either infected for 72 hrs with 1ppc NG-615, enadenotucirev or left uninfected were used for quantification of viral DNA by qPCR and analysis of transgene expression by ELISA. Cell supernatants were collected and clarified by centrifuging for 5 mins, 1200rpm. 45µL of supernatant was used for DNA analysis and the remaining supernatant was used for ELISA.

qPCR

DNA was extracted from the supernatant sample using the Qiagen DNeasy kit, according to the manufacturer's protocol. A standard curve using enadenotucirev virus particles (2.5e10-2.5e5vp) was also prepared and extracted using the DNeasy kit. Each extracted sample or standard was analysed by qPCR using a virus gene specific primer-probe set to the early gene E3. Quantification of the number of detected virus genomes per cell demonstrated that NG-615 showed significant genome replication in A549 cell lines at a level similar to that of the parental virus enadenotucirev (Figure 84). These data indicated that inclusion of the bispecific T-cell activator and three immunomodulatory transgenes does not significantly impact virus replicative activity. No virus genomes could be detected in uninfected cells.

ELISA

IFNα ELISA was carried out using the Verikine Human IFN alpha Kit (Pbl assay science), MIP1α ELISA was carried out using the Human CCL3 Quantikine ELISA kit (R & D systems) and Flt3L ELISA was carried out using the Flt3L human ELISA kit (Abcam). All assays were carried out according to the manufacturers' protocol.

The concentrations of secreted IFNα, MIPα or FLt3L were determined by interpolating from the standard curves. IFNα, MIP1α and Flt3 L expression could be detected in the cellular supernatant of NG-615 but not enadenotucirev or untreated control cells (Figure 85).

2017320776 18 Sep 2024

T cell activation and degranulation mediated by bispecific T-cell activator expressing viruses.

Carcinoma cell infection

A549 cells were seeded into 24 well plates at a density of 2.5e5 cells/well. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before cells were either infected with 1ppc of NG-612, NG-615, enadenotucirev or were left uninfected. At 24, 48 or 72hrs post-infection supernatants were harvested from the cells, clarified by centrifuging for 5 mins, 1200rpm and snap frozen.

T cell Assay

FAP expressing lung fibroblast cell lines MRC-5 were seeded into 48 well plates at a density of 5.7e4 cells/well. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before media was replaced with 150µL/well of thawed supernatant harvested from the A549 plates. Purified CD3 T cells isolated form human PBMC donors were then also added to the plates to give a ratio of T cells to MRC-5 of 2 to 1. The co-cultures were incubated for 16hrs, 37°C, 5% CO_2 before cellular supernatants were collected for ELISA analysis and T cells harvested for flow cytometry analysis according to the methods detailed in Example 29.

Upregulation of T cell activation markers

Flow cytometry analysis of T cell activation was assessed by expression of the T cell activation markers CD25, CD69, HLA-DR and CD40L or the T cell degranulation marker, CD107a on live, $CD3^+$, single cells. These data showed that when co-cultured with FAP^+ MRC-5 cells the number of T cells expressing CD25, CD69, HLA-DR, CD40L or CD107a was significantly increased when NG-615 or 612 supernantants were added to the cells compared to enadenotucirev or untreated control supernatants (Figure 86).

Secretion of the stimulatory cytokine IFNγ

For detection of IFNγ expression, co-culture supernatants were diluted into 5% BSA/PBS assay buffer (in a range of 1:10 to 1:1000) and ELISA was carried out using the Human IFN gamma Quantikine kit (RandD Systems) according to the manufacturer's protocol. The concentration of secreted IFNγ was determined by interpolating from the standard curve. Expression of IFNγ could only be detected in the supernatants of co-cultures using NG-612 or NG-615 infected A549 supernatants (Figure 87).

Example 36 – EnAd virus co-expressing a bispecific T-cell activator targeting FAP and a bispecific T-cell activator targeting EpCam

The virus NG-618 was generated that encoded two bispecific T-cell activator molecules, one targeting EpCam (EpCam bispecific T-cell activator) and one targeting FAP (FAP bispecific T-cell activator) (Table 10).

Table 10

Virus ID	Transgene Cassette
NG-618 (SEQ ID NO: 120)	SSA[1]-EpCAMbispecific T-cell activator[2]-P2A[3]-FAPbispecific T-cell activator[4]-PA[5]

[1]SEQ ID NO. 55; [2]SEQ ID NO. 121; [3]SEQ ID NO. 106; [4]SEQ ID NO. 122; [5]SEQ ID NO. 65;

2017320776 18 Sep 2024

Virus Production

The plasmid pEnAd2.4 was used to gerneate the plasmid pNG-618 by direct insertion of a synthesised transgene cassettes (SEQ ID NO. 123). The NG-618 virus contains two transgenes encoding an EpCam targeting bispecific T-cell activator (SEQ ID NO. 93) and a FAP targeting bispecific T-cell activator (SEQ ID NO. 95). A schematic of the transgene cassette is shown in Figure 88. Construction of plasmid DNA was confirmed by restriction analysis and DNA sequencing.

The plasmid pNG-618, was linearised by restriction digest with the enzyme AscI to produce the virus genomes. The viruses were amplified and purified according to methods detailed in Example 33

T cell activation and degranulation mediated by bispecific T-cell activator expressing viruses.

Carcinoma cell infection

A549 cells were seeded into 6 well plates at a density of 1.2e6 cells/well. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before cells were either infected with NG-611, NG-612, NG-618, enadenotucirev or were left uninfected. At 72hrs post-infection supernatants were harvested from the cells and clarified by centrifuging for 5 mins, 1200rpm.

T cell Assay

FAP expressing lung fibroblast cell lines MRC-5 and EpCam expressing A549 cells, were seeded into 24 well plates at a density of 1.5e5 cells/well. MRC-5 and A549 cells were also mixed at a 1 to 1 ratio and seeded in to 24 plates at a total cell density of 1.5e5 cells/well. Plates were incubated for 4 hrs, 37°C, 5% CO_2, before media was replaced with 300µL/well of thawed supernatant harvested from the A549 plates. Purified CD3 T cells isolated form human PBMC donors were then also added to the plates to give a ratio of T cells to MRC-5 or SKOV3 cells of 2 to 1. The co-cultures were incubated for 16hrs, 37°C, 5% CO_2 before cellular supernatants were collected for ELISA analysis and T, MRC-5 and A549 cells harvested for flow cytometry analysis.

Detection of FAP and EpCam on MRC-5 or SKOV cells

Flow cytometry analysis of detectable FAP or EpCam on the surface of MRC-5 or SKOV cells, respectively was assessed by washing the cells once in FACs buffer before staining with panels of directly conjugated antibodies: anti-FAP conjugated to AF647; anti-EpCam conjugated to PE. Analysis showed that FAP expression was no longer detectable on the MRC-5 cells that had been incubated with supernatant from cells infected with FAP-bispecific T-cell activator expressing virus, NG-618 but was detected on >80% of cells incubated with supernatants from cells treated with EnAd, or the untreated cells (Figure 89A). These data indicate that FAP-bispecific T-cell activator produced by the NG-618 viruses binds to its FAP target on the MRC-5 cells occluding binding of the anti-FAP antibody. Live, large, single cells SKOV cells were assessed for detectable expression of EpCam. EpCam expression was only detectable at low levels on the SKOV cells that had been incubated with supernatants from cells infected with EpCam-bispecific T-cell activator expressing virus, NG-618 (17% of cells), but was detected on >40% of cells incubated with supernatants from cells treated with EnAd or the untreated cells (Figure 89B). Collectively these data indicate that NG-618 produces bispecific T-cell activator molecules that bind to EpCam and FAP target proteins.

2017320776 18 Sep 2024

Upregulation of T cell activation markers

Flow cytometry analysis of T cell activation was assessed by expression of the T cell activation markers CD25, CD69, HLA-DR and CD40L or the T cell degranulation marker, CD107a on live, $CD3^+$, single cells. These data showed that when co-cultured with FAP^+ MRC-5 cells the number of T cells expressing CD25, CD40L or CD107a was significantly increased when NG-618 supernantants were added to the cells compared enadenotucirev or untreated control supernatants (Figure 90). The number of T cells expressing CD25, CD40L or CD107a was also significantly increased when NG-618 supernantants were added to the $EpCam^+$ SKOV3 cells compared to enadenotucirev or untreated control supernatants (Figure 91). These data demonstrate that both bispecific T-cell activator molecules expressed by the NG-618 virus are functional in terms of inducing T cell activation.

Analysis of T cell mediated target (MRC-5 and SKOV) cell killing

Flow cytometry analysis of MRC-5 and SKOV cell viability was assessed by staining the cells in 50µL of PBS containing Live/Dead Aqua (Life tech) for 15 minutes at RT. The cells were washed once in FACs buffer before staining with panels of directly conjugated antibodies: anti-FAP conjugated to AF647; anti-EpCam conjugated to PE. MRC-5 and SKOV cell viability was significantly reduced following incubation with NG-618 supernatant samples, whereas no significant cell death was detectable in the enadenotucirev or untreated control supernatants Figure 92. These data demonstrate the functional ability of NG-618 coexpressed FAP and EpCam targeting bispecific T-cell activators to induce T cell mediated cell killing of target cells.

SEQUENCES

SEQ ID NO: 25: FAP bispecific T-cell activator-P2A-RFP (*ITALICS* = leader, **BOLD** = furin cleavage site, UNDERLINE = P2A sequence, lower case = RFP)

*MGWSCIILFLVATATGVHS*DIVMTQSPDSLAVSLGERATINCKSSQSLLYSRNQKNYLAWYQQKP
GQPPKLLIFWASTRESGVPDRFSGSGFGTDFTLTISSLQAEDVAVYYCQQYFSYPLTFGQGTKVEI
KGGGGSGGGGSGGGGSQVQLVQSGAEVKKPGASVKVSCKTSRYTFTEYTIHWVRQAPGQRLE
WIGGINPNNGIPNYNQKFKGRVTITVDTSASTAYMELSSLRSEDTAVYYCARRRIAYGYDEGHA
MDYWGQGTLVTVSSGGGGSDVQLVQSGAEVKKPGASVKVSCKASGYTFTRYTMHWVRQAPG
QGLEWIGYINPSRGYTNYADSVKGRFTITTDKSTSTAYMELSSLRSEDTATYYCARYYDDHYCL
DYWGQGTTVTVSSGEGTSTGSGGSGGSGGADDIVLTQSPATLSLSPGERATLSCRASQSVSYMN
WYQQKPGKAPKRWIYDTSKVASGVPARFSGSGSGTDYSLTINSLEAEDAATYYCQQWSSNPLT
FGGGTKVEIKHHHHHHHHHHH**RRKRGSG**ATNFSLLKQAGDVEENPGPmselikenmhmklymegtvnnh
hfkctsegegkpyegtqtmkikvveggplpfafdilatsfmygskafinhtqgipdffkqsfpegftwerittyedggvltatqdtsfqngciiynvk
ingvnfpsngpvmqkktrgweantemlypadgglrghsqmalklvgggylhcsfkttyrskkpaknlkmpgfhfvdhrlerikeadketyveq
hemavakycdlpsklghr

SEQ ID NO: 26: Control (Anti-FHA) bispecific T-cell activator-P2A-RFP (*ITALICS* = leader, **BOLD** = furin cleavage site, UNDERLINE = P2A sequence, lower case = RFP)

*MGWSCIILFLVATATGVHS*ELDIVMTQAPASLAVSLGQRATISCRASKSVSSSGYNYLHWYQQKP
GQPPKLLIYLASNLESGVPARFSGSGSGTDFTLNIHPVEEEDAATYYCQHSREFPLTFGAGTKLEI
KSSGGGGSGGGGGGSSRSSLEVQLQQSGPELVKPGASVKISCKTSGYTFTGYTMHWVRQSHGK
SLEWIGGINPKNGGIIYNQKFQGKATLTVDKSSSTASMELRSLTSDDSAVYYCARRVYDDYPYY
YAMDYWGQGTSVTVSSAKTTPPSVTSGGGGSDVQLVQSGAEVKKPGASVKVSCKASGYTFTR

2017320776 18 Sep 2024

YTMHWVRQAPGQGLEWIGYINPSRGYTNYADSVKGRFTITTDKSTSTAYMELSSLRSEDTATY
YCARYYDDHYCLDYWGQGTTVTVSSGEGTSTGSGGSGGSGGADDIVLTQSPATLSLSPGERAT
LSCRASQSVSYMNWYQQKPGKAPKRWIYDTSKVASGVPARFSGSGSGTDYSLTINSLEAEDAA
TYYCQQWSSNPLTFGGGTKVEIKHHHHHHHHHHH**RRKRGSG**ATNFSLLKQAGDVEENPGPmseli
kenmhmklymegtvnnhhfkctsegegkpyegtqtmkikvveggplpfafdilatsfmygskafinhtqgipdffkqsfpegftwerittyedg
gvltatqdtsfqngciiynvkingvnfpsngpvmqkktrgweantemlypadgglrghsqmalklvgggylhcsfkttyrskkpaknlkmpgf
hfvdhrlerikeadketyveqhemavakycdlpsklghr

SEQ ID NO: 33: Splice acceptor sequence
CAGG

SEQ ID NO: 55 short splice acceptor (SSA) DNA sequence (null sequence)
CAGG

SEQ ID NO: 58 Kozak sequence (null sequence)
CCACC

2017320776 18 Sep 2024

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An oncolytic adenovirus comprising a sequence of formula **(I)**:

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \quad (I)$$

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises: L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position B_Y encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and

one of the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

2. An oncolytic adenovirus according to claim 1, wherein the adenovirus is EnAd.
3. An oncolytic adenovirus according to claim 1 or 2, wherein the component of the TCR is CD3.
4. An oncolytic adenovirus according to claim 3, wherein the CD3 is CD3ε.
5. An oncolytic adenovirus according to any one of claims 1 to 4, wherein the tumour stromal antigen is FAP.
6. An oncolytic adenovirus according to any one of claims 1 to 5, wherein the adenovirus is replication competent.
7. An oncolytic adenovirus according to any one of claims 1 to 6, wherein the bispecific T cell activator that is encoded in position B_Y is under the control of the major late promoter.
8. An oncolytic adenovirus according to any one of claims 1 to 7, wherein the adenovirus further encodes a second bispecific T cell activator.
9. An oncolytic adenovirus according to any one of the claims 1 to 8, wherein the encoded bispecific T cell activator comprises a VH domain comprising an amino acid sequence as set forth in SEQ ID NO: 8 and a VL comprising an amino acid sequence as set forth in SEQ ID NO: 9.
10. An oncolytic adenovirus according to claim 9, wherein the encoded bispecific T cell activator comprises an scFv comprising an amino acid sequence as set forth in SEQ ID NO: 7.
11. An oncolytic adenovirus according to any one of claims 1 to 10, wherein the encoded bispecific T cell activator comprises a VH domain comprising an amino acid sequence as set forth in SEQ ID NO: 13 and a VL comprising an amino acid sequence as set forth in SEQ ID NO: 12.
12. An oncolytic adenovirus according to claim 11, wherein the encoded bispecific T cell activator comprises an scFv comprising an amino acid sequence as set forth in SEQ ID NO: 11 or 75.

2017320776 18 Sep 2024

13. An oncolytic adenovirus according to any one of claims 8 to 12, wherein the second encoded bispecific T cell activator comprises a VH domain comprising an amino acid sequence as set forth in SEQ ID NO: 18, and a VL comprising an amino acid sequence as set forth in SEQ ID NO: 17.
14. An oncolytic adenovirus according to claim 13, wherein the second encoded bispecific T cell activator comprises an scFv comprising an amino acid sequence as set forth in SEQ ID NO: 16 or 73.
15. An oncolytic adenovirus according to any one of claims 1 to 14, wherein the adenovirus comprises a sequence shown in SEQ ID NO: 36, 37, 81, 82, 97, 98, 99 or 100.
16. An oncolytic adenovirus according to any one of claims 8 to 15 wherein the adenovirus comprises a sequence shown in SEQ ID NO: 34, 35, 79, 80 or 96.
17. An oncolytic adenovirus according to any one of claims 1 to 16, wherein the adenovirus encodes 2, 3 or 4 further transgenes.
18. An oncolytic virus according to claim 17, wherein a different cleavage peptide is encoded between each of the transgenes.
19. An oncolytic adenovirus according to claim 17 or 18, wherein the further transgene(s) encodes a cytokine, chemokine and/or an immunomodulator.
20. An oncolytic adenovirus according to any one of claims 17 to 19, wherein the further transgene(s) is in position B_Y.
21. An oncolytic adenovirus according to any one of claims 17 to 20, wherein at least one further transgene encodes a cytokine selected from MIP1α, IL-1α, IL-1β, IL-6, IL-9, IL-12, IL-13, IL-17, IL-18, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-33, IL-35, IL-2, IL-4, IL-5, IL-7, IL-10, IL-15, IL-21, IL-25, IL-1RA, IFNα, IFNβ, IFNγ, TNFα, lymphotoxin α (LTA), Flt3L, GM-CSF and IL-8.
22. An oncolytic adenovirus according to any one of claims 17 to 21, wherein at least one further transgene encodes a chemokine selected from CCL2, CCL3, CCL5, CCL17, CCL20, CCL22, CXCL9, CXCL10, CXCL11, CXCL13, CXCL12, CCL2, CCL19 and CCL21.
23. A composition comprising an oncolytic adenovirus according to any one of claims 1 to 22 and a diluent or carrier.
24. A composition according to claim 23, wherein the composition comprises a second oncolytic virus.
25. A composition according to claim 24, wherein the second oncolytic virus is EnAd or Ad11.
26. A method of treating cancer in a patient comprising administering a therapeutically effective amount of an oncolytic adenovirus according to any one of claims 1 to 22 or a composition according to any one of claims 23 to 25.
27. A method according to claim 26, wherein the cancer comprises a solid tumour.
28. Use of an adenovirus according to any one of claims 1 to 22 or a composition according to any one of claims 23 to 25, in the manufacture of a medicament for the treatment of cancer.
29. A method of targeting tumour stromal cells comprising administering a therapeutically effective amount of an oncolytic adenovirus, wherein the adenovirus comprises a sequence of formula **(I)**:

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \quad \textbf{(I)}$$

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

2017320776 18 Sep 2024

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position B_Y encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and

one the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

30. Use of an oncolytic adenovirus in the manufacture of a medicament for targeting tumour stromal cells, wherein the adenovirus comprises a sequence of formula **(I)**:

$$5'ITR\text{-}B_1\text{-}B_A\text{-}B_2\text{-}B_X\text{-}B_B\text{-}B_Y\text{-}B_3\text{-}3'ITR \quad \textbf{(I)}$$

wherein:

B_1 is absent or comprises: E1A, E1B or E1A-E1B;

B_A comprises: E2B-L1-L2-L3-E2A-L4;

B_2 is absent or comprises: E3;

B_X is absent or a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_B comprises L5;

B_Y is a DNA sequence comprising: a restriction site, one or more transgenes or both;

B_3 is absent or comprises: E4;

wherein the transgene in position BY encodes a bispecific T cell activator comprising at least two binding domains wherein:

one of the binding domains is specific to a component of the T-cell receptor complex (TCR); and

one the binding domains is specific to a tumour stromal antigen selected from: fibroblast activation protein (FAP), TREM1, IGFBP7, FSP-1, platelet-derived growth factor-α receptor (PDGFR-α), platelet-derived growth factor-β receptor (PDGFR-β) and vimentin, and

wherein the adenovirus is Enadenotucirev (EnAd) or serotype 11 adenovirus (Ad11).

Figure 1A

α-FAP scFv
α-CD3 scFv
Ig SP
V_L
L
V_H
L
V_H
L
V_L
10xHis
V_L
V_H
V_H
V_L
10x
His
α-FAP scFv
α-CD3 scFv
Ig SP
V_L
L
V_H
L
V_H
L
V_L
V_L
V_H
V_H
V_L

Figure 1B

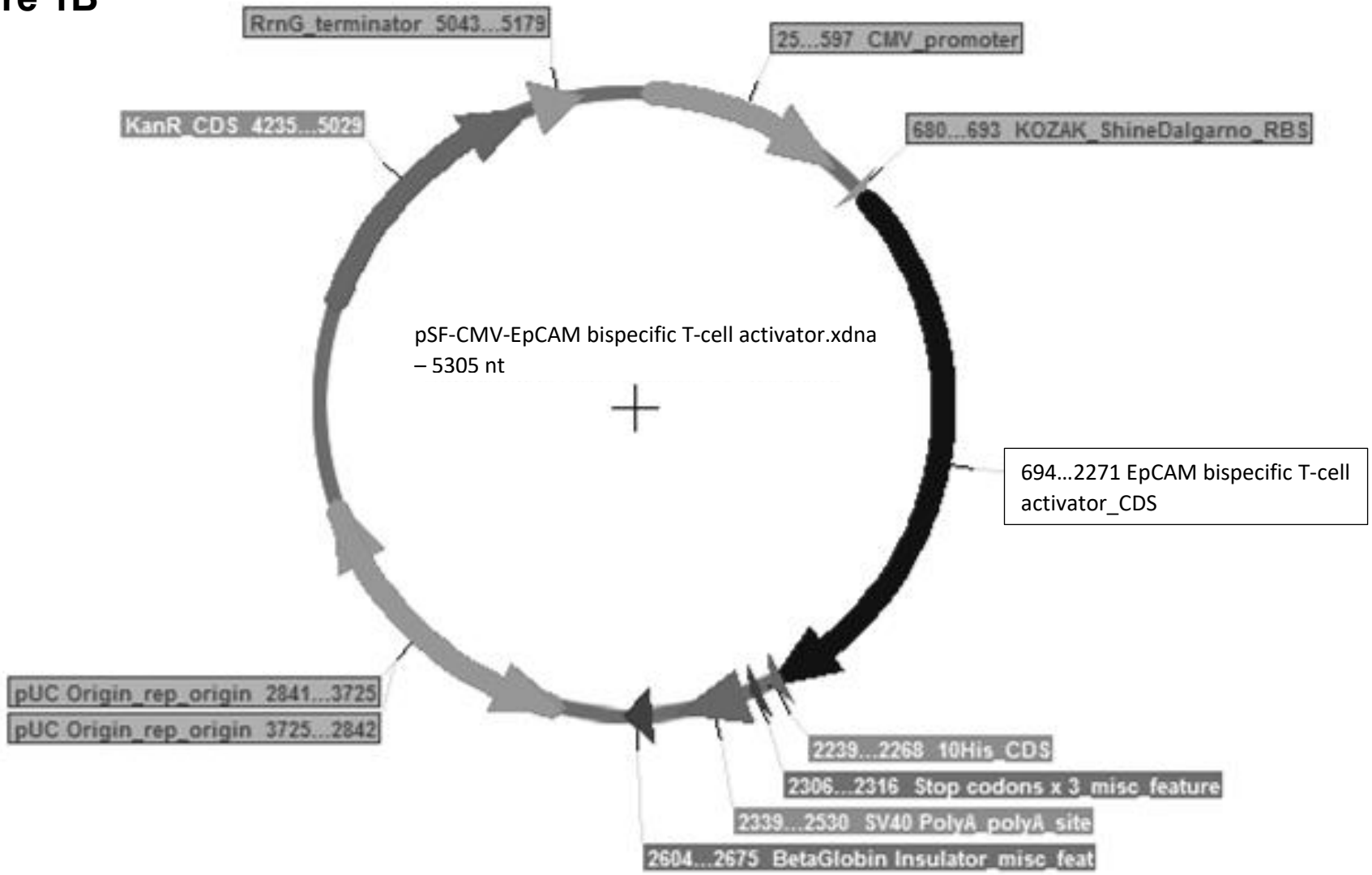

RrnG_terminator 5043...5179
25...597 CMV_promoter
KanR_CDS 4235...5029
680...693 KOZAK_ShineDalgarno_RBS
pSF-CMV-EpCAM bispecific T-cell activator.xdna – 5305 nt
694…2271 EpCAM bispecific T-cell activator_CDS
pUC Origin_rep_origin 2841...3725
pUC Origin_rep_origin 3725...2842
2239...2268 10His_CDS
2306...2316 Stop codons x 3_misc_feature
2339...2530 SV40 PolyA_polyA_site
2604...2675 BetaGlobin Insulator_misc_feat

Figure 1C

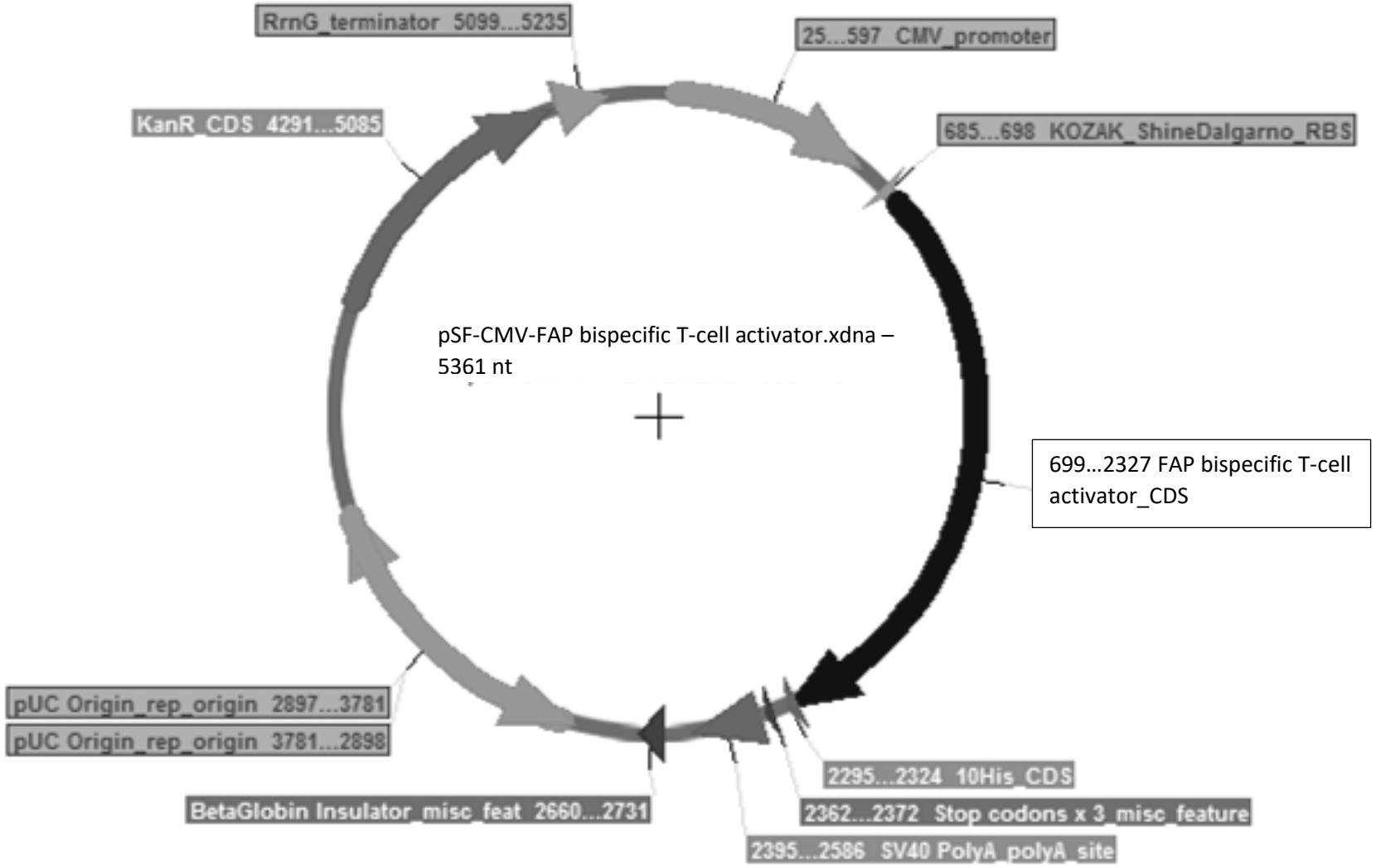
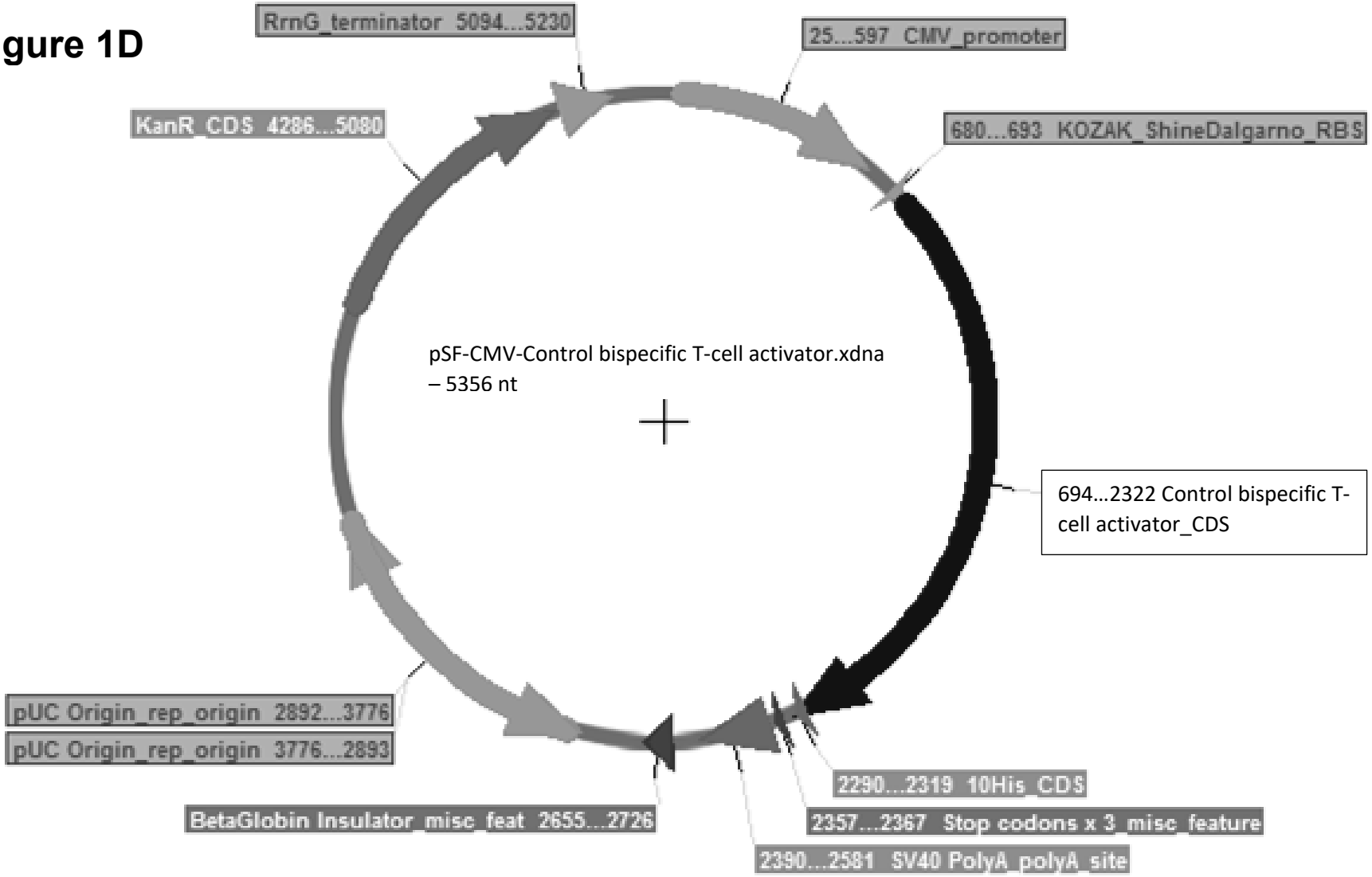
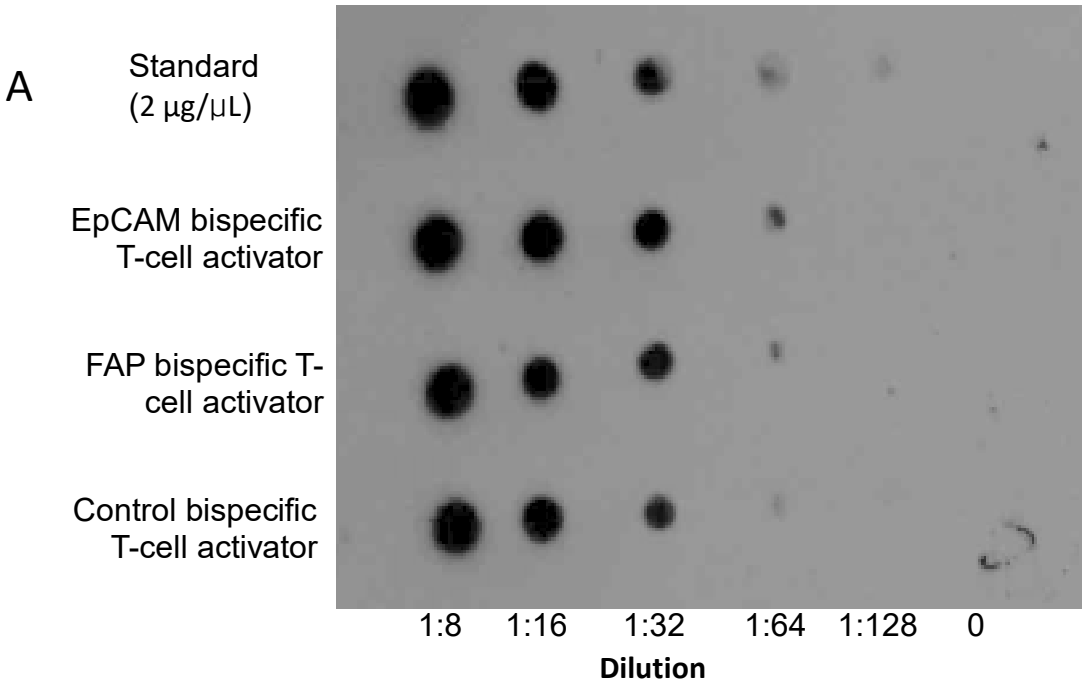

RrnG_terminator 5099...5235
25...597 CMV_promoter
KanR_CDS 4291...5085
685...698 KOZAK_ShineDalgarno_RBS
pSF-CMV-FAP bispecific T-cell activator.xdna – 5361 nt
699…2327 FAP bispecific T-cell activator_CDS
pUC Origin_rep_origin 2897...3781
pUC Origin_rep_origin 3781...2898
2295...2324 10His_CDS
BetaGlobin Insulator_misc_feat 2660...2731
2362...2372 Stop codons x 3_misc_feature
2395...2586 SV40 PolyA_polyA_site

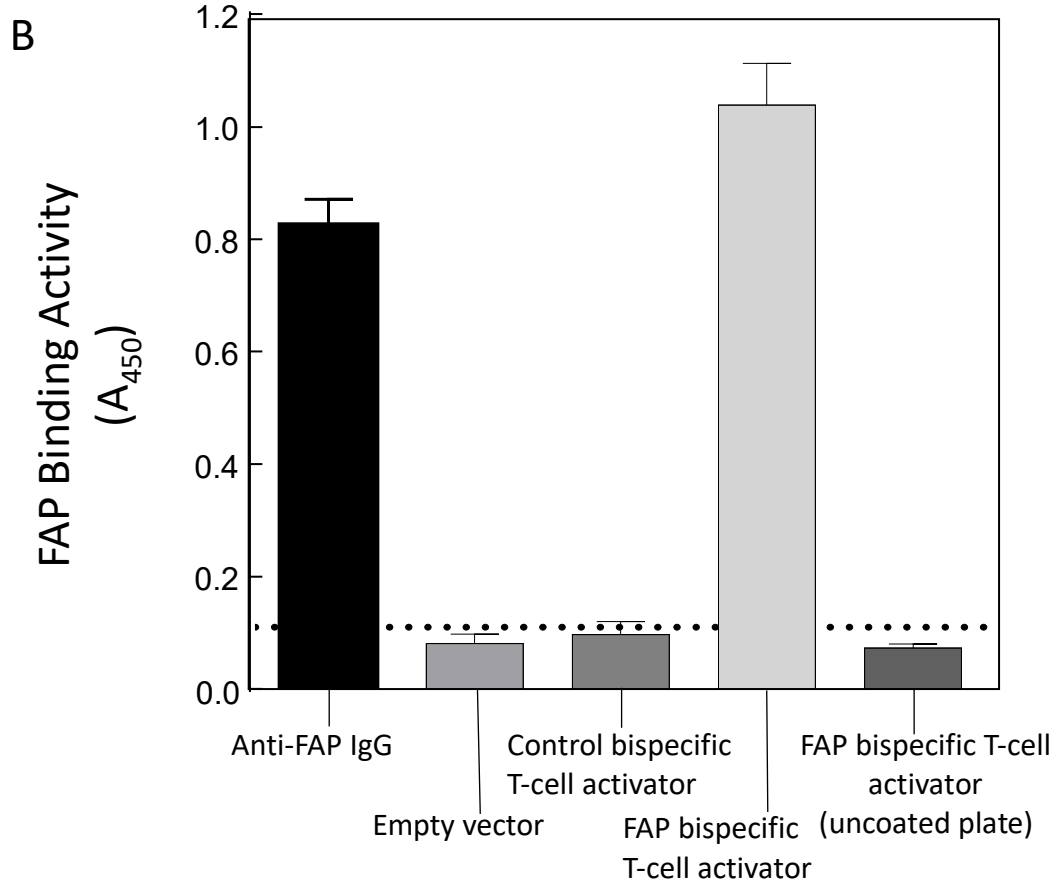
Figure 1D


RrnG_terminator 5094...5230
25...597 CMV_promoter
KanR_CDS 4286...5080
680...693 KOZAK_ShineDalgarno_RBS
pSF-CMV-Control bispecific T-cell activator.xdna
– 5356 nt
694…2322 Control bispecific T-cell activator_CDS
pUC Origin_rep_origin 2892...3776
pUC Origin_rep_origin 3776...2893
2290...2319 10His_CDS
BetaGlobin Insulator_misc_feat 2655...2726
2357...2367 Stop codons x 3_misc_feature
2390...2581 SV40 PolyA_polyA_site

2017320776 18 Sep 2024

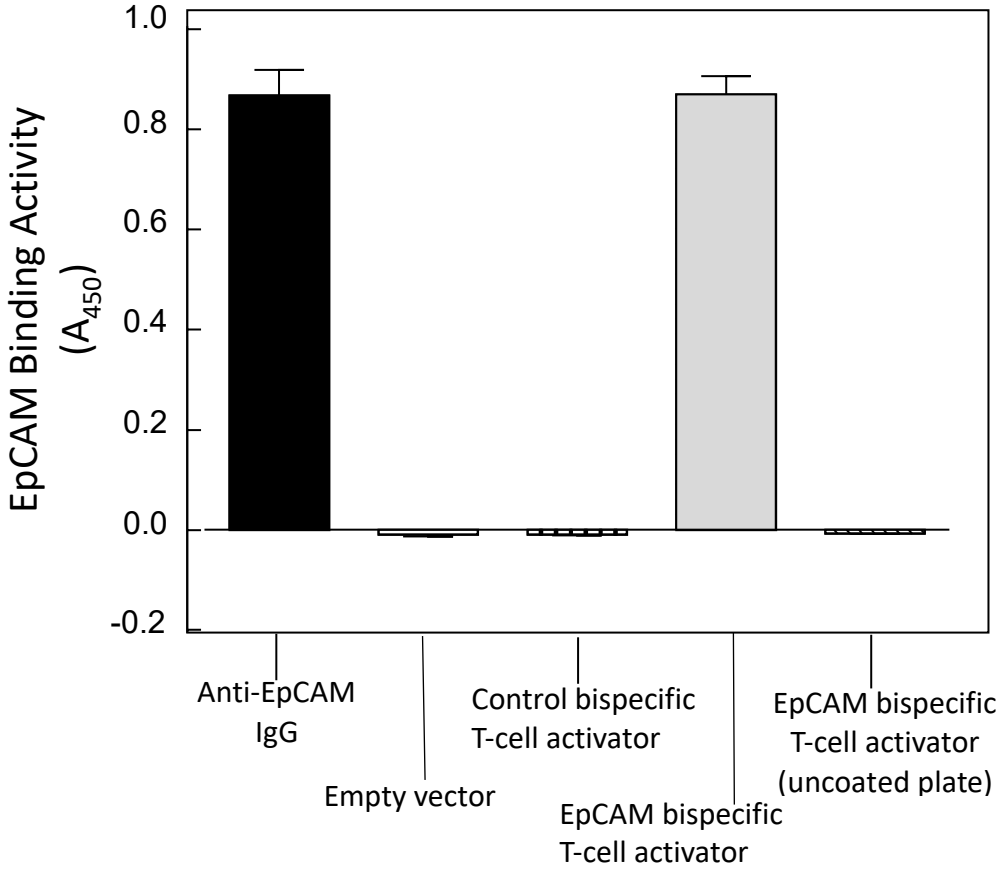
Figure 2





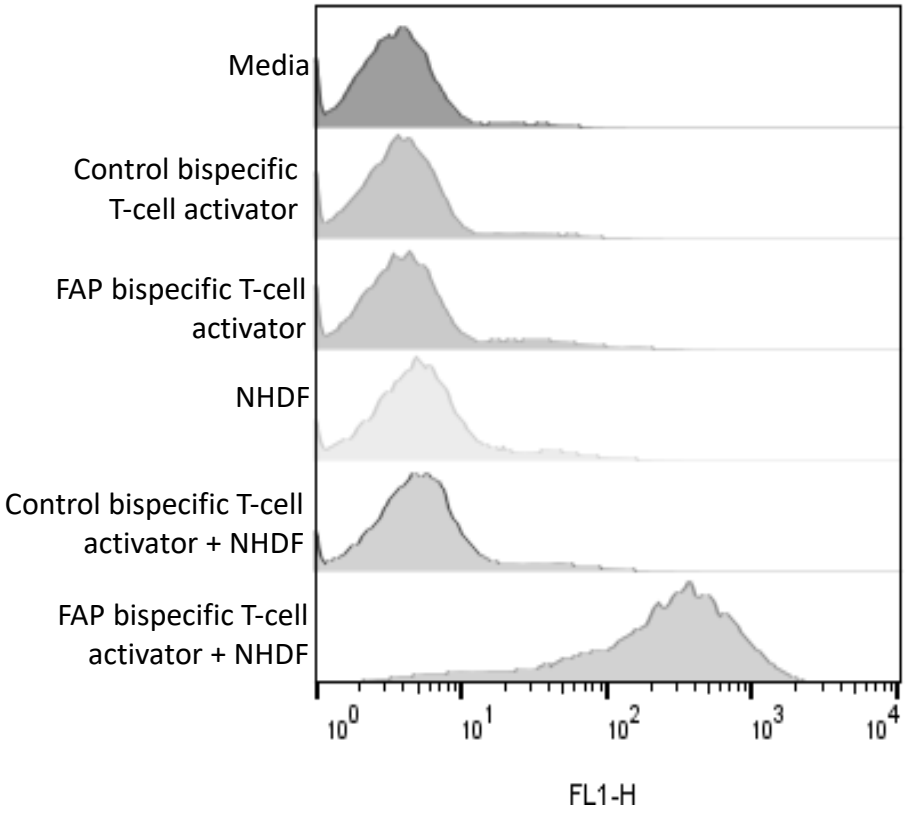
2017320776 18 Sep 2024

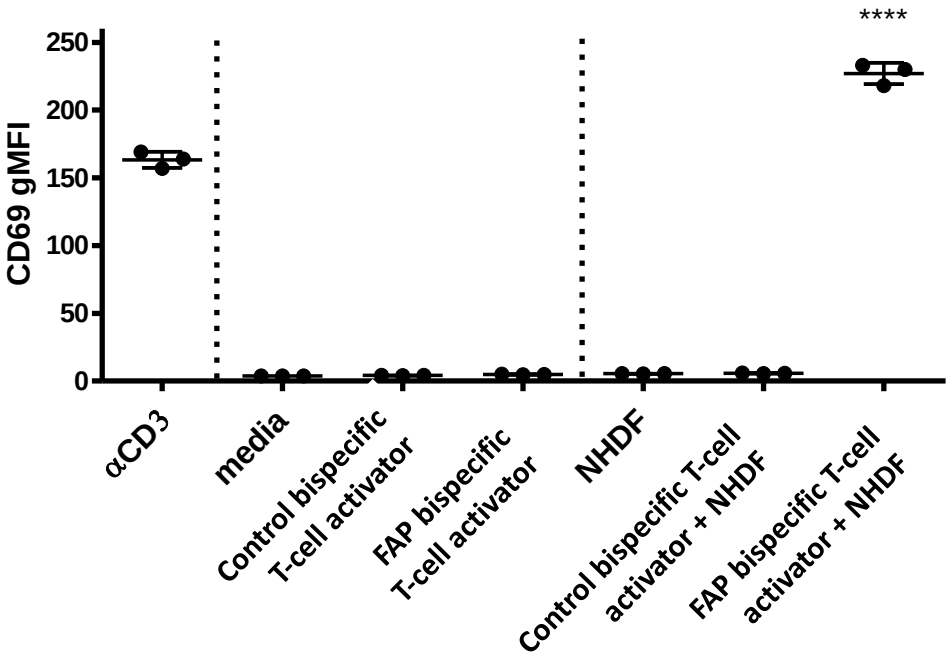
Figure 2C



2017320776 18 Sep 2024

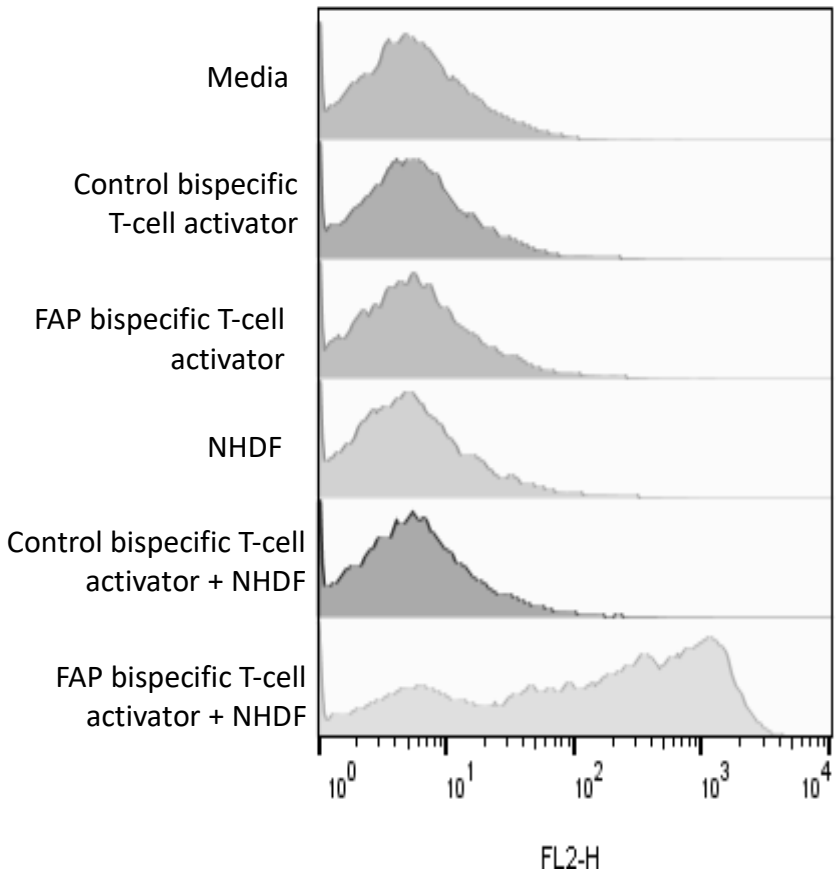
Figure 3A

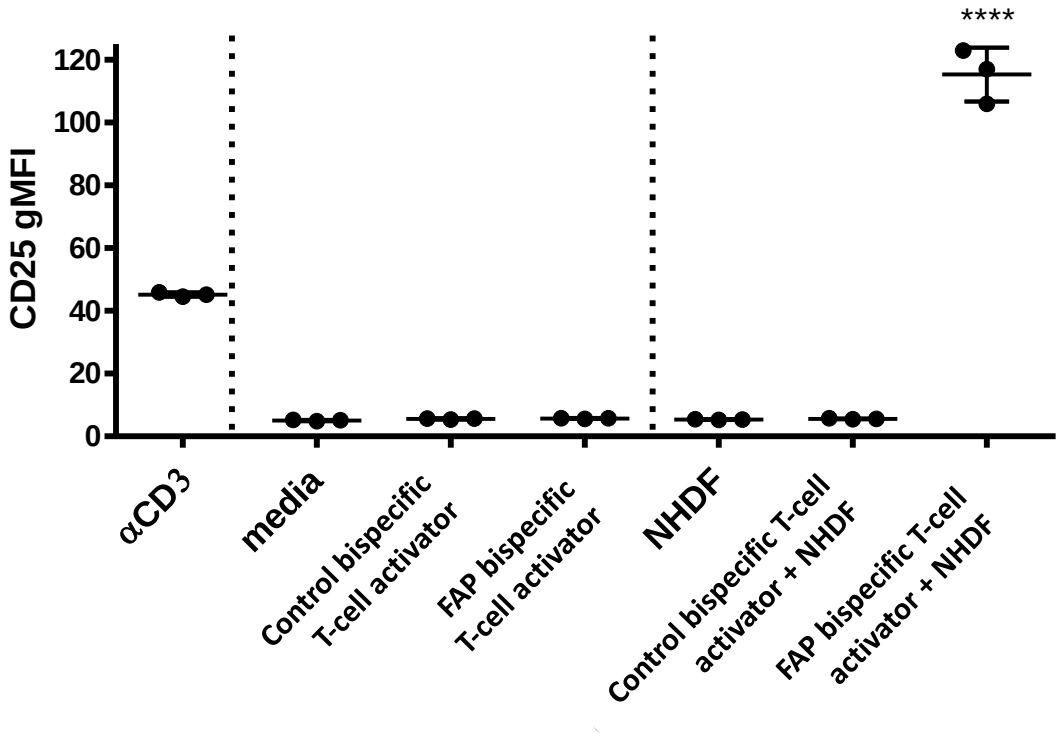




2017320776 18 Sep 2024

Figure 3B





2017320776 18 Sep 2024

Figure 4A

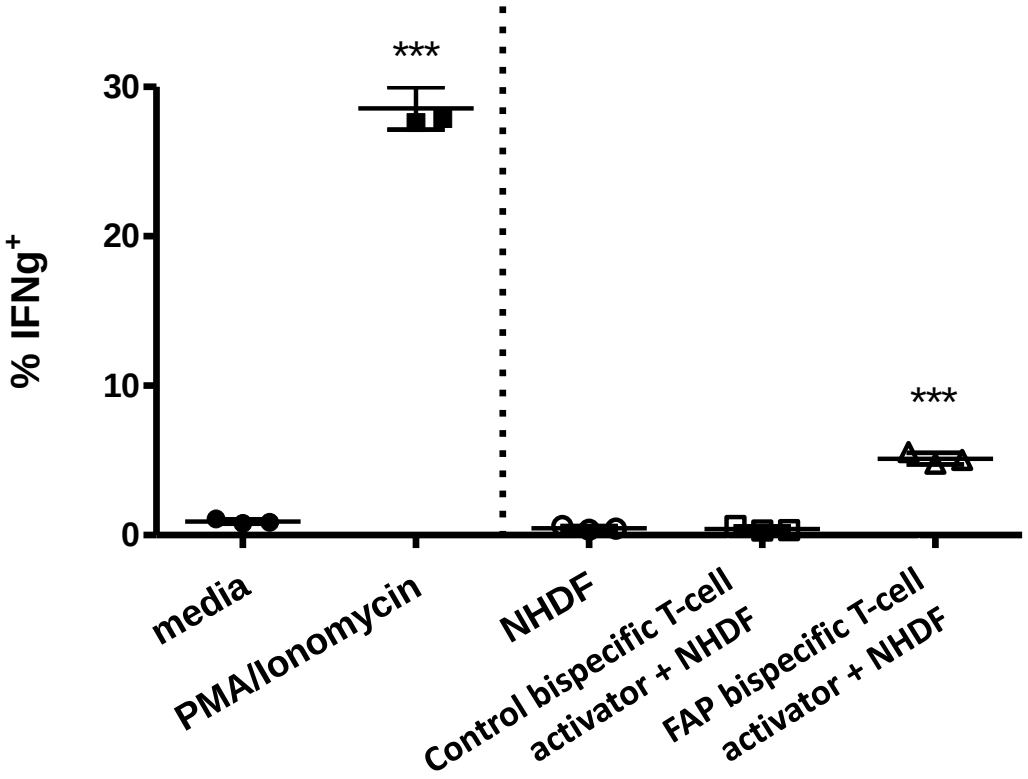
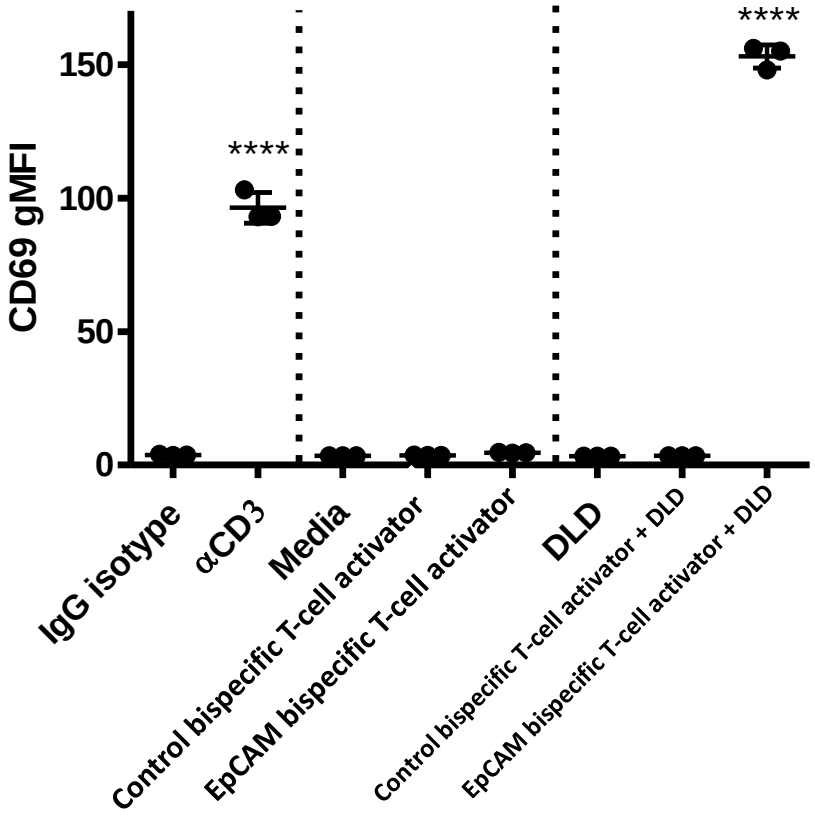


Figure 4B



18 Sep 2024 2017320776

Figure 4C

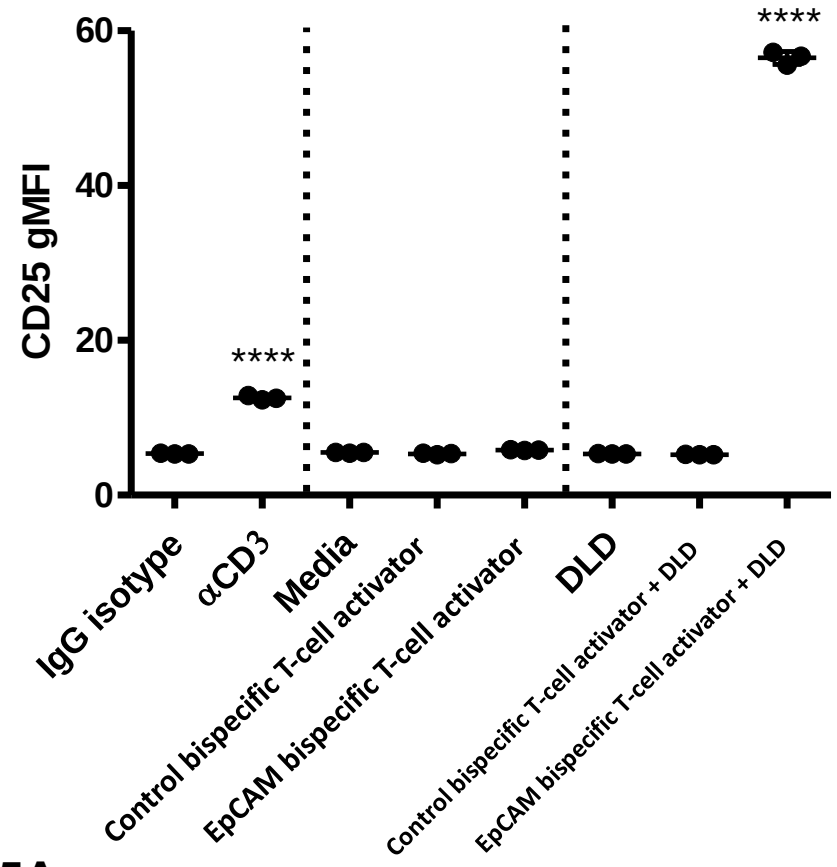
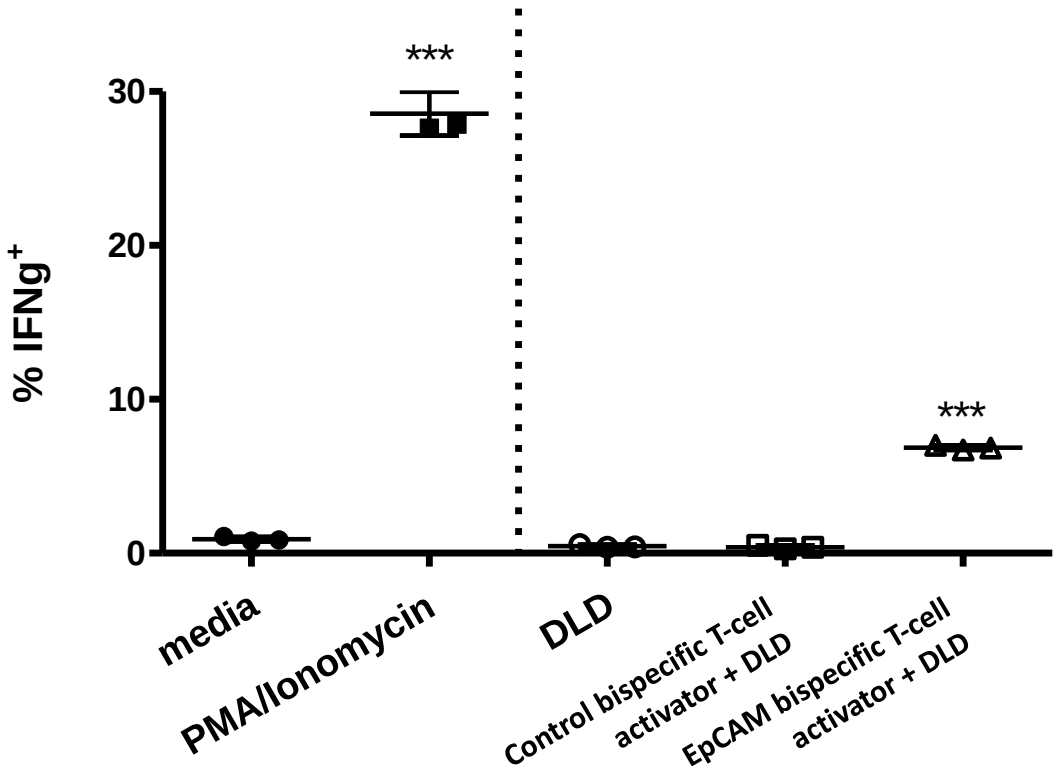
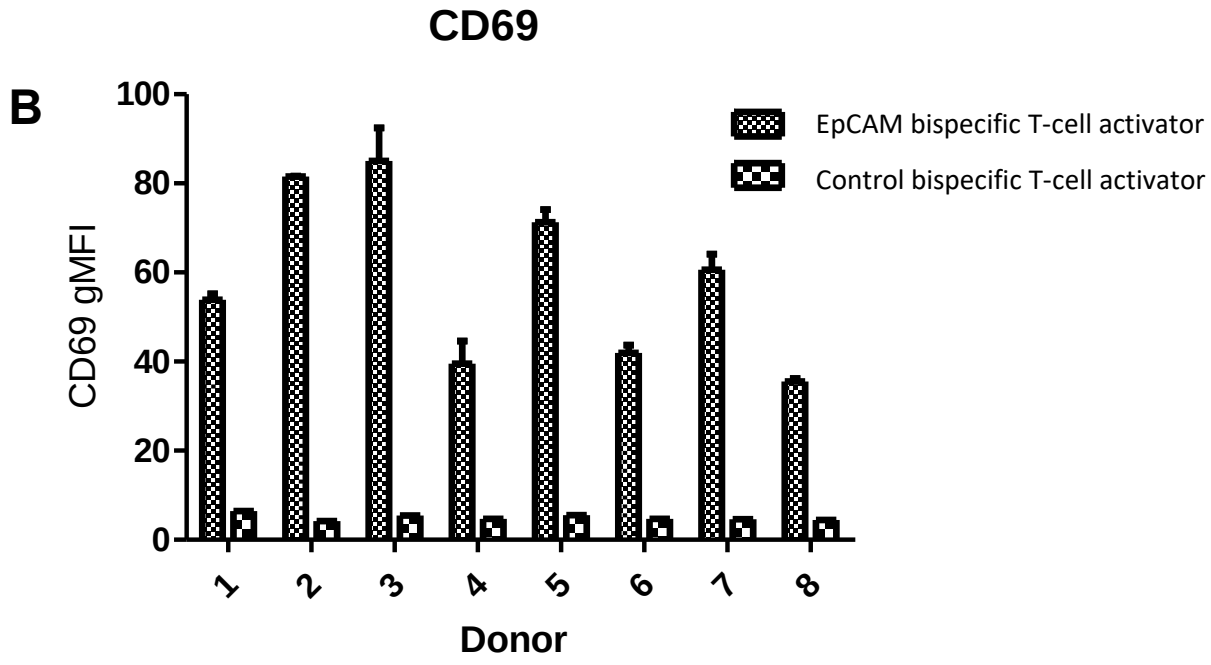


Figure 5A



2017320776 18 Sep 2024

FIGURE 5 cont.



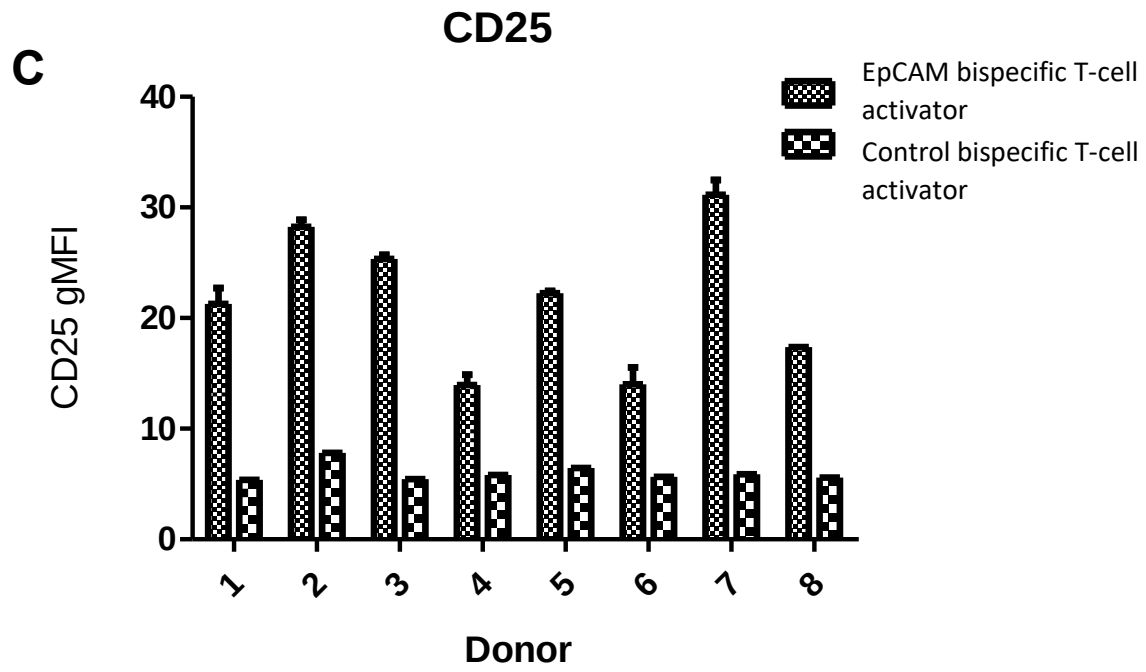
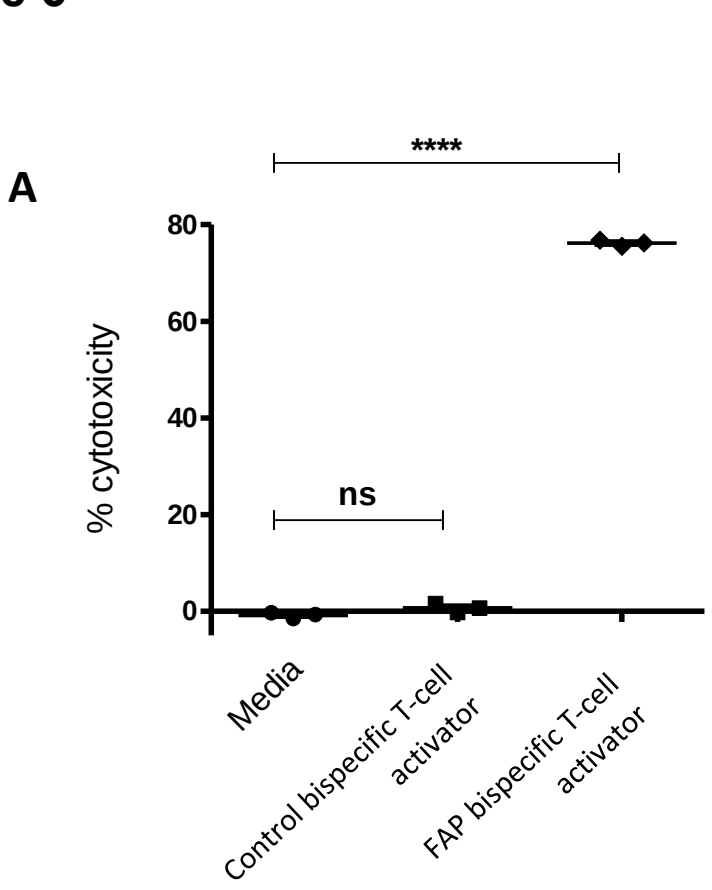
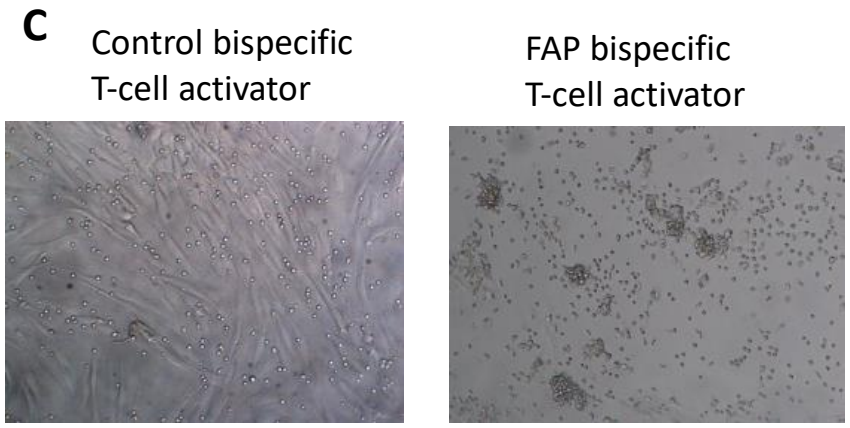
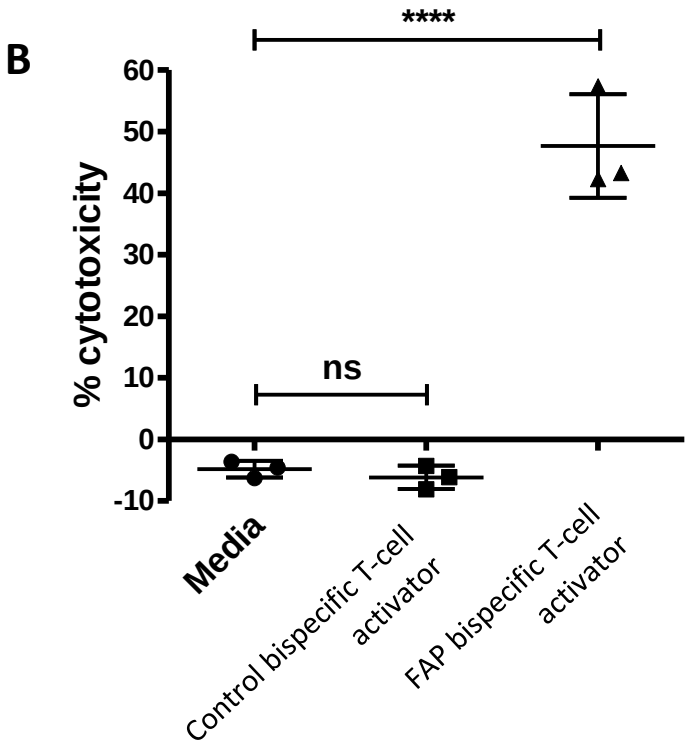


Figure 6

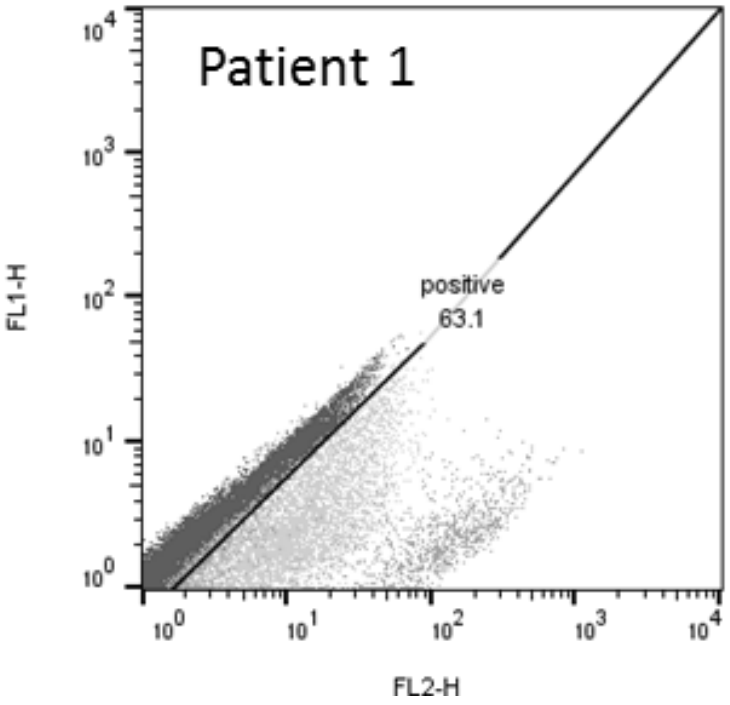

A
****
ns
% cytotoxicity
80
60
40
20
0
Media
Control bispecific T-cell activator
FAP bispecific T-cell activator


C
Control bispecific T-cell activator
FAP bispecific T-cell activator

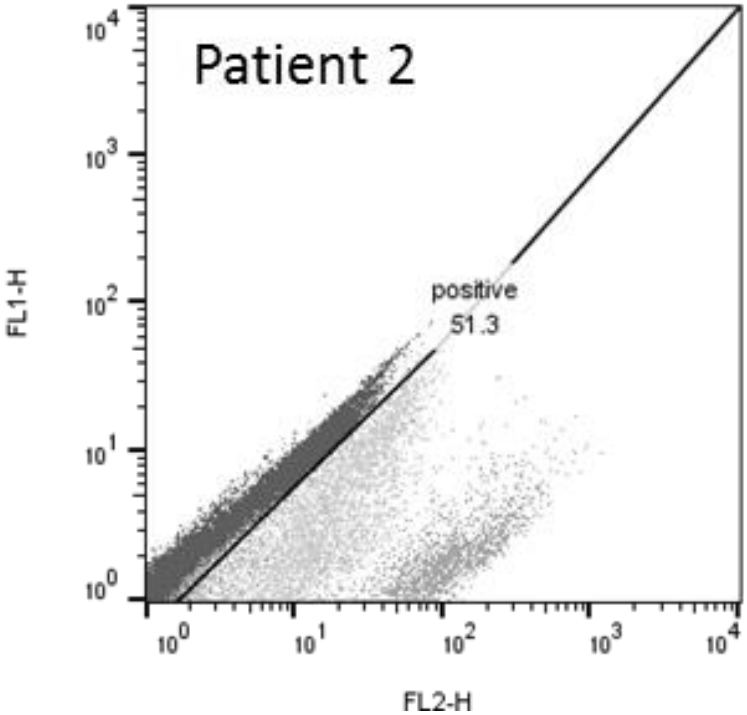

B
****
ns
% cytotoxicity
60
50
40
30
20
10
0
-10
Media
Control bispecific T-cell activator
FAP bispecific T-cell activator

2017320776 18 Sep 2024

Figure 7A



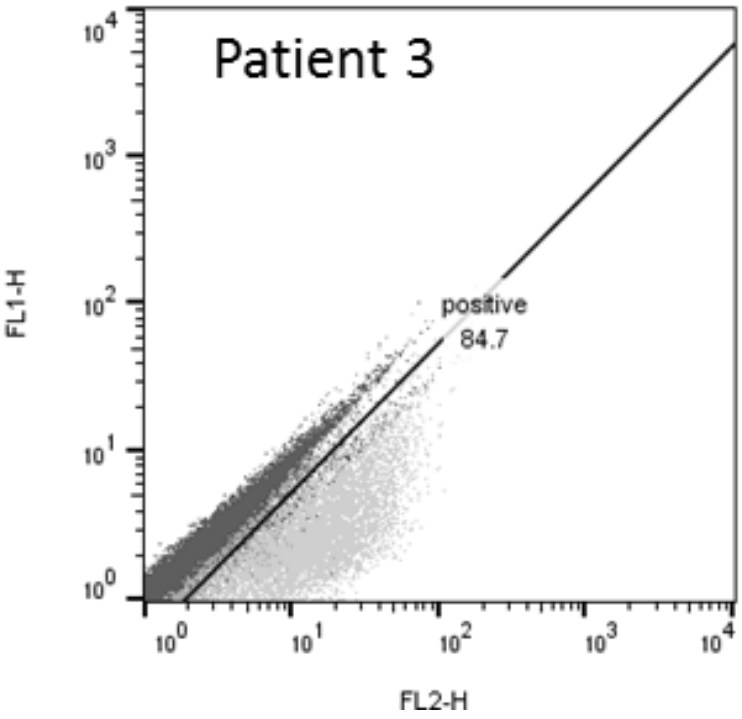
	Sample Name	positive :: Freq. of Paren
	Unstained	0.19
	Isotype C	0.41
	EpCAM bispecific T-cell activator	15.7
	FAP bispecific T-cell activator	63.1



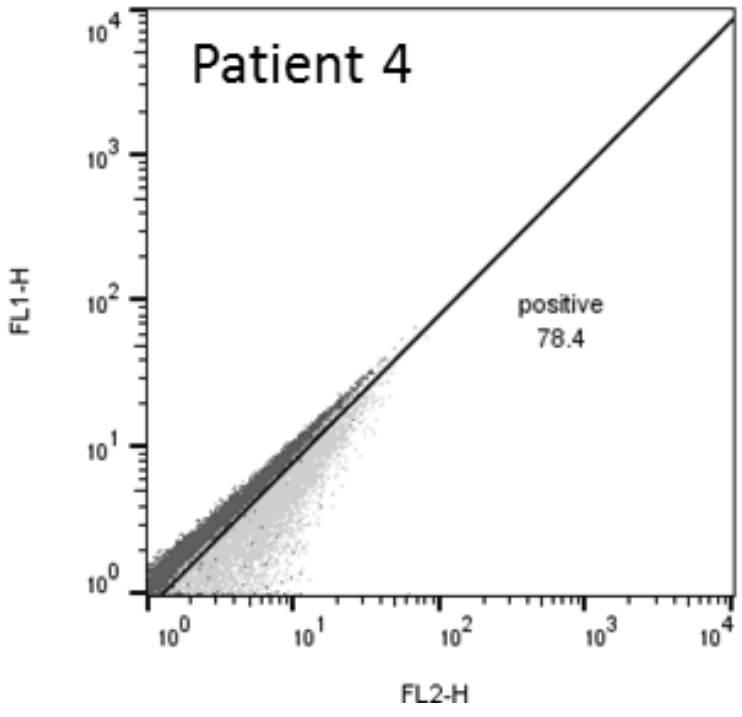
	Sample Name	positive :: Freq. of Paren
	Unstained	0.45
	Isotype C	0.56
	EpCAM bispecific T-cell activator	23.9
	FAP bispecific T-cell activator	51.3

18 Sep 2024 2017320776

Figure 7A cont.



Sample Name	positive :: Freq. of Paren
Unstained	1.06
Isotype C	1.12
EpCAM bispecific T-cell activator	4.48
FAP bispecific T-cell activator	84.7



Sample Name	positive :: Freq. of Paren
Unstained	0.78
Isotype C	0.22
EpCAM bispecific T-cell activator	0.37
FAP bispecific T-cell activator	78.4

2017320776 18 Sep 2024

Figure 7B

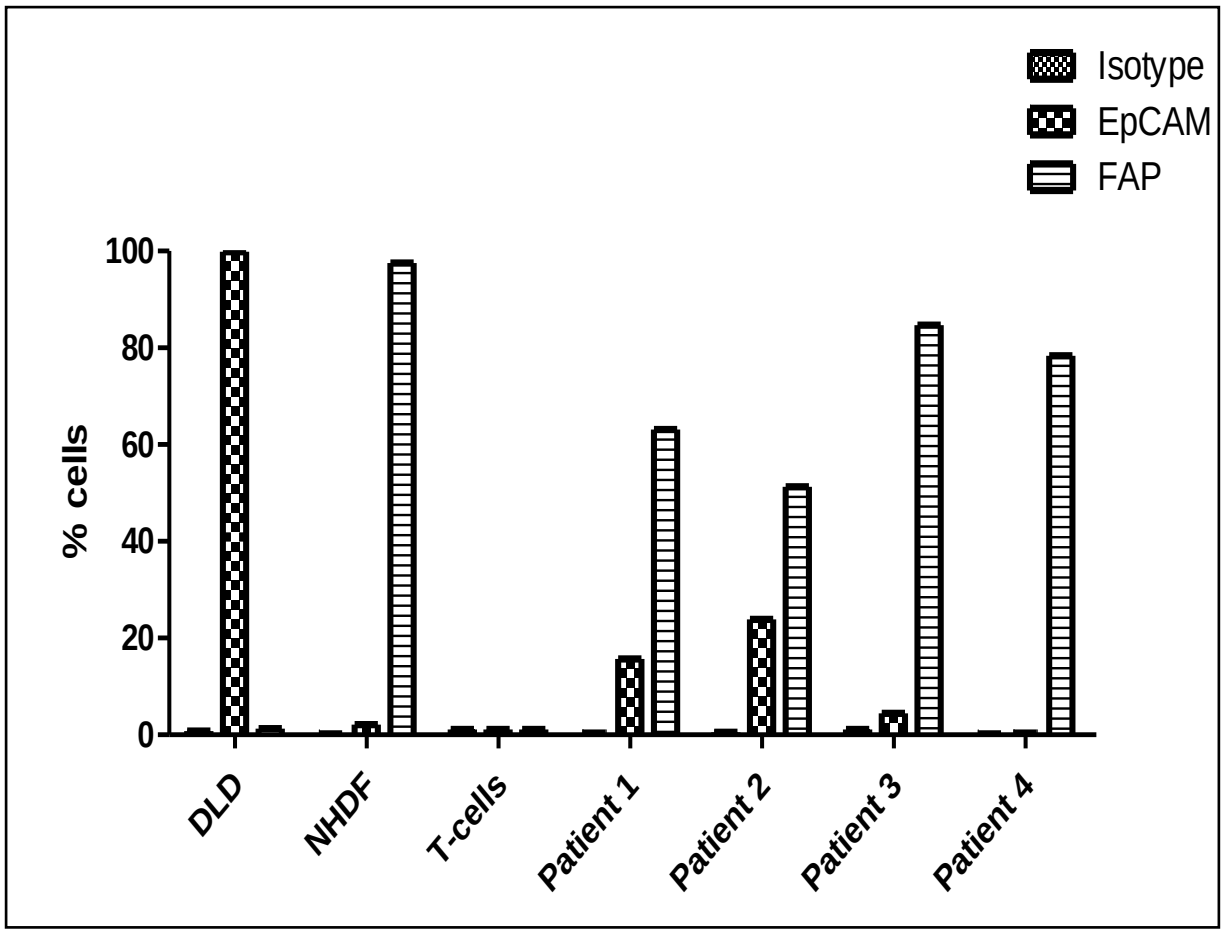
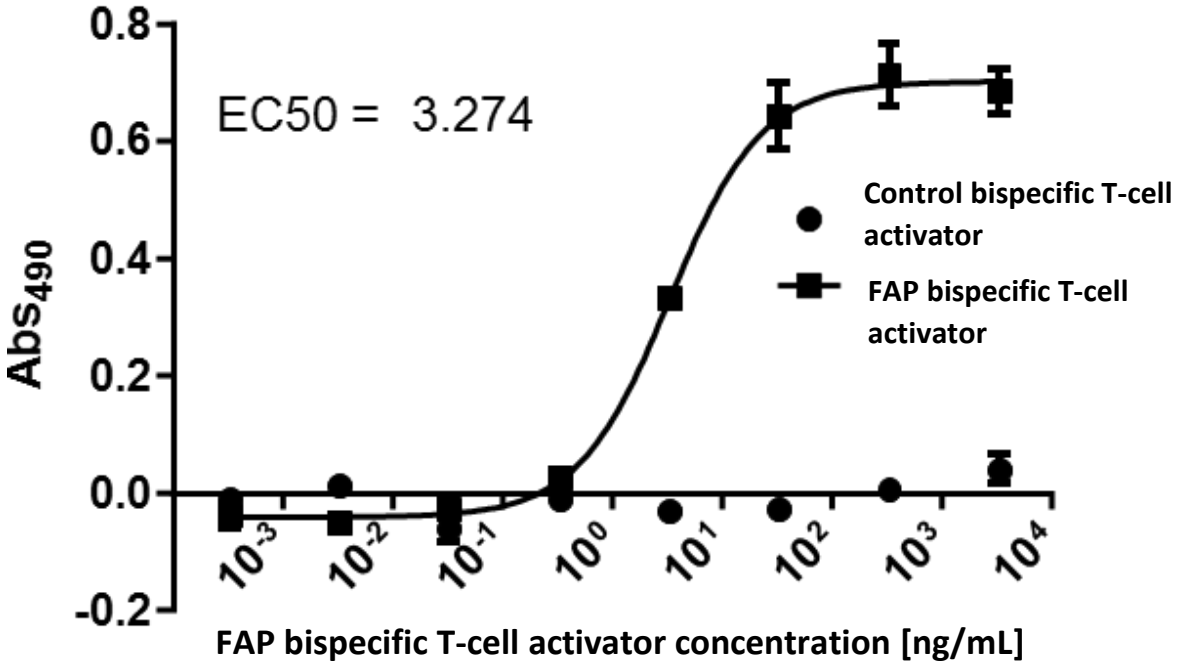


Figure 8A



20173207776 18 Sep 2024

Figure 8B

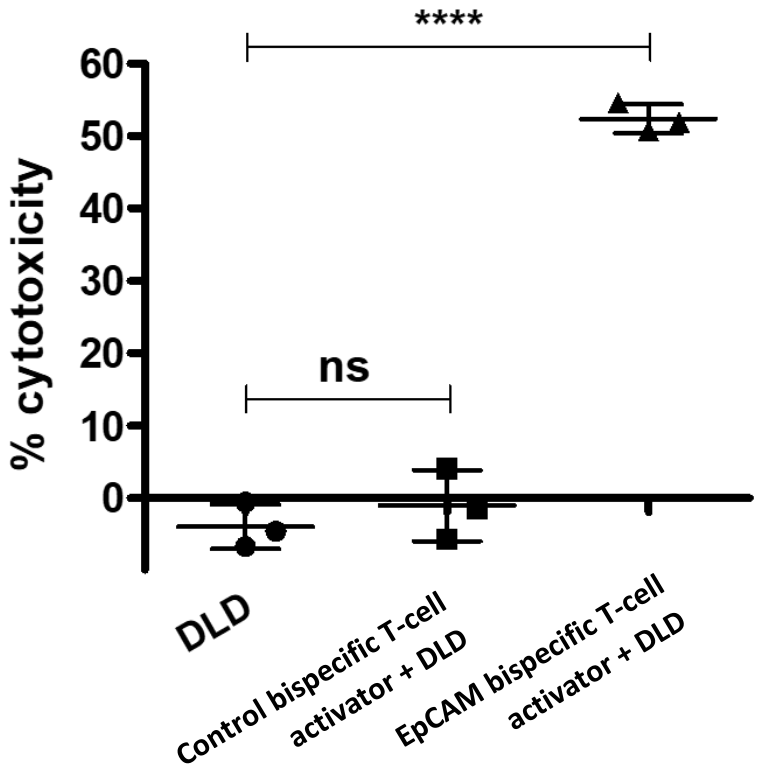
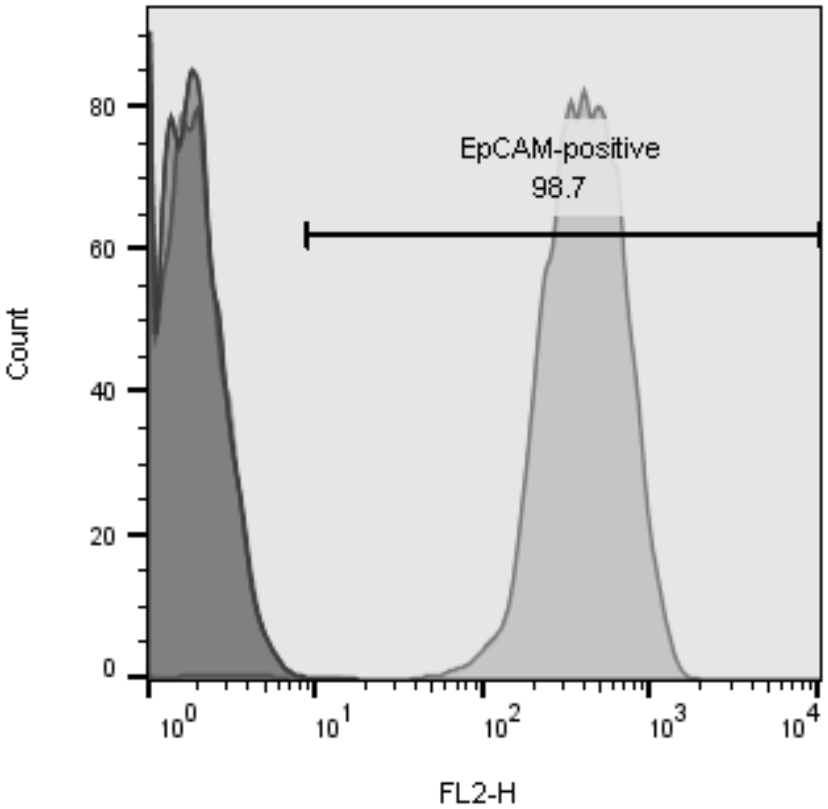


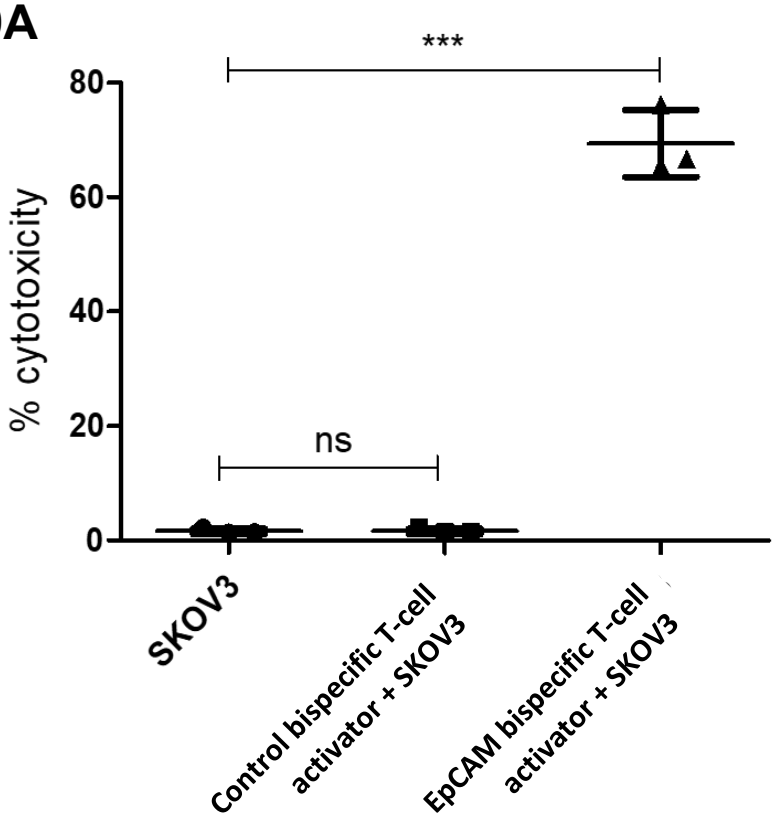
Figure 8C

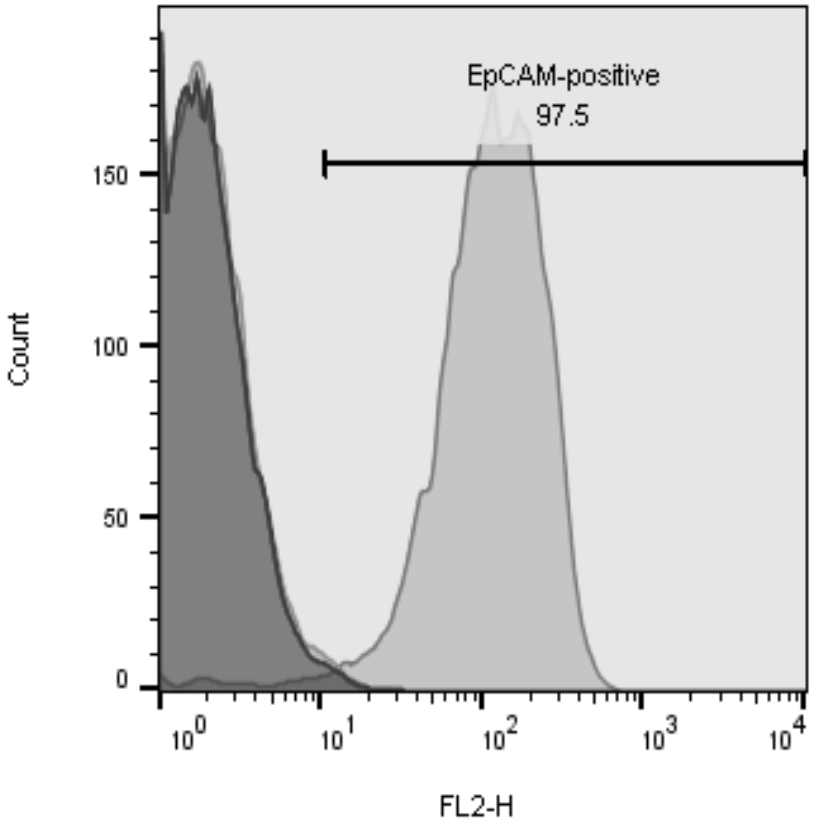


	Sample Name	EpCAM-positive :: Freq. of Parent	Geometric Mean : FL2-H
	[DLD unstained.021]	0.40	1.77
	[DLD iso.022]	0.36	1.81
	[DLD ep.023]	98.7	361

2017320776 18 Sep 2024

Figure 9A

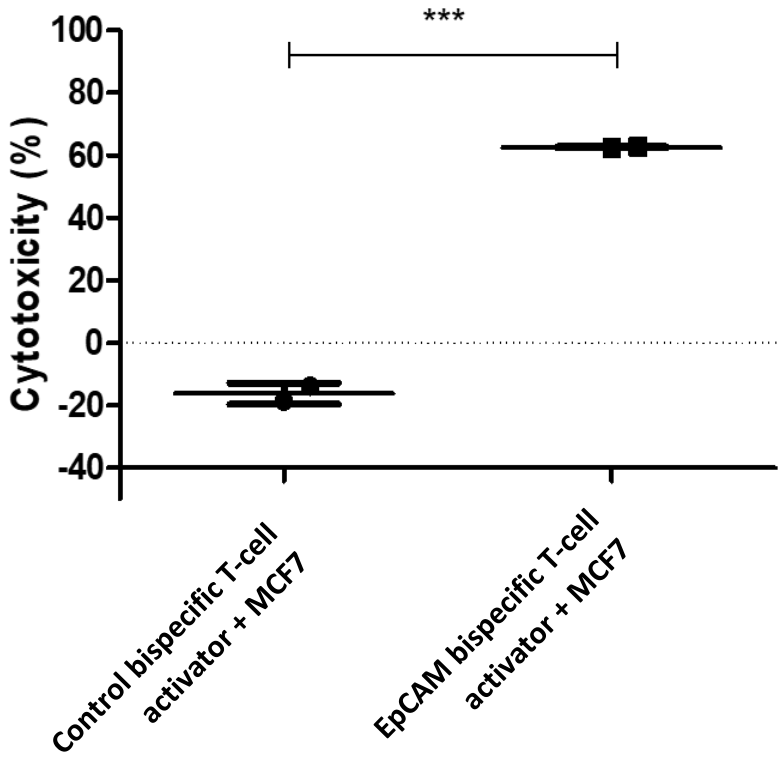


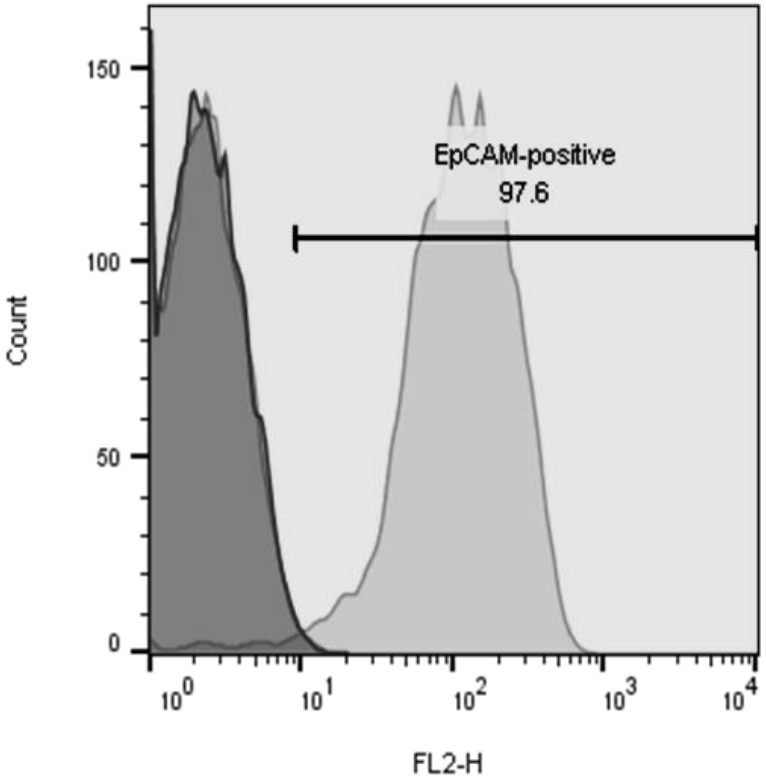


	Sample Name	EpCAM-positive :: Freq. of Parent	Geometric Mean : FL2-H
	[Skov unstained.024]	1.48	1.99
	[Skov iso.025]	1.53	2.00
	[Skov ep.026]	97.5	103

2017320776 18 Sep 2024

Figure 9B

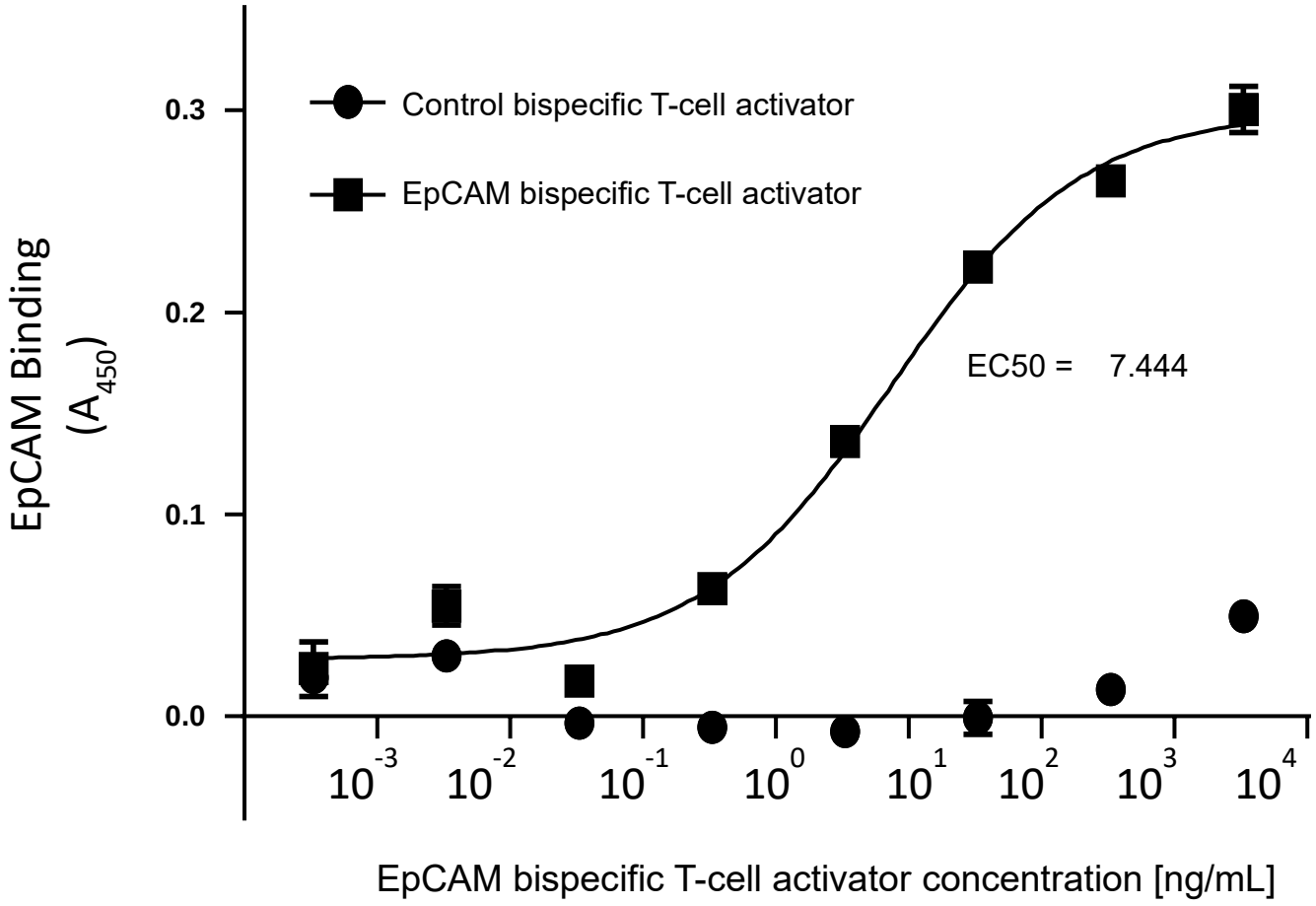




	Sample Name	EpCAM-positive :: Freq. of Parent	Geometric Mean : FL2-H
	[MCF7 unstained.018]	0.84	2.24
	[MCF7 iso.019]	0.86	2.21
	[MCF7 ep.020]	97.6	101

2017320776 18 Sep 2024

Figure 10



2017320776 18 Sep 2024

Figure 11A

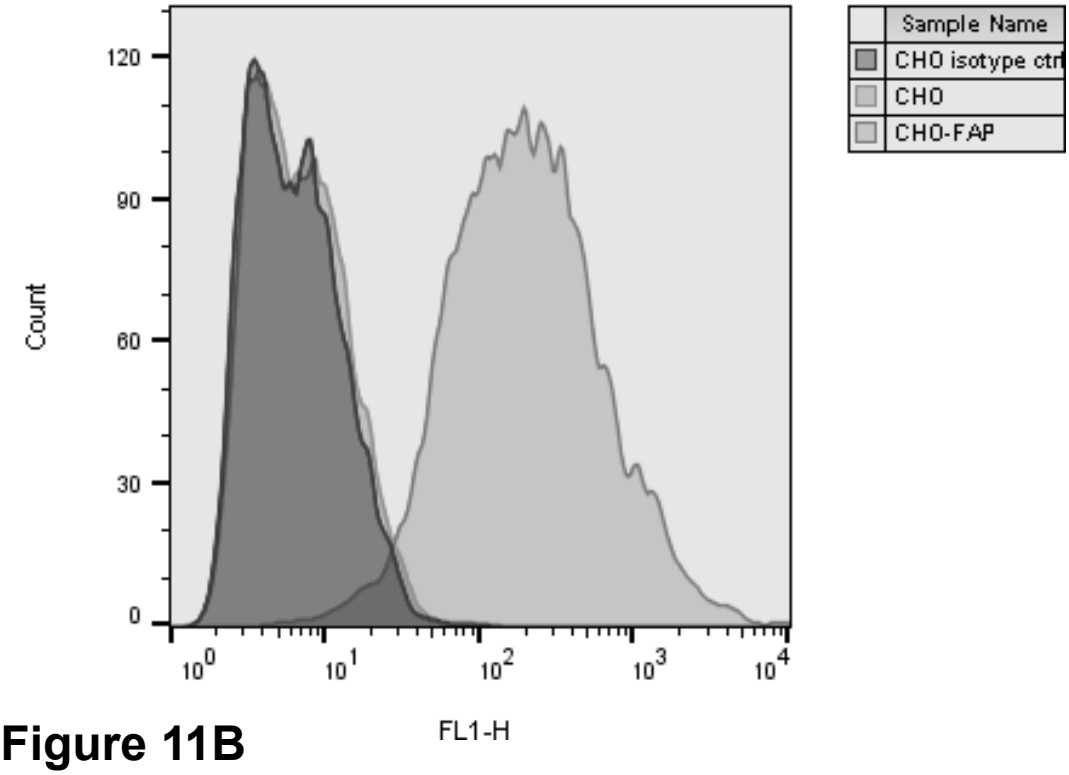
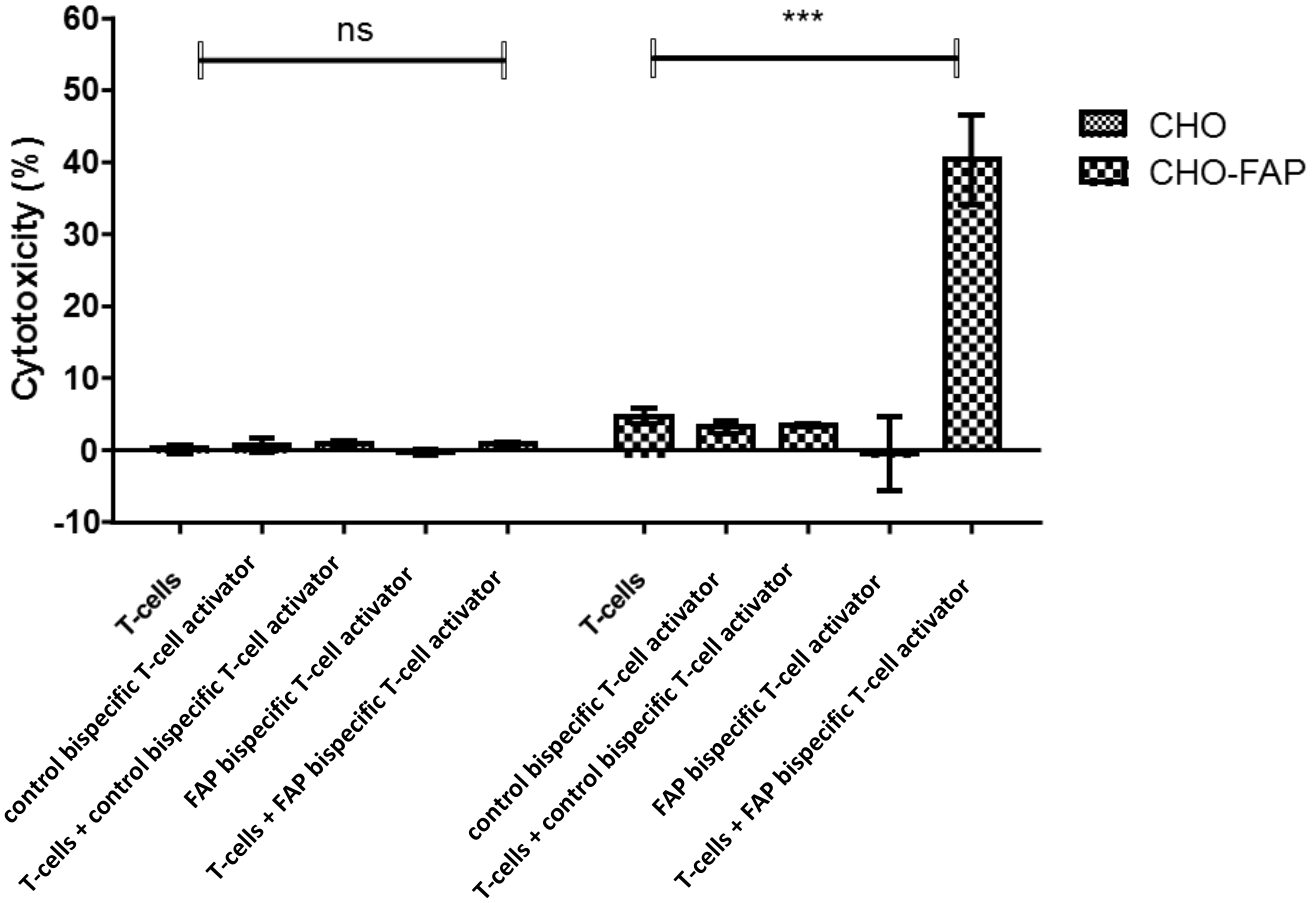
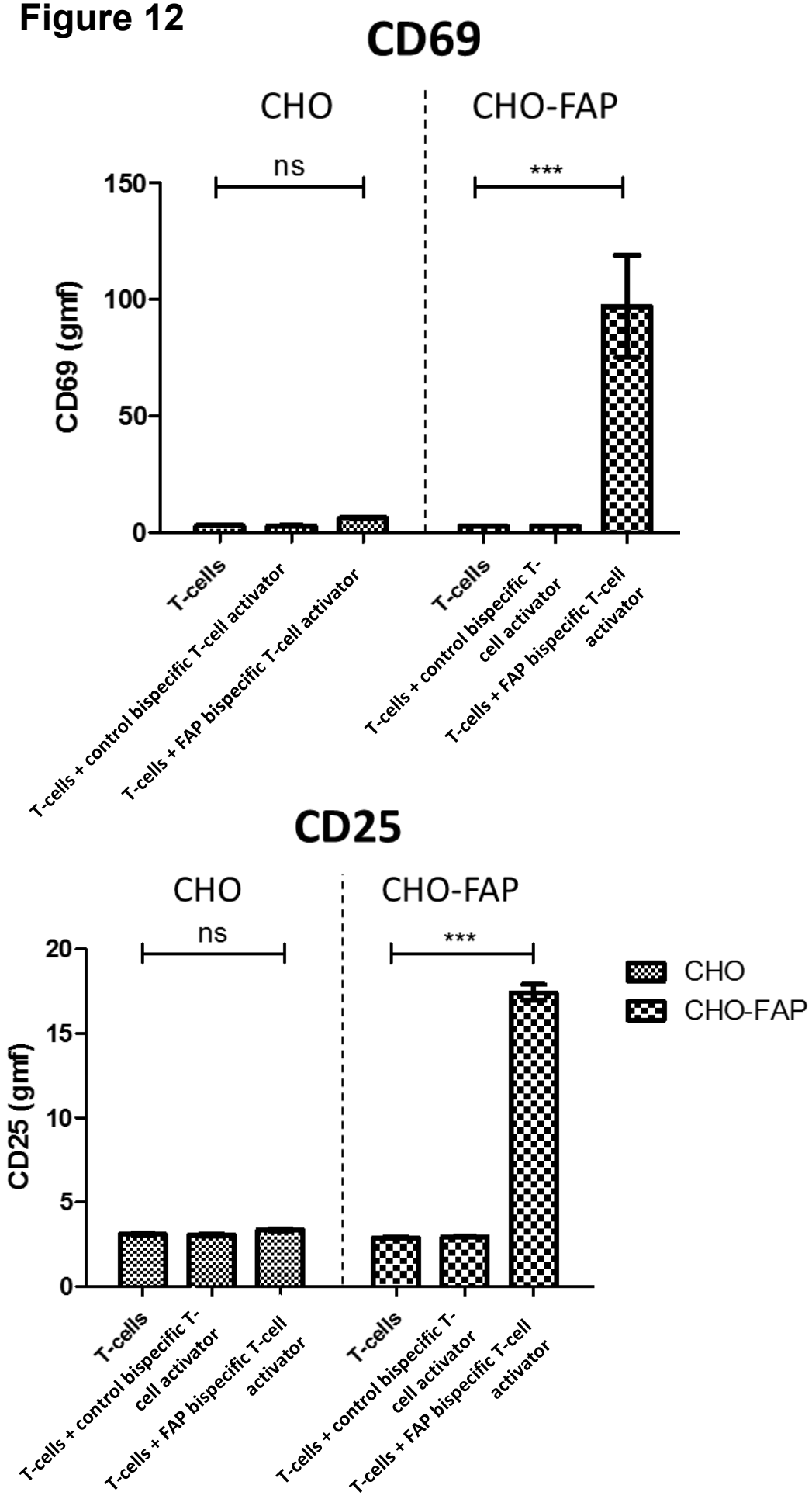


Figure 11B



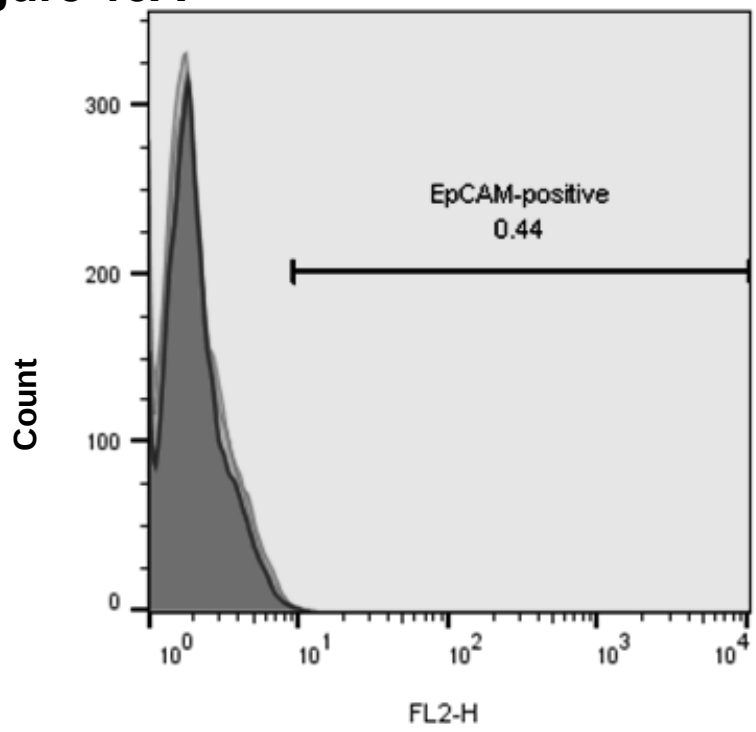
2017320776 18 Sep 2024

Figure 12

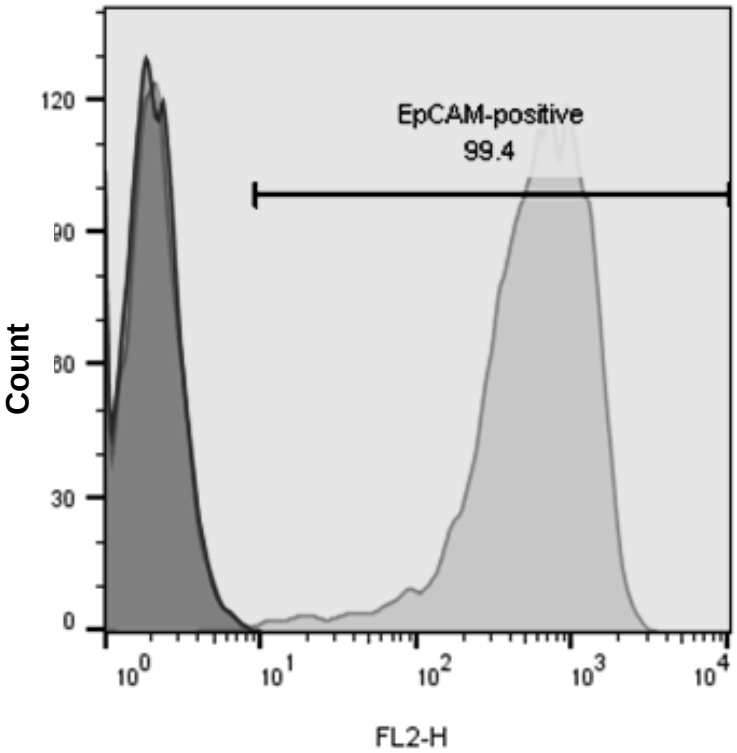


2017320776 18 Sep 2024

Figure 13A

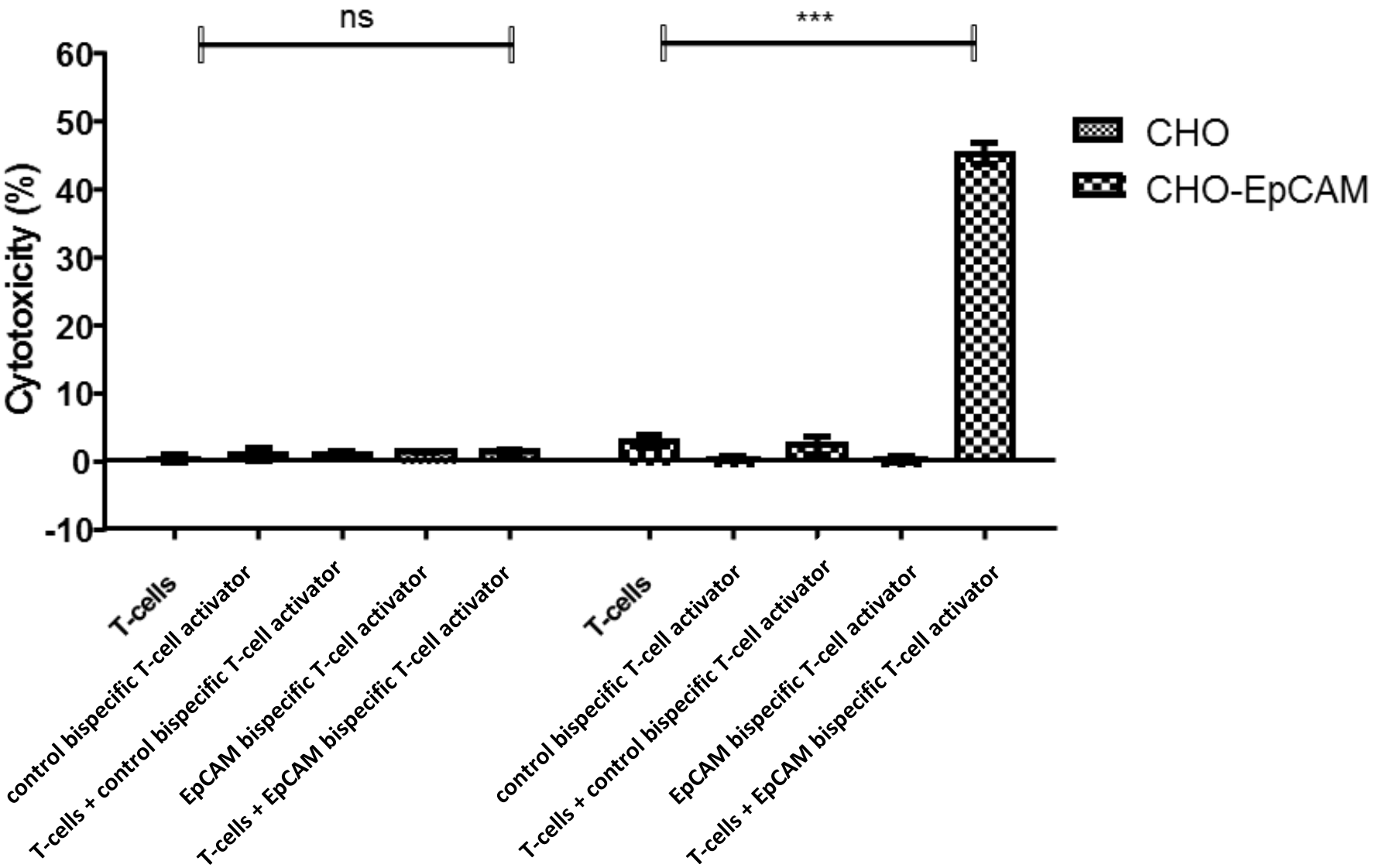


	Sample Name	EpCAM-positive :: Freq. of Parent	Geometric Mean : FL2-H
■	[CHO unstained.036]	0.38	2.06
□	[CHO iso.037]	0.42	2.08
□	[CHO ep.038]	0.44	2.02



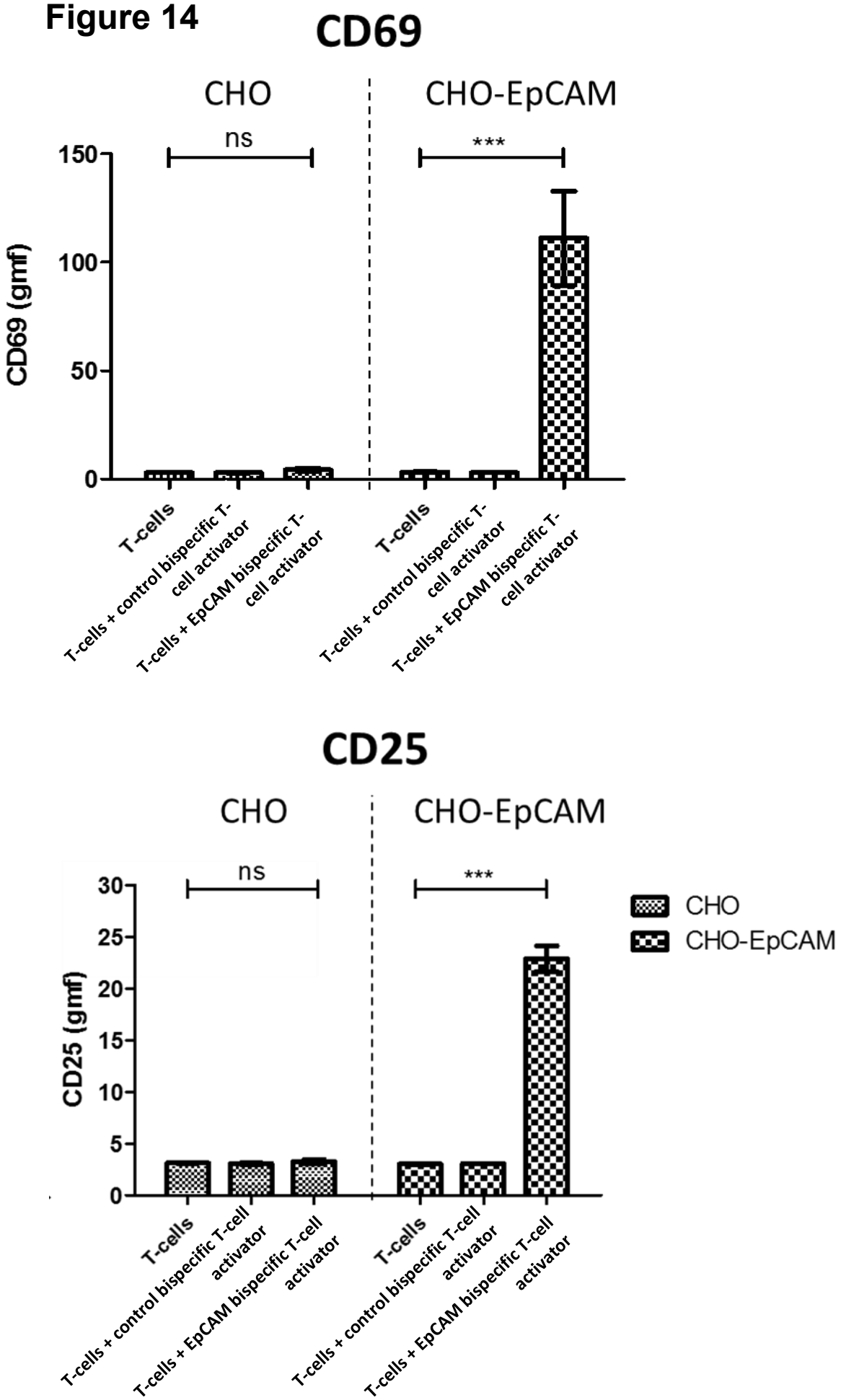
	Sample Name	EpCAM-positive :: Freq. of Parent	Geometric Mean : FL2-H
■	[CHO-epcam unstained.039]	0.093	2.03
□	[CHO-epcam iso.040]	0.15	2.05
□	[CHO-epcam ep.041]	99.4	513

Figure 13B


ns
***
60
50
40
30
20
10
0
-10
Cytotoxicity (%)
CHO
CHO-EpCAM
T-cells
control bispecific T-cell activator
T-cells + control bispecific T-cell activator
EpCAM bispecific T-cell activator
T-cells + EpCAM bispecific T-cell activator
T-cells
control bispecific T-cell activator
T-cells + control bispecific T-cell activator
EpCAM bispecific T-cell activator
T-cells + EpCAM bispecific T-cell activator

2017320776 18 Sep 2024

Figure 14



20173207776 18 Sep 2024

Figure 15

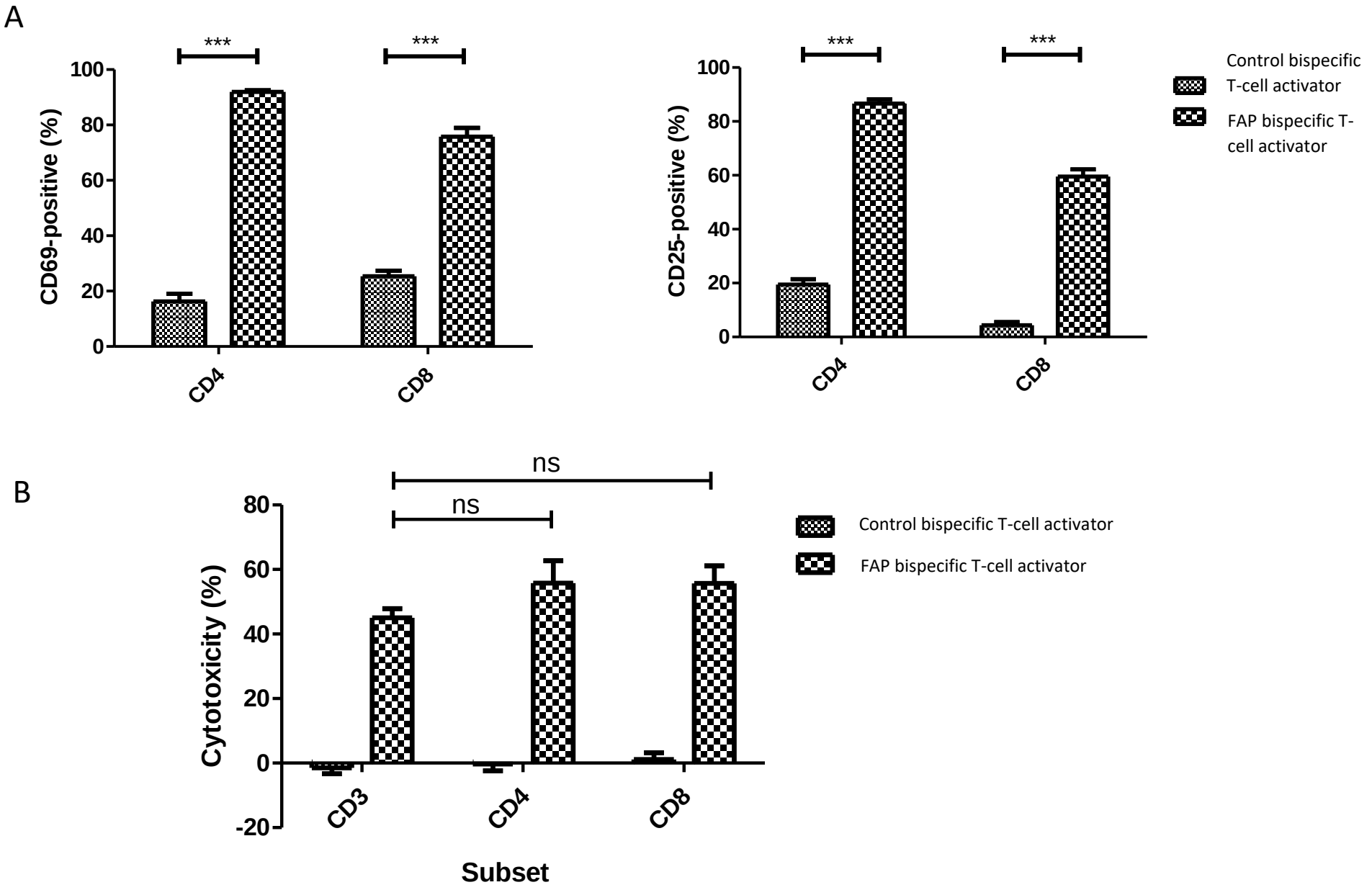


Figure 16

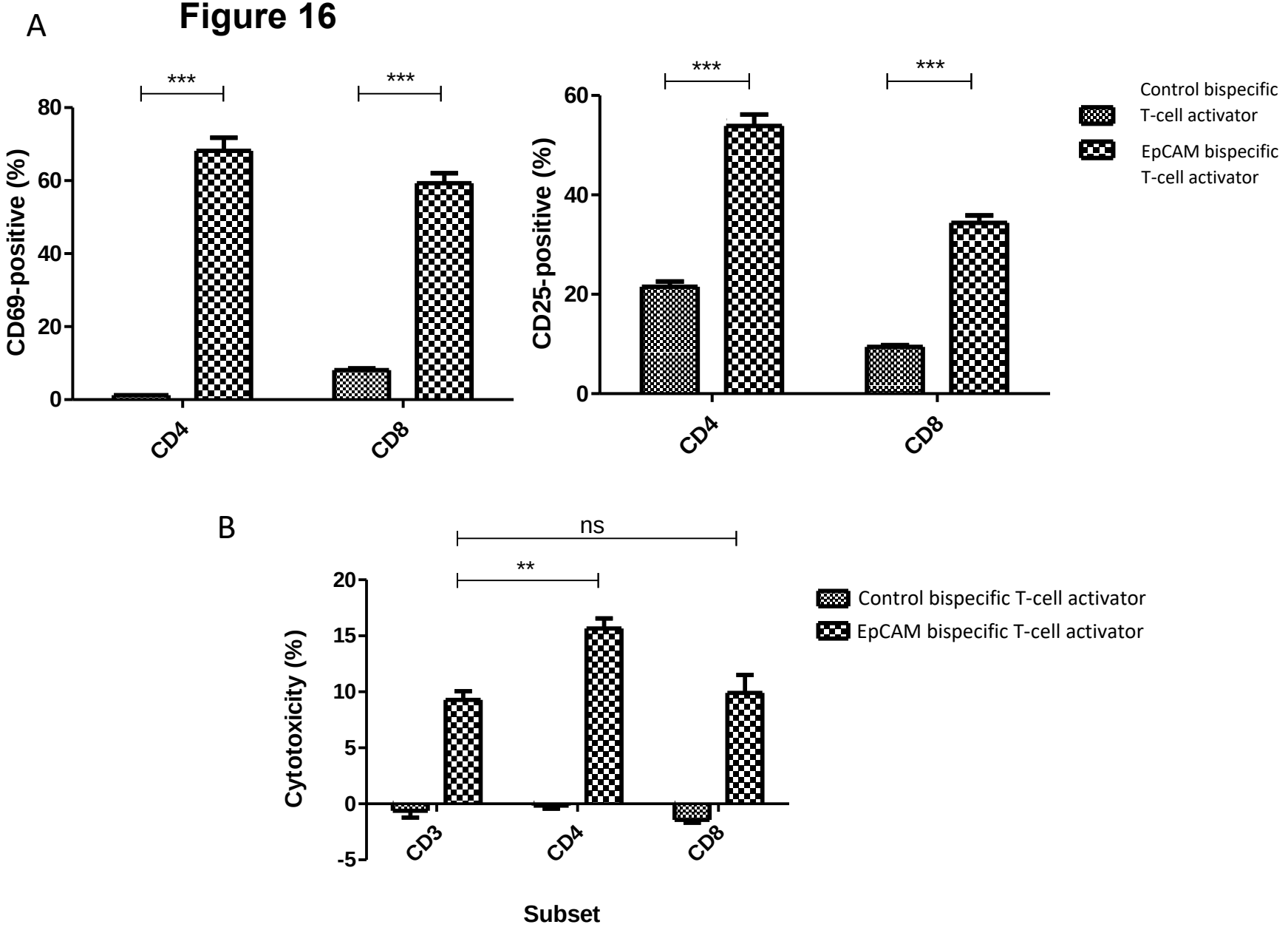

A
***
***
CD69-positive (%)
80
60
40
20
0
CD4
CD8
***
***
CD25-positive (%)
60
40
20
0
CD4
CD8
Control bispecific T-cell activator
EpCAM bispecific T-cell activator
B
ns
**
Cytotoxicity (%)
20
15
10
5
0
-5
CD3
CD4
CD8
Subset
Control bispecific T-cell activator
EpCAM bispecific T-cell activator

Figure 17

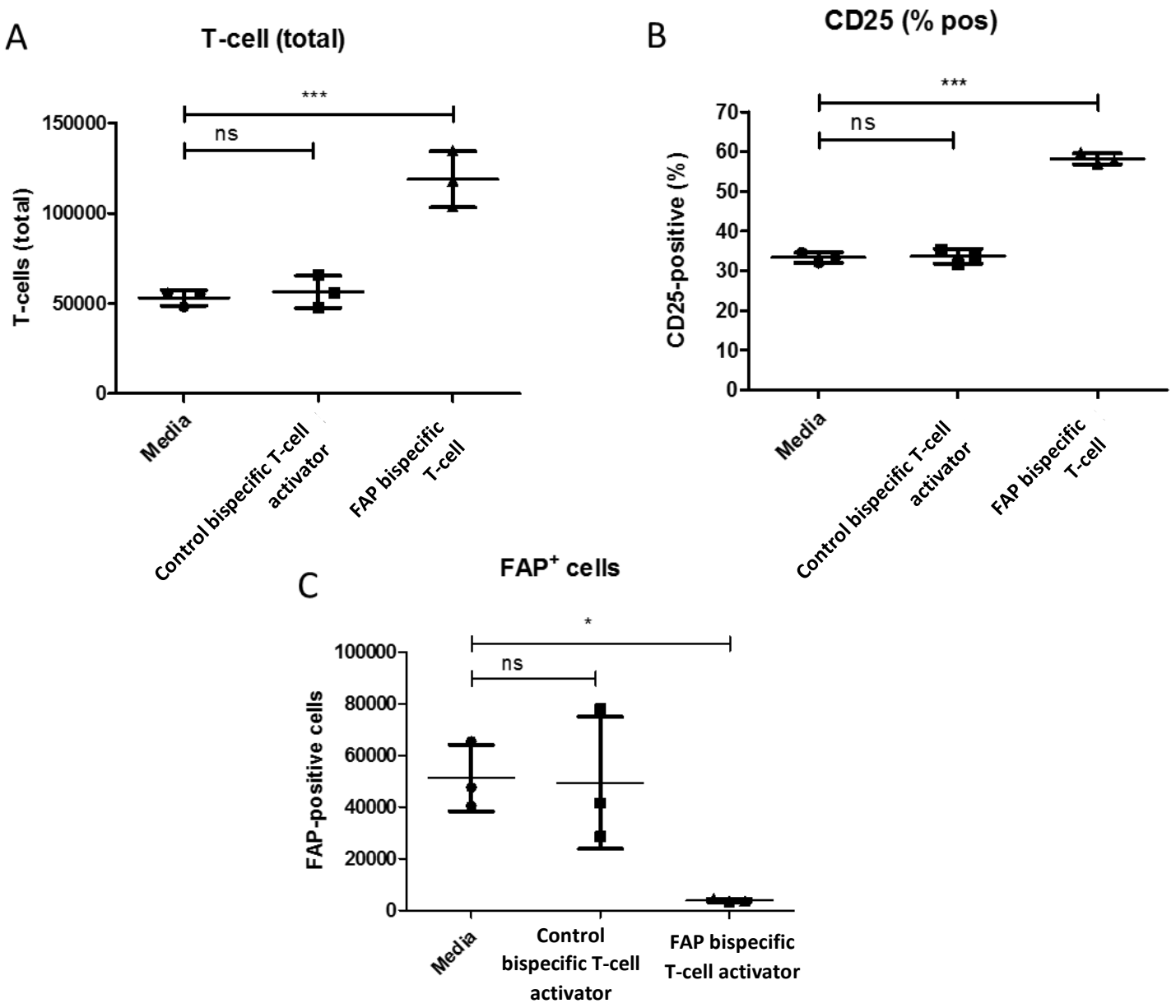
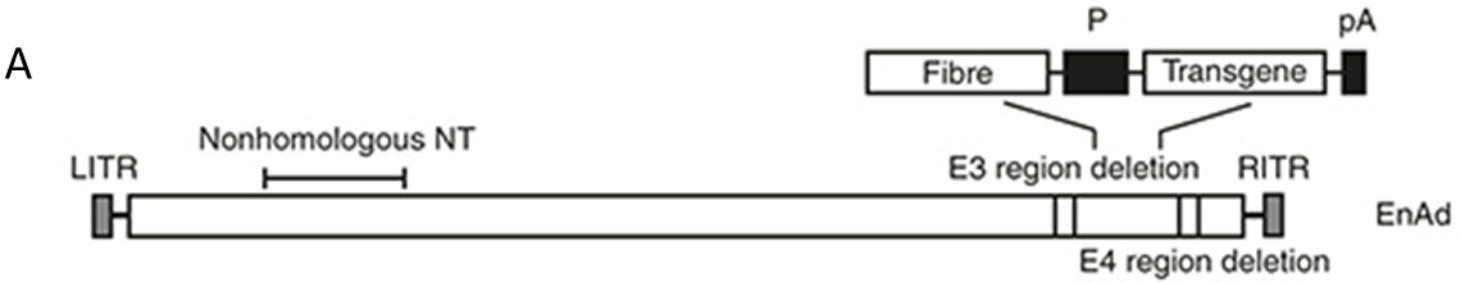

A
T-cell (total)
T-cells (total)
150000
100000
50000
0
***
ns
Media
Control bispecific T-cell activator
FAP bispecific T-cell
B
CD25 (% pos)
CD25-positive (%)
70
60
50
40
30
20
10
0
***
ns
Media
Control bispecific T-cell activator
FAP bispecific T-cell
C
FAP+ cells
FAP-positive cells
100000
80000
60000
40000
20000
0
*
ns
Media
Control bispecific T-cell activator
FAP bispecific T-cell activator

Figure 18


A
P
pA
Fibre
Transgene
Nonhomologous NT
LITR
E3 region deletion
RITR
EnAd
E4 region deletion

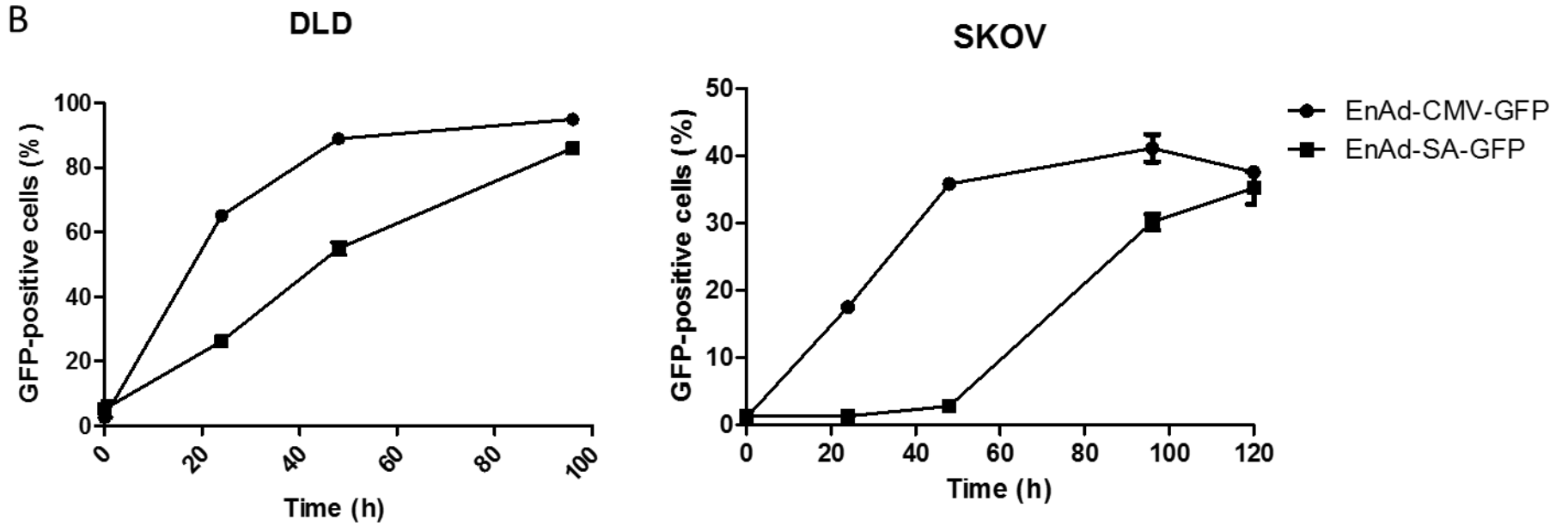
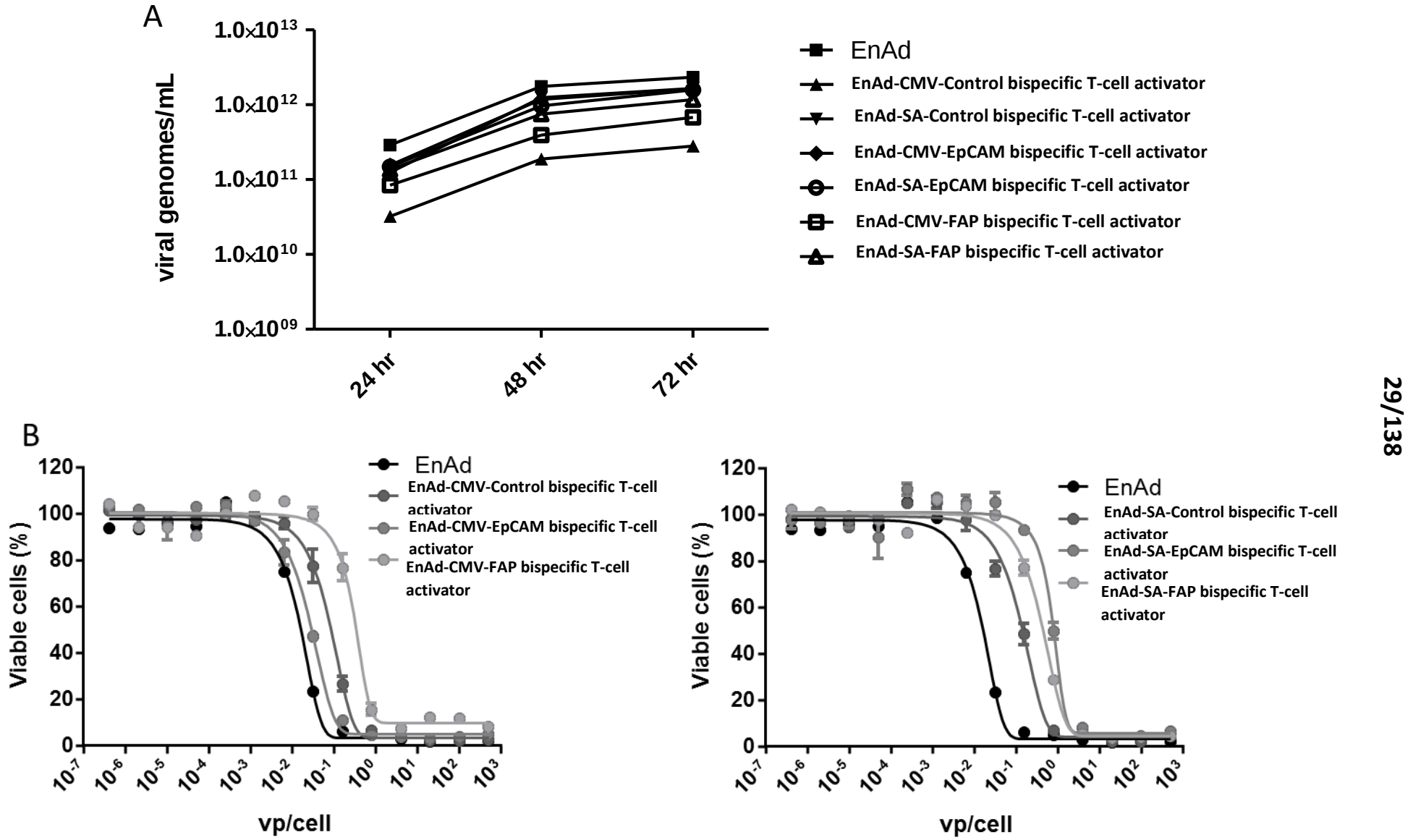
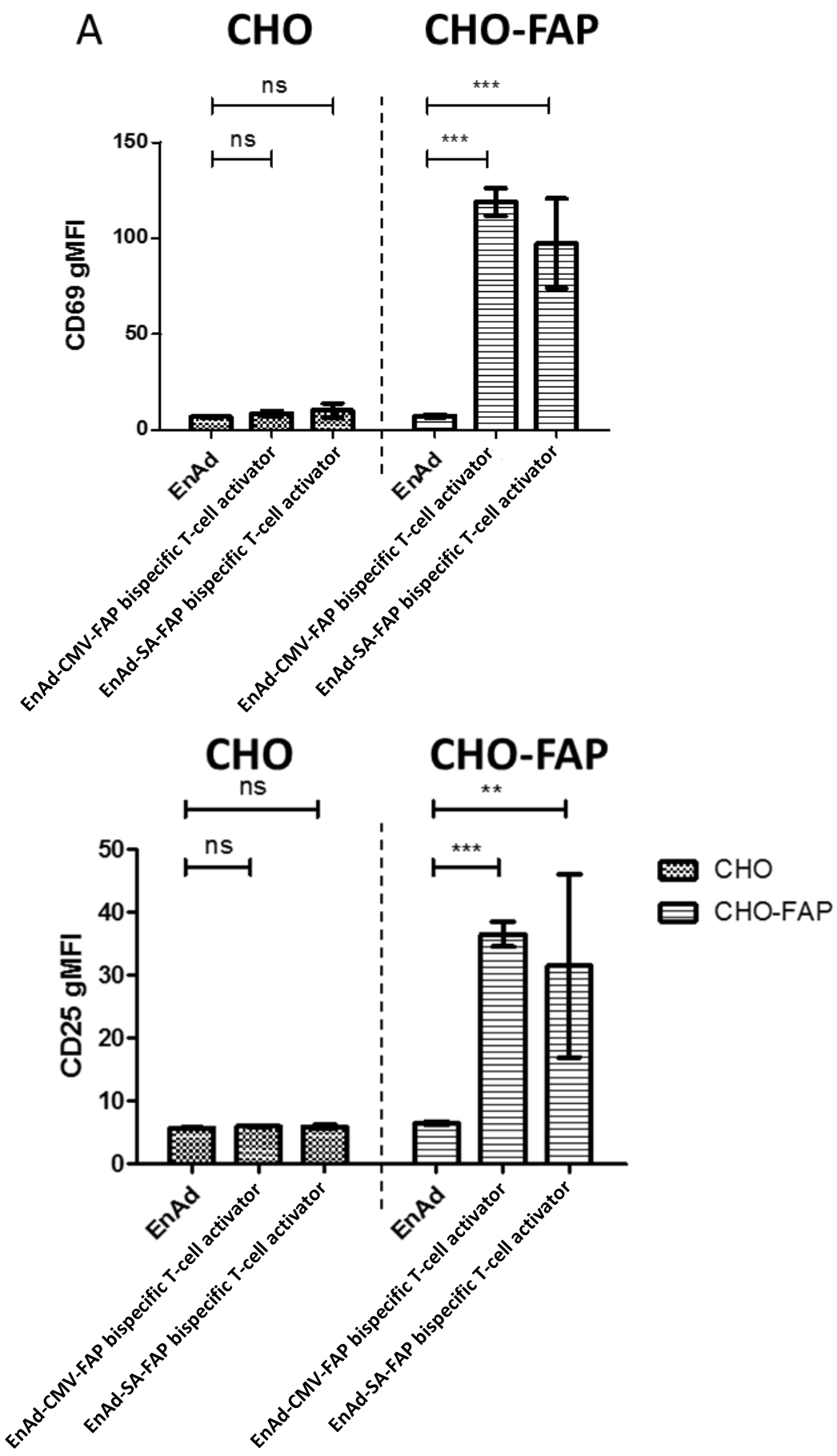

B
DLD
SKOV
GFP-positive cells (%)
Time (h)
EnAd-CMV-GFP
EnAd-SA-GFP

Figure 19


A
viral genomes/mL
1.0x10^13
1.0x10^12
1.0x10^11
1.0x10^10
1.0x10^09
24 hr
48 hr
72 hr
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-SA-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator
EnAd-CMV-FAP bispecific T-cell activator
EnAd-SA-FAP bispecific T-cell activator
B
Viable cells (%)
vp/cell
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell activator
EnAd-CMV-FAP bispecific T-cell activator
EnAd-SA-Control bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator
EnAd-SA-FAP bispecific T-cell activator

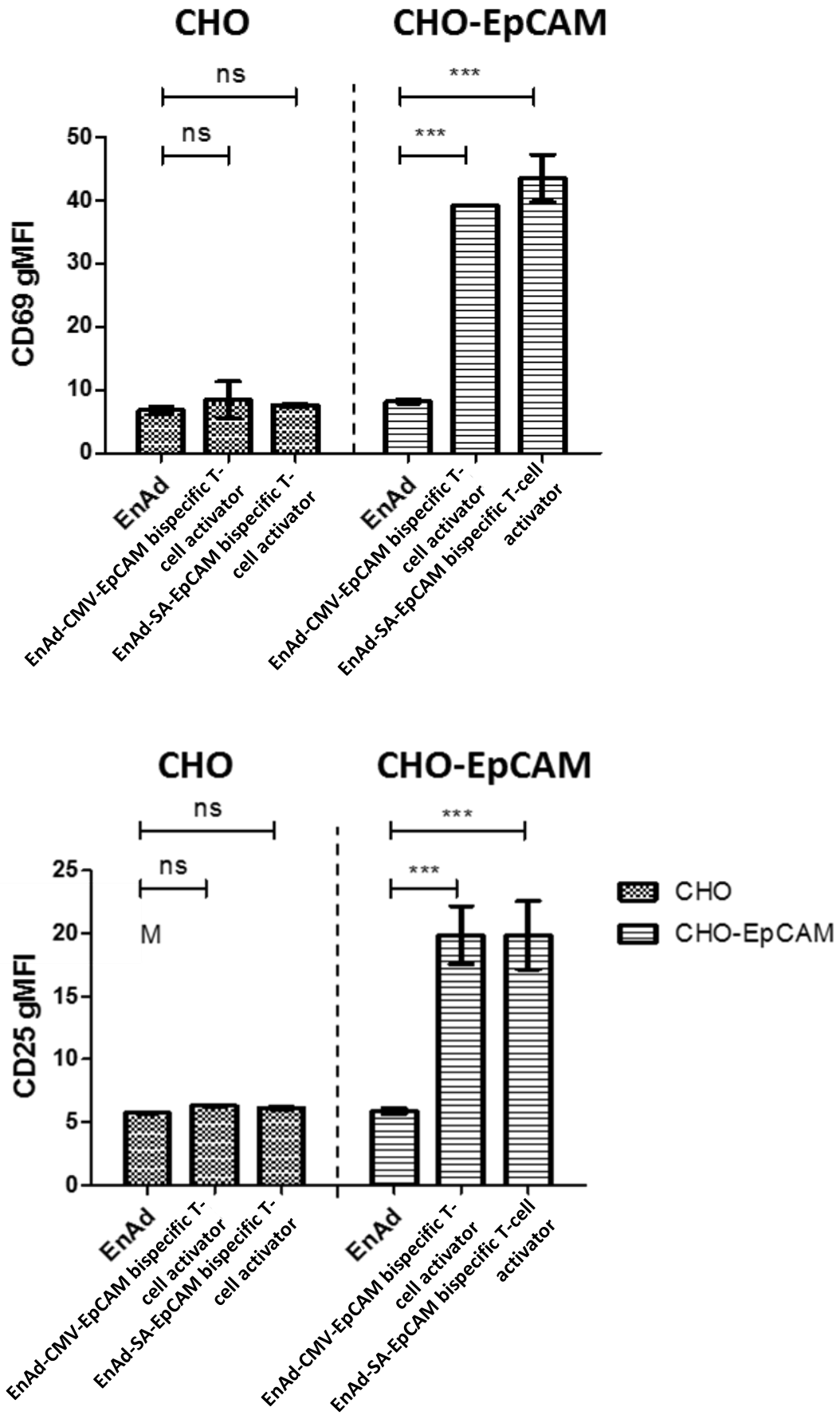
2017320776 18 Sep 2024

Figure 20A



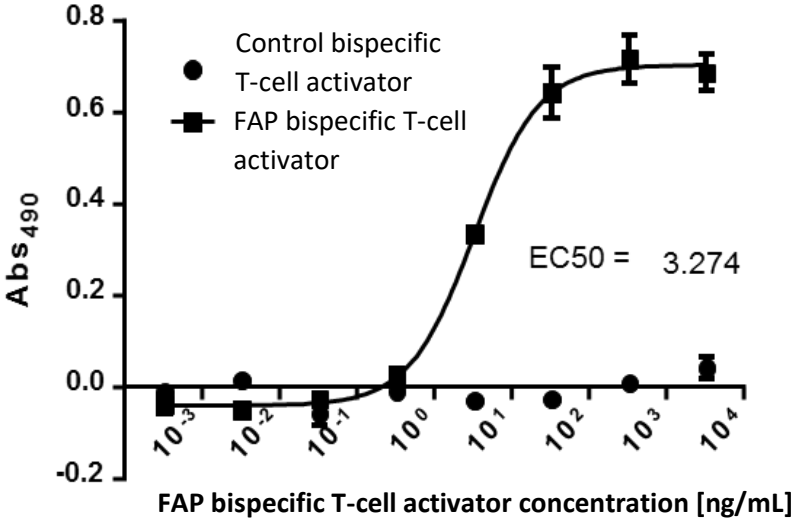
2017320776 18 Sep 2024

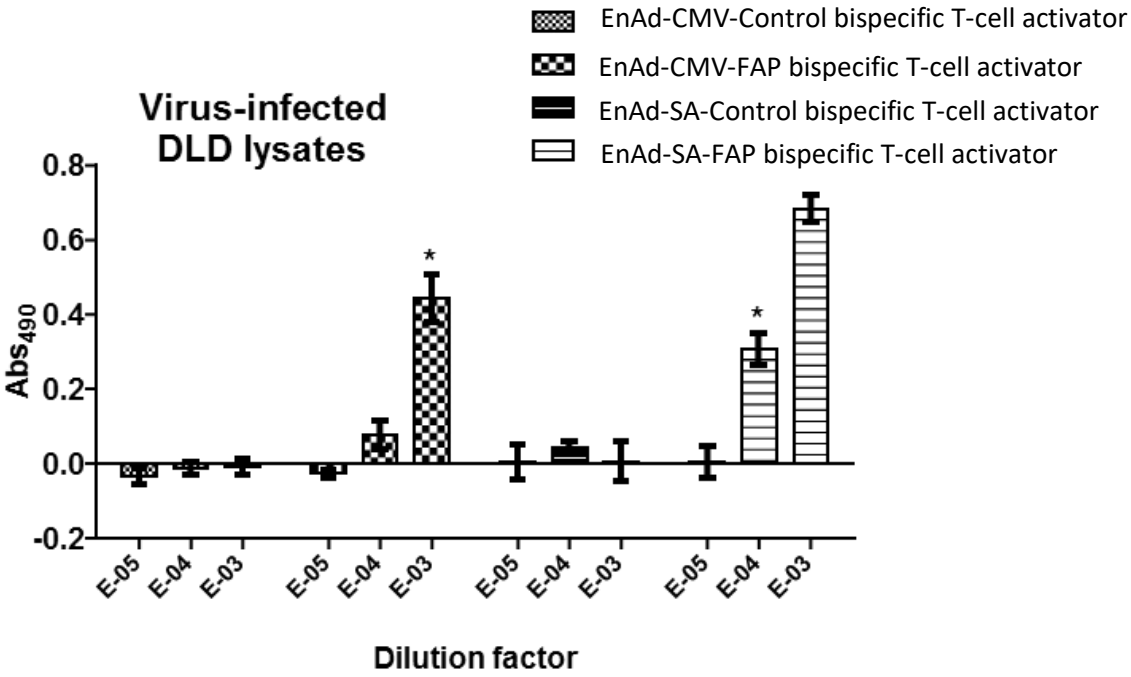
Figure 20B

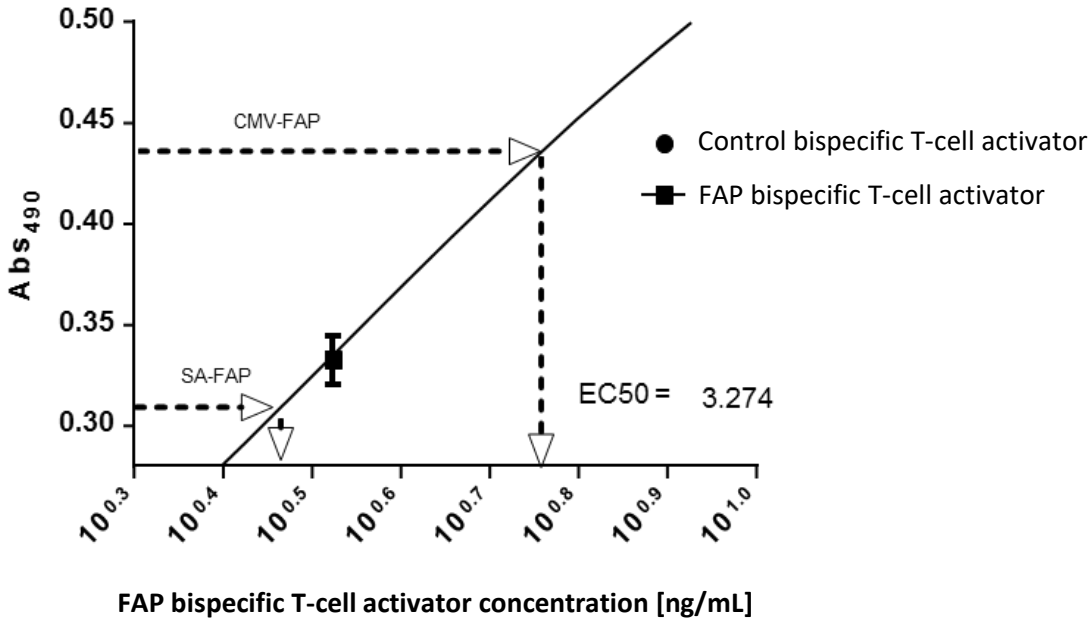


2017320776 18 Sep 2024

Figure 21

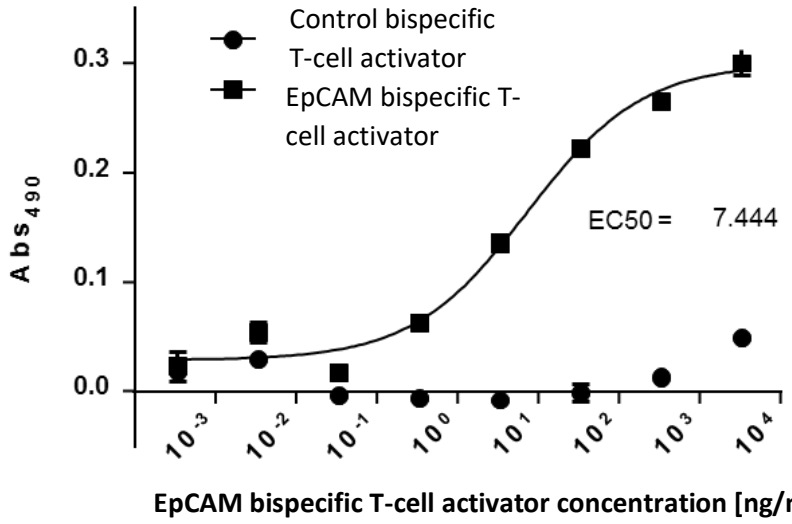


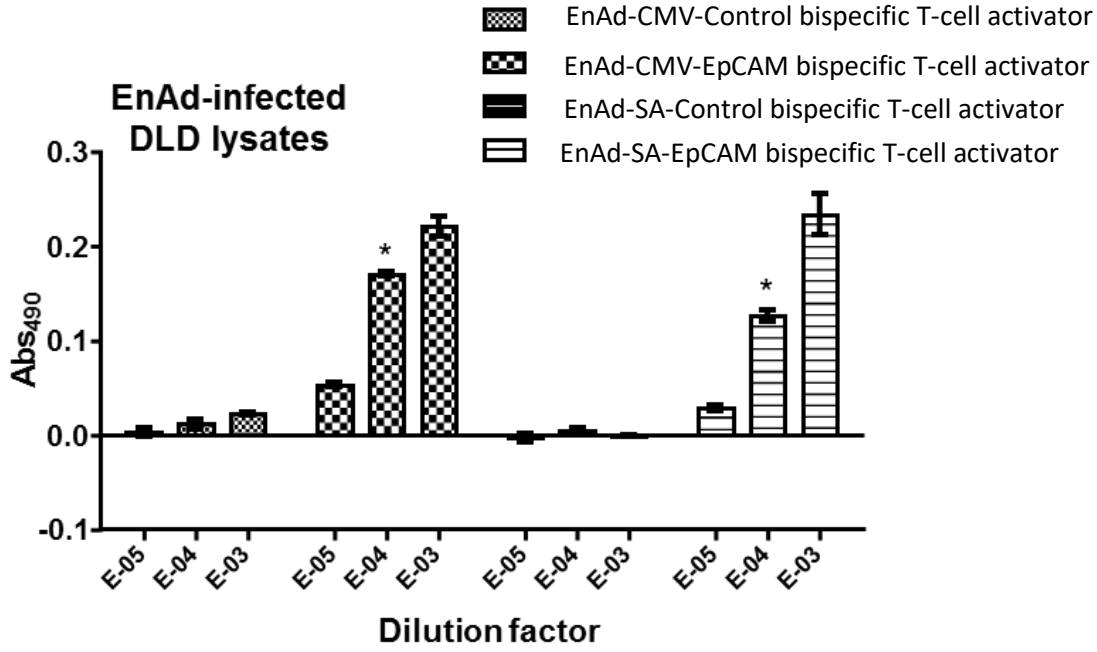




2017320776 18 Sep 2024

Figure 22





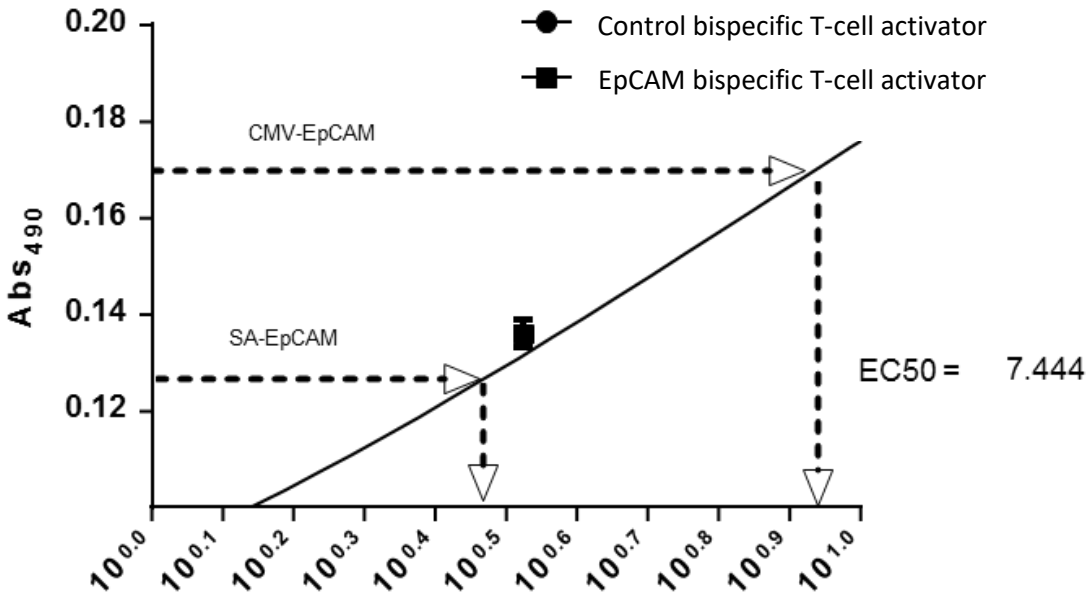
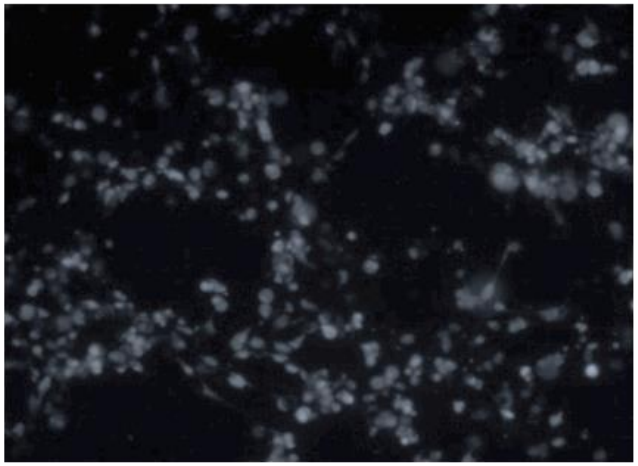
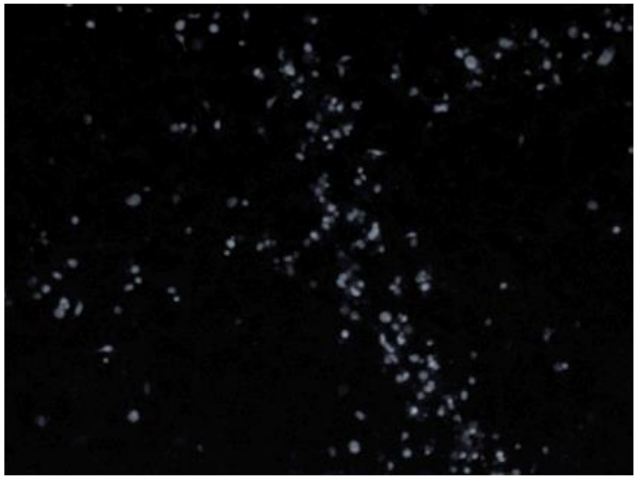


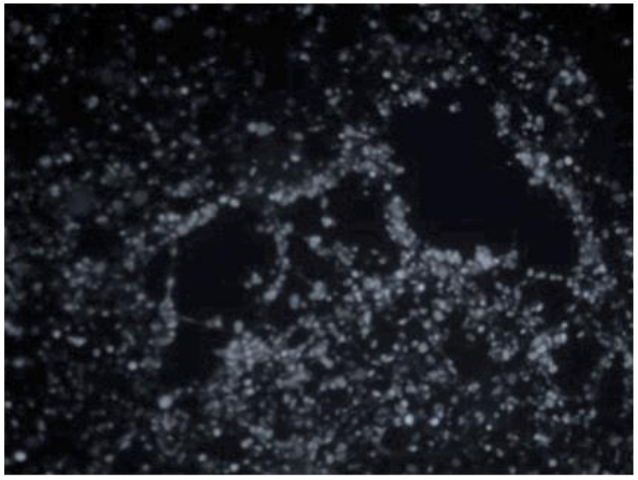
Figure 23

EnAd-SA-Control bispecific T-cell activator-P2A-RFP

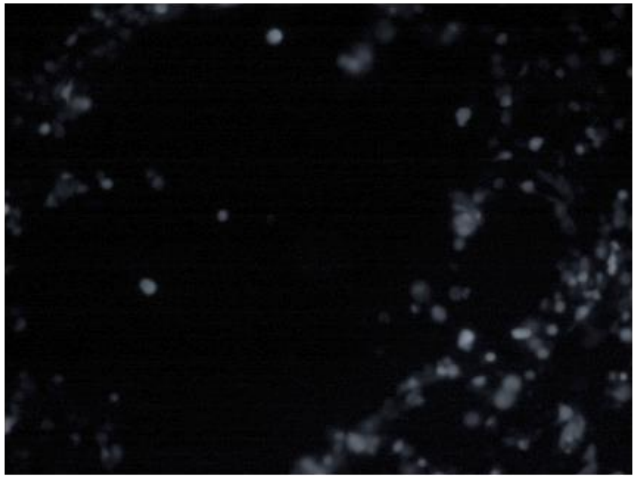


EnAd-SA-FAP bispecific T-cell activator-P2A-RFP



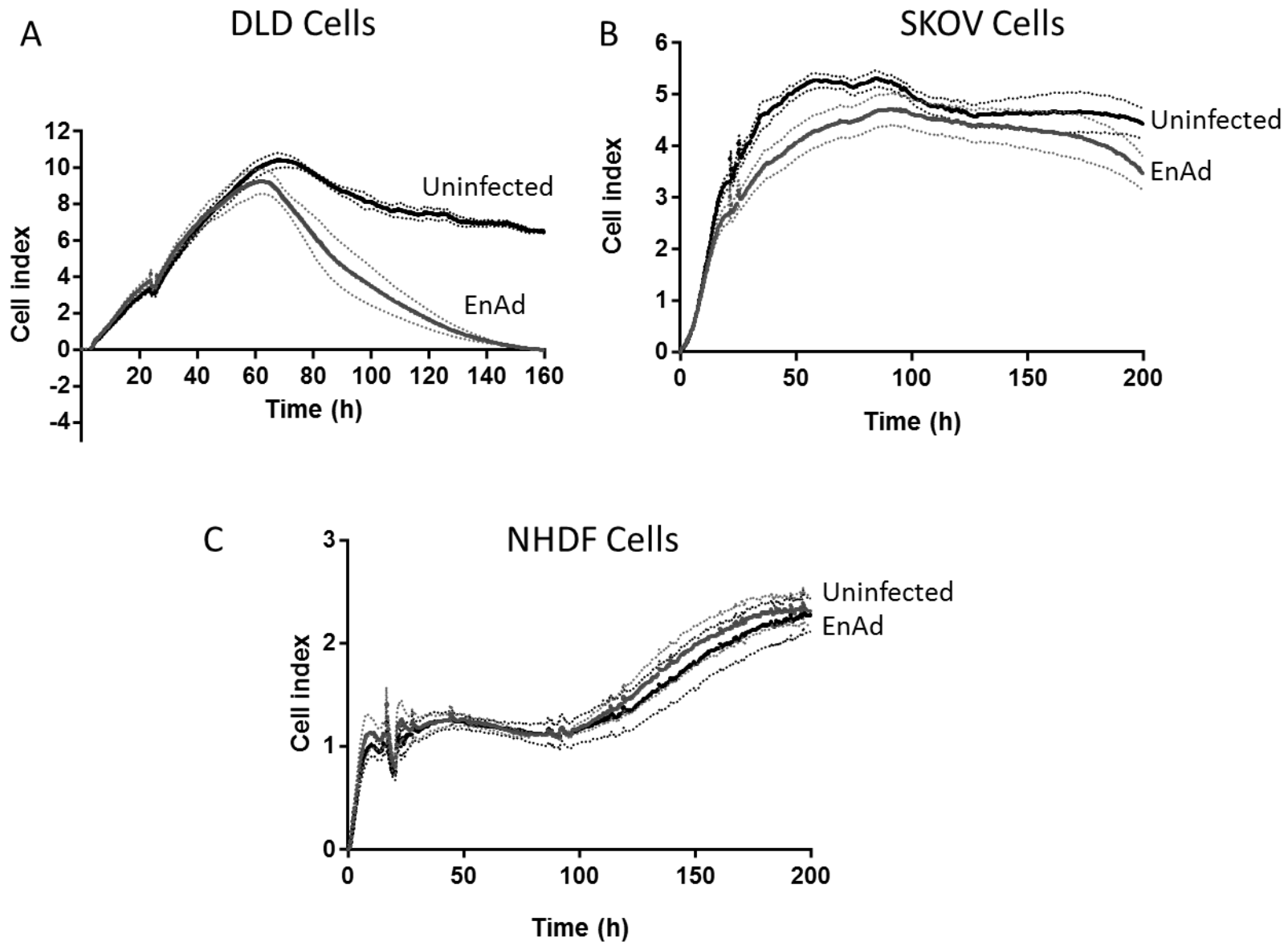


EnAd-CMV-Control bispecific T-cell activator-P2A-RFP



EnAd-CMV-FAP bispecific T-cell activator-P2A-RFP

Figure 24


A
DLD Cells
Cell index
Time (h)
Uninfected
EnAd
B
SKOV Cells
Cell index
Time (h)
Uninfected
EnAd
C
NHDF Cells
Cell index
Time (h)
Uninfected
EnAd

2017320776 18 Sep 2024

Figure 25A

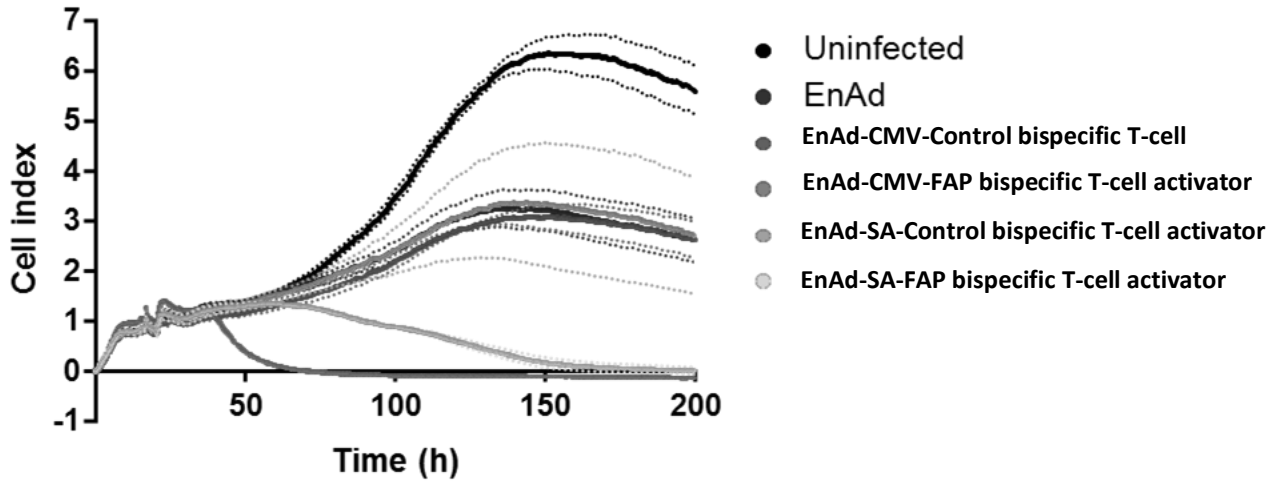
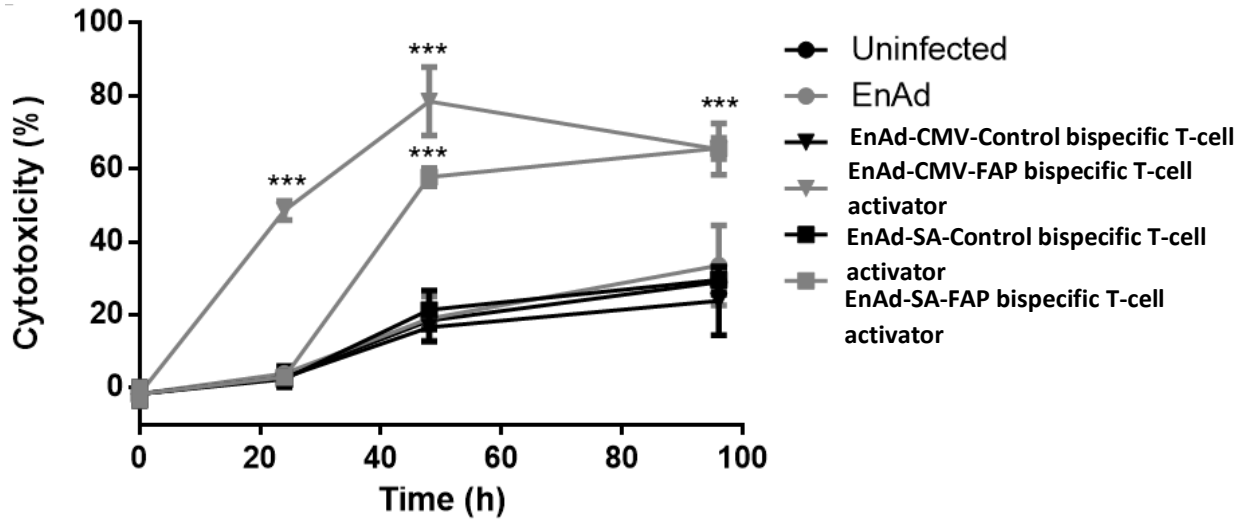
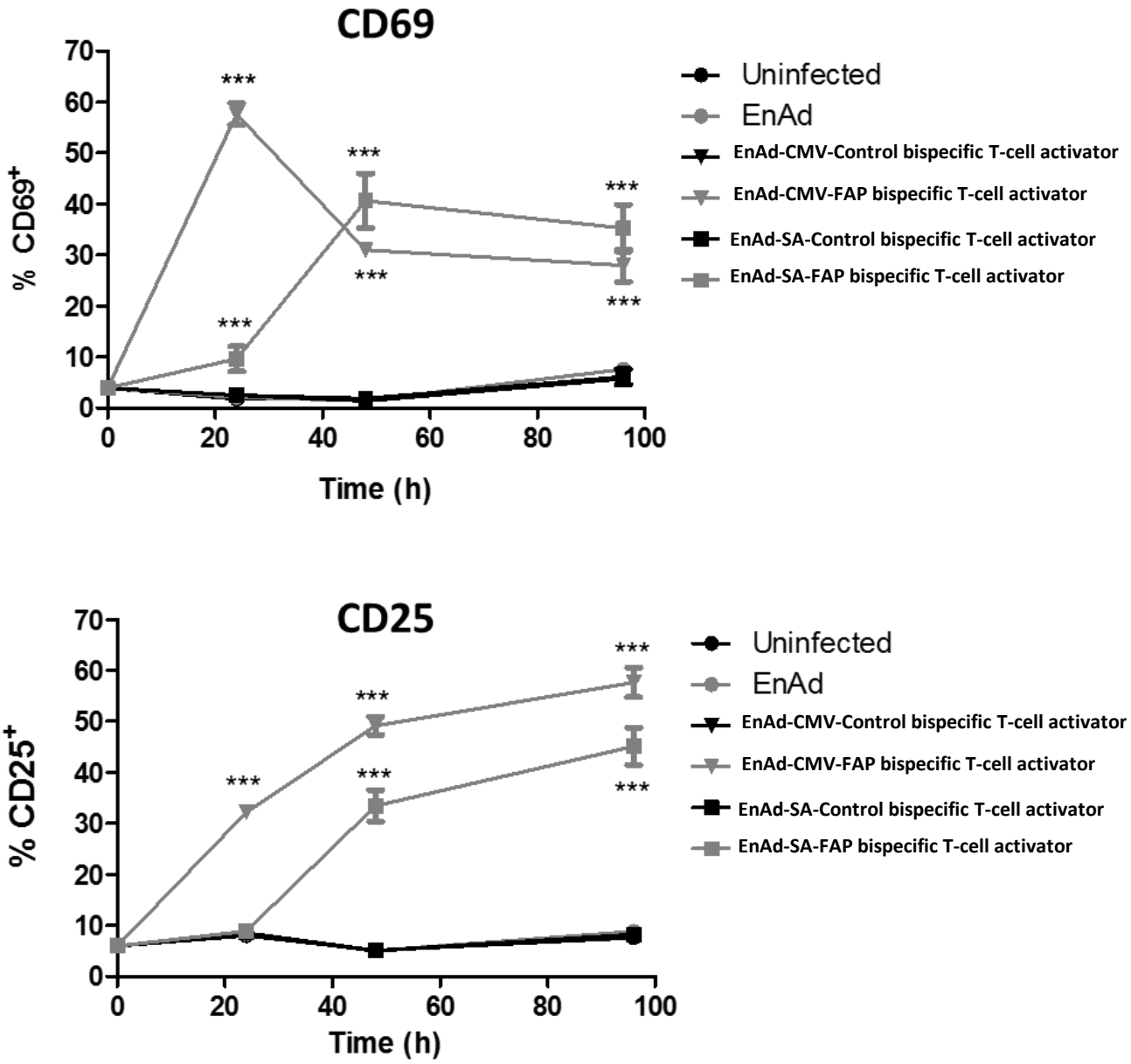


Figure 25B



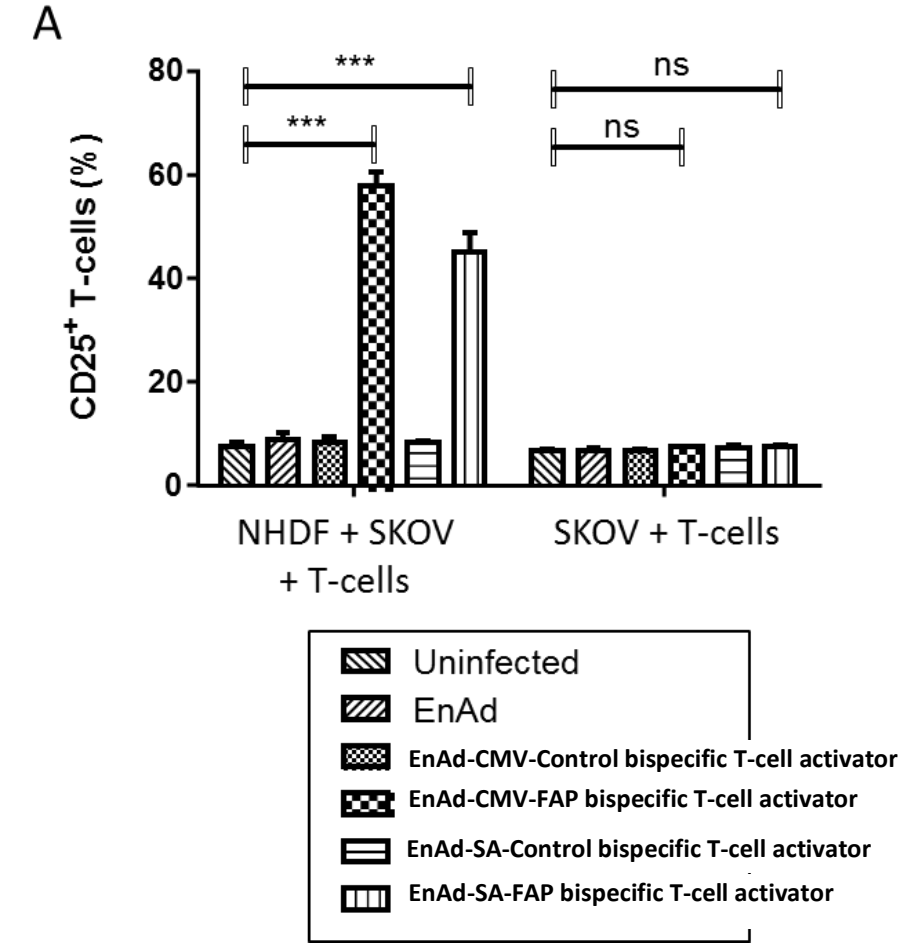
2017320776 18 Sep 2024

Figure 26



2017320776 18 Sep 2024

Figure 27



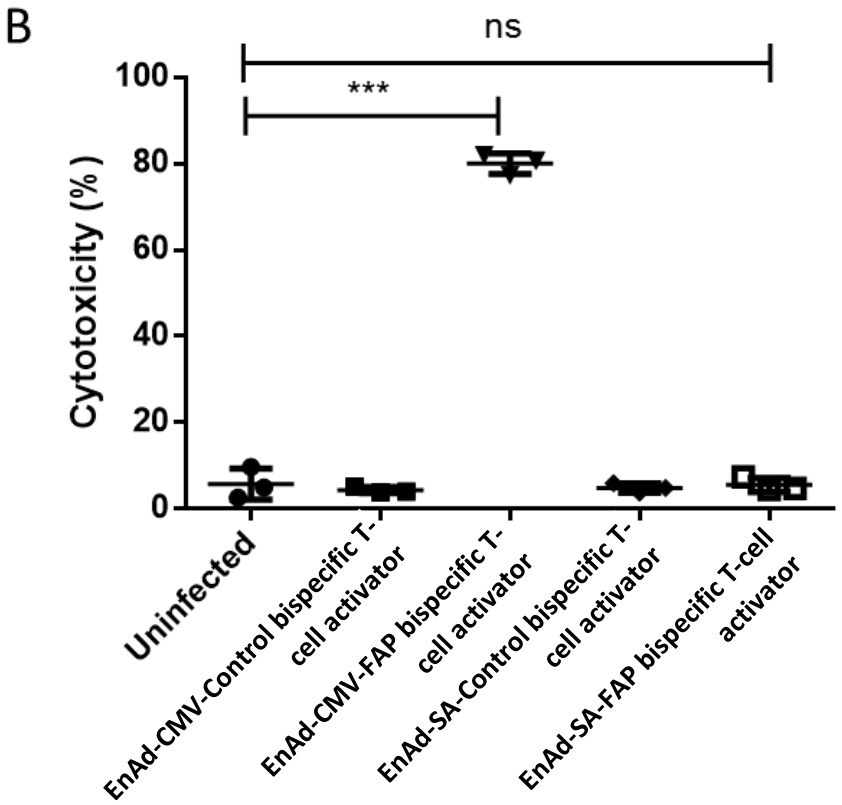


Figure 28

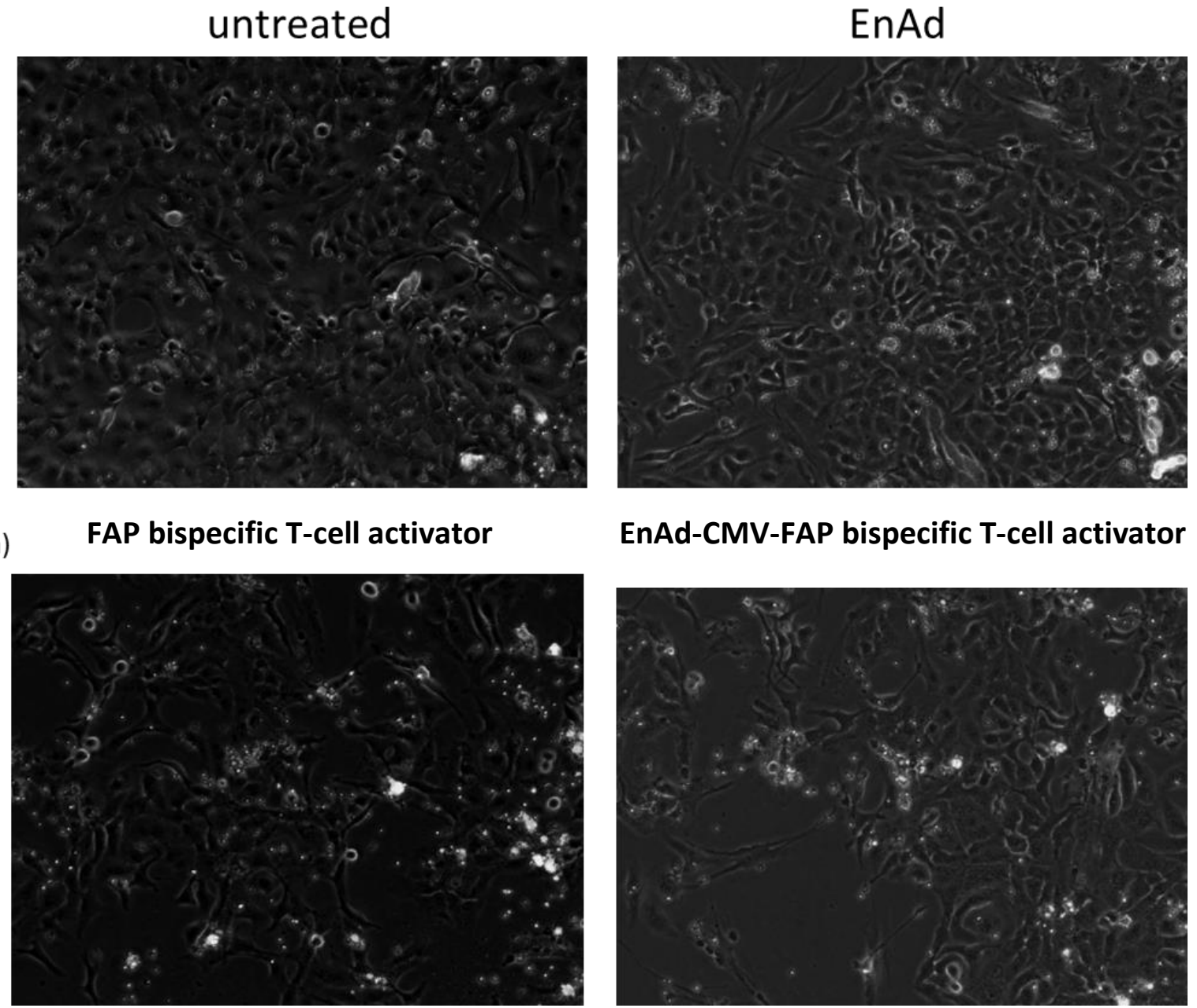

untreated
EnAd
SKOV (unstained)
NHDF (red)
caspase stain (green)
Virus – 100 vp/cell
FAP bispecific T-cell activator
EnAd-CMV-FAP bispecific T-cell activator

Figure 29

EnAd-CMV-Control bispecific T-cell activator/RFP

EnAd-CMV-FAP bispecific T-cell activator/RFP

EnAd-SA-Control bispecific T-cell activator/RFP

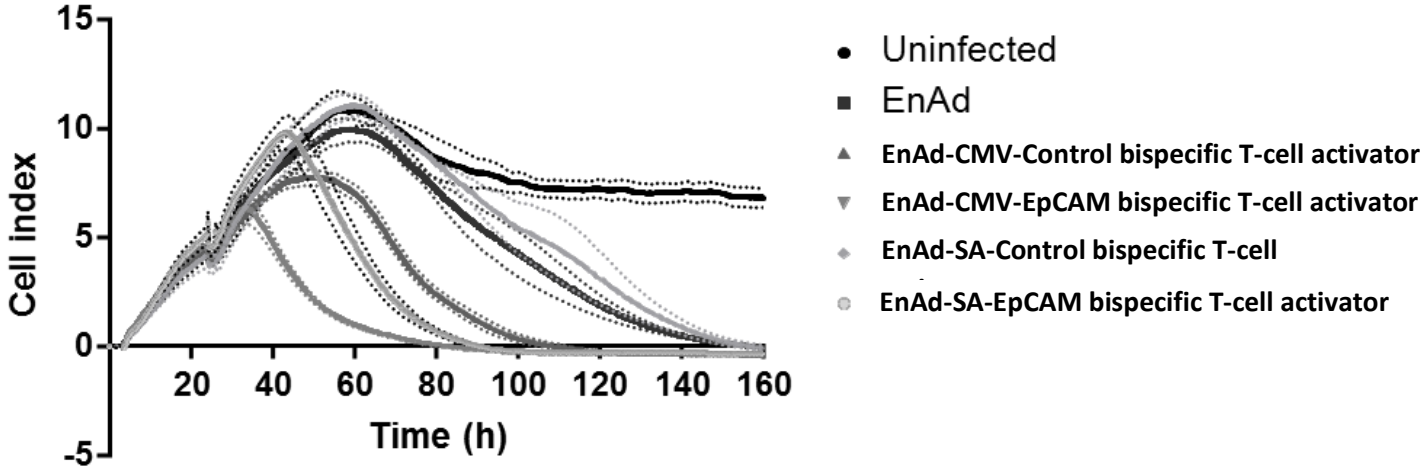
EnAd-SA-FAP bispecific T-cell activator/RFP

- SKOV (unstained)
- NHDF (green)
- RFP virus (red) – MOI of 1 for CMV, 10 for SA

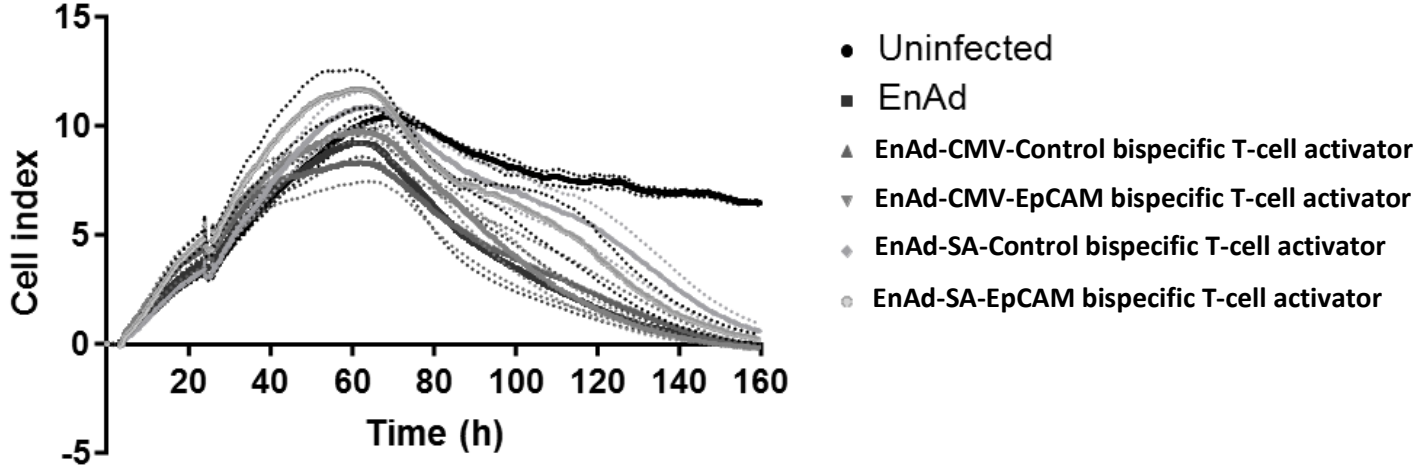
18 Sep 2024
2017320776

Figure 30

With T-cells added



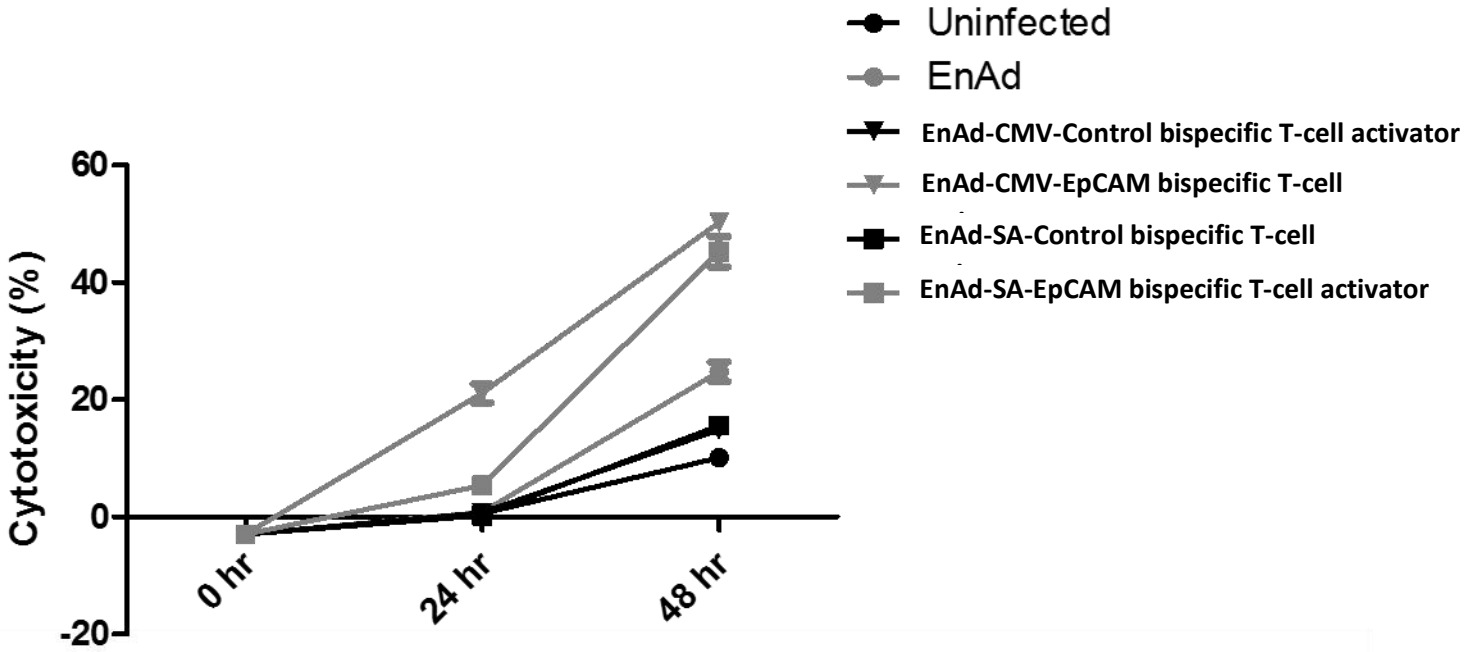
No T-cells added



2017320776 18 Sep 2024

Figure 31

With T-cells added



No T-cells added

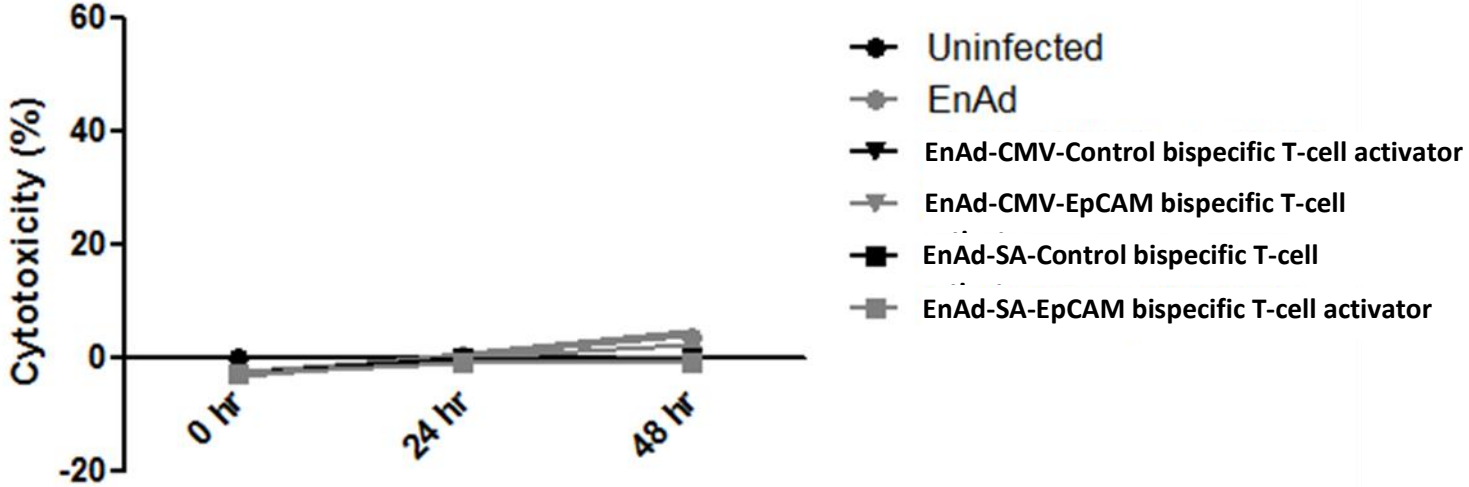


Figure 32

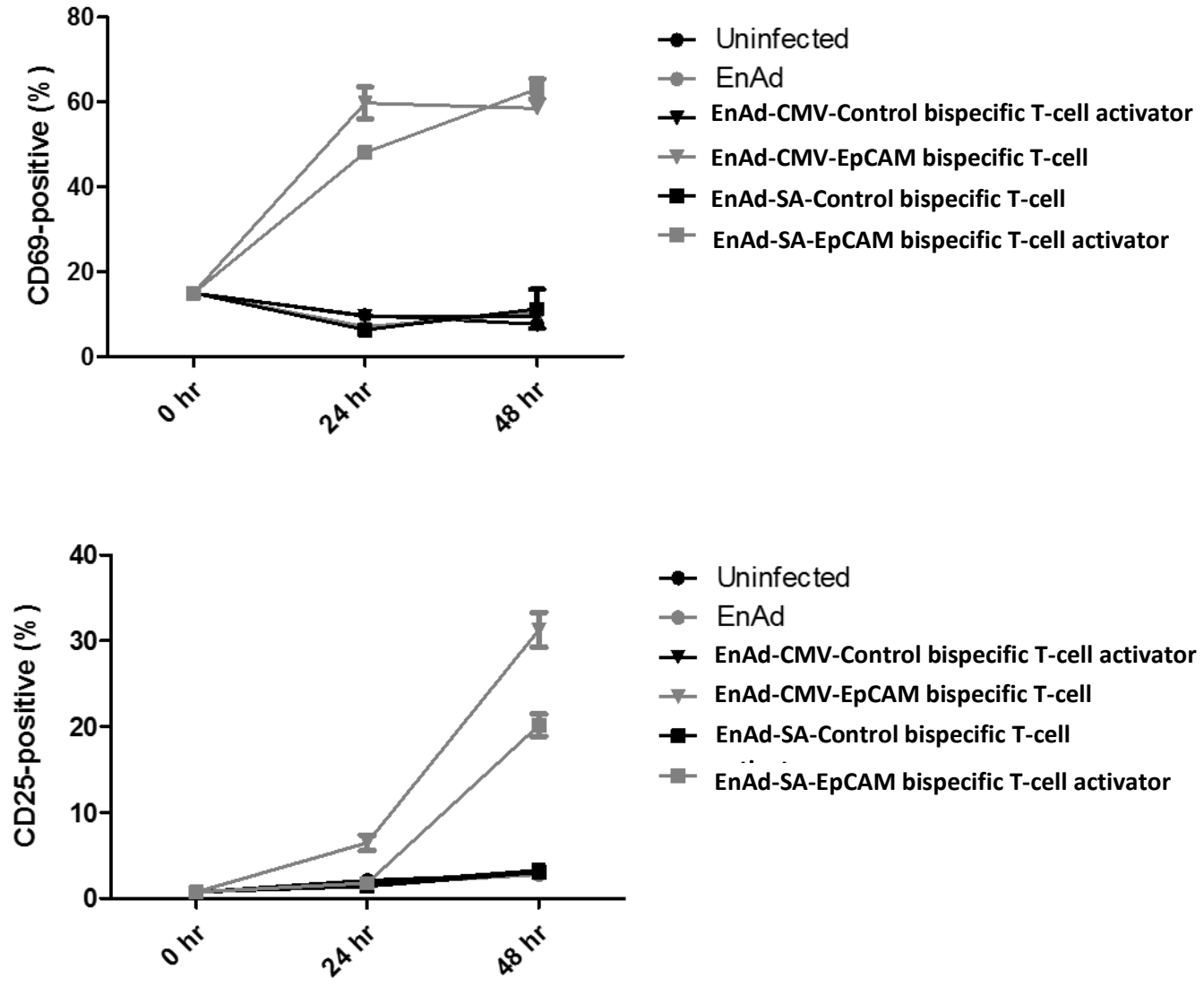
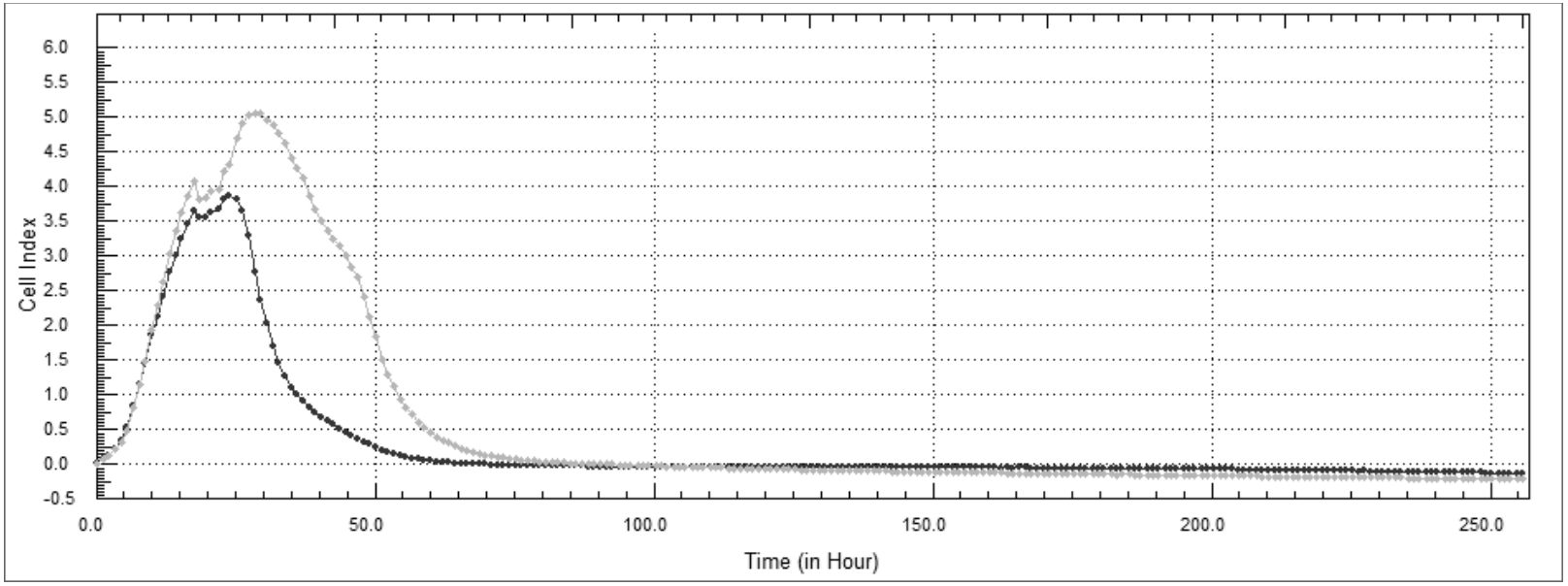

CD69-positive (%)
80
60
40
20
0
0 hr
24 hr
48 hr
Uninfected
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell
EnAd-SA-Control bispecific T-cell
EnAd-SA-EpCAM bispecific T-cell activator
CD25-positive (%)
40
30
20
10
0
0 hr
24 hr
48 hr
Uninfected
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell
EnAd-SA-Control bispecific T-cell
EnAd-SA-EpCAM bispecific T-cell activator

Figure 33

MOI: 10



Light grey – no T-cells added
Dark grey - T-cells added

MOI: 1

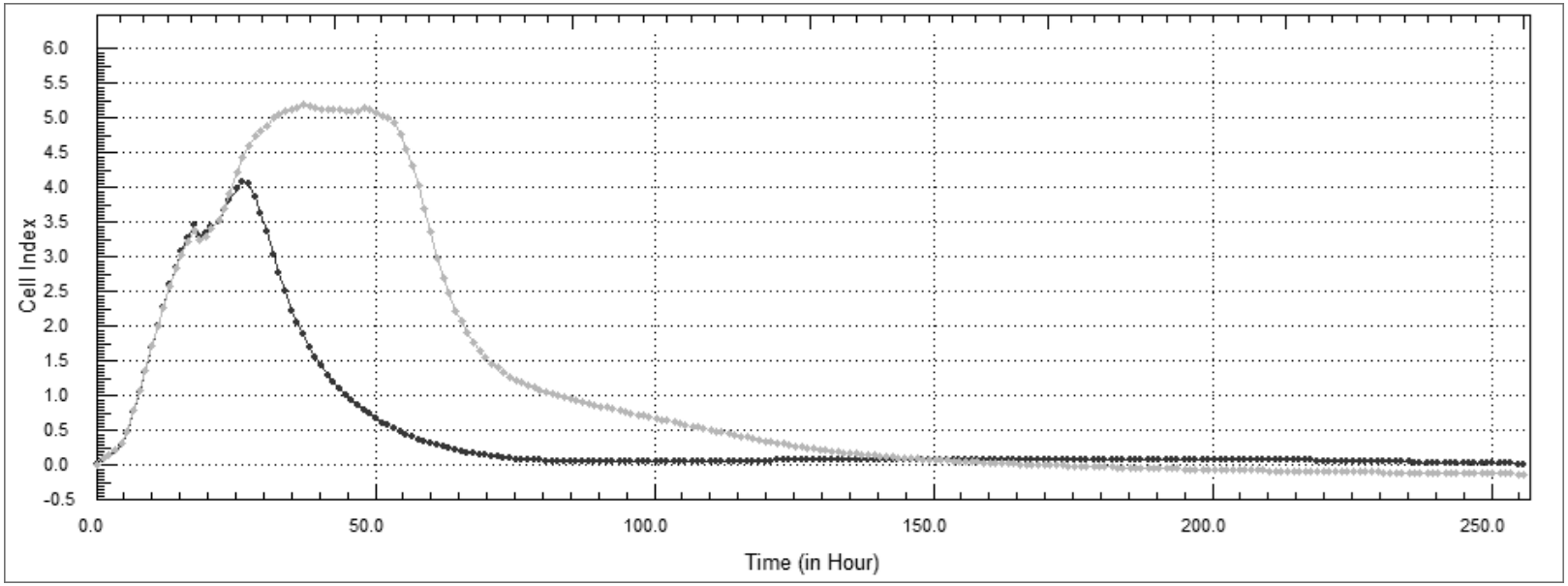
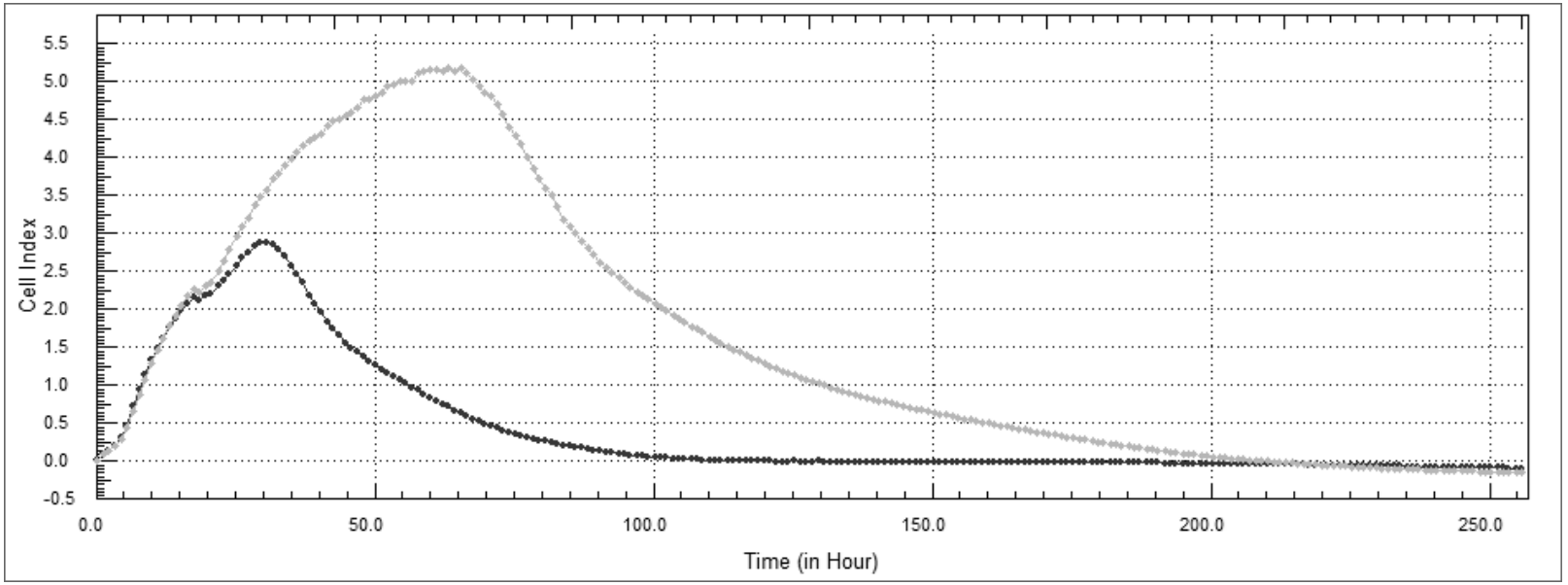


Figure 33 cont.

MOI: 0.1



Light grey –
no T-cells added
Dark grey -
T-cells added

MOI: 0.01

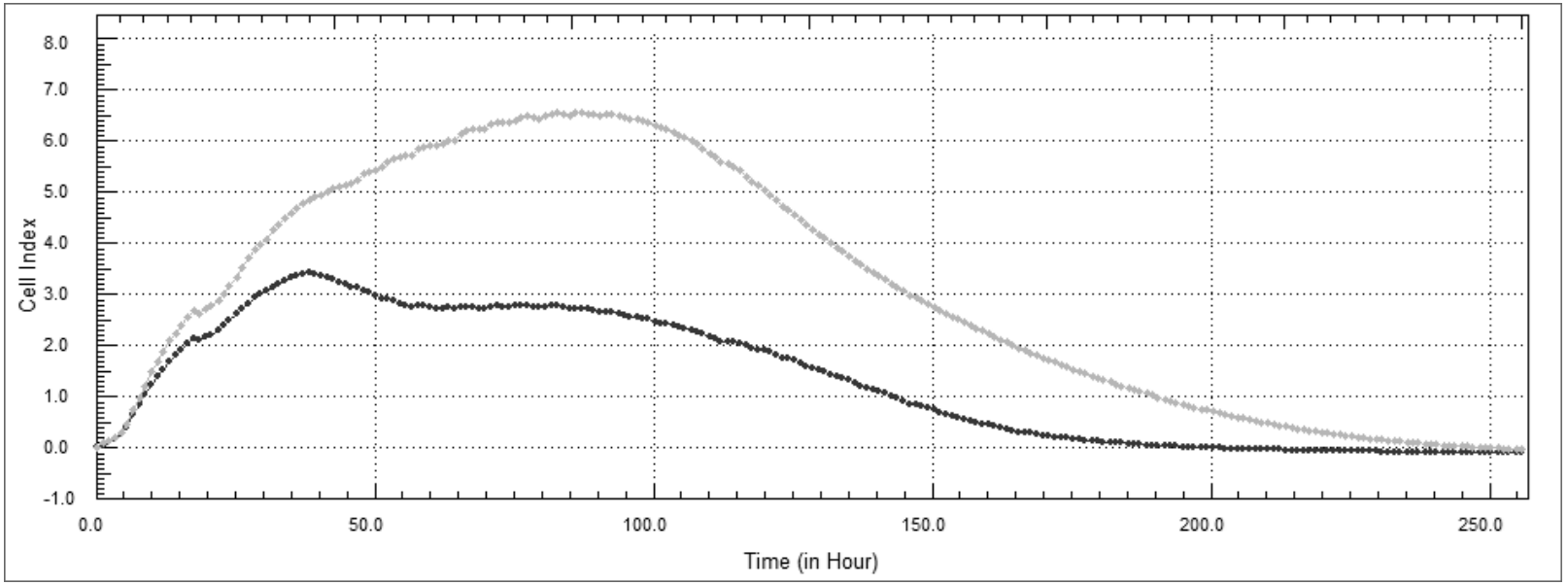
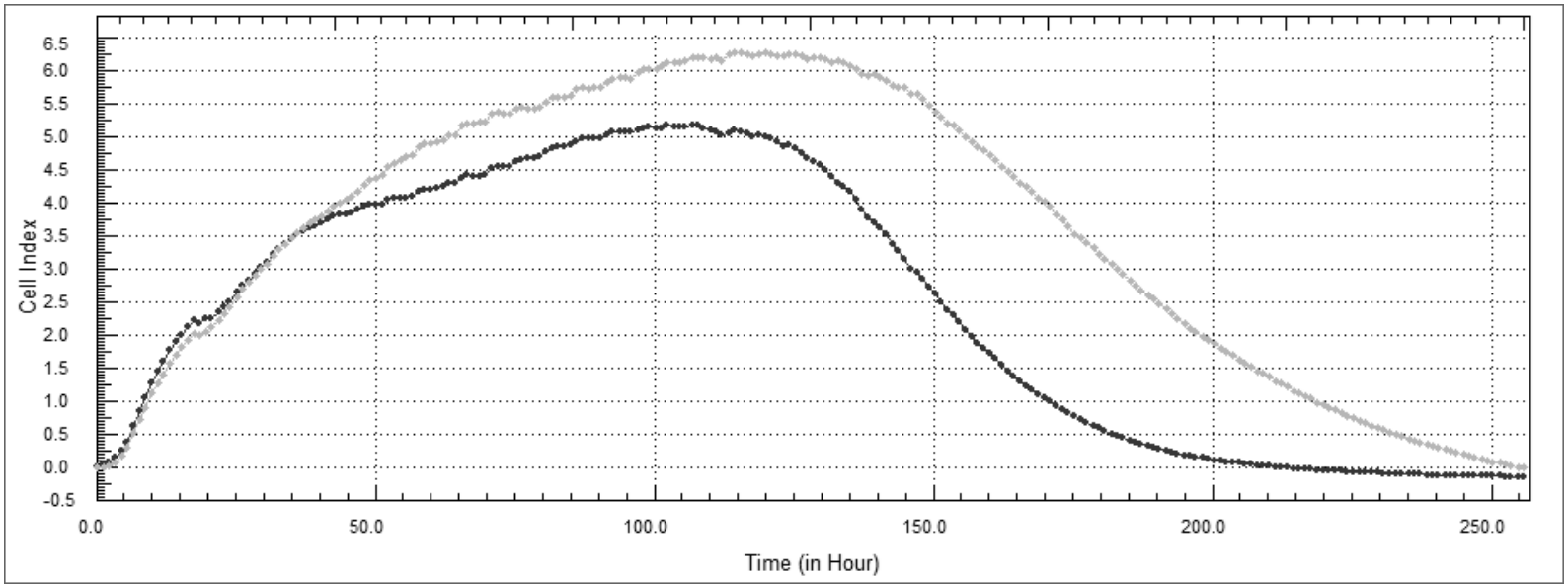


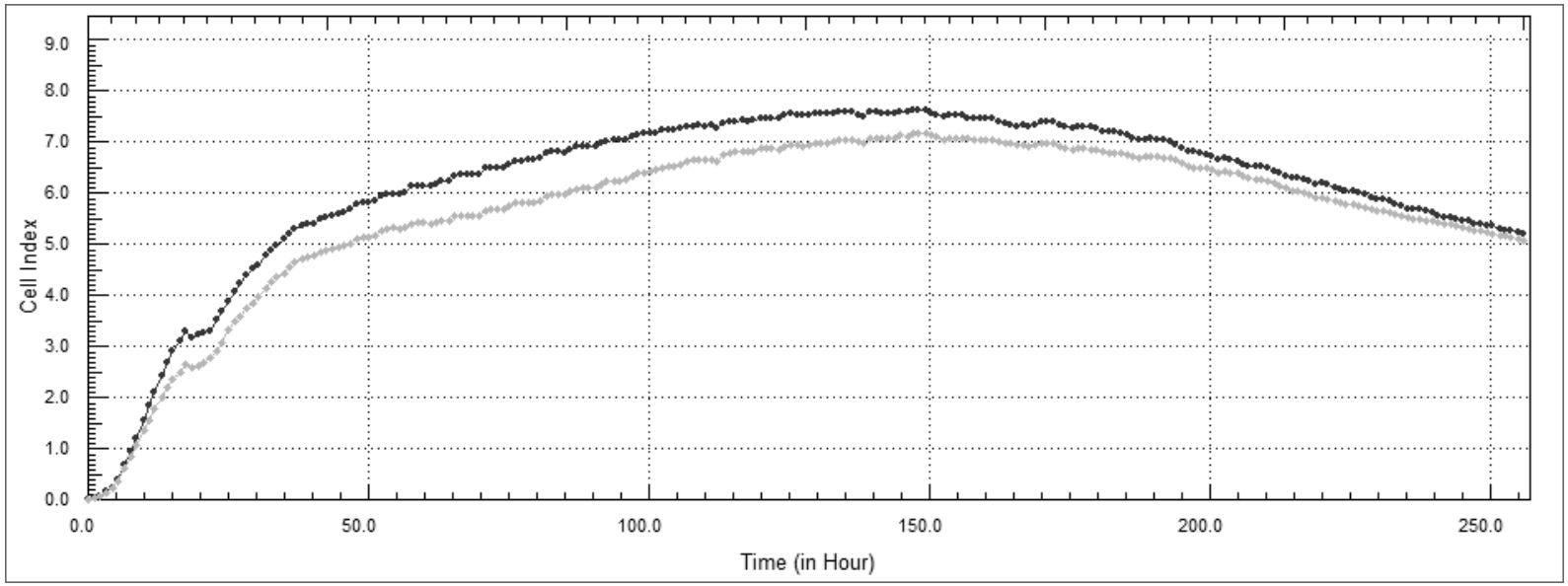
Figure 33 cont.

MOI: 0.001



Light grey –
no T-cells added
Dark grey -
T-cells added

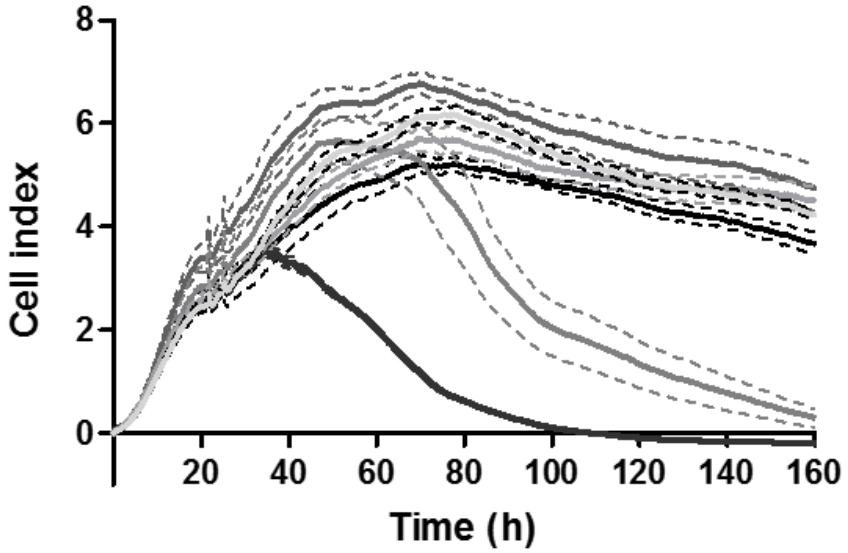
MOI: 0



2017320776 18 Sep 2024

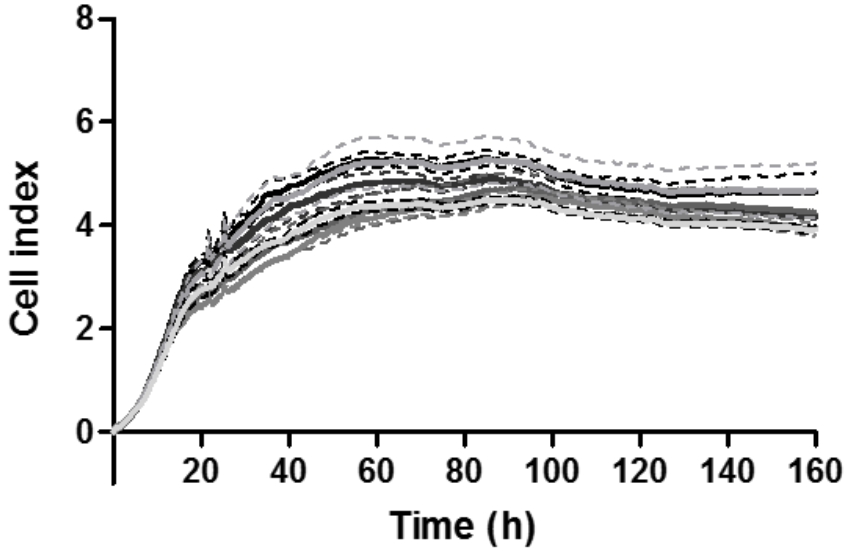
Figure 34

With T-cells added



- Uninfected
- EnAd
- EnAd-CMV-Control bispecific T-cell activator
- EnAd-CMV-EpCAM bispecific T-cell
- EnAd-SA-Control bispecific T-cell
- EnAd-SA-EpCAM bispecific T-cell activator

No T-cells added

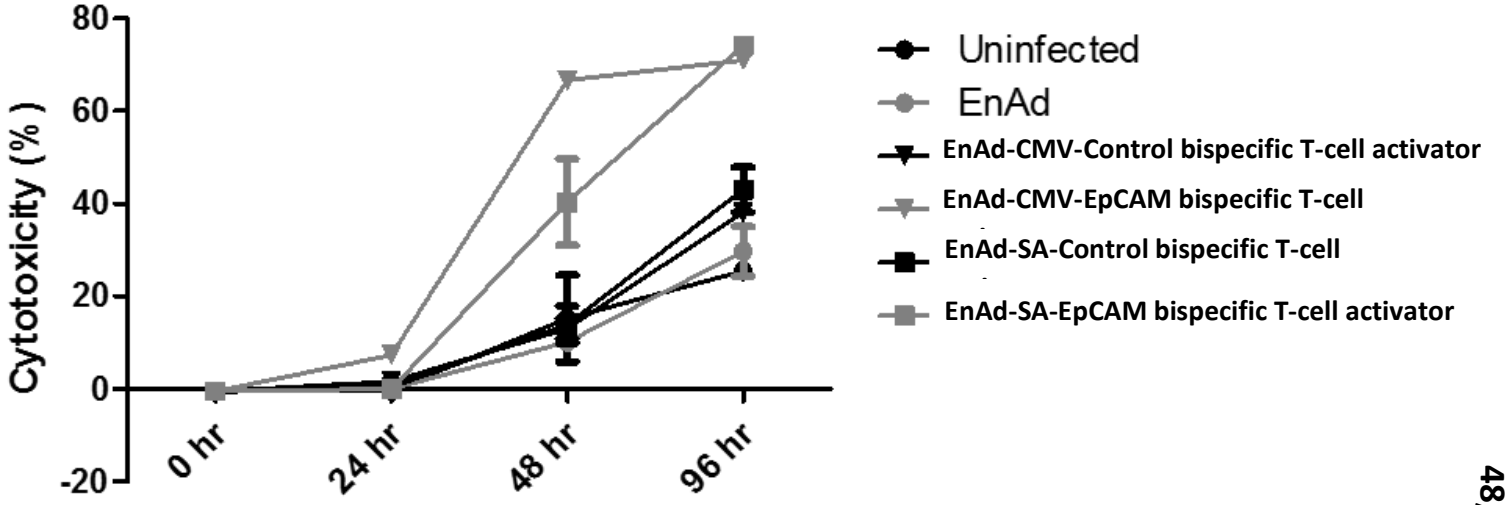


- Uninfected
- EnAd
- EnAd-CMV-Control bispecific T-cell activator
- EnAd-CMV-EpCAM bispecific T-cell
- EnAd-SA-Control bispecific T-cell
- EnAd-SA-EpCAM bispecific T-cell activator

2017320776 18 Sep 2024

Figure 35

With T-cells added



No T-cells added

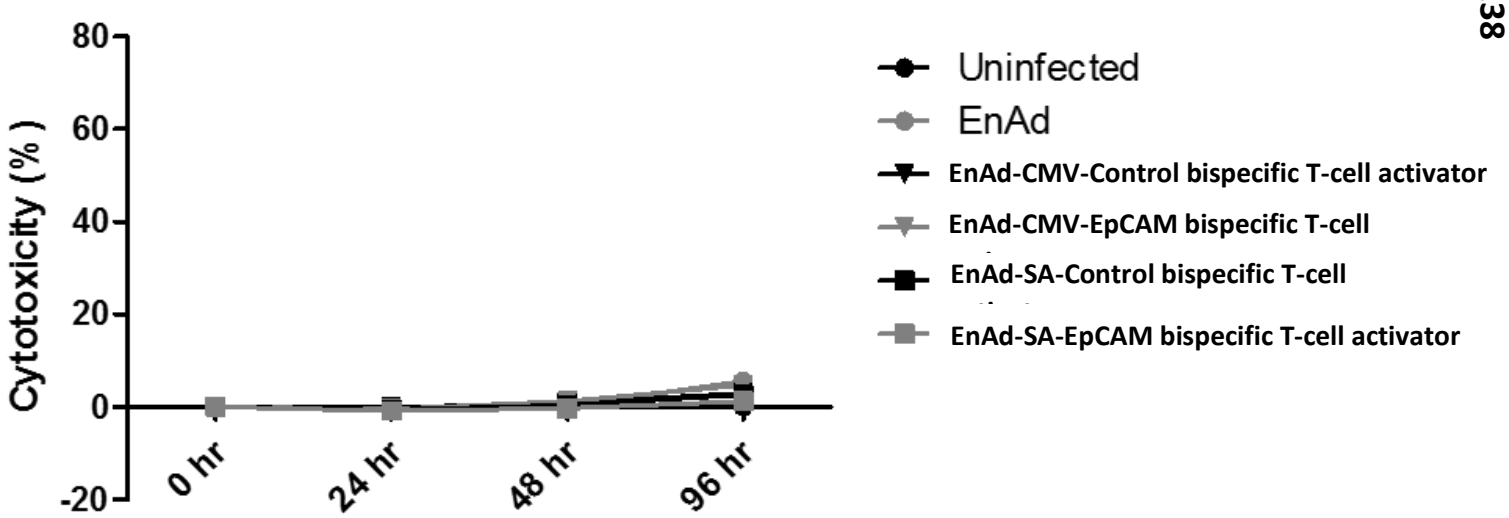


Figure 36

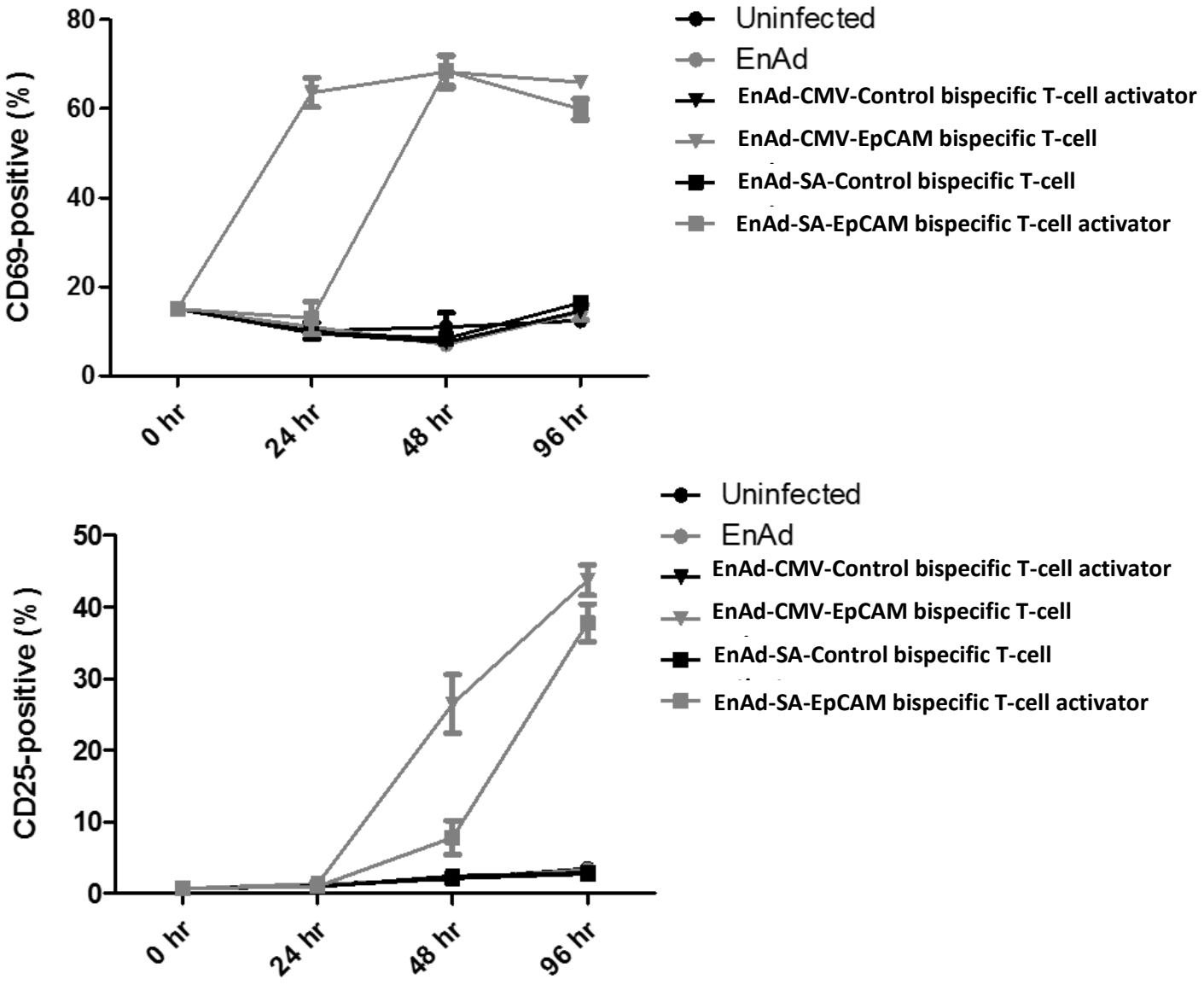

CD69-positive (%)
80
60
40
20
0
0 hr
24 hr
48 hr
96 hr
Uninfected
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell
EnAd-SA-Control bispecific T-cell
EnAd-SA-EpCAM bispecific T-cell activator
CD25-positive (%)
50
40
30
20
10
0
0 hr
24 hr
48 hr
96 hr
Uninfected
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell
EnAd-SA-Control bispecific T-cell
EnAd-SA-EpCAM bispecific T-cell activator

Figure 37

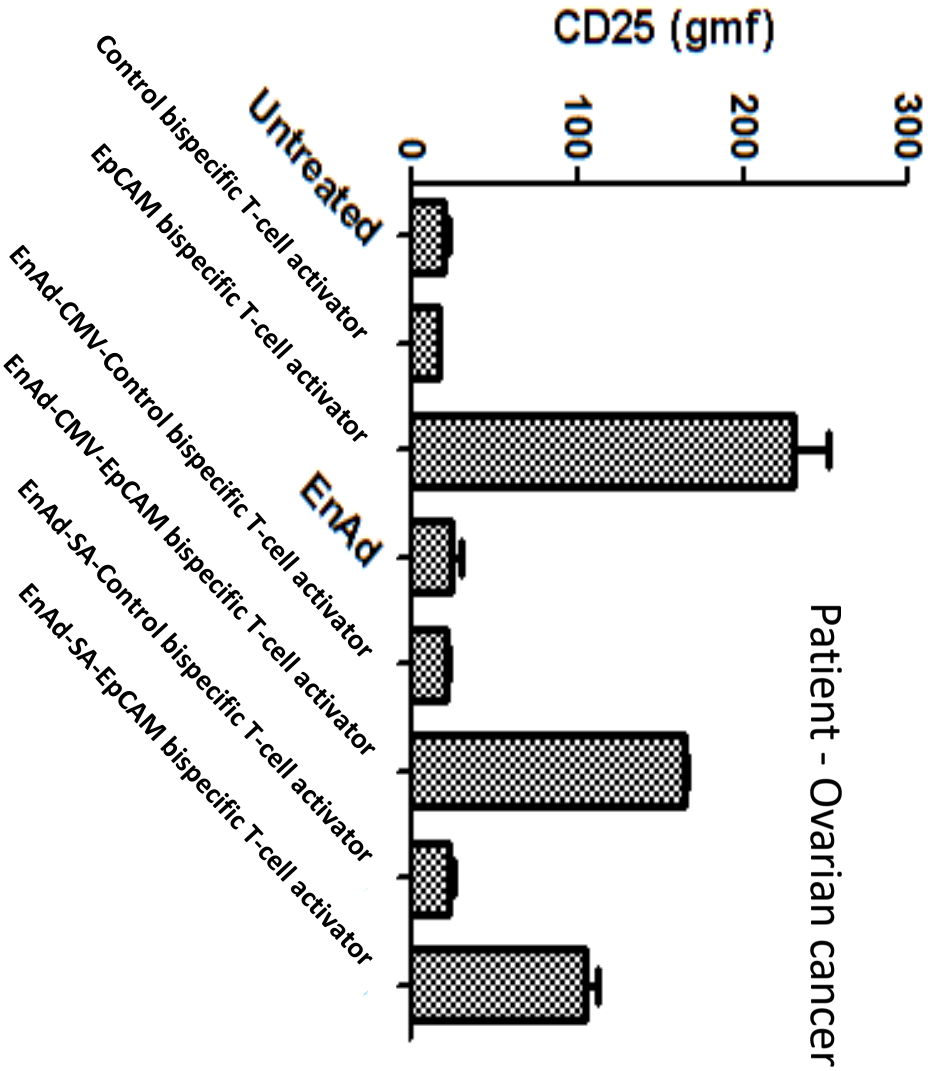
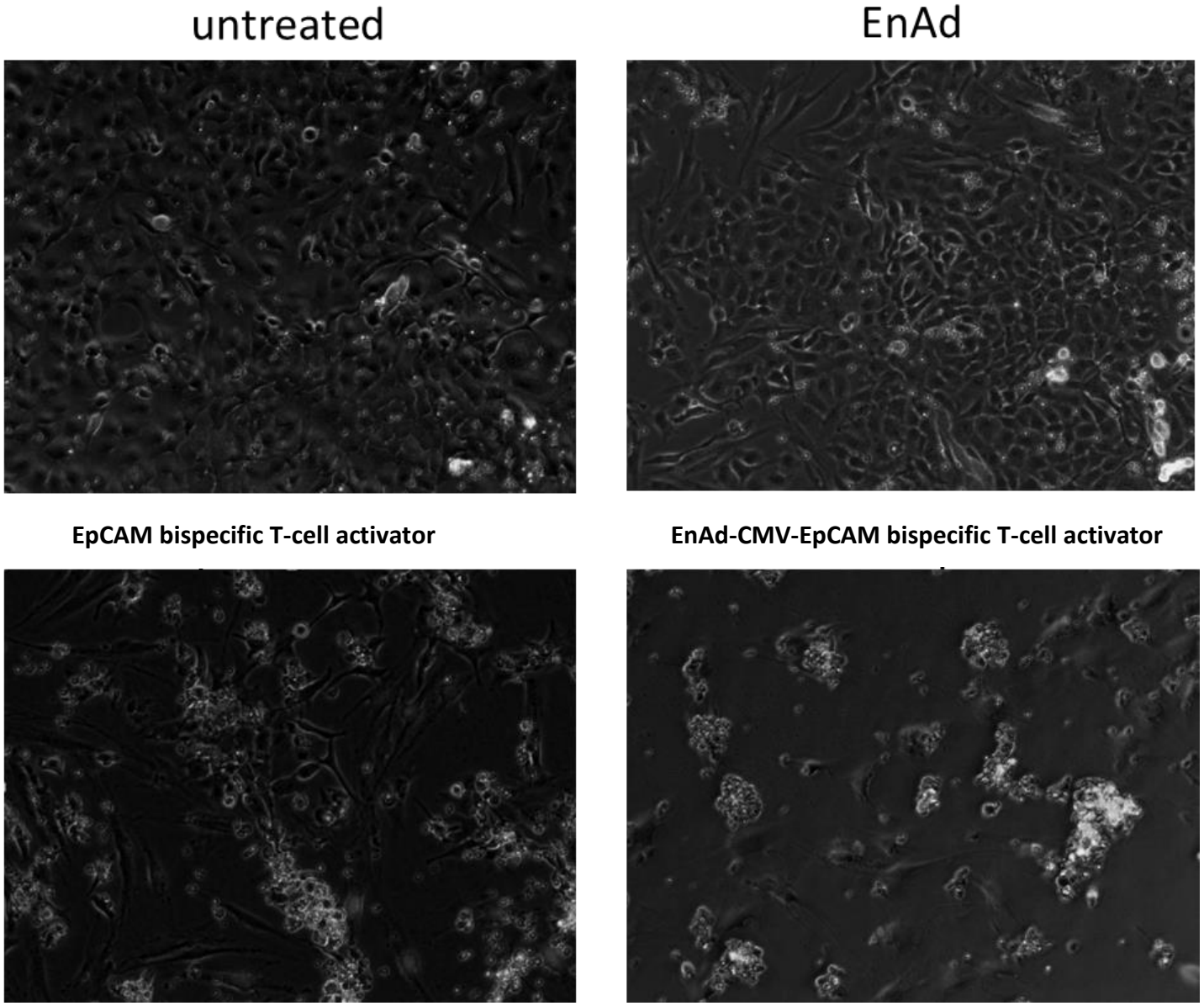

CD25 (gmf)
0
100
200
300
Untreated
EnAd
Control bispecific T-cell activator
EpCAM bispecific T-cell activator
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell activator
EnAd-SA-Control bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator
Patient - Ovarian cancer

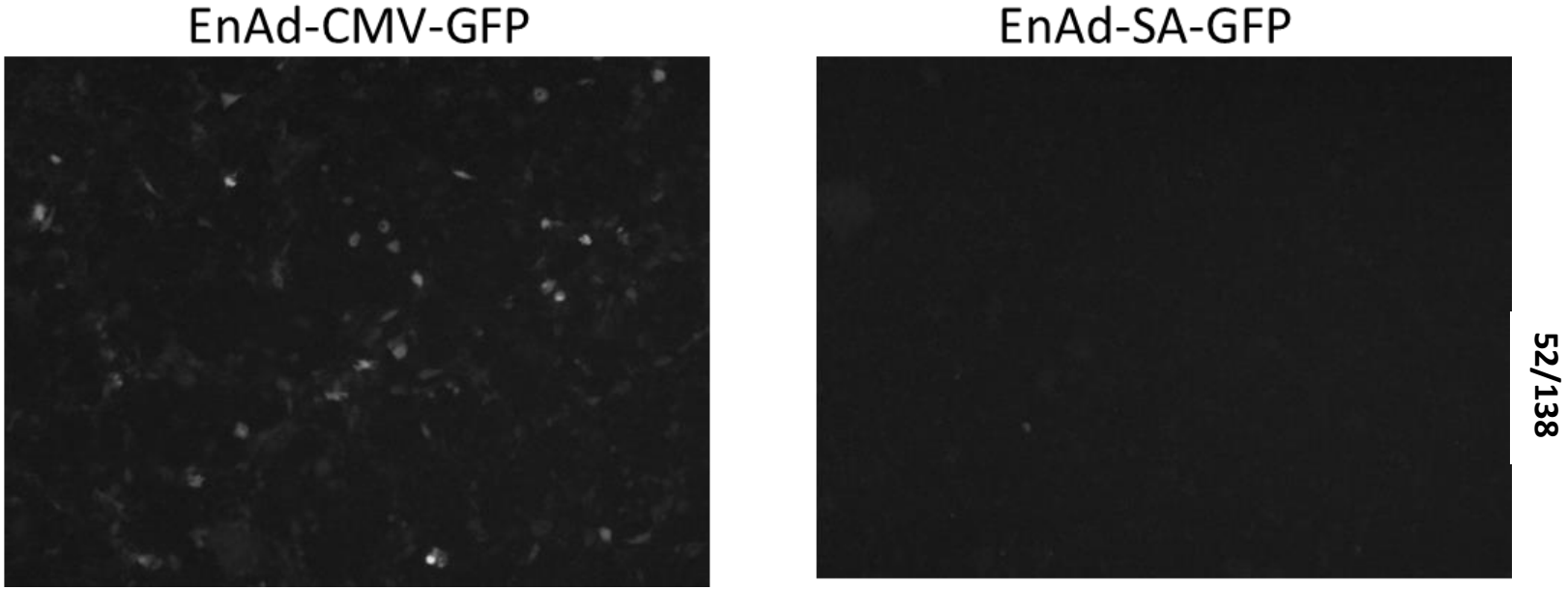
Figure 38

- SKOV (unstained)
- NHDF (red)
- caspase stain (green)
- Virus – 100 vp/cell



2017320776 18 Sep 2024

Figure 39



2017320776 18 Sep 2024

Figure 40

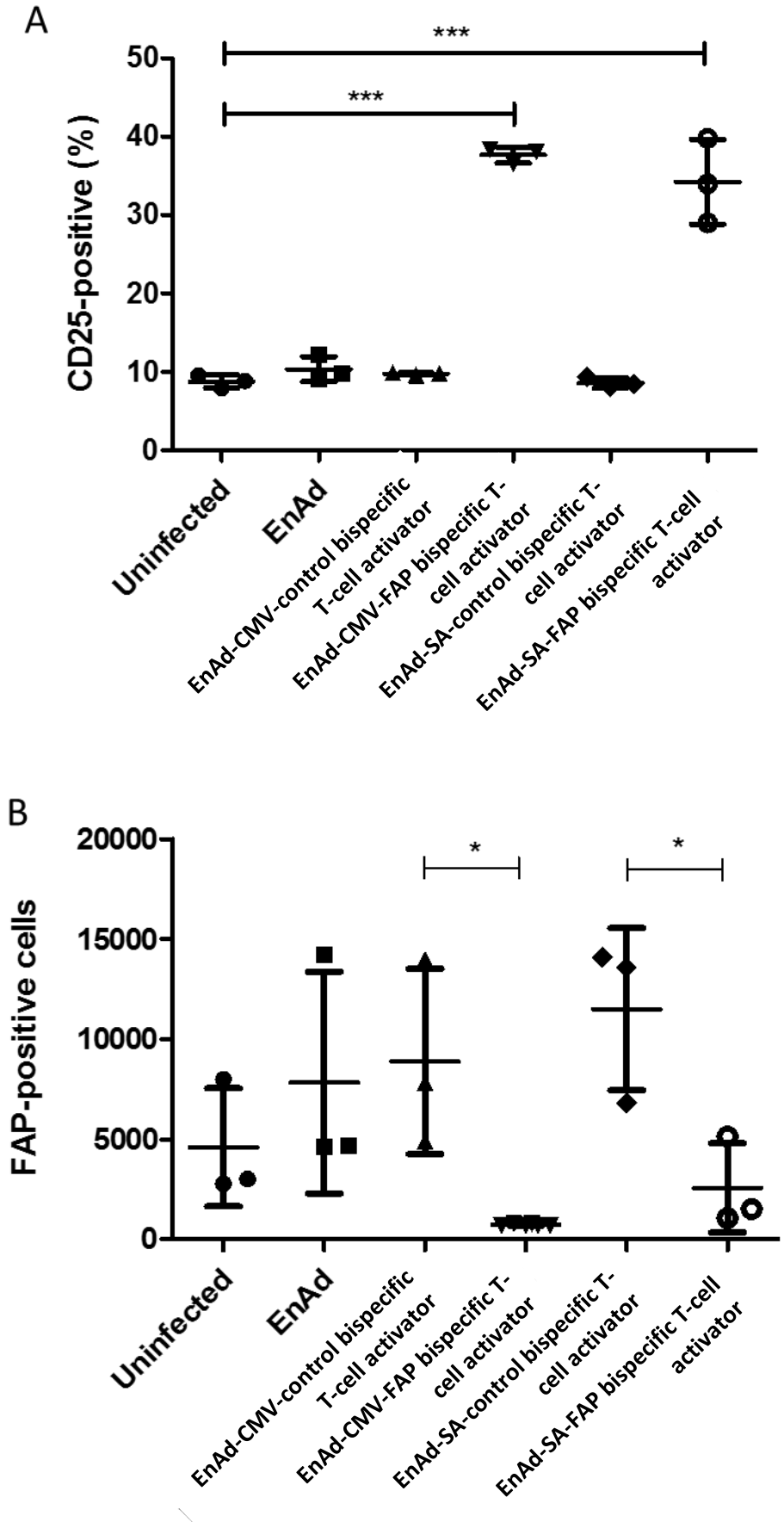
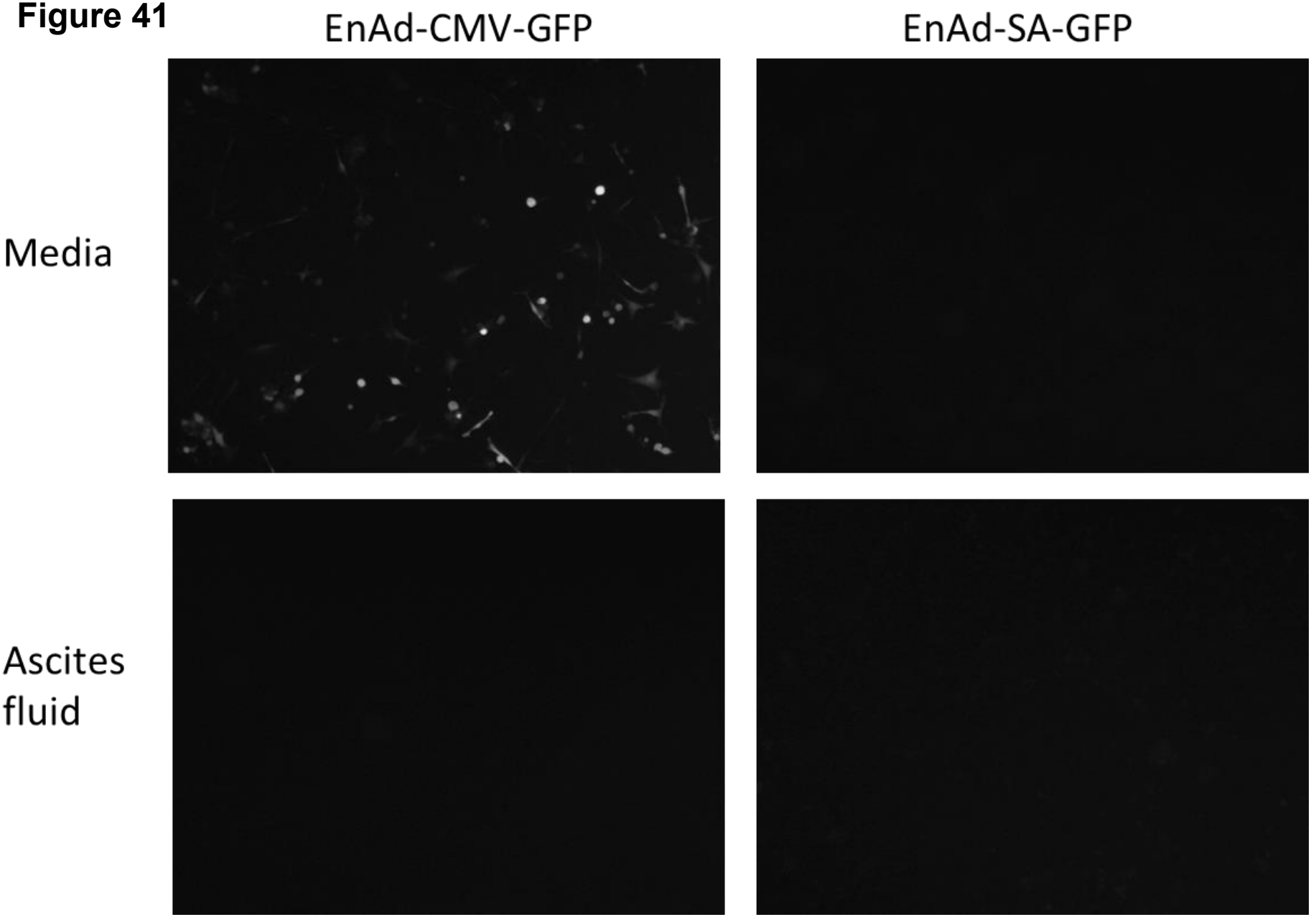


Figure 41



20173207776 18 Sep 2024

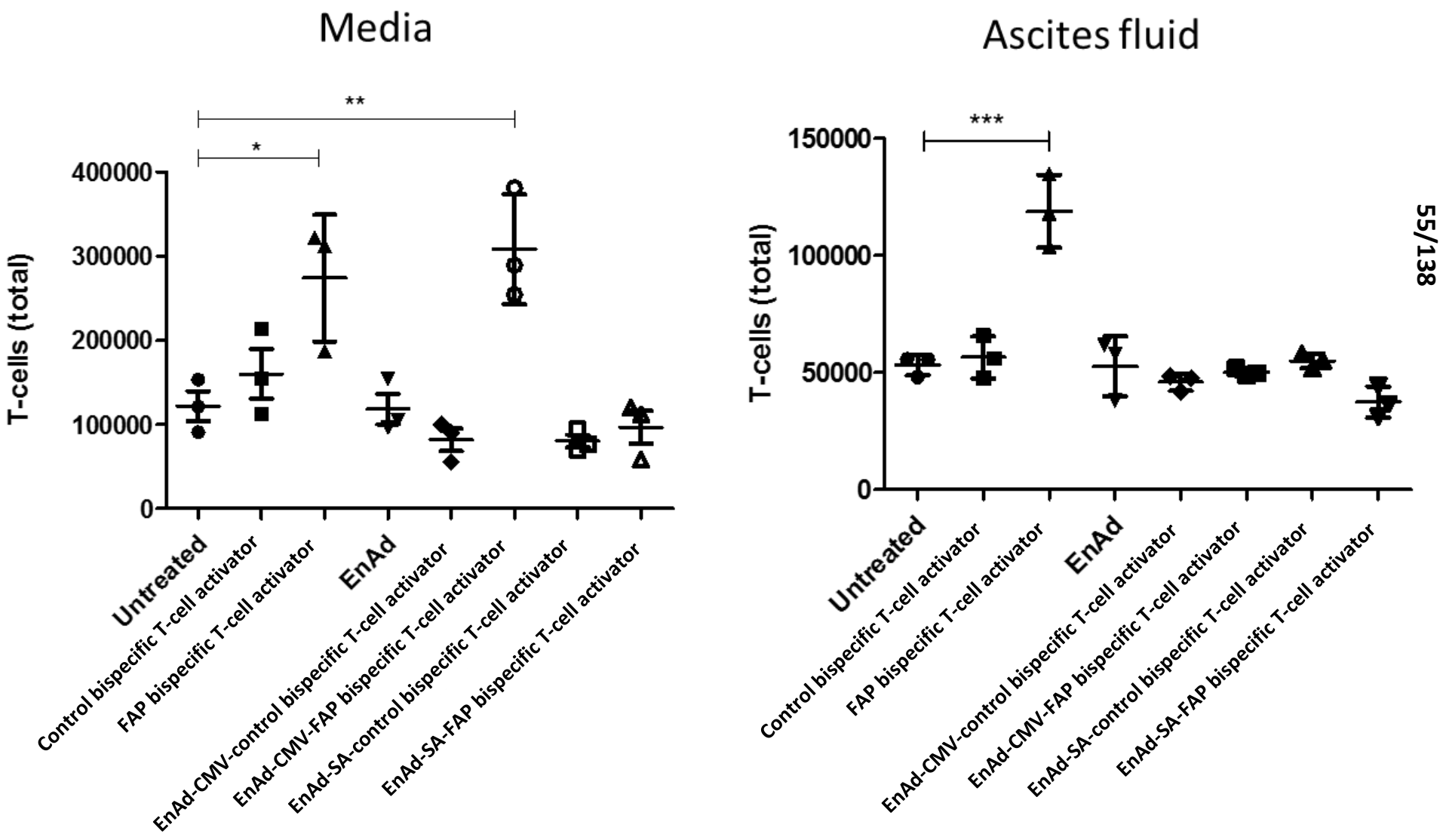


Figure 42

20173207776 18 Sep 2024

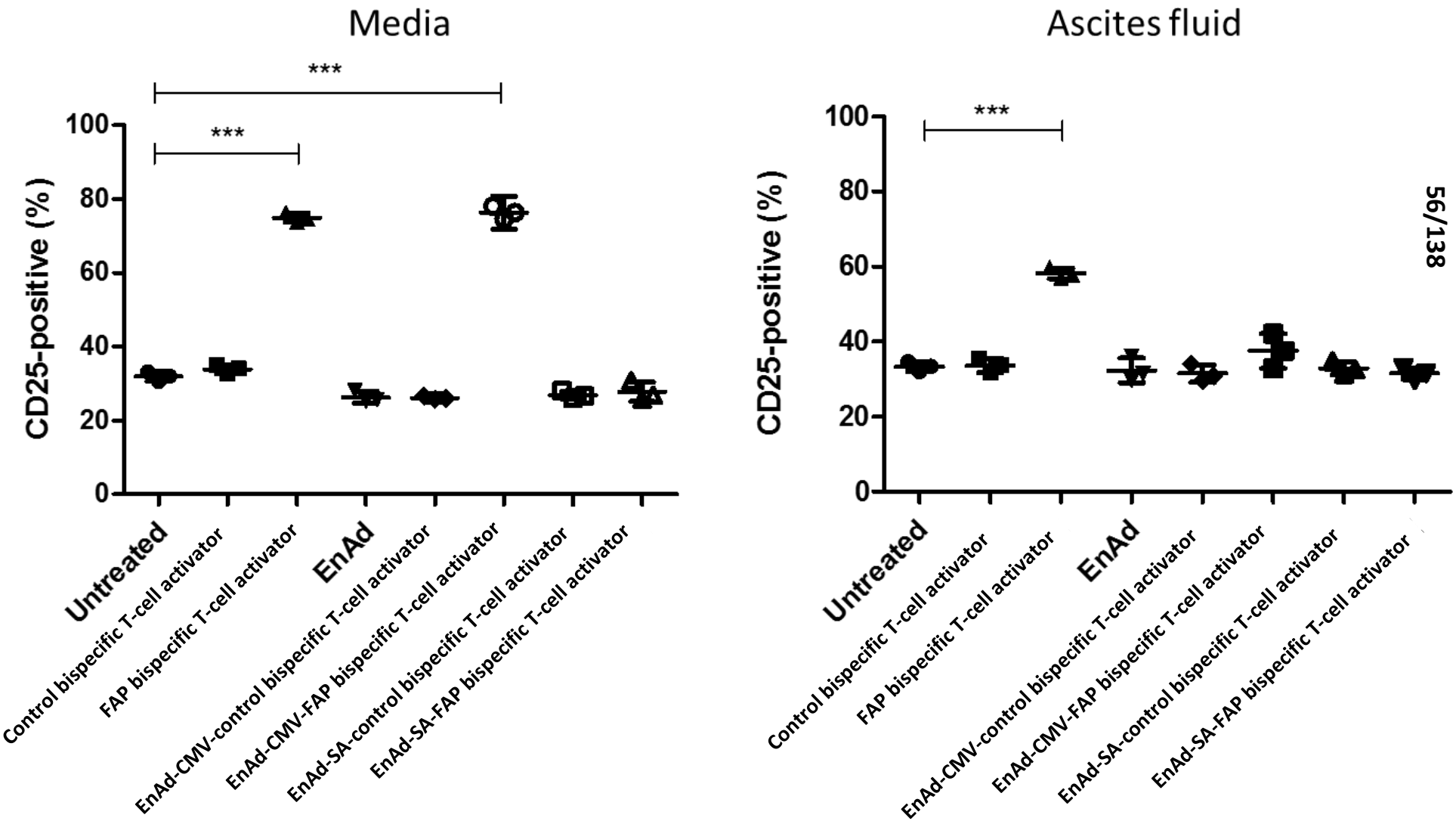


Figure 43

20173207776 18 Sep 2024

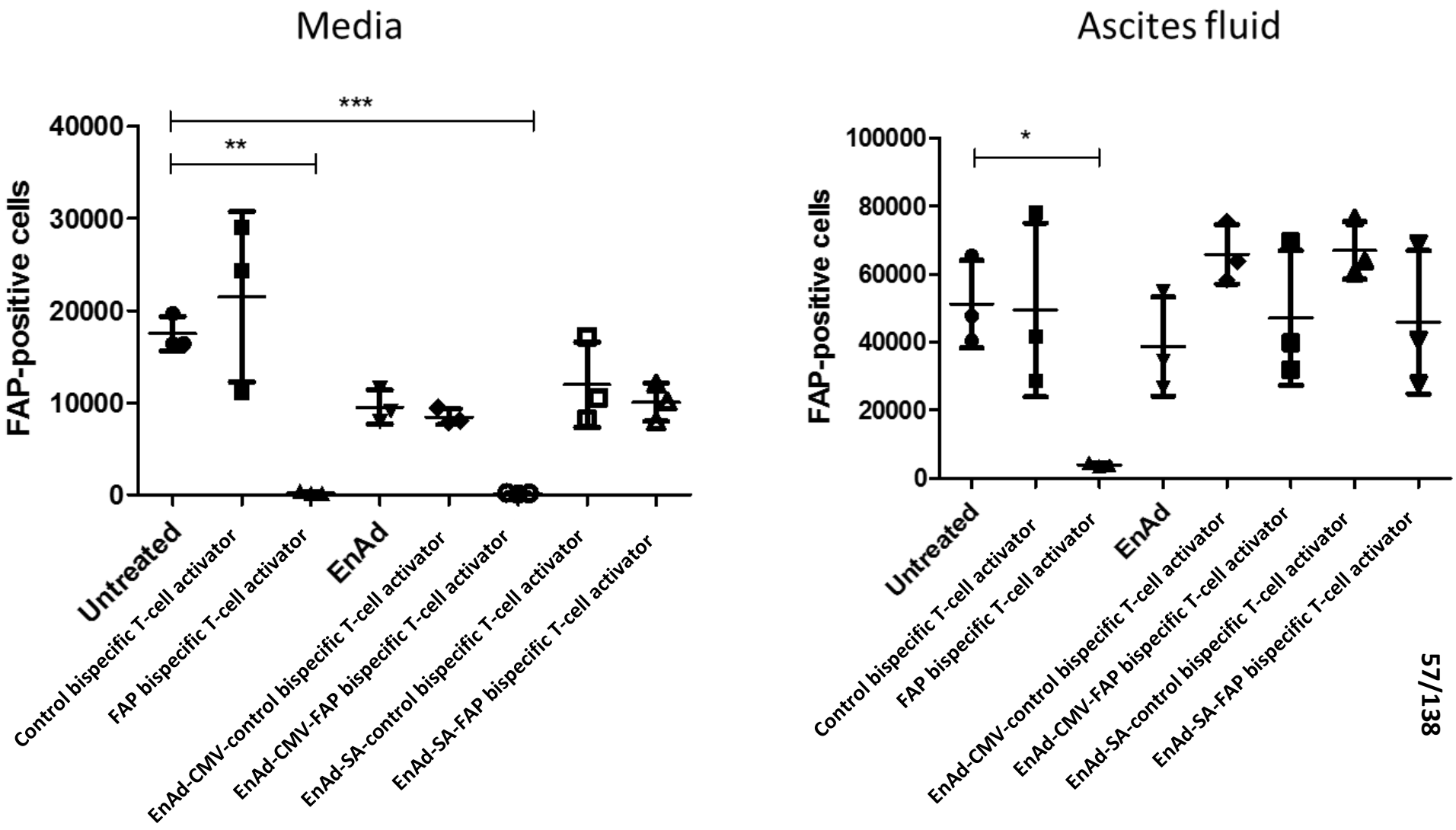


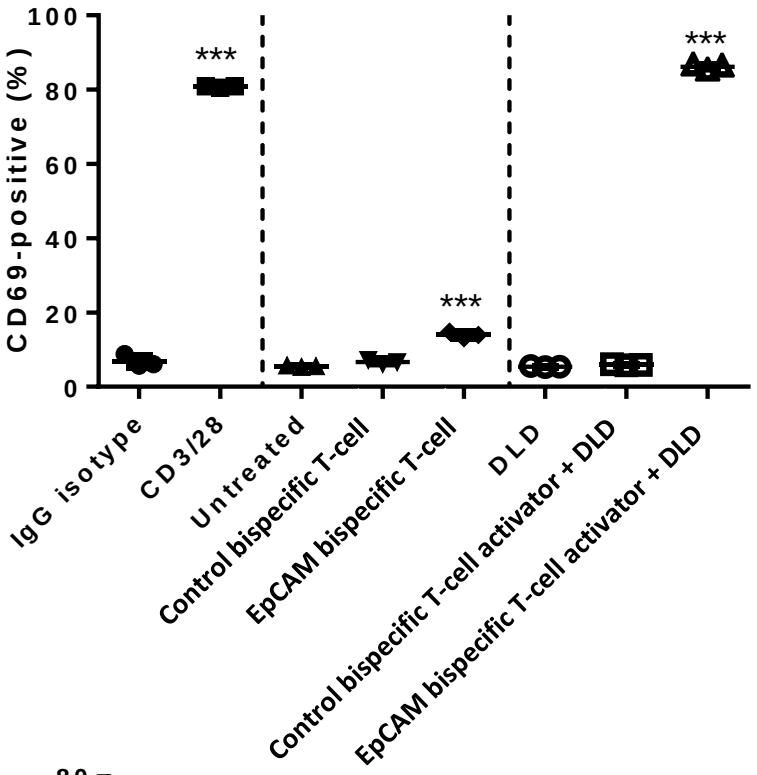
Figure 44

Figure 45A

α-EpCAM scFv
α-CD3ε scFv
Ig SP
V_L
L
V_H
L
V_H
L
V_L
10×His
α-FHA scFv
α-CD3ε scFv
Ig SP
V_L
L
V_H
L
V_H
L
V_L
10×His

2017320776 18 Sep 2024

B



C

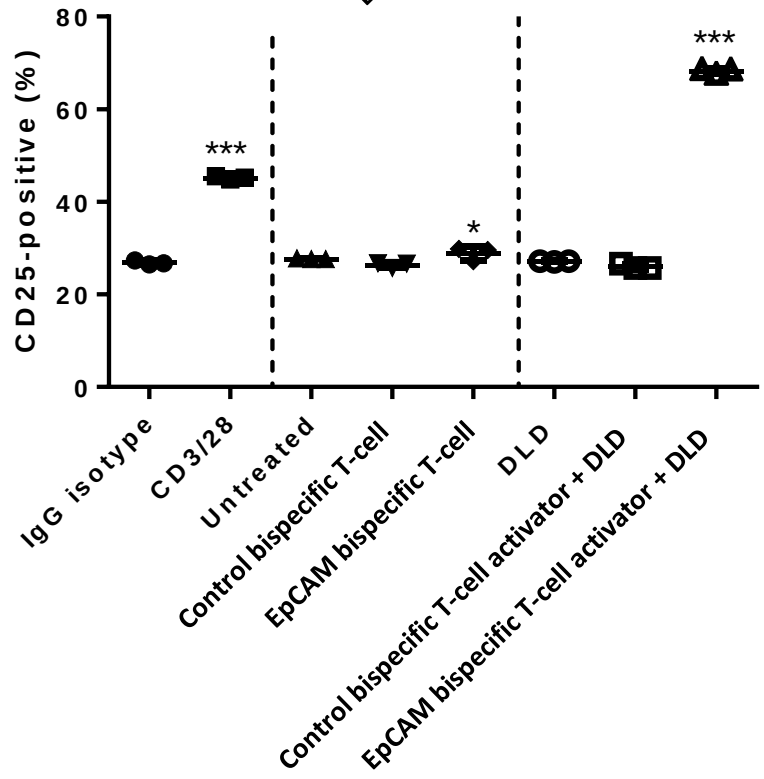
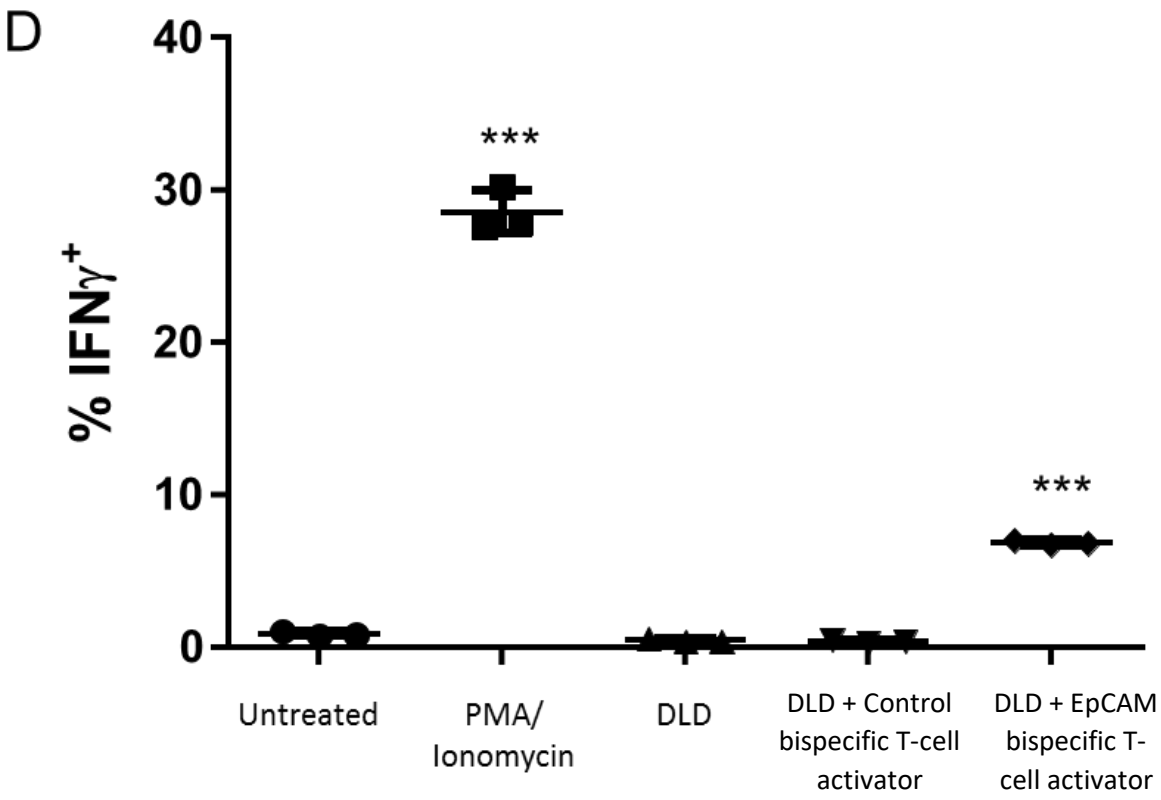


Figure 45 cont.

2017320776 18 Sep 2024



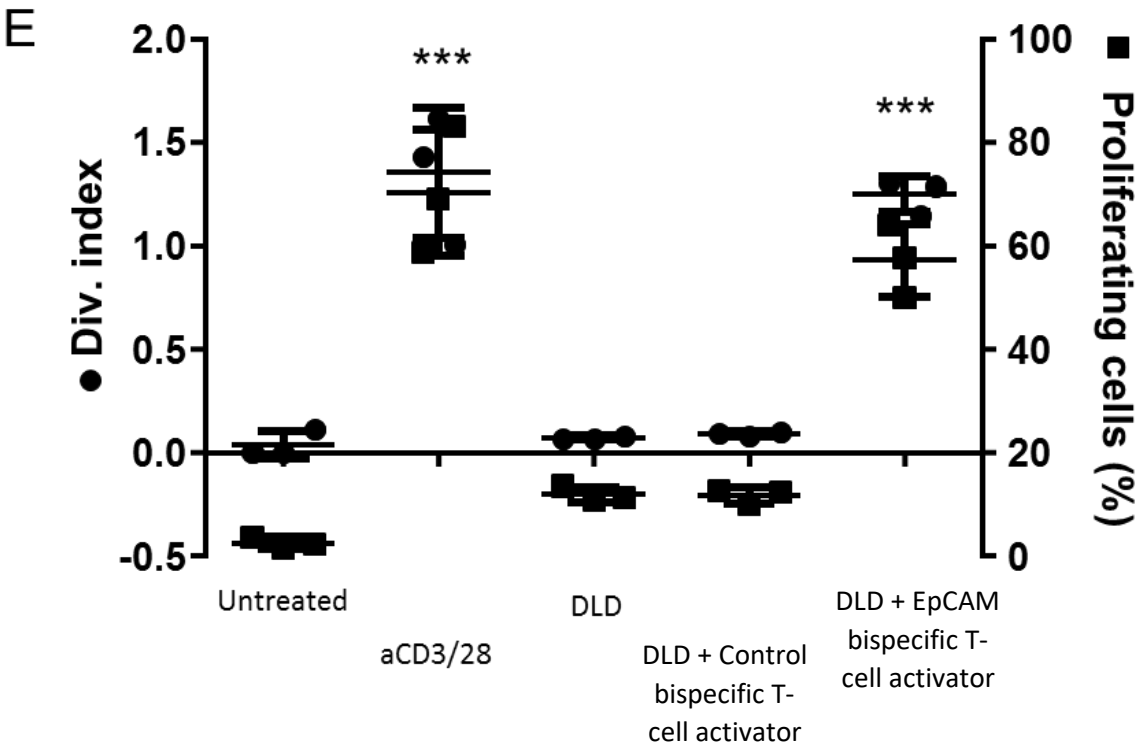


Figure 45 cont.

2017320776 18 Sep 2024

Figure 45 cont.

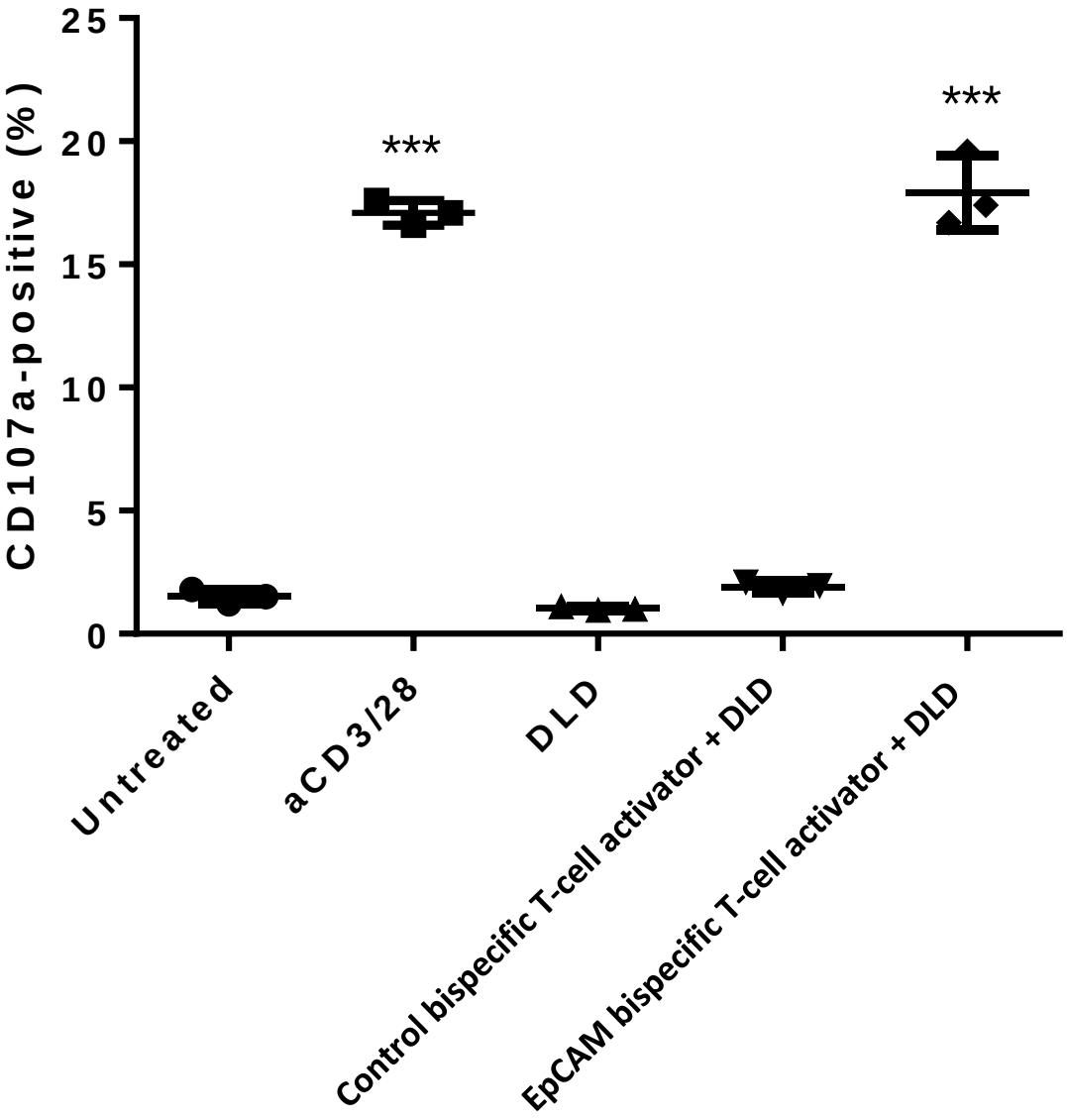
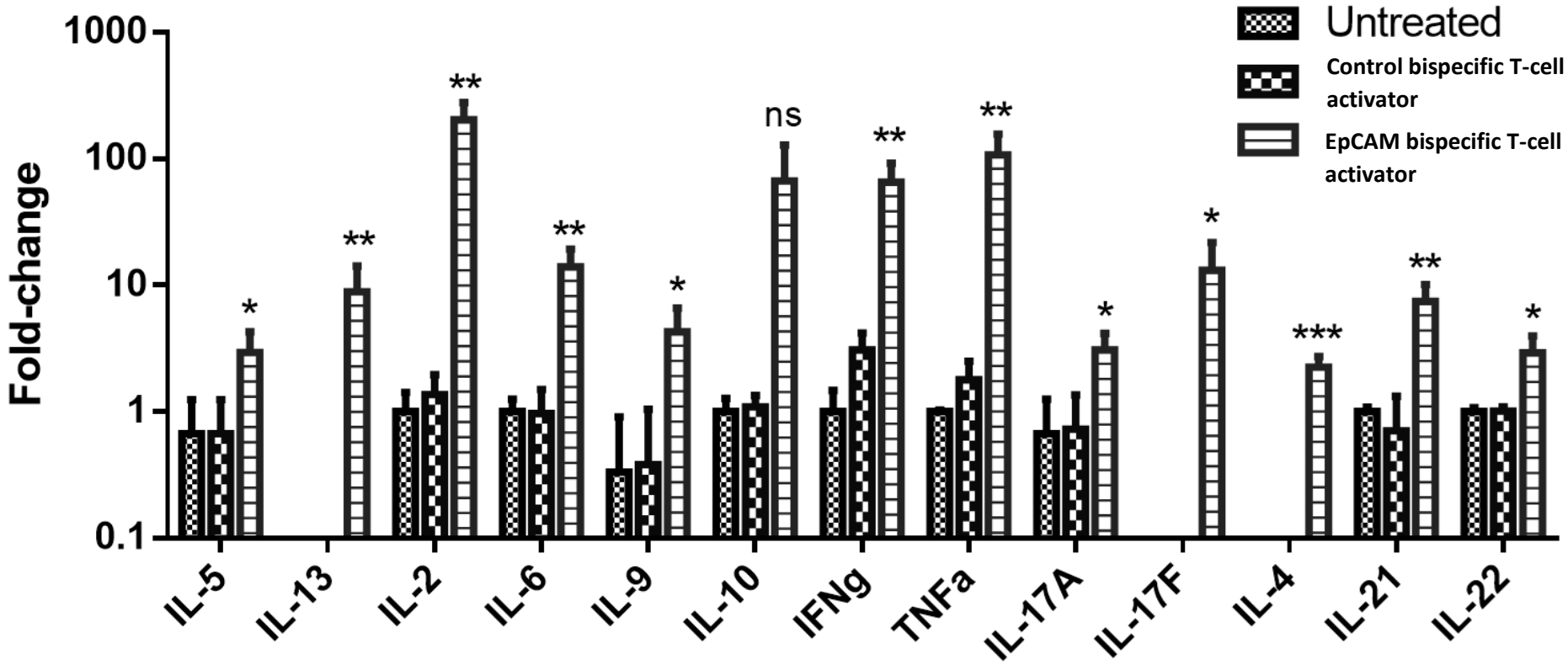


Figure 45G


Untreated
Control bispecific T-cell activator
EpCAM bispecific T-cell activator
Fold-change
1000
100
10
1
0.1
IL-5
IL-13
IL-2
IL-6
IL-9
IL-10
IFNg
TNFa
IL-17A
IL-17F
IL-4
IL-21
IL-22
*
**
ns
***

18 Sep 2024
2017320776

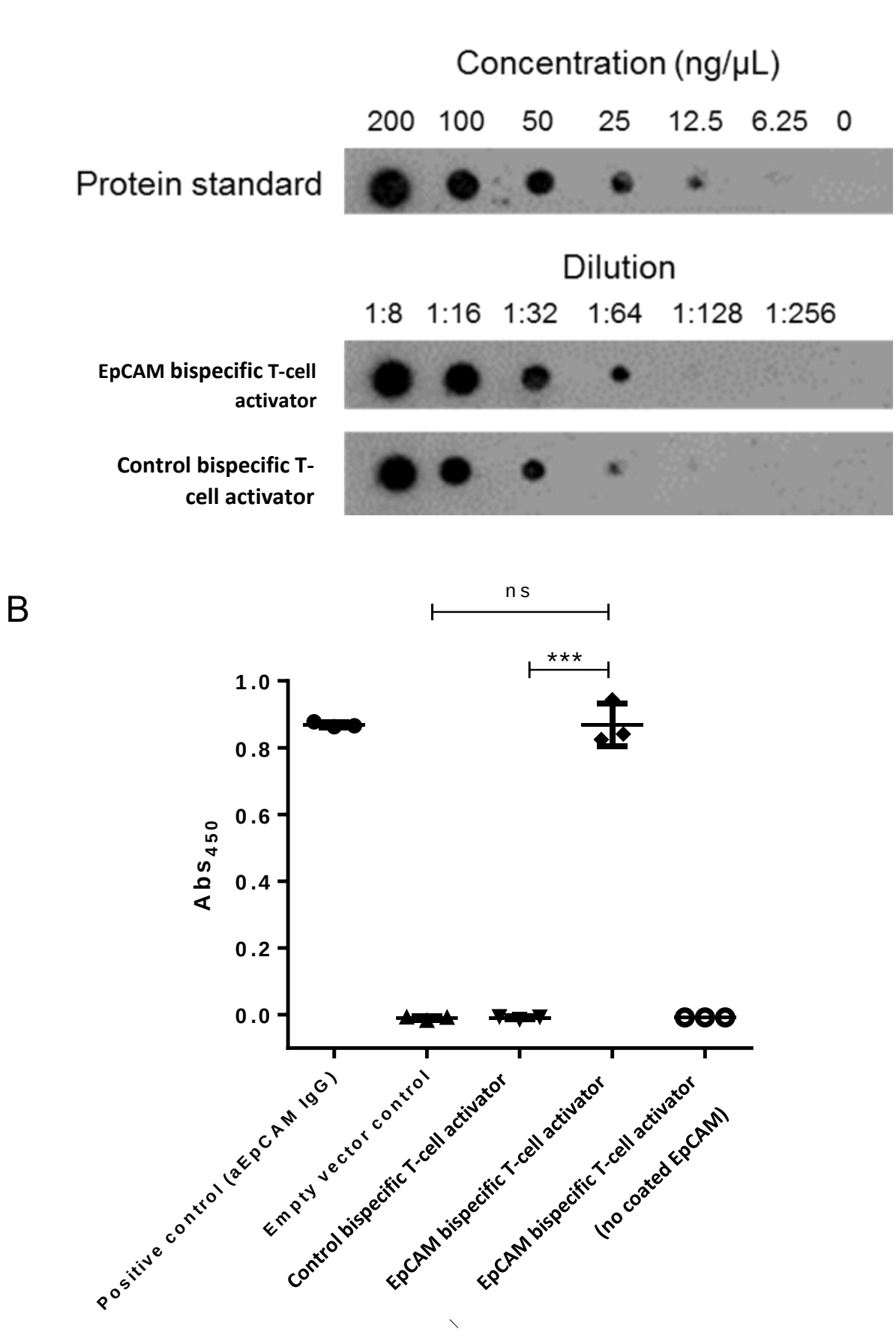


Figure 46

2017320776 18 Sep 2024

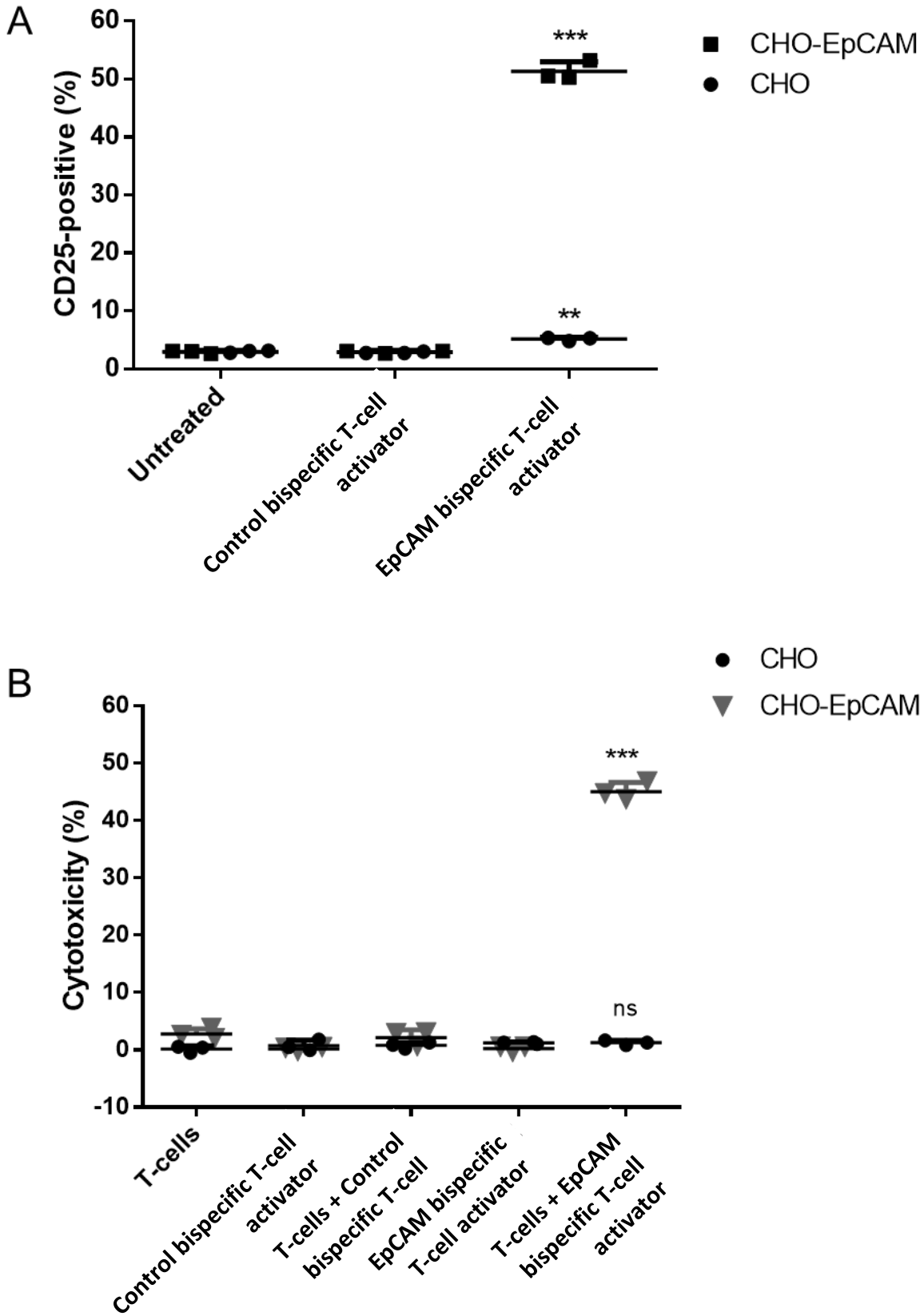
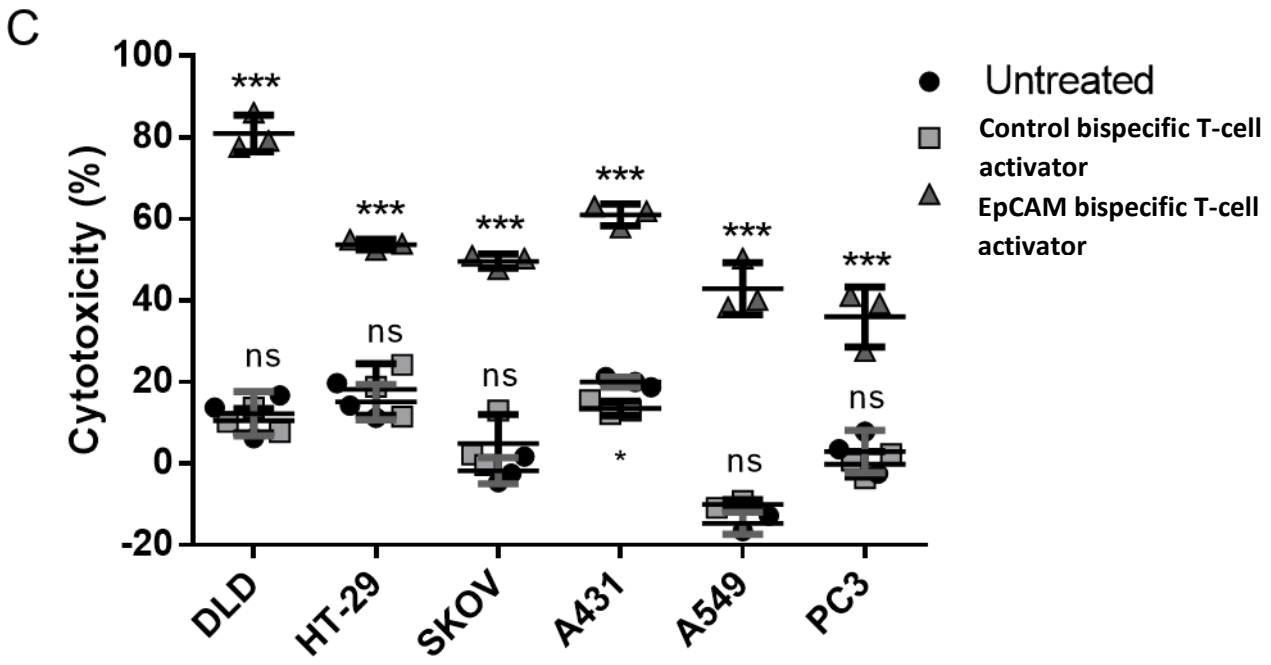


Figure 47

2017320776 18 Sep 2024



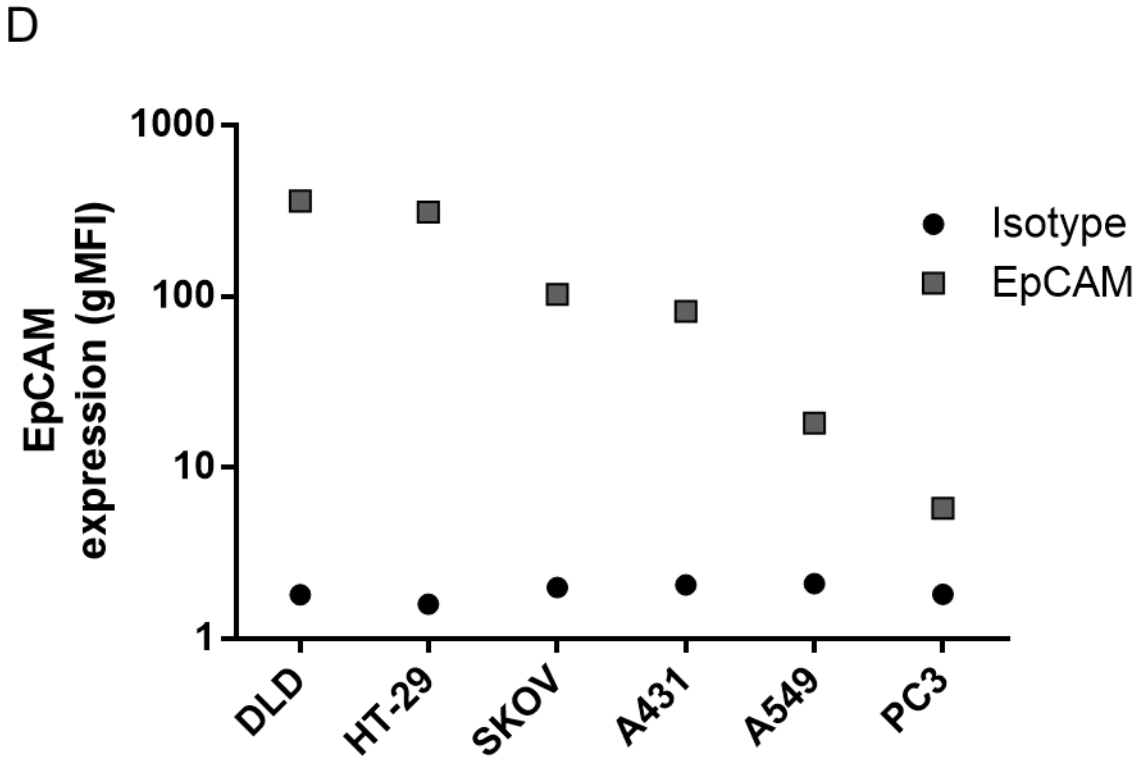
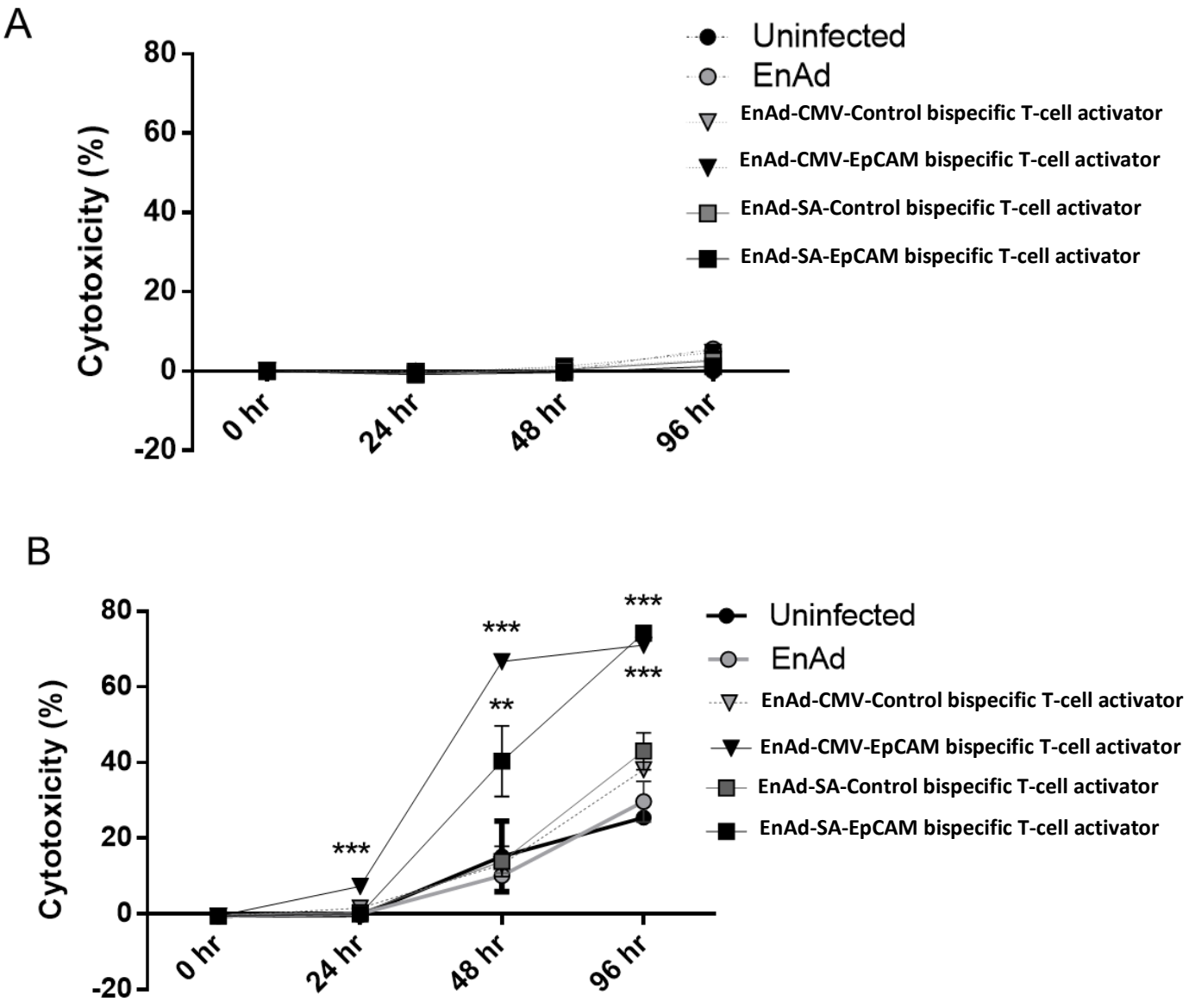


Figure 47 cont.

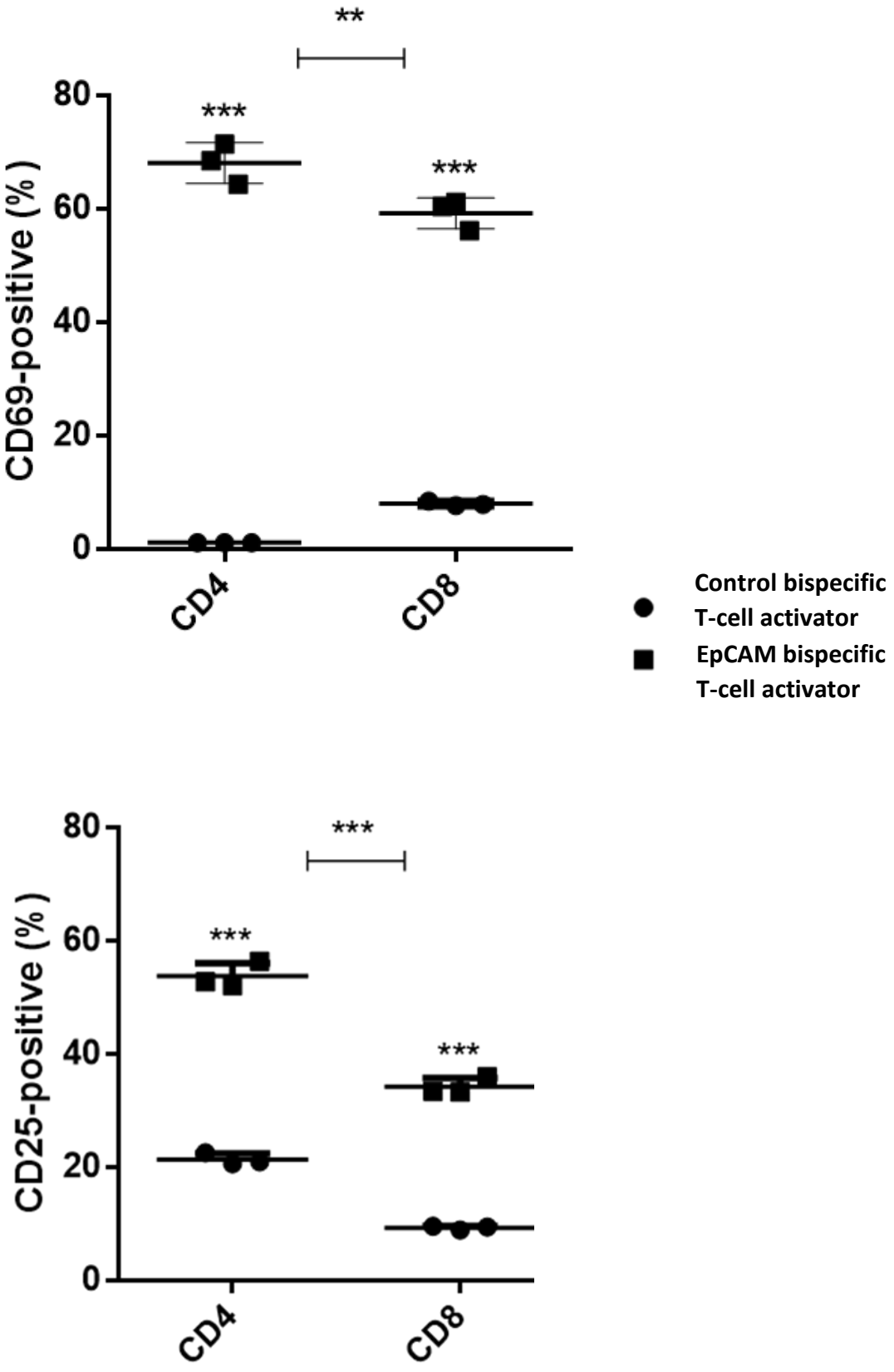
2017320776 18 Sep 2024

Figure 48

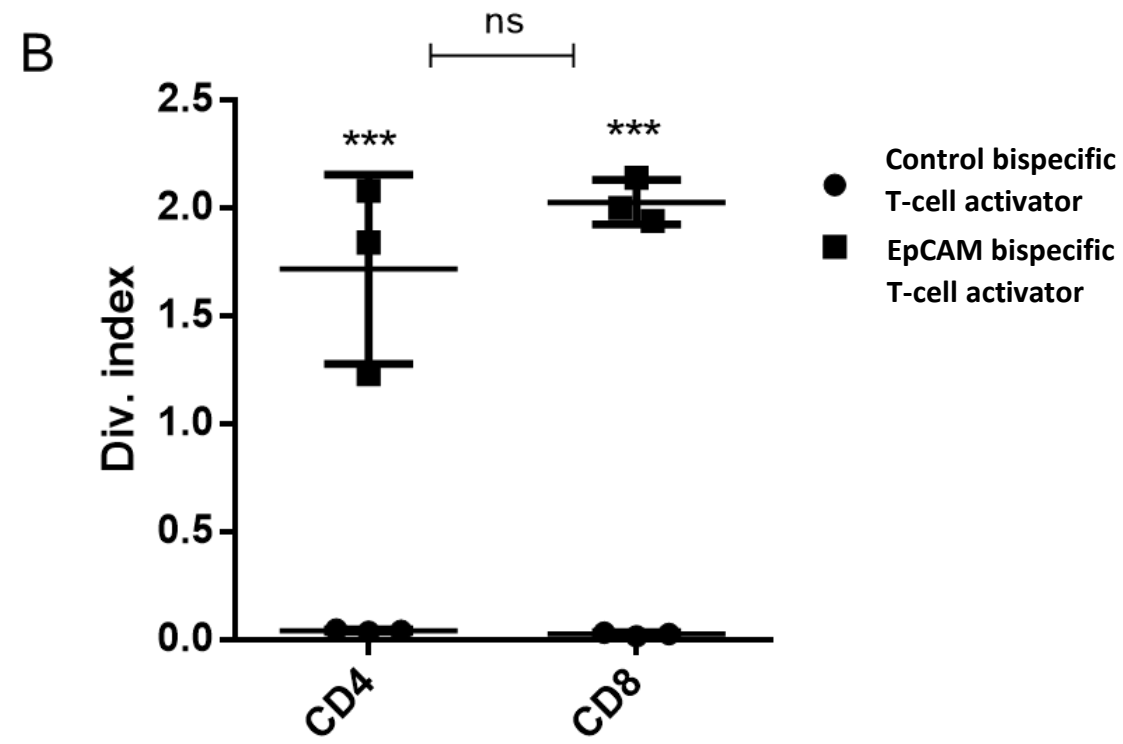


2017320776 18 Sep 2024

Figure 49A



18 Sep 2024 2017320776



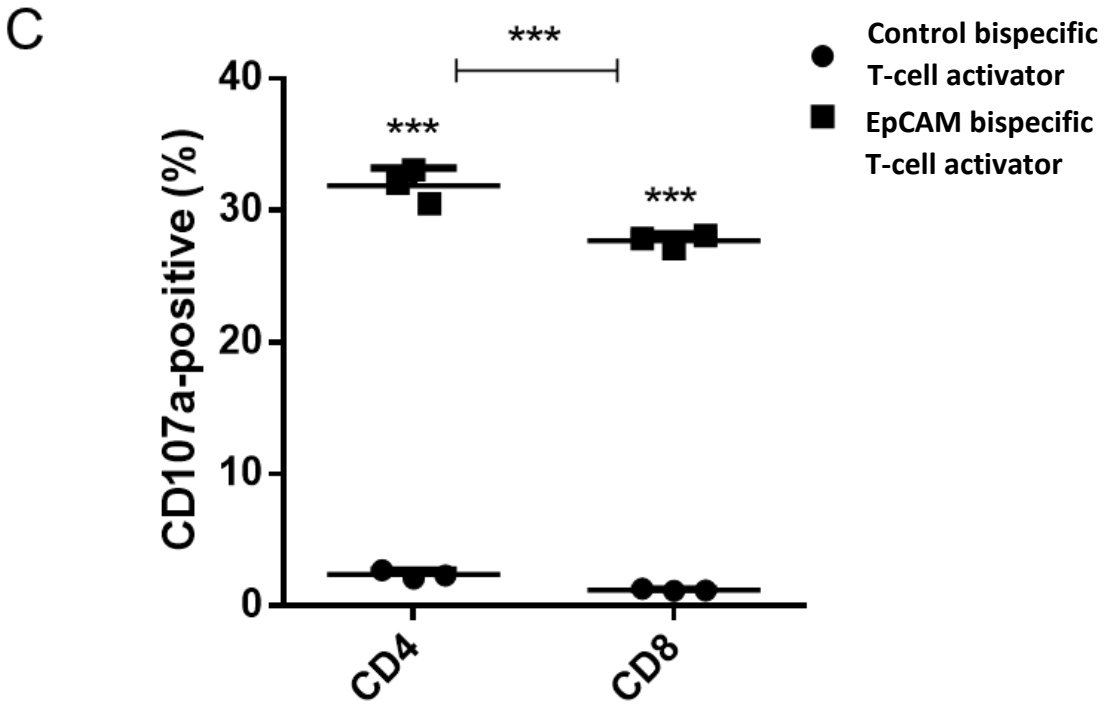


Figure 49 cont.

18 Sep 2024 2017320776

D

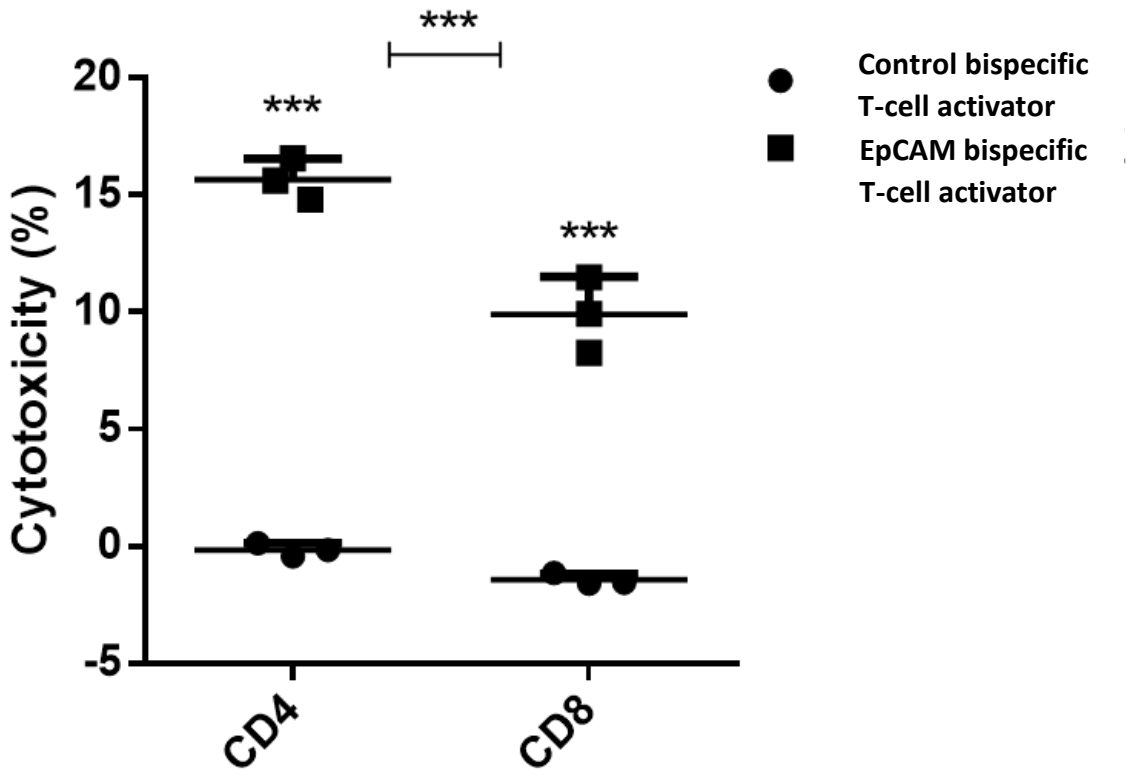


Figure 49 cont.

2017320776 18 Sep 2024

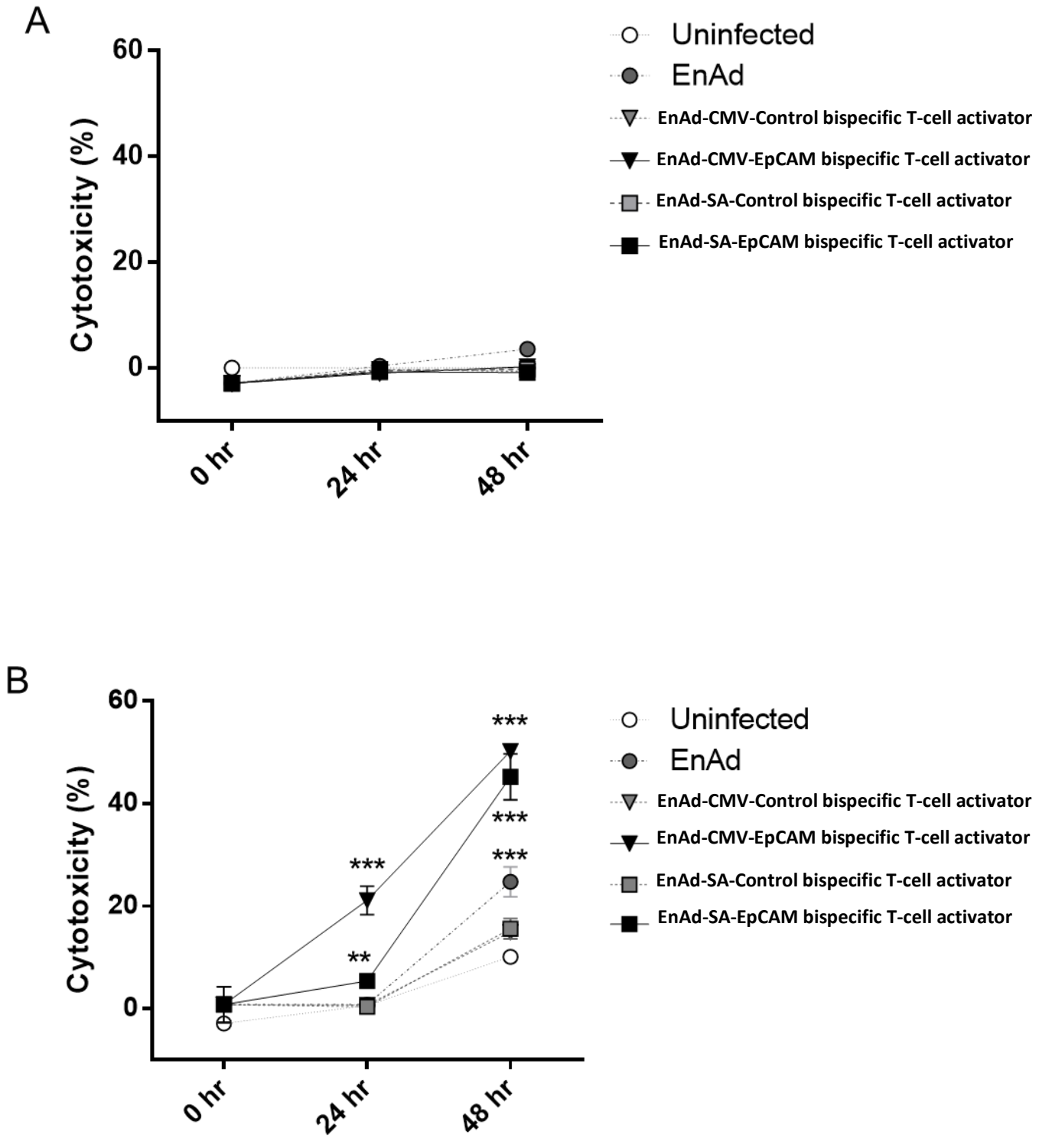


Figure 50

2017320776 18 Sep 2024

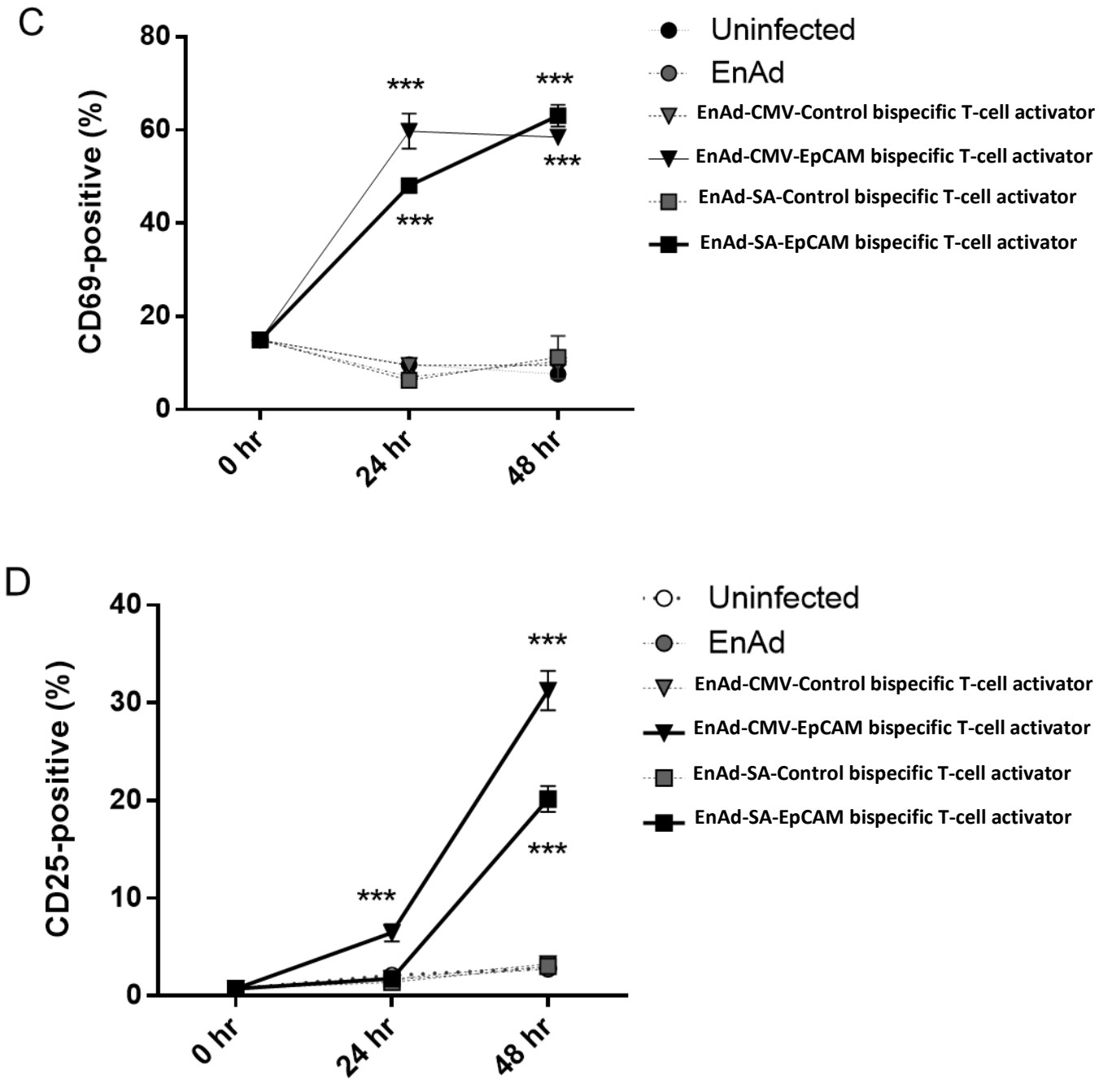
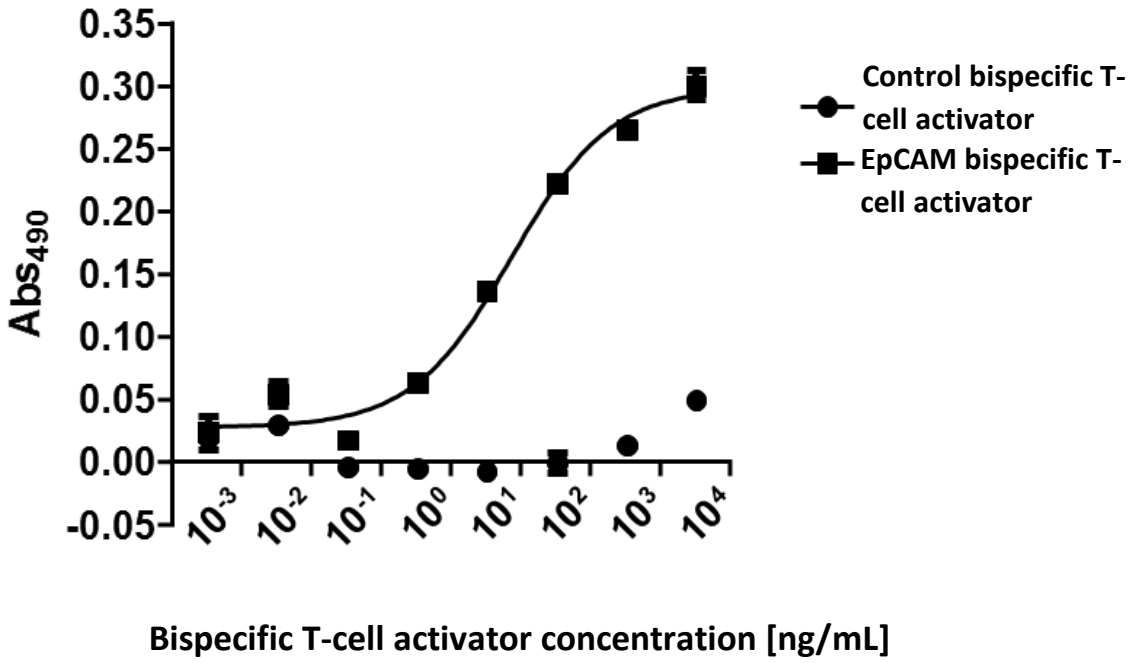


Figure 50 cont.

2017320776 18 Sep 2024

E



EC50 7.444

F

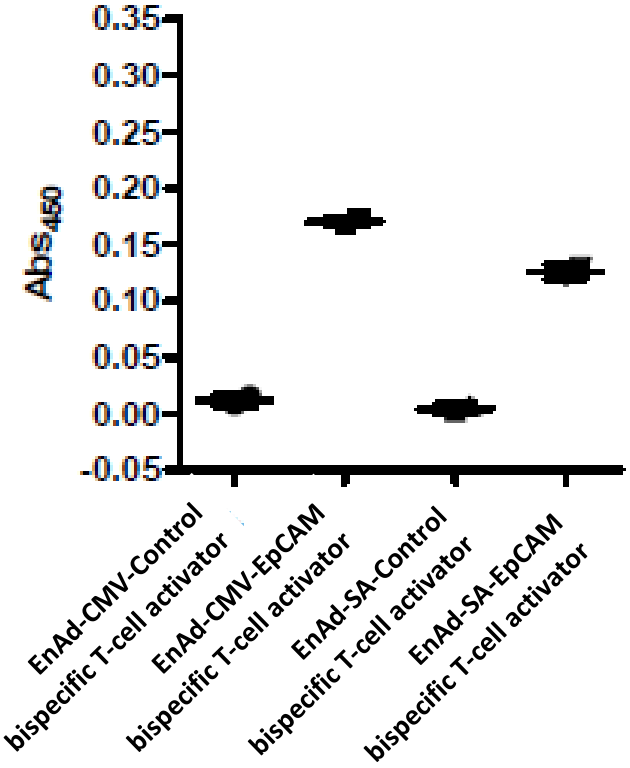


Figure 50 cont.

2017320776 18 Sep 2024

G

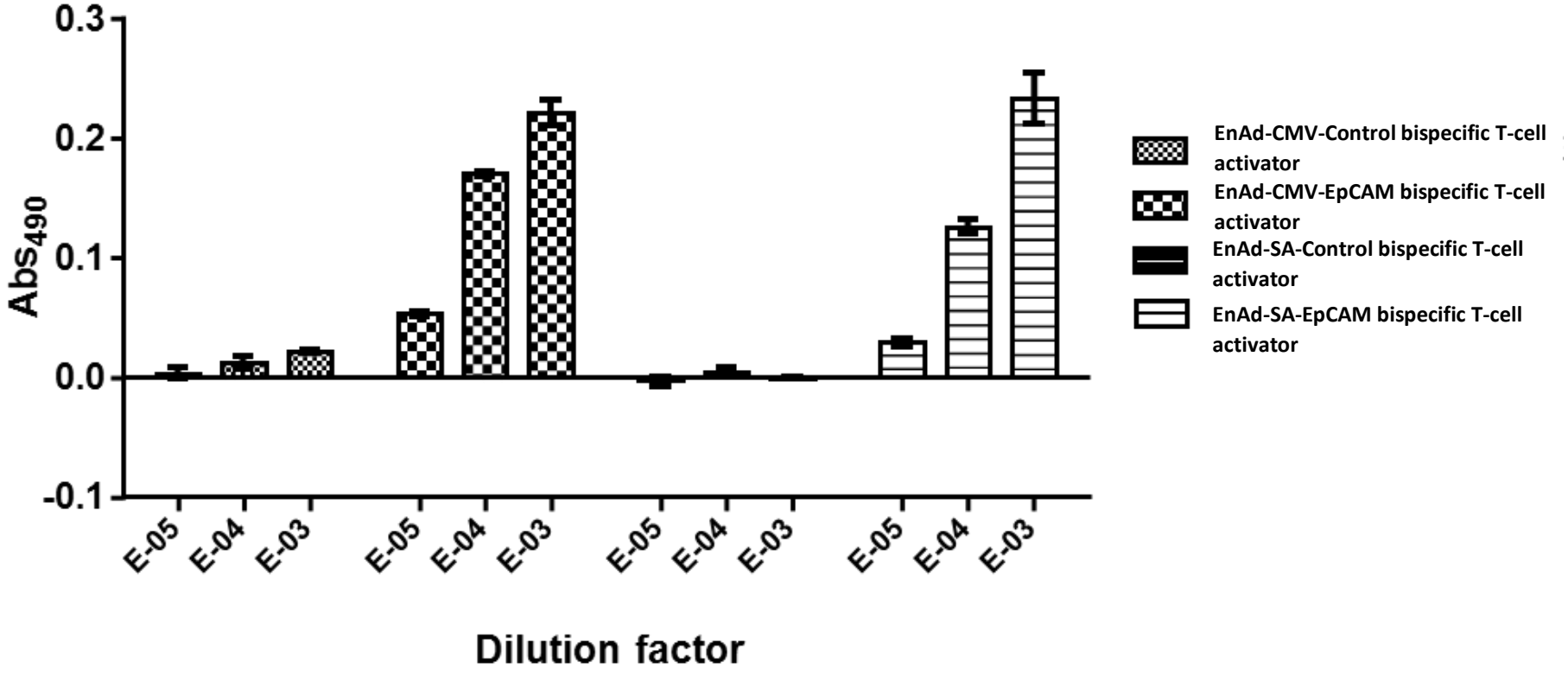


Figure 50 cont.

73/138

2017320776 18 Sep 2024

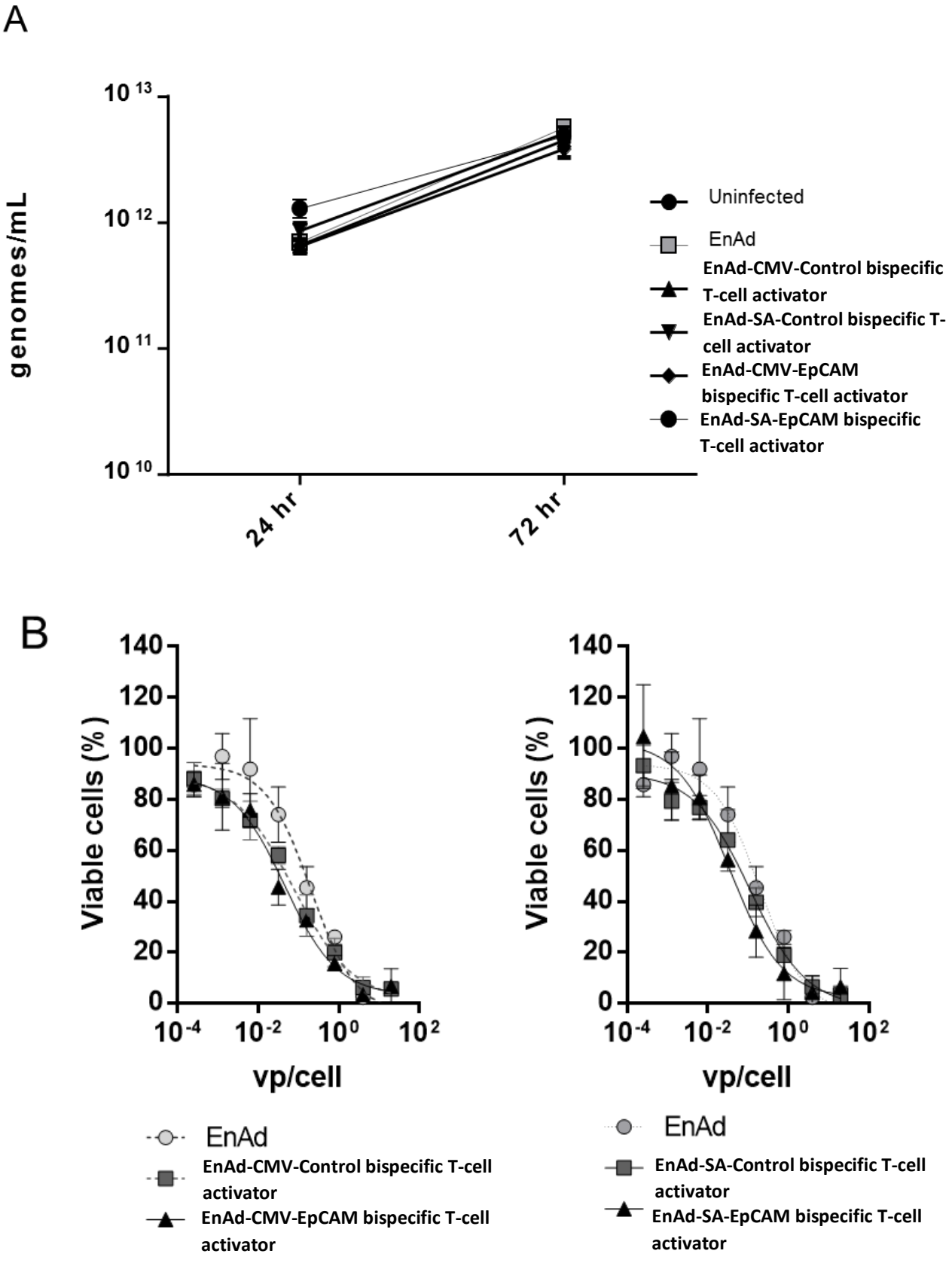


Figure 51

2017320776 18 Sep 2024

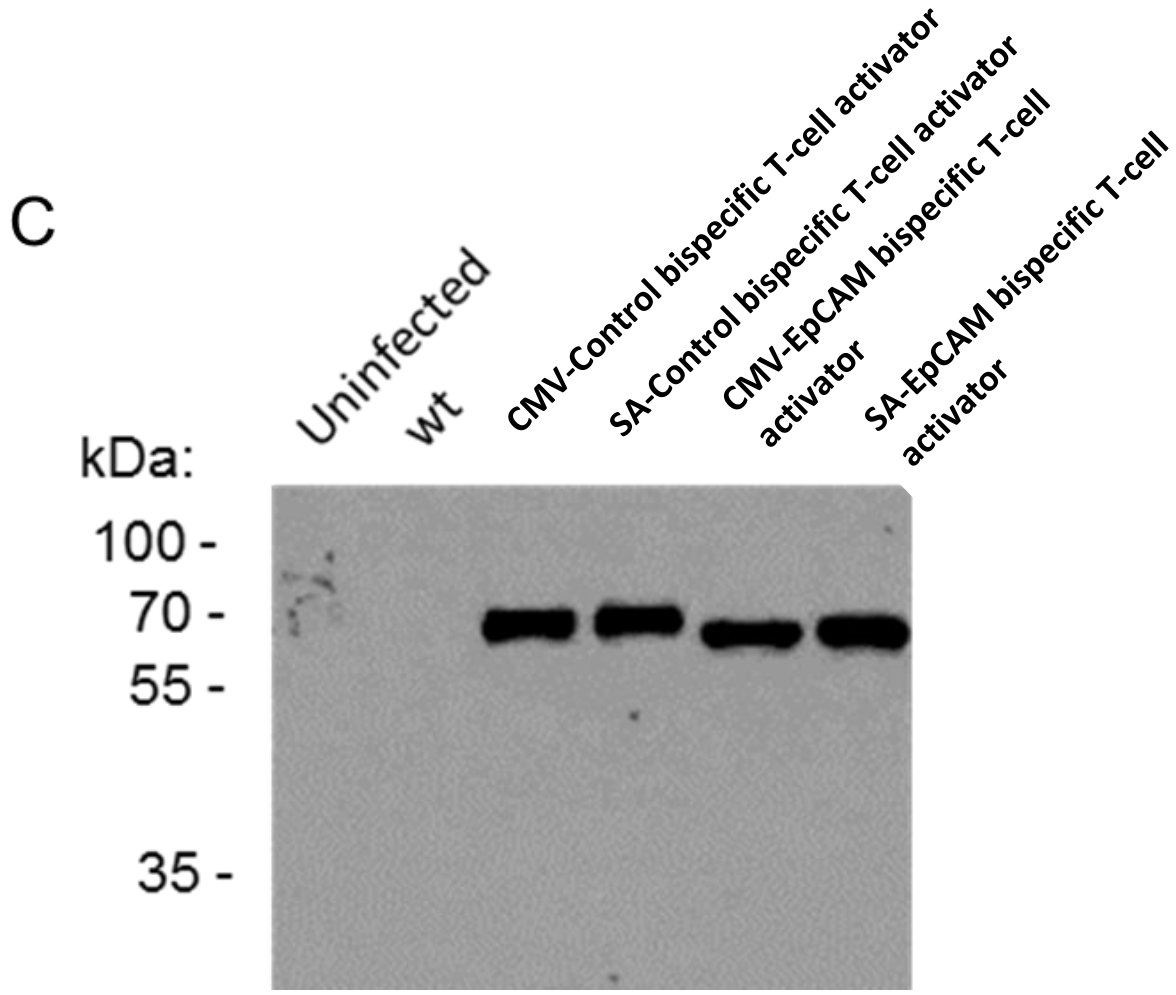
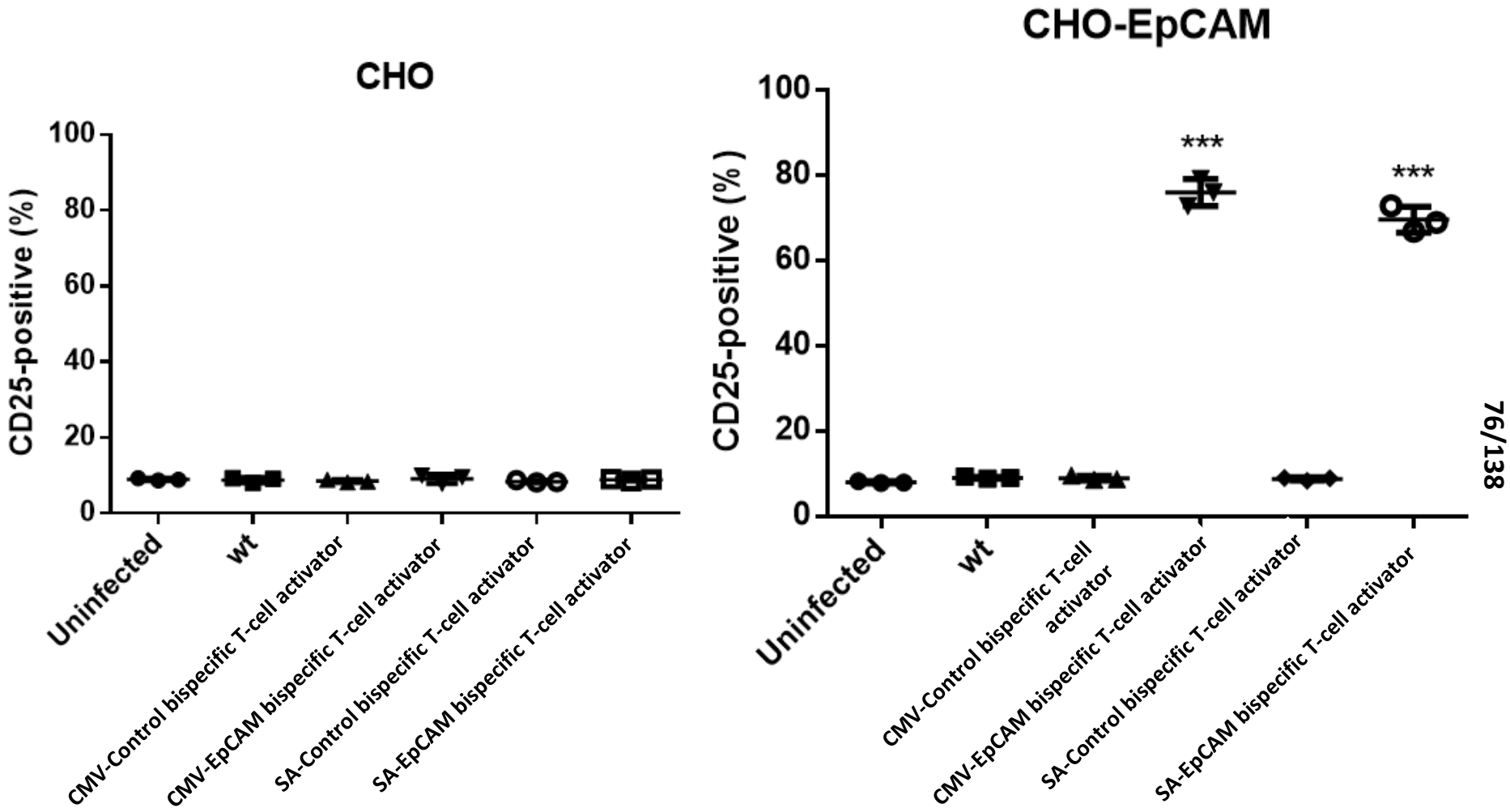


Figure 51 cont.

18 Sep 2024 2017320776

D

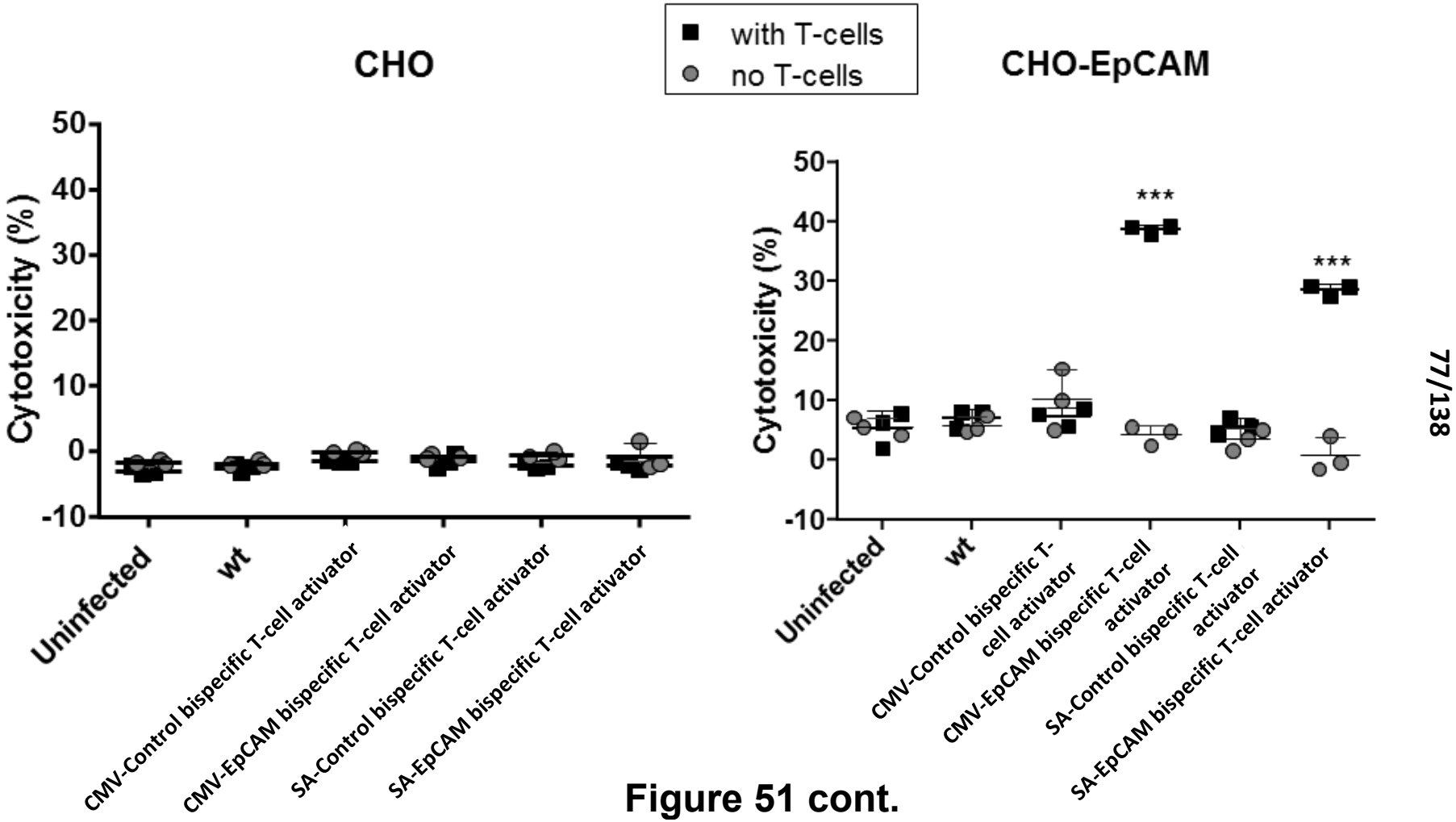


76/138

Figure 51 cont.

2017320776 18 Sep 2024

E



77/138

Figure 51 cont.

2017320776 18 Sep 2024

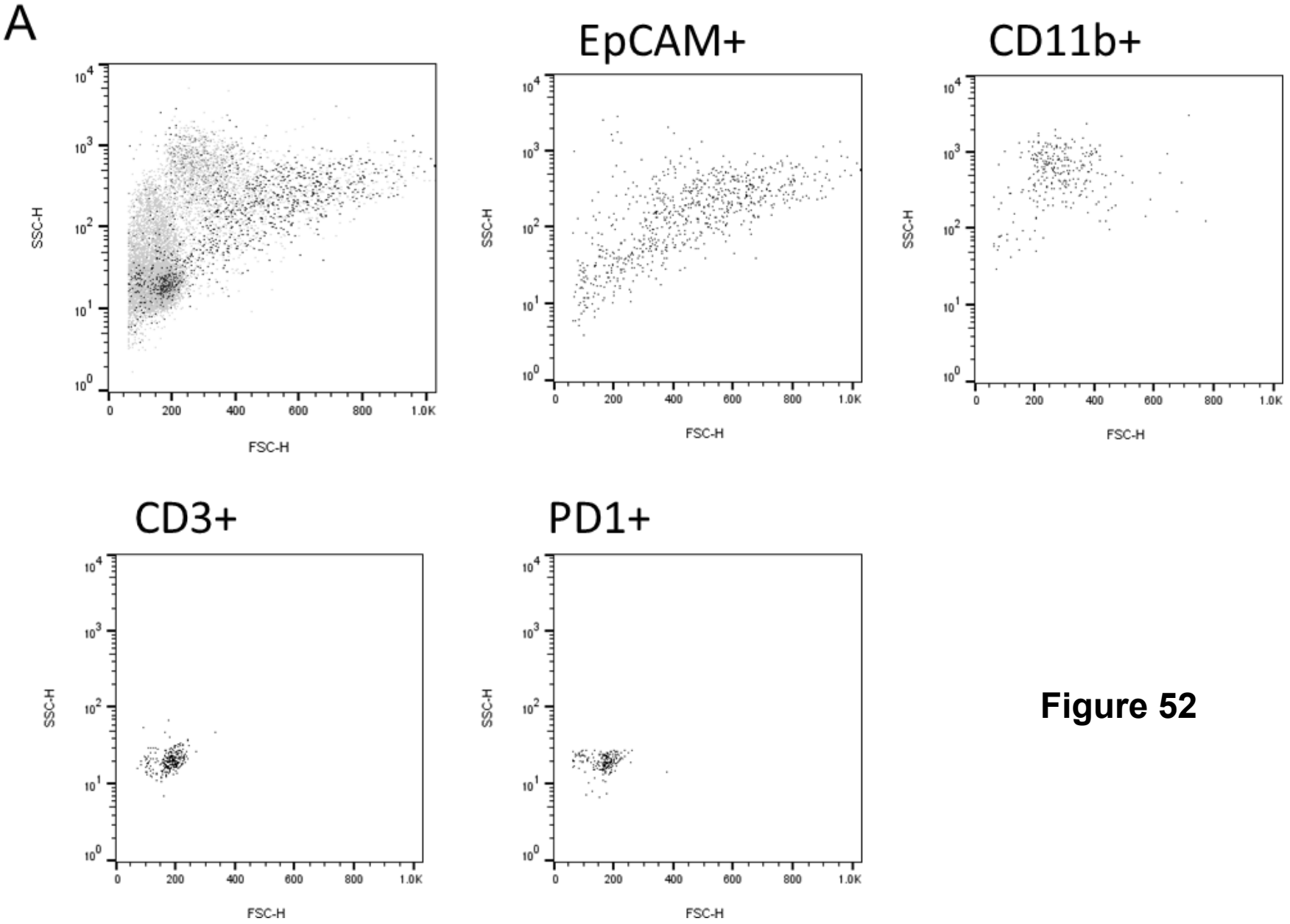


Figure 52

78/138

18 Sep 2024 2017320776

B

Subset	Count
EpCAM	749
CD3	289
PD1	206
CD11b	277
Total	10000

Figure 52

2017320776 18 Sep 2024

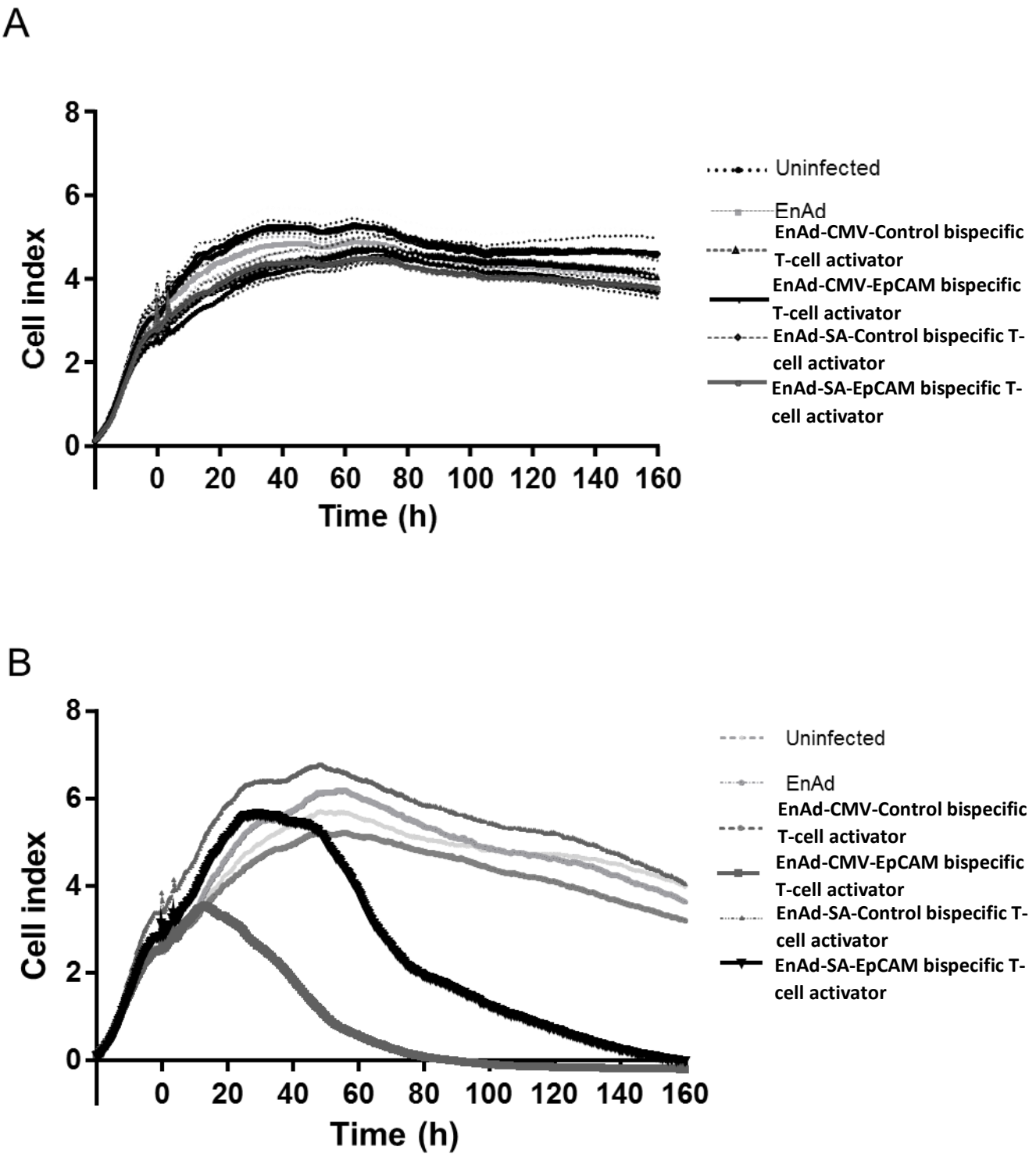


Figure 53

2017320776 18 Sep 2024

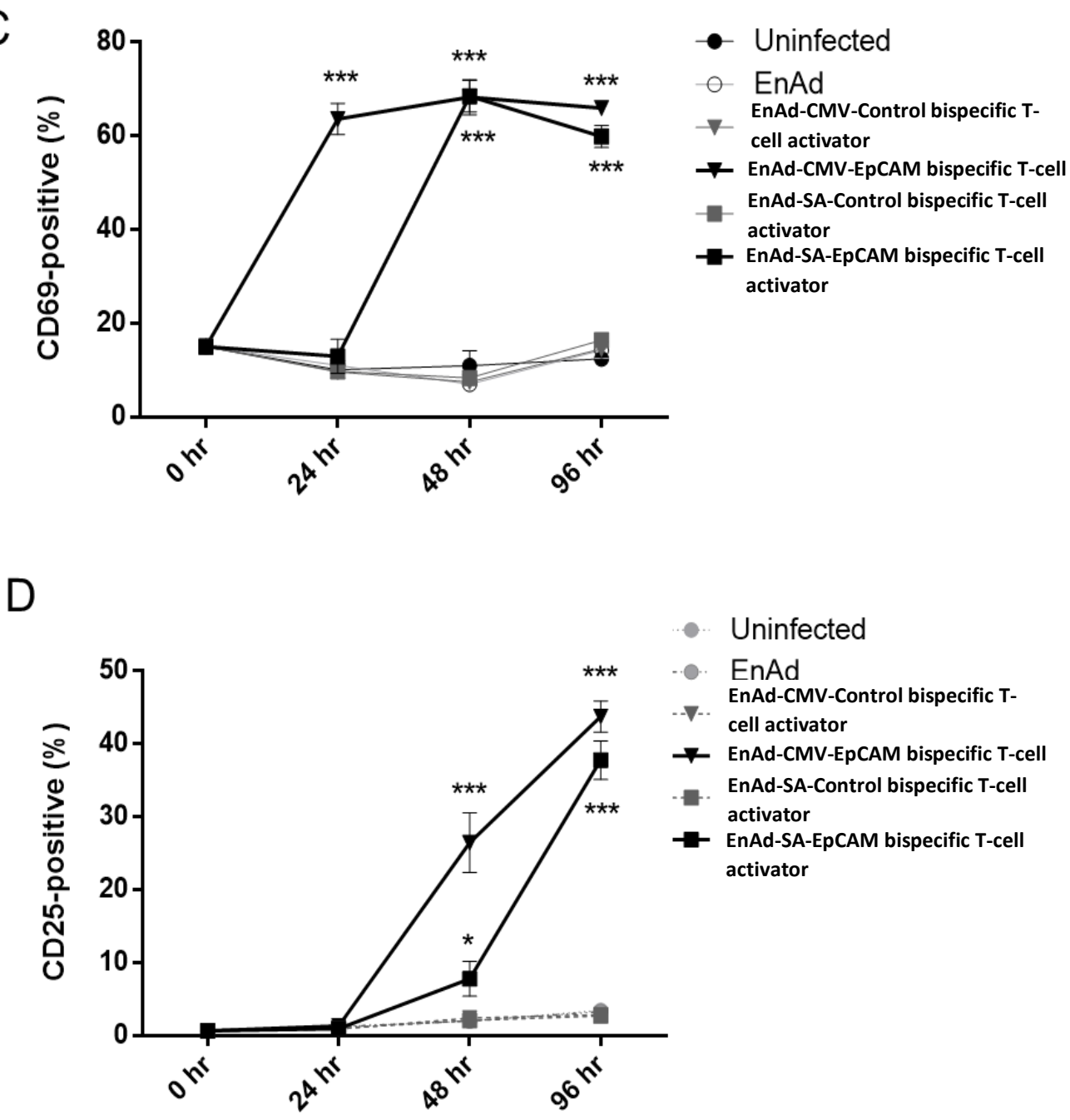


Figure 53 cont.

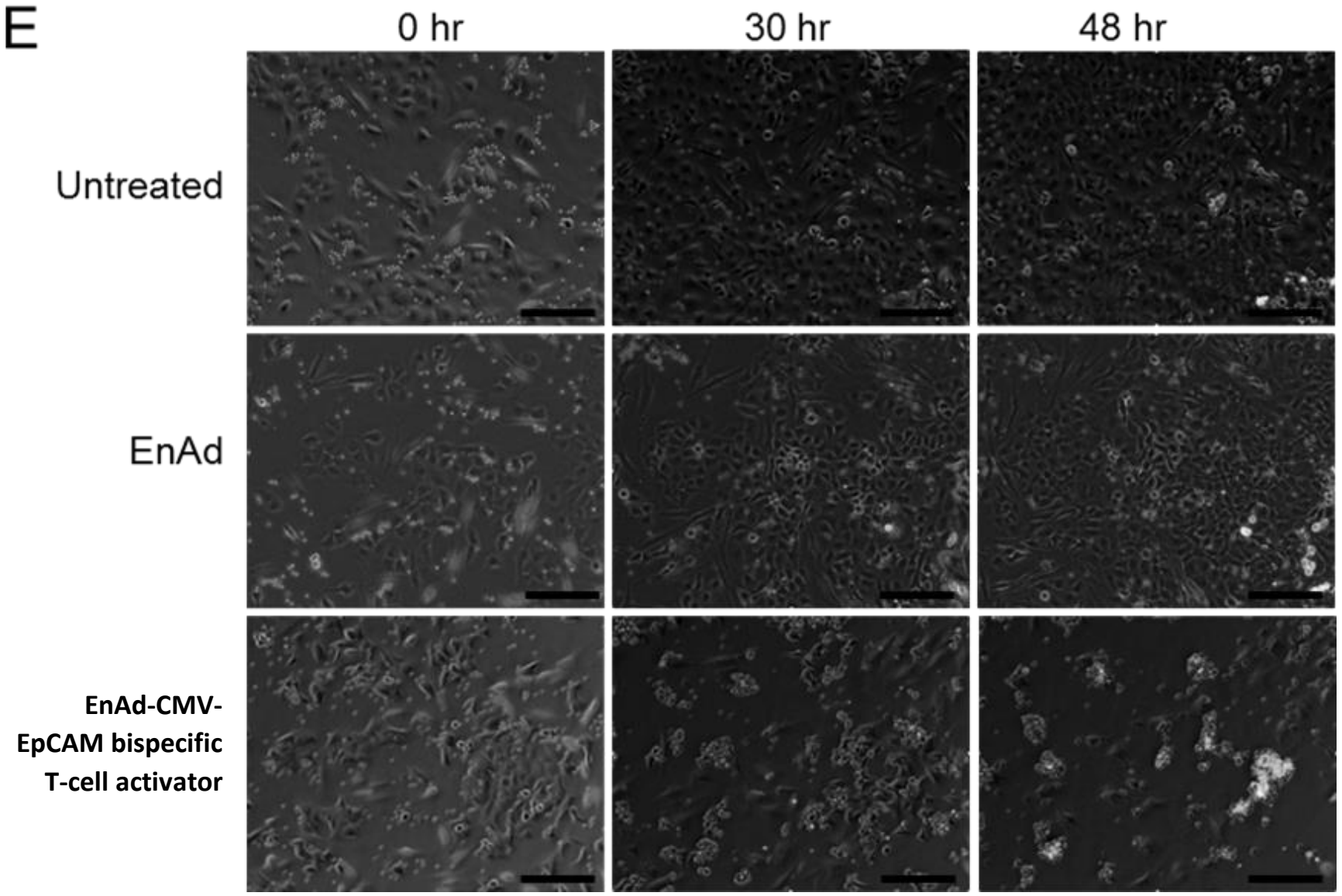


Figure 53 cont.

18 Sep 2024
2017320776

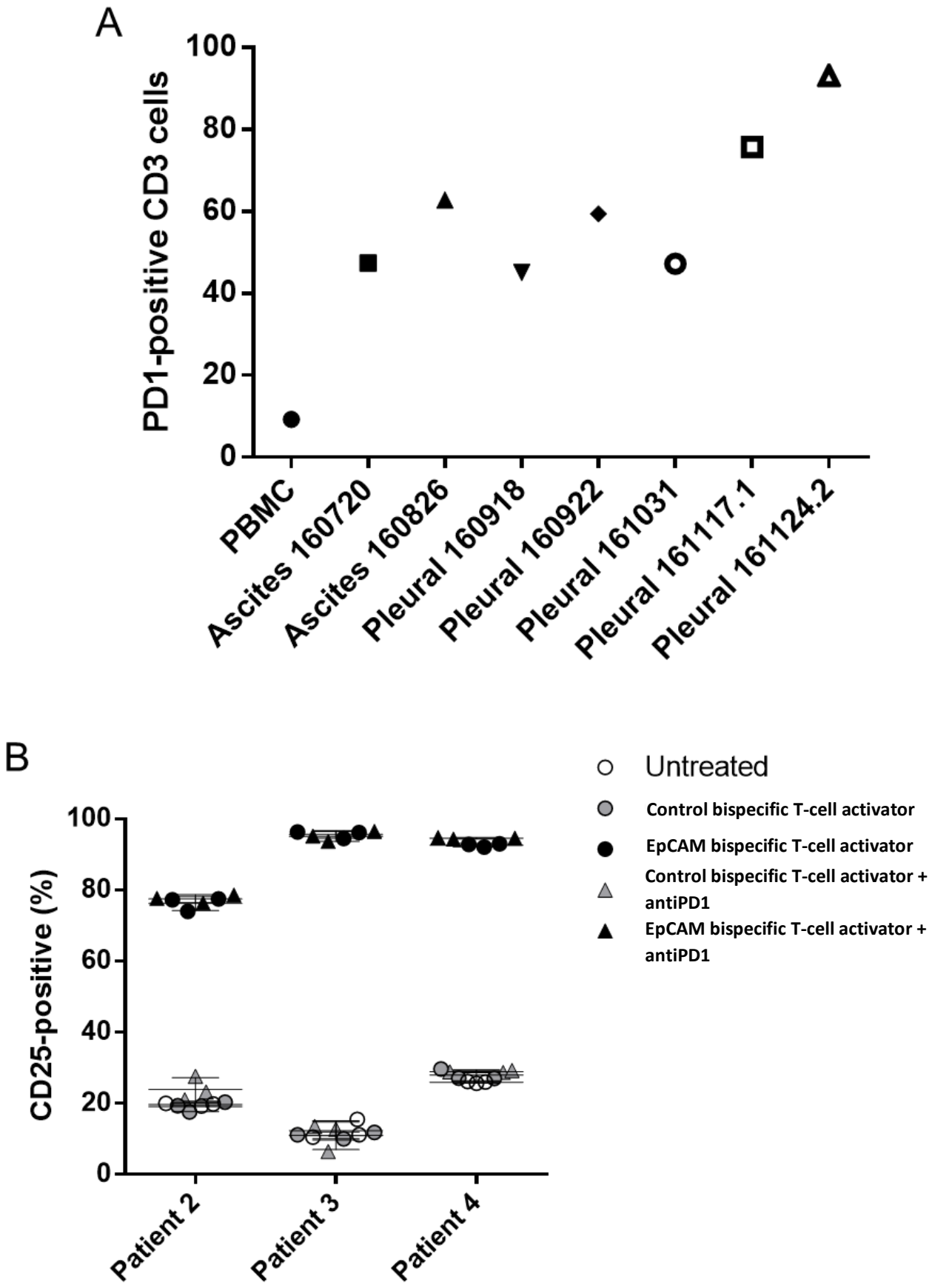


Figure 54

2017320776 18 Sep 2024

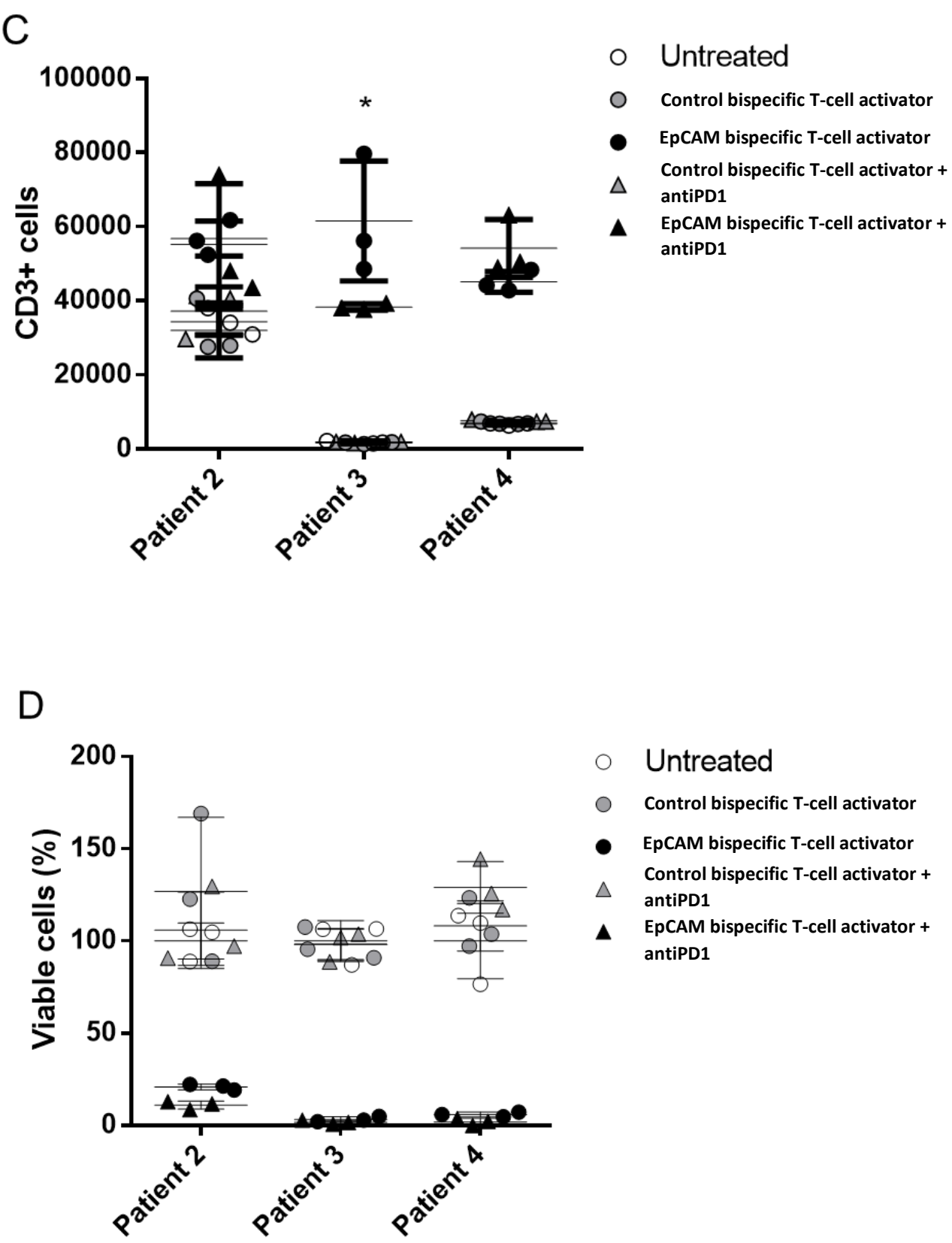
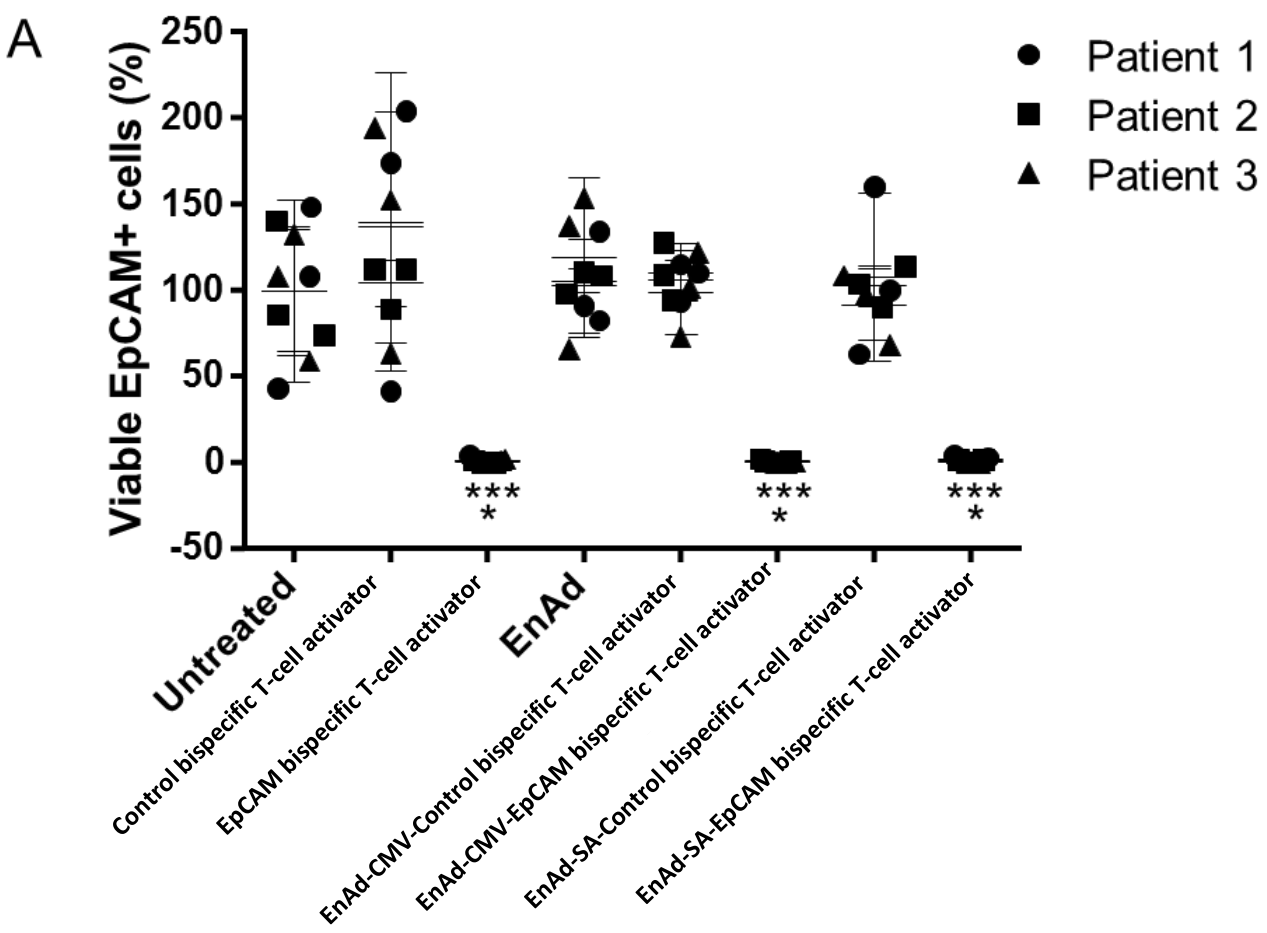


Figure 54 cont.

2017320776 18 Sep 2024



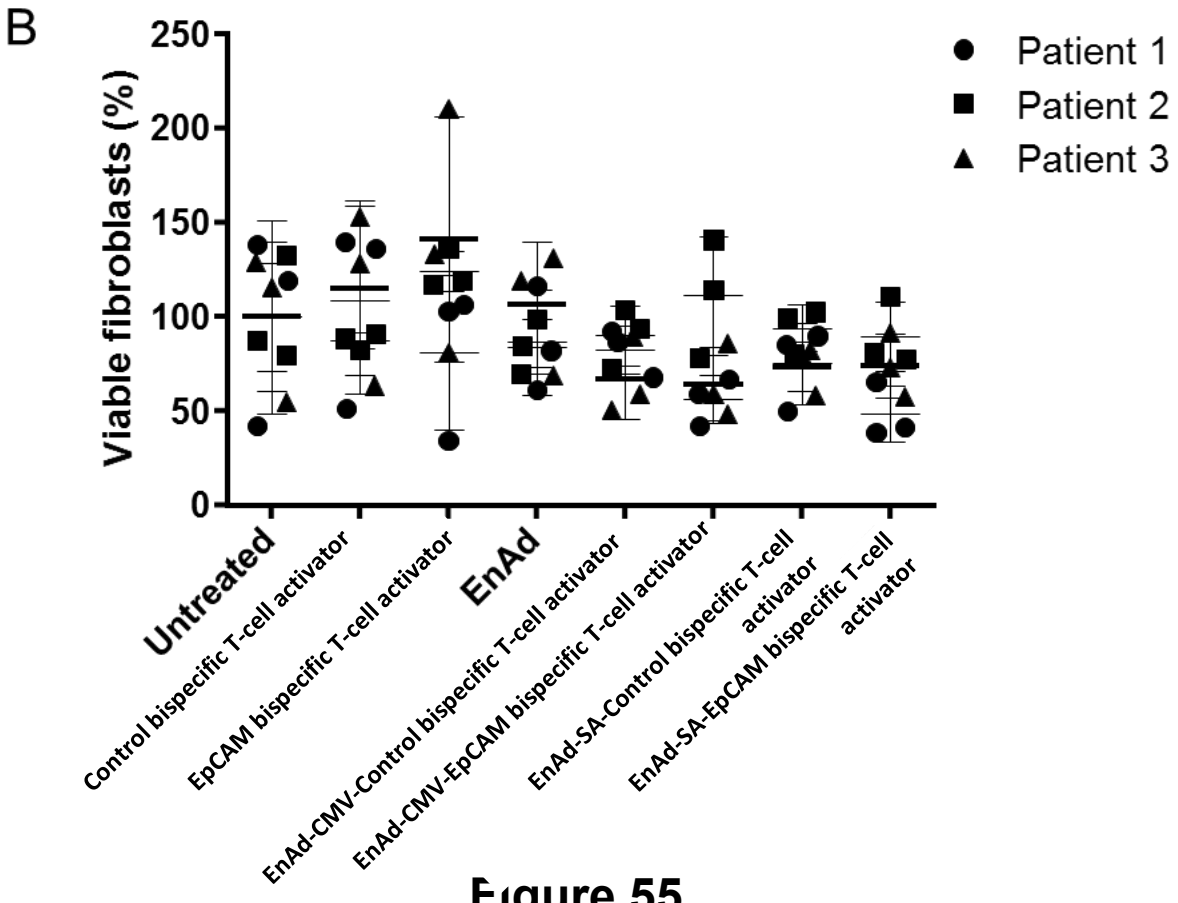


Figure 55

2017320776 18 Sep 2024

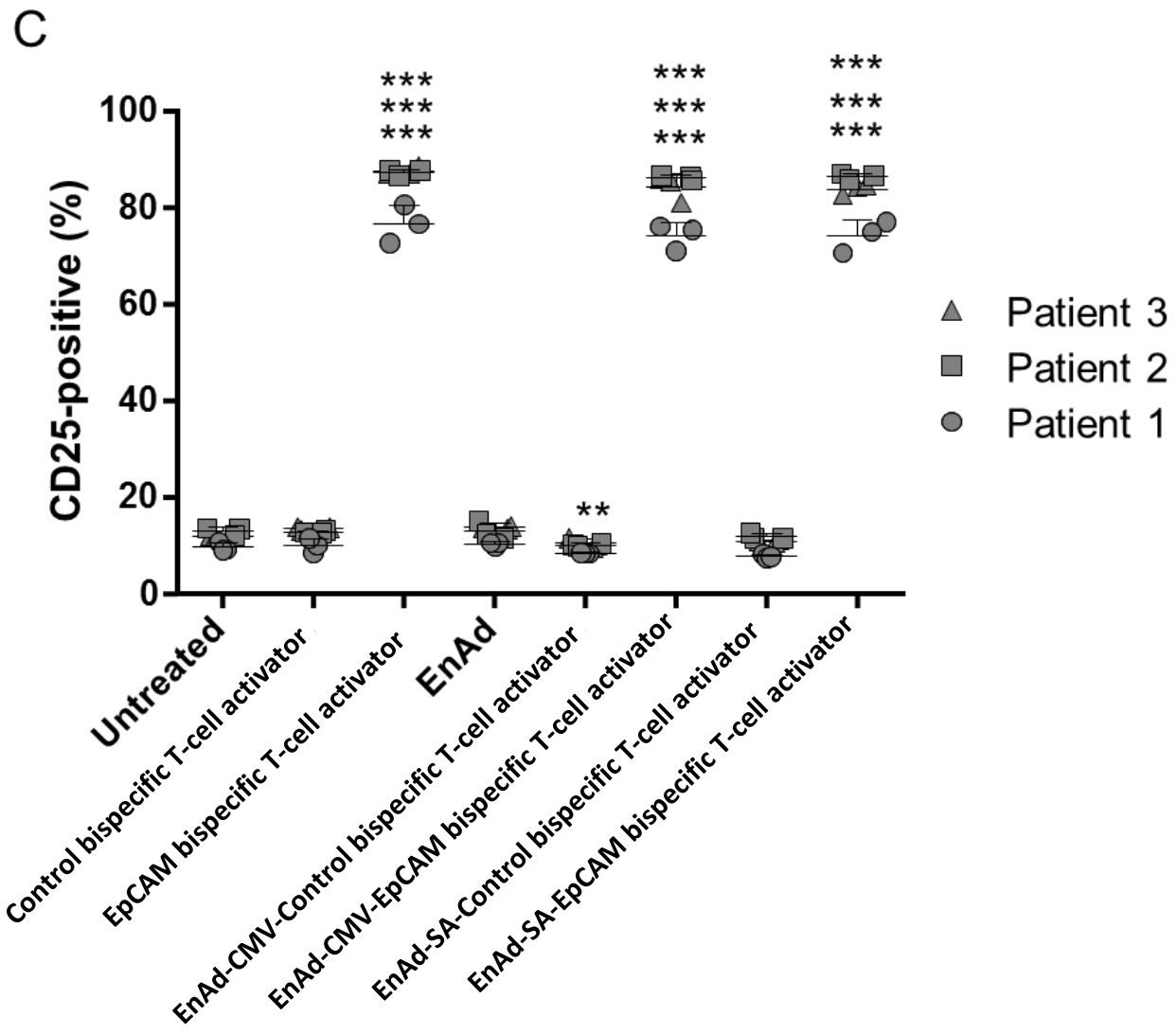


Figure 55 cont.

18 Sep 2024
2017320776

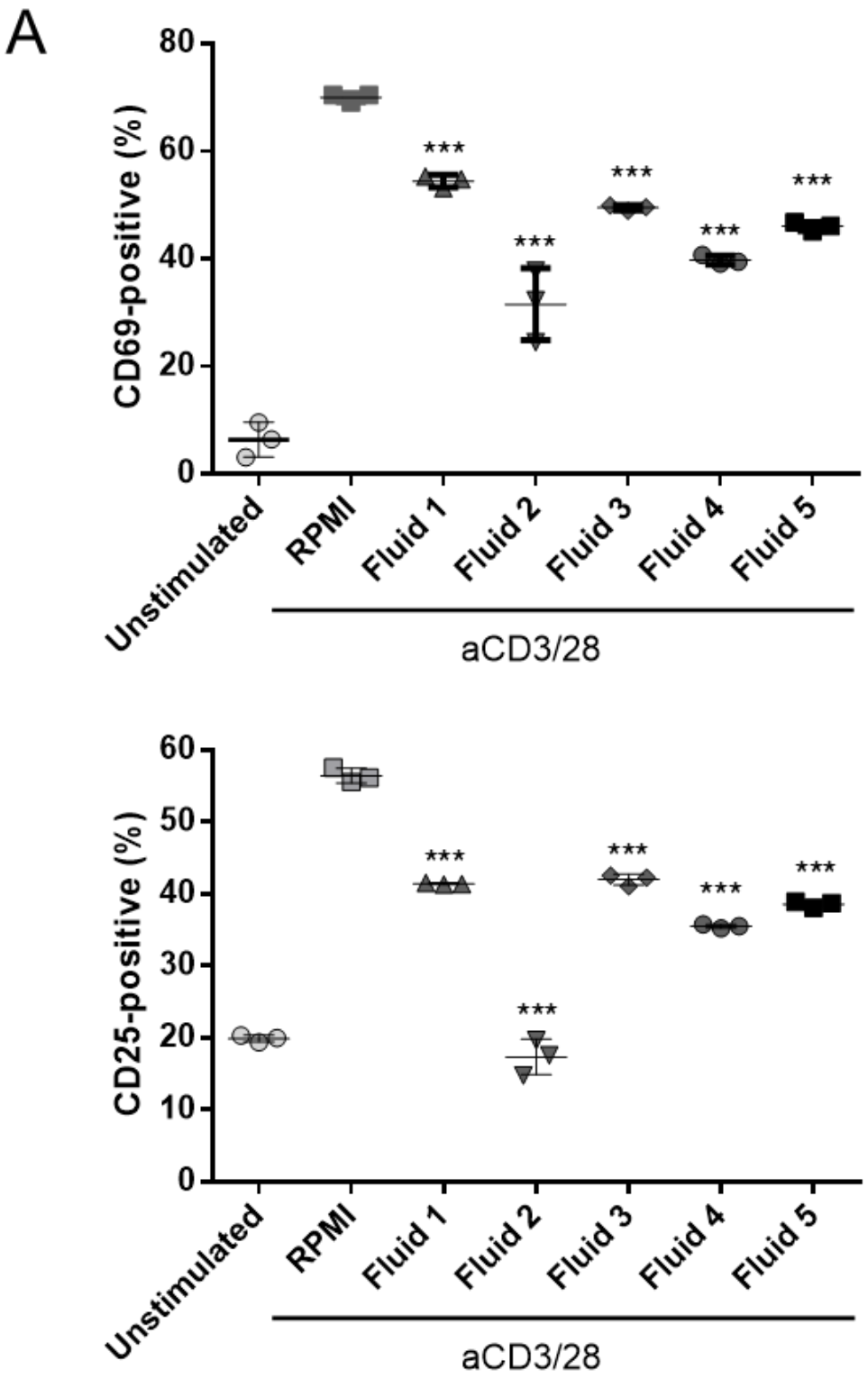


Figure 56

20173207776 18 Sep 2024

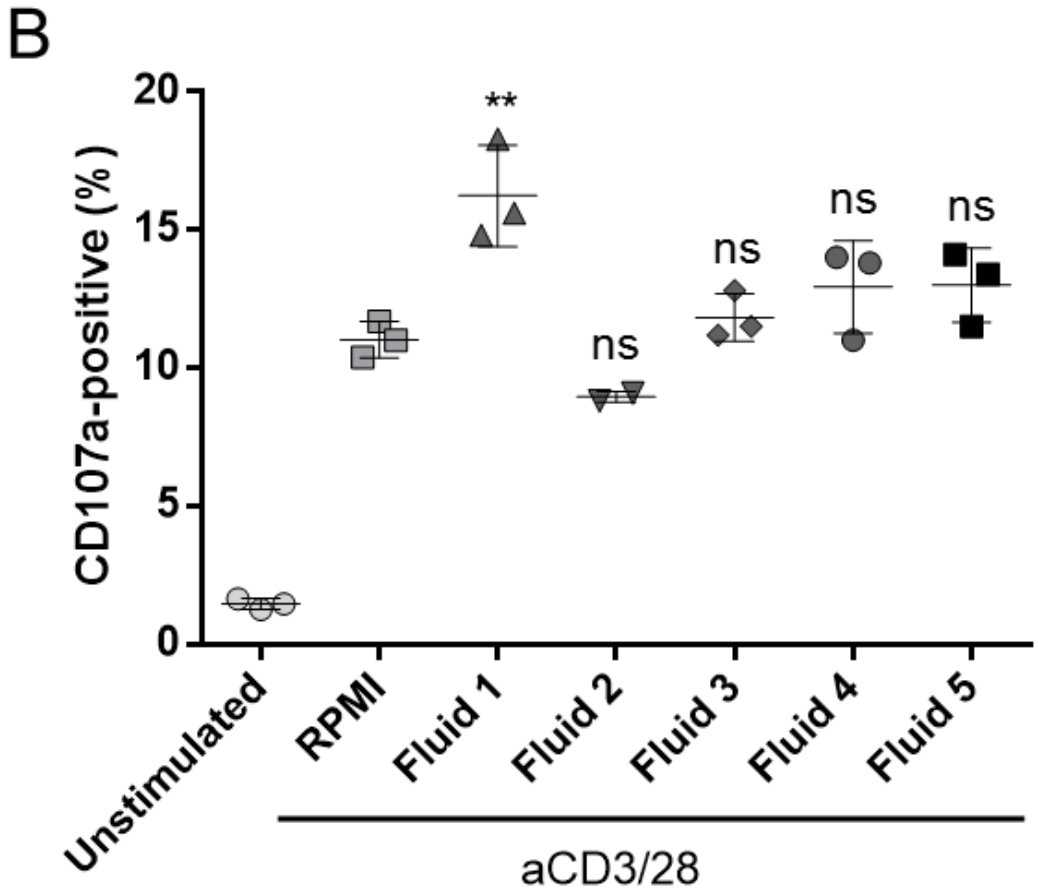
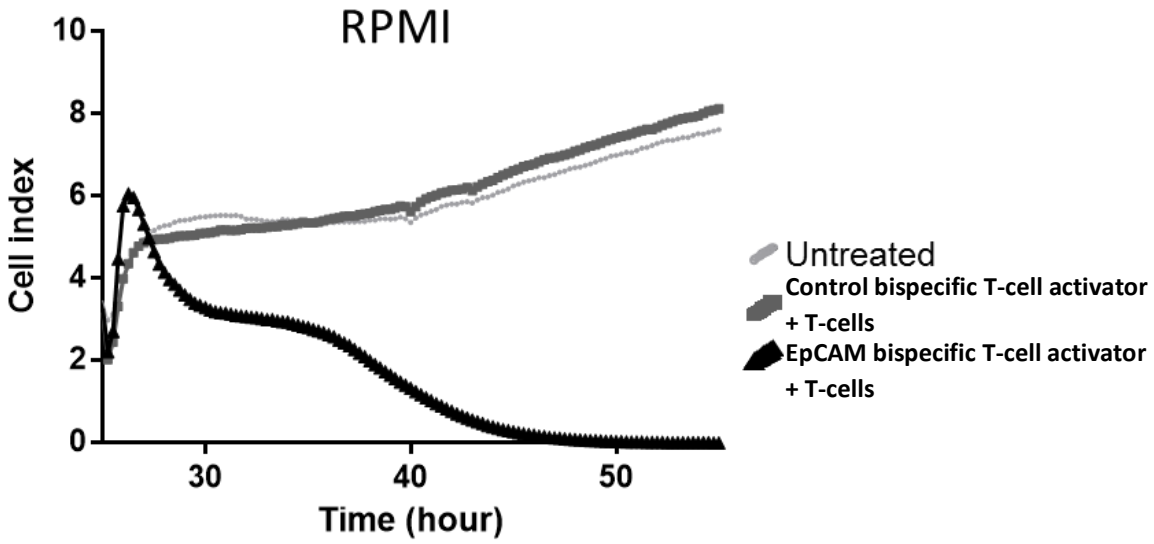
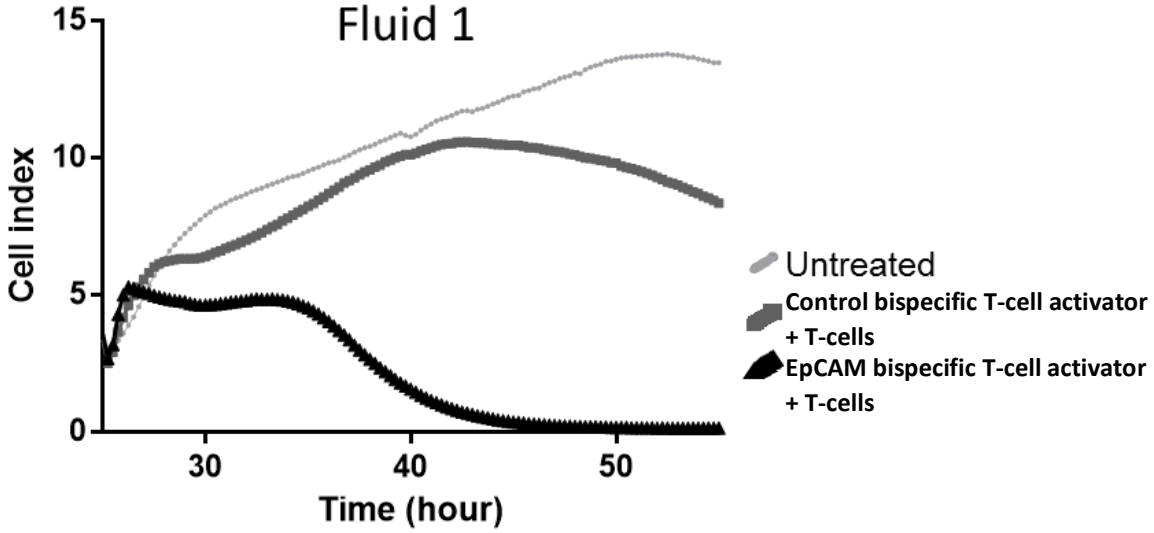


Figure 56 cont.

2017320776 18 Sep 2024

C





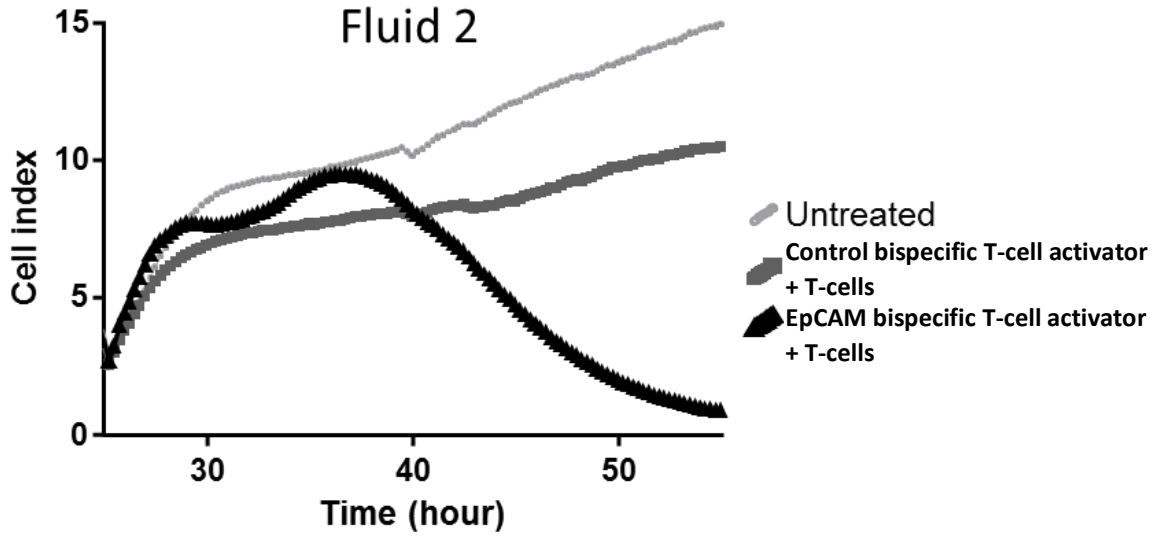


Figure 56 cont.

2017320776 18 Sep 2024

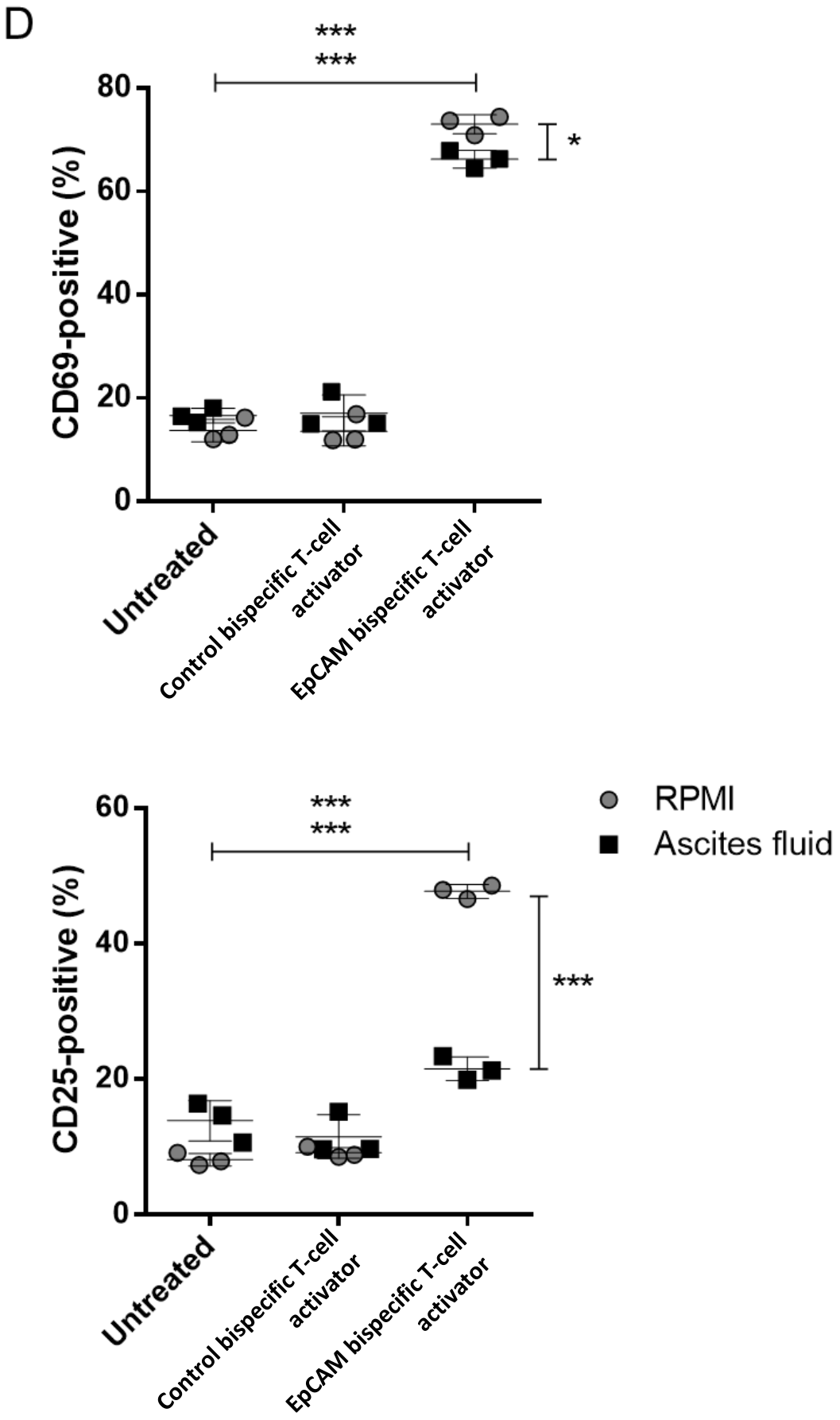
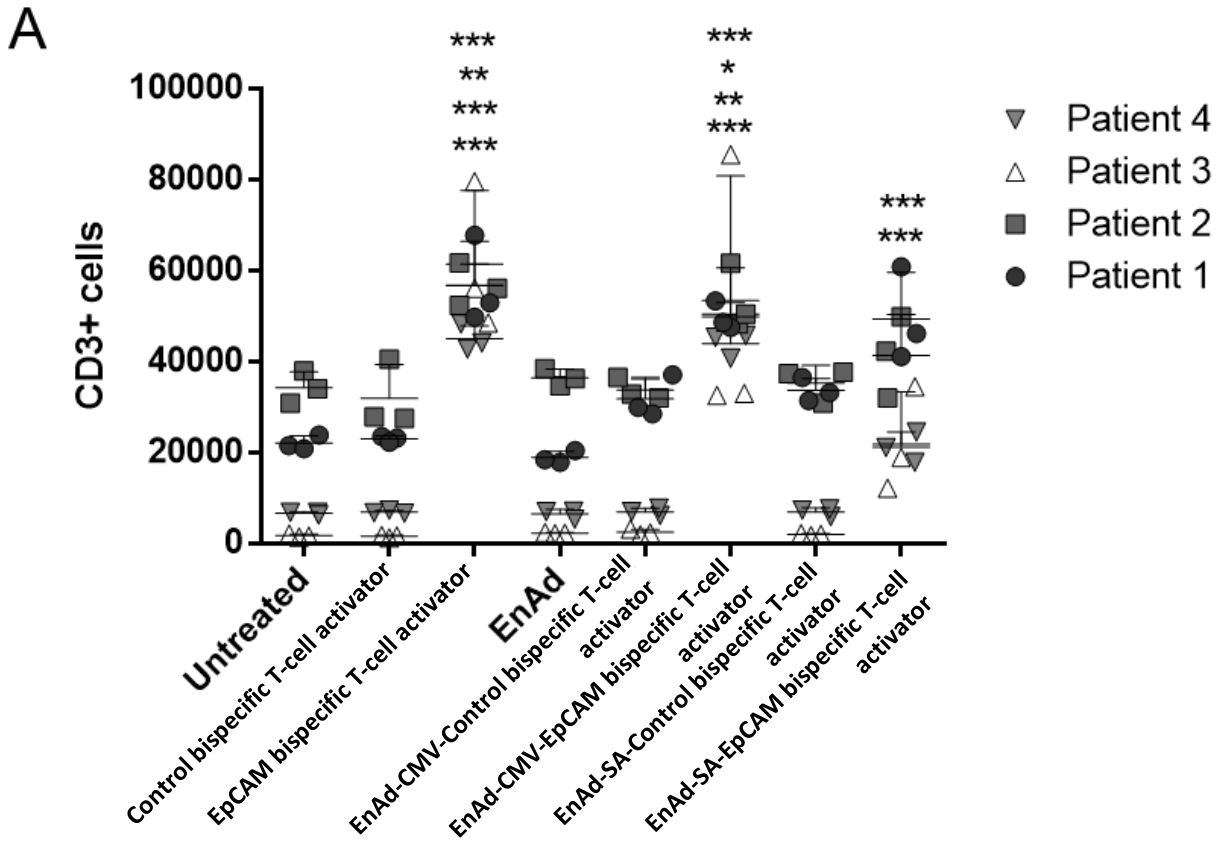


Figure 56 cont.

2017320776 18 Sep 2024



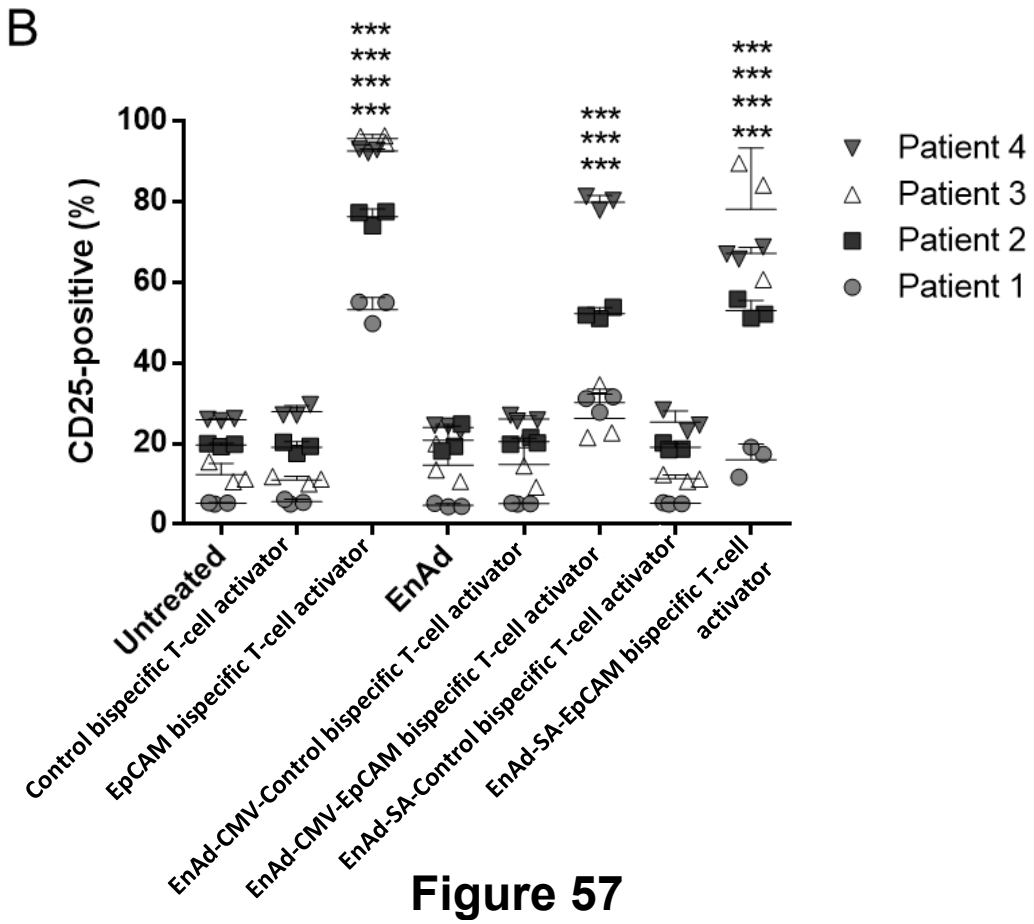


Figure 57

2017320776 18 Sep 2024

C

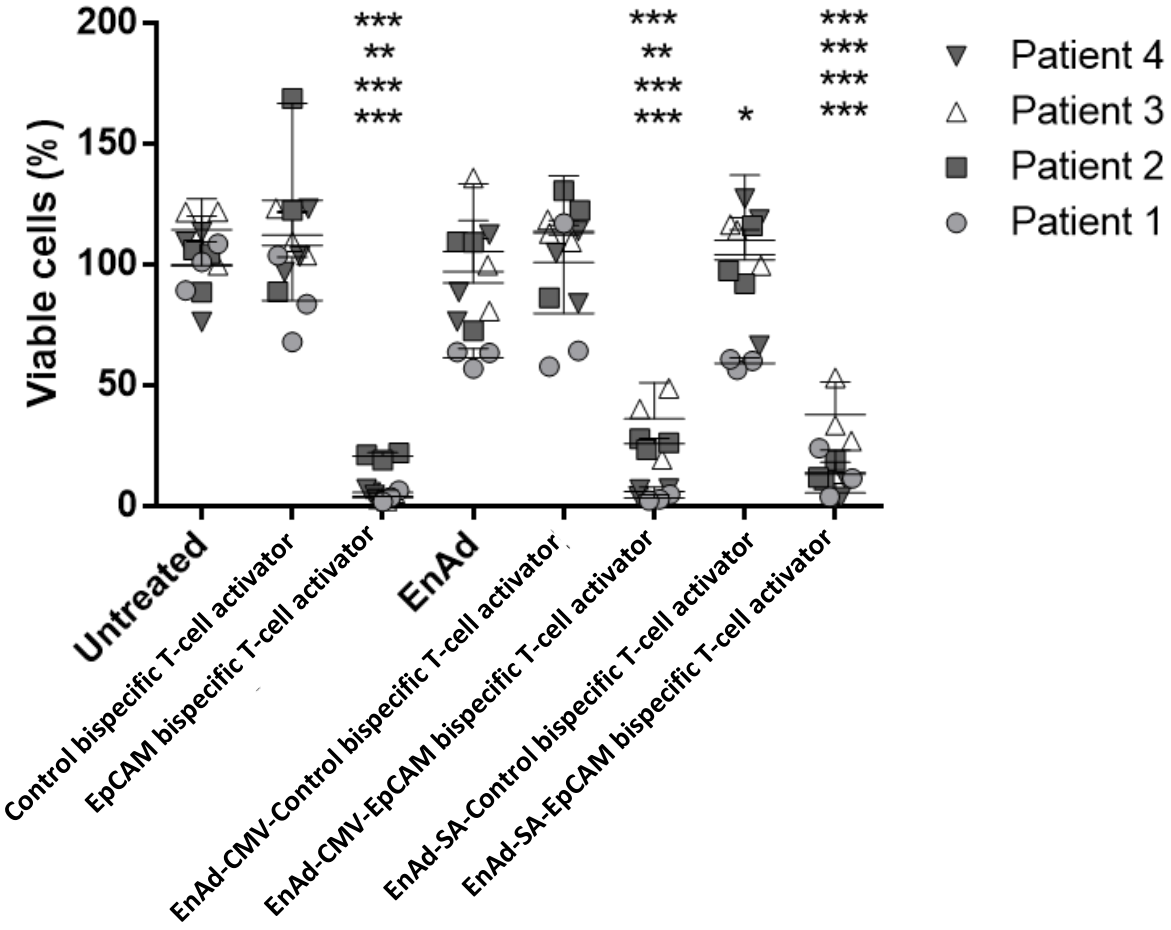
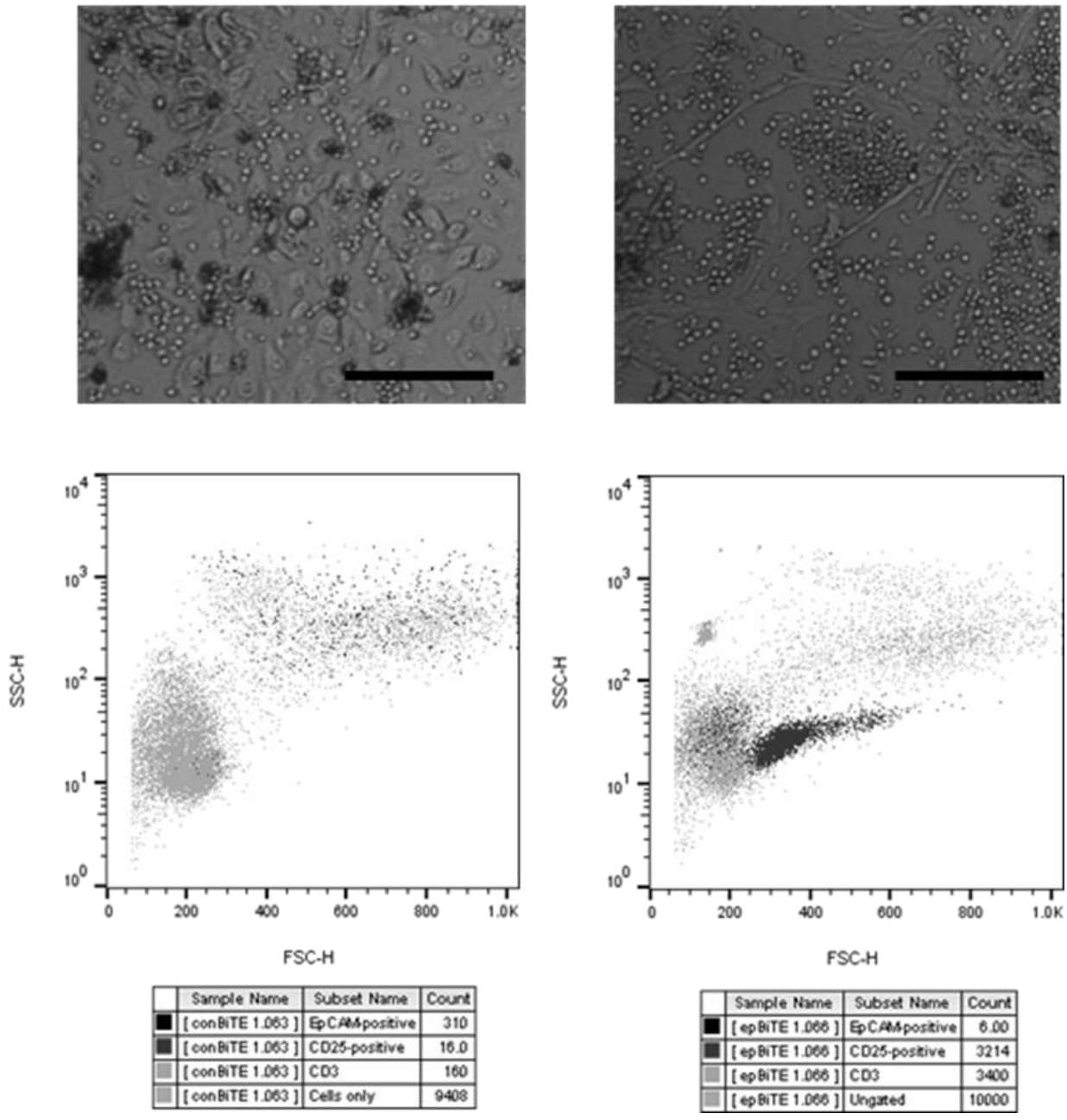


Figure 57 cont.

18 Sep 2024
2017320776

D EnAd

EnAd-CMV-EpCAM bispecific T-cell activator



	Sample Name	Subset Name	Count
■	[conBiTE 1.063]	EpCAMpositive	310
■	[conBiTE 1.063]	CD25-positive	16.0
■	[conBiTE 1.063]	CD3	160
■	[conBiTE 1.063]	Cells only	9408

	Sample Name	Subset Name	Count
■	[epBiTE 1.066]	EpCAMpositive	6.00
■	[epBiTE 1.066]	CD25-positive	3214
■	[epBiTE 1.066]	CD3	3400
■	[epBiTE 1.066]	Ungated	10000

Figure 57 cont.

E

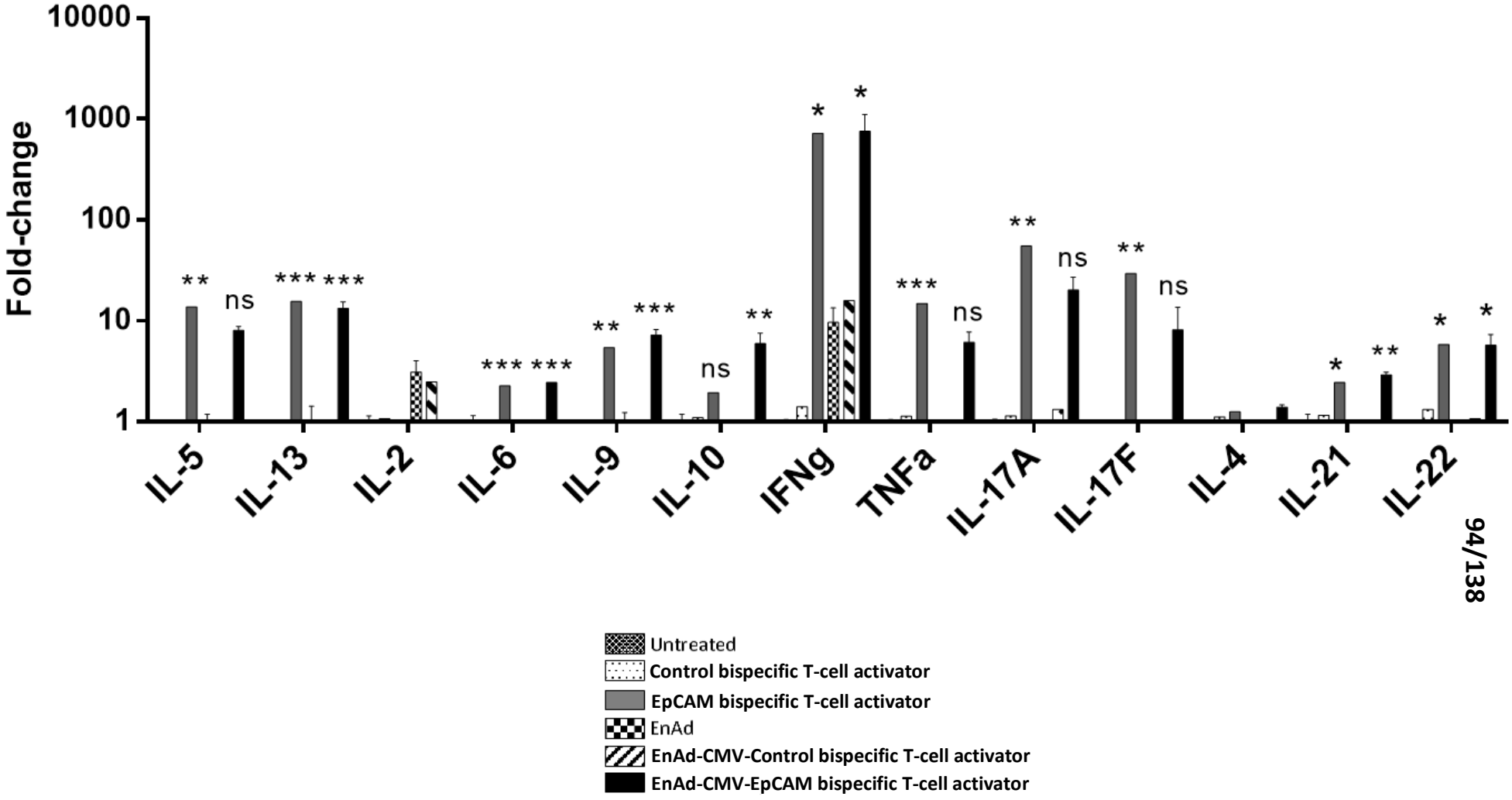


Figure 57 cont.

FIGURE 58

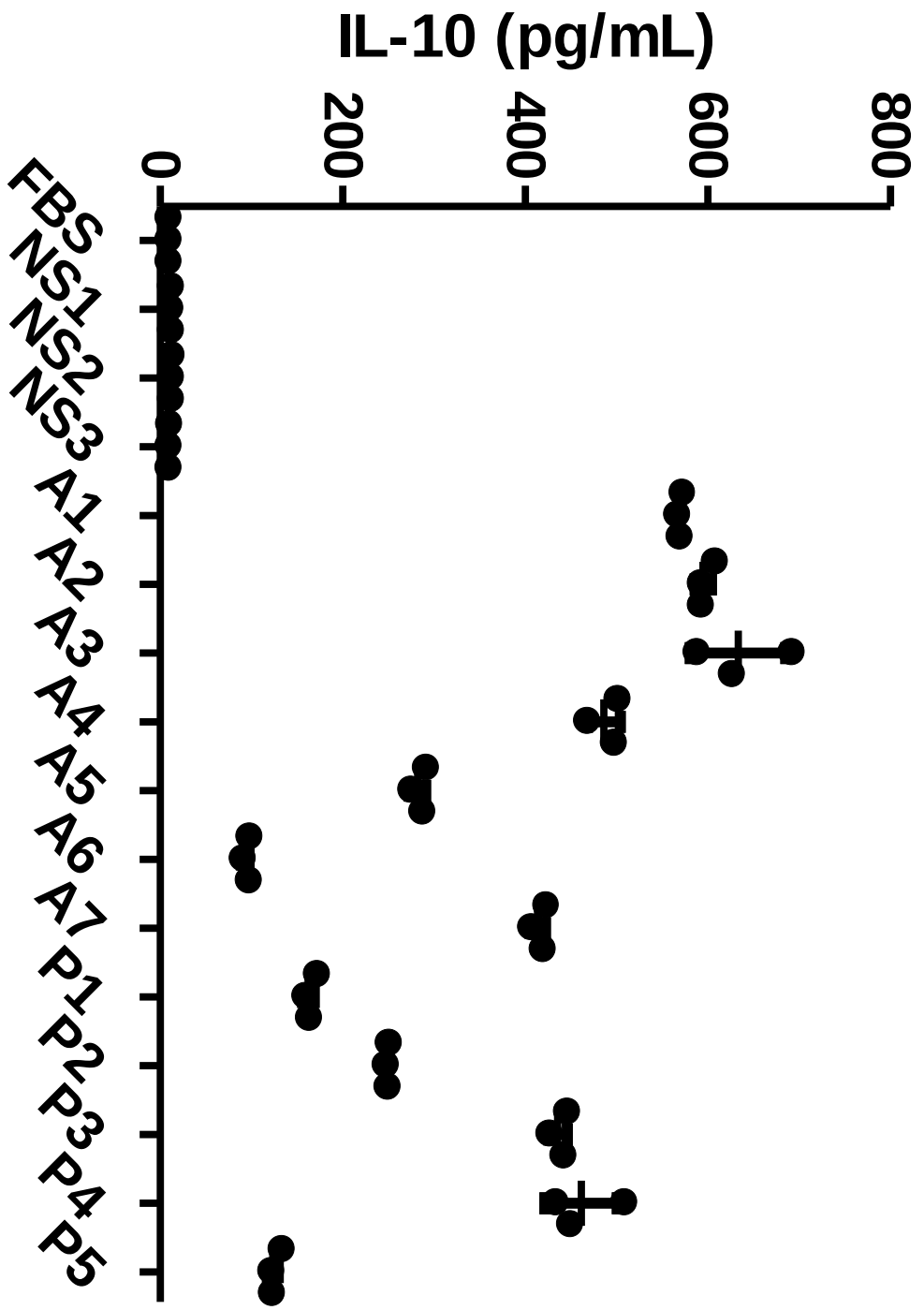

IL-10 (pg/mL)
0
200
400
600
800
FBS
NS
S1
S2
S3
A1
A2
A3
A4
A5
A6
A7
P1
P2
P3
P4
P5

FIGURE 59

80
60
40
20
0
CD69+CD25+ (%)
Untreated
CD3/CD28
***
***
***
*
***
normal serum
A1
A2
A3
A4
A5
A6
A7
P1
P2
P3
P4
P5

FIGURE 60

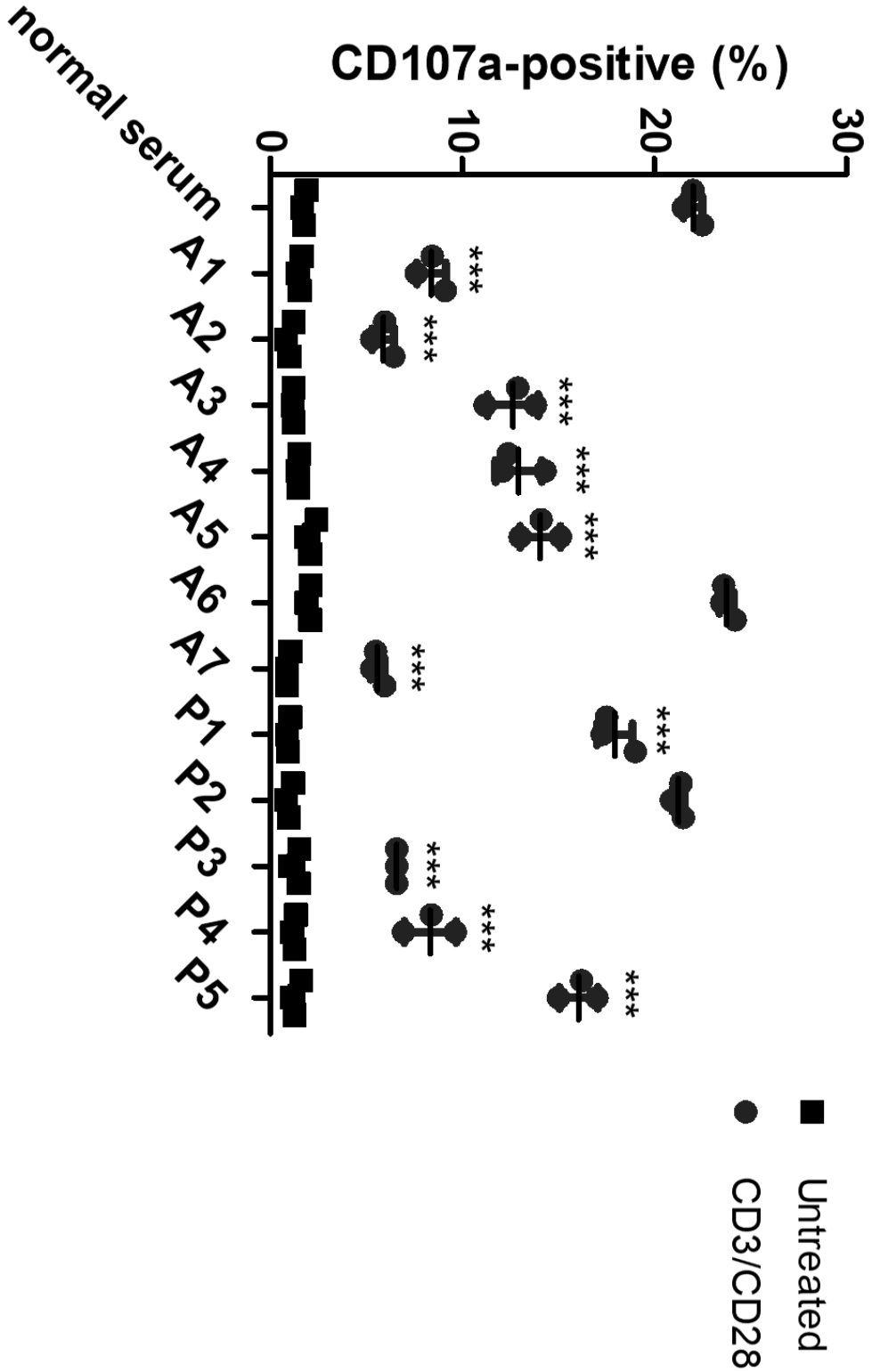

CD107a-positive (%)
0
10
20
30
normal serum
A1
A2
A3
A4
A5
A6
A7
P1
P2
P3
P4
P5
***
Untreated
CD3/CD28

FIGURE 61

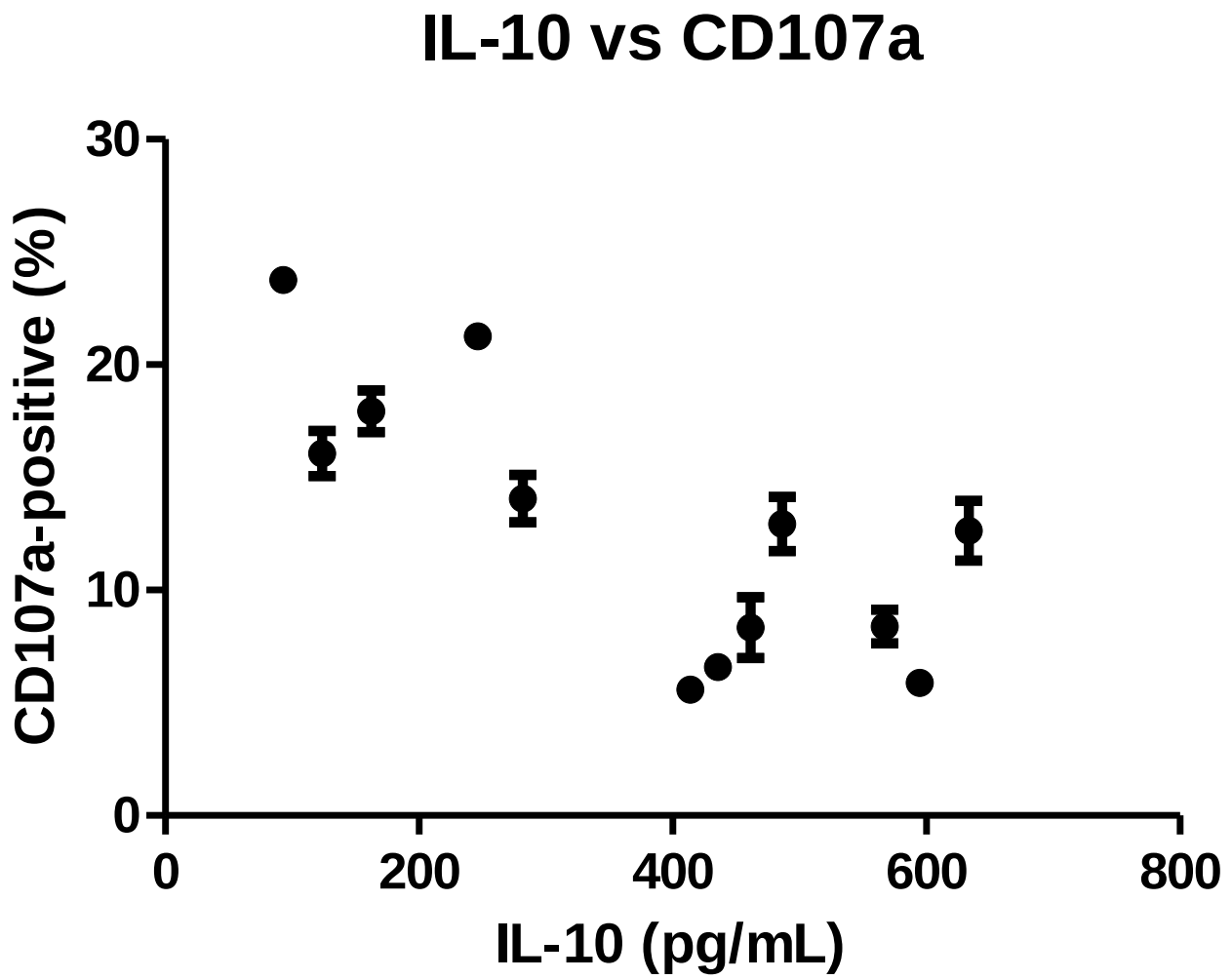
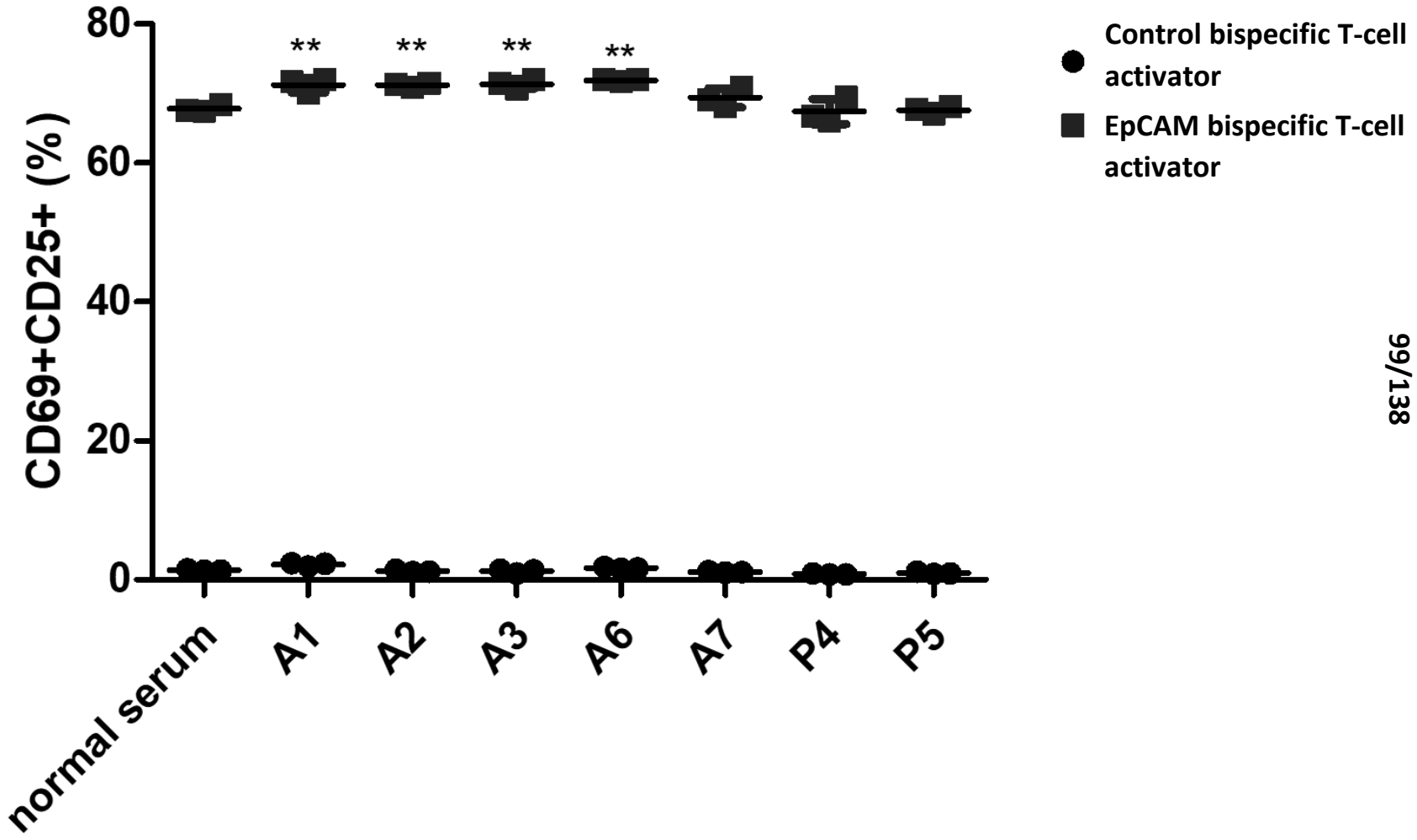

IL-10 vs CD107a
CD107a-positive (%)
30
20
10
0
0
200
400
600
800
IL-10 (pg/mL)

FIGURE 62


CD69+CD25+ (%)
80
60
40
20
0
**
**
**
**
normal serum
A1
A2
A3
A6
A7
P4
P5
Control bispecific T-cell activator
EpCAM bispecific T-cell activator

2017320776 18 Sep 2024

FIGURE 63

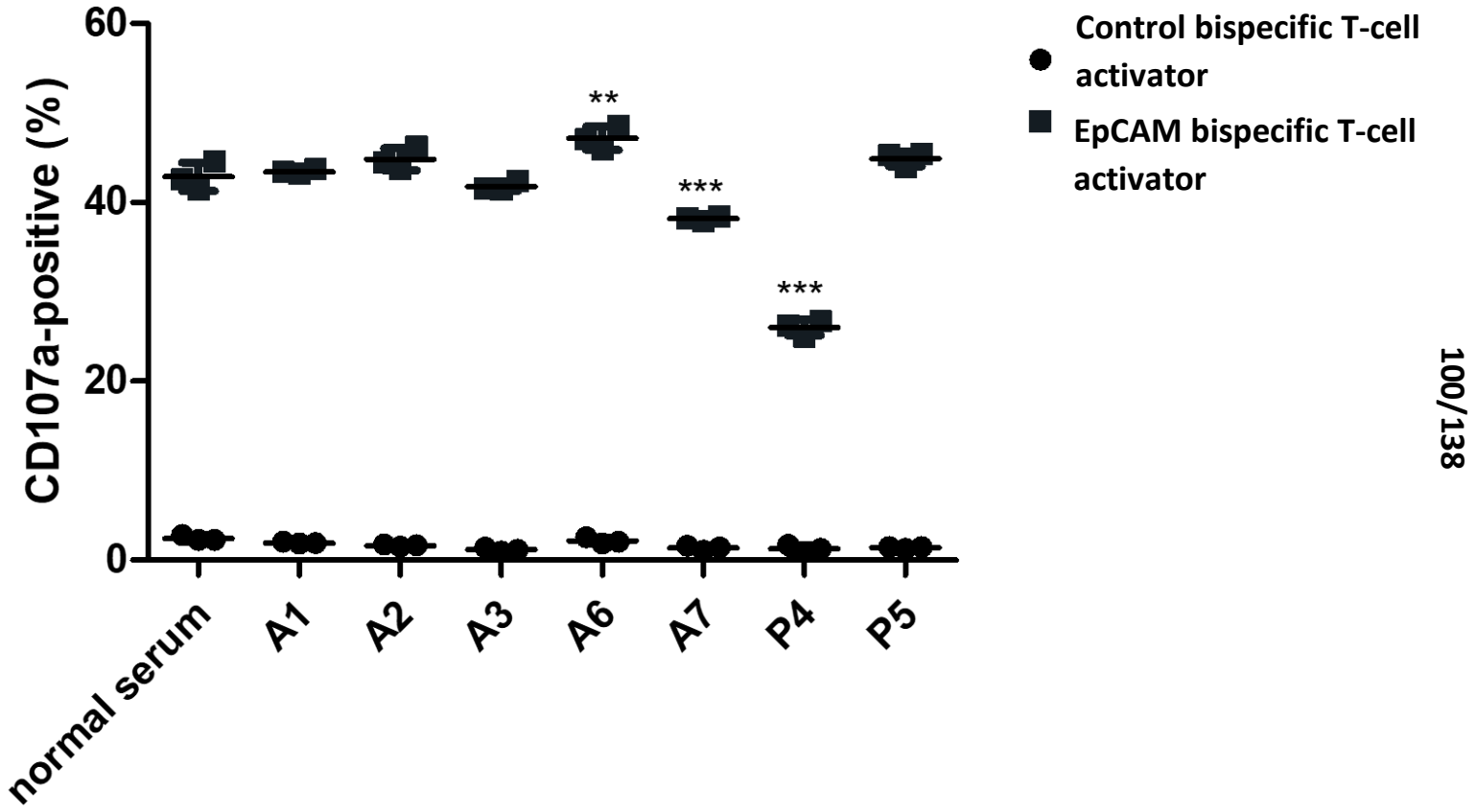
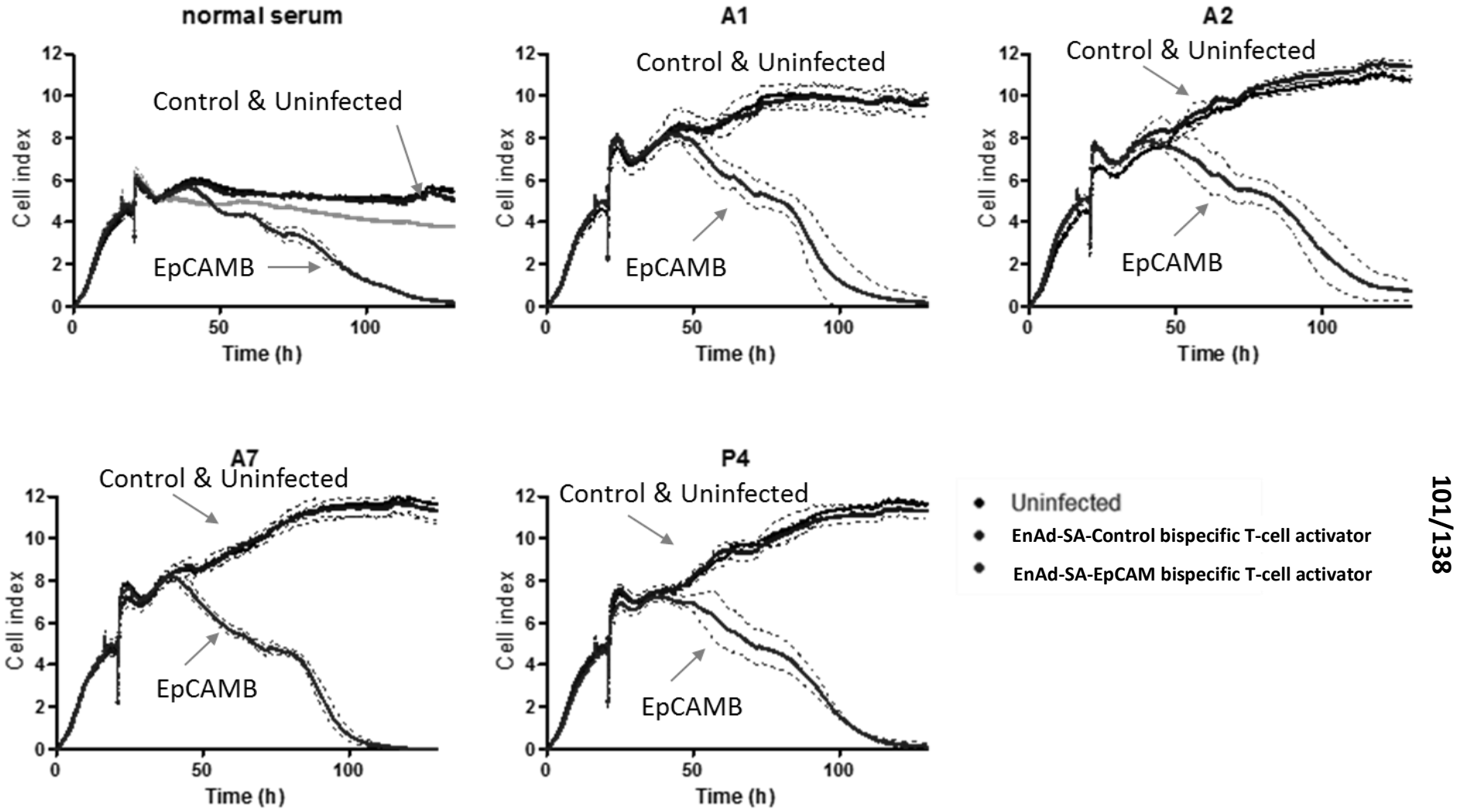


FIGURE 64

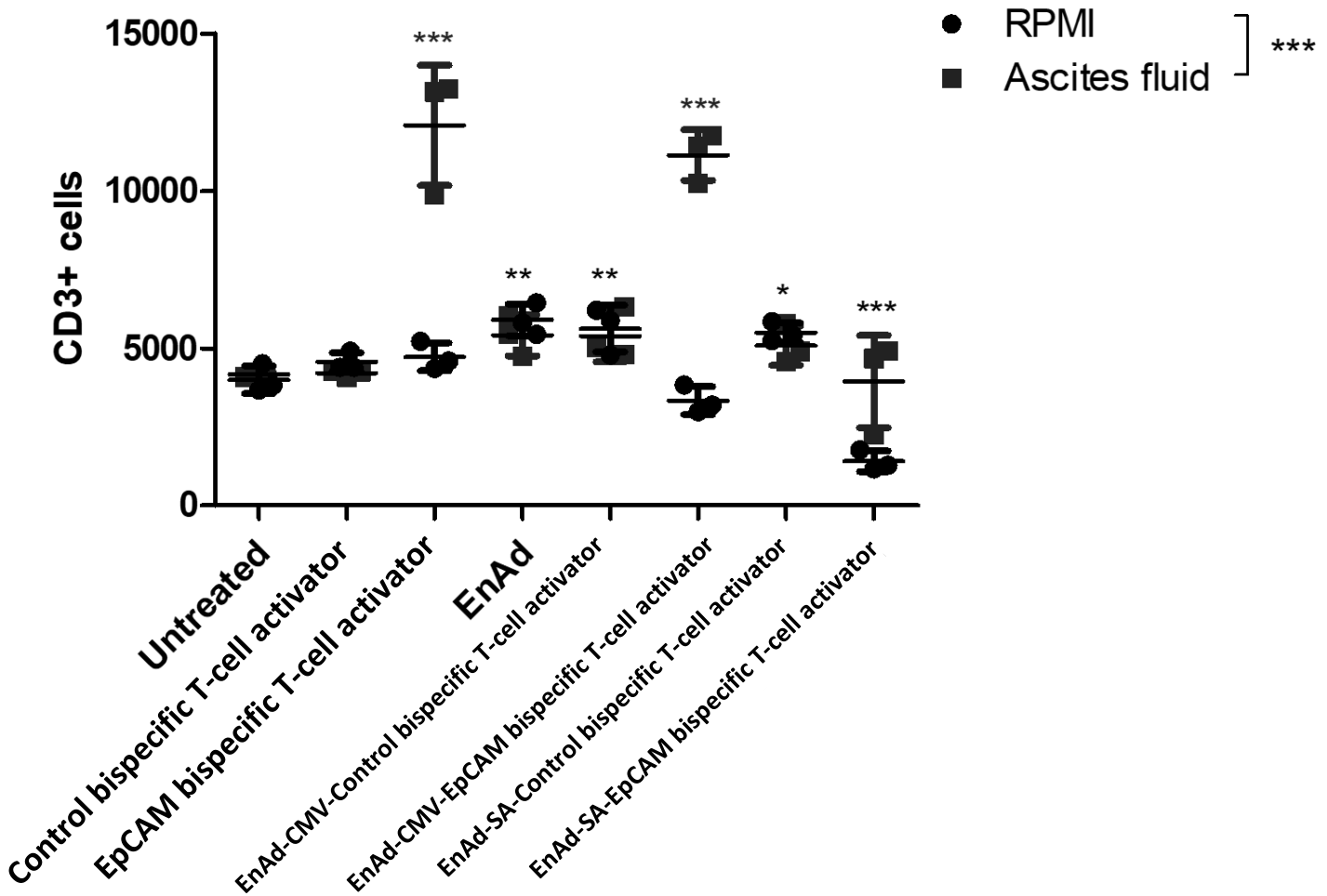

normal serum
A1
A2
A7
P4
Control & Uninfected
EpCAMB
Cell index
Time (h)
0
50
100
2
4
6
8
10
12
Uninfected
EnAd-SA-Control bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator

2017320776 18 Sep 2024

FIGURE 65

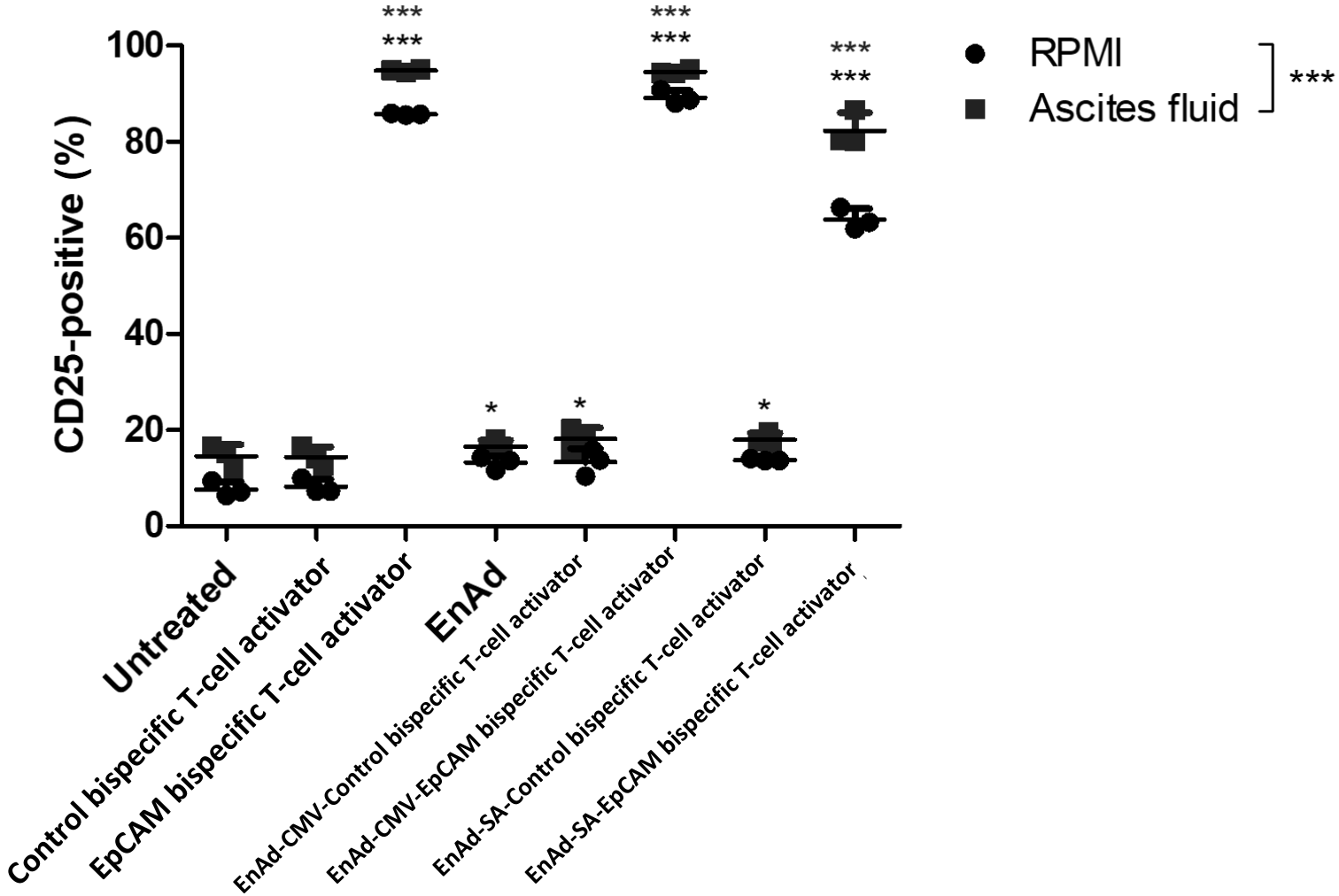
2017320776 18 Sep 2024

FIGURE 66A



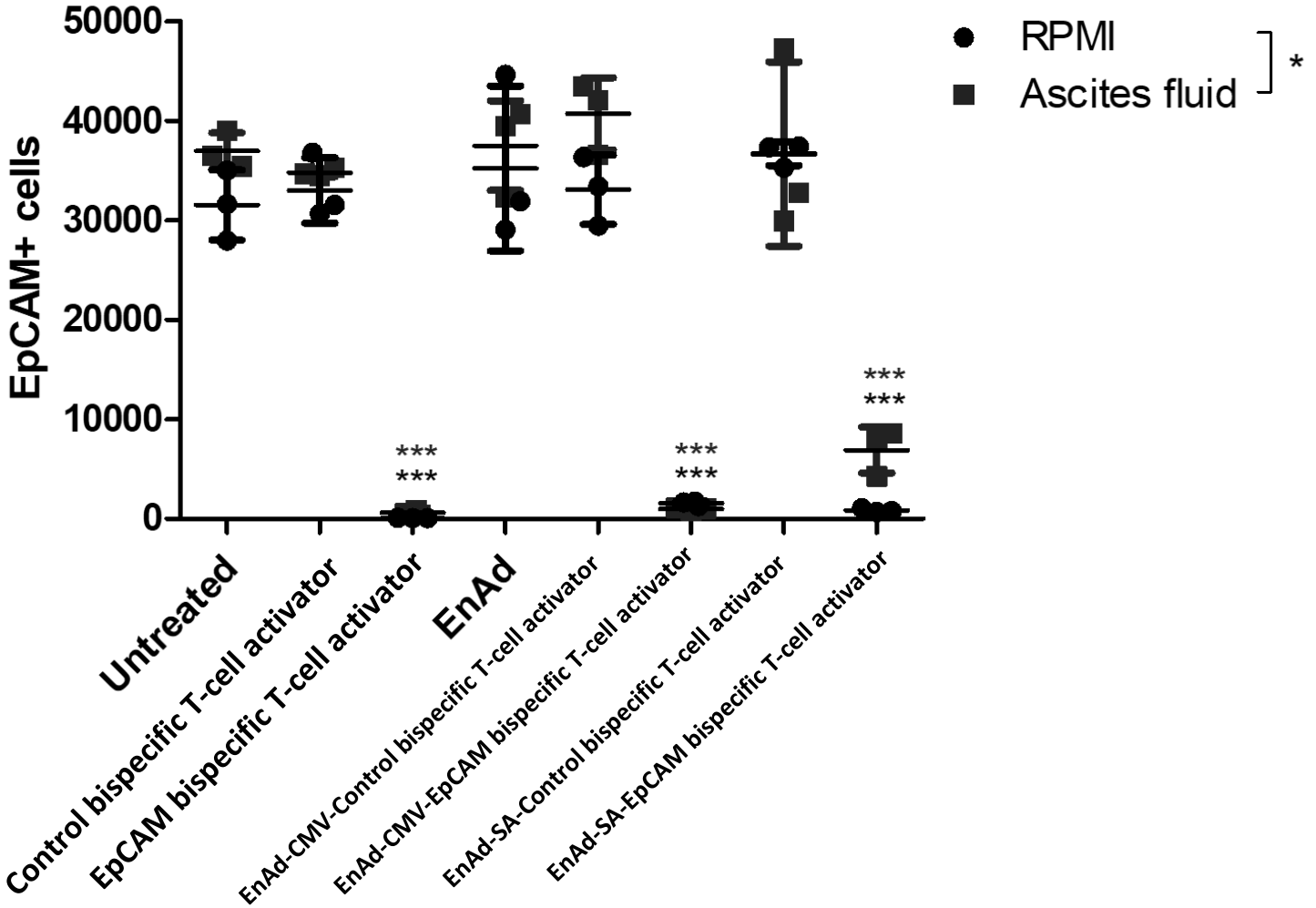
2017320776 18 Sep 2024

FIGURE 66B



2017320776 18 Sep 2024

FIGURE 66C



2017320776 18 Sep 2024

FIGURE 67A

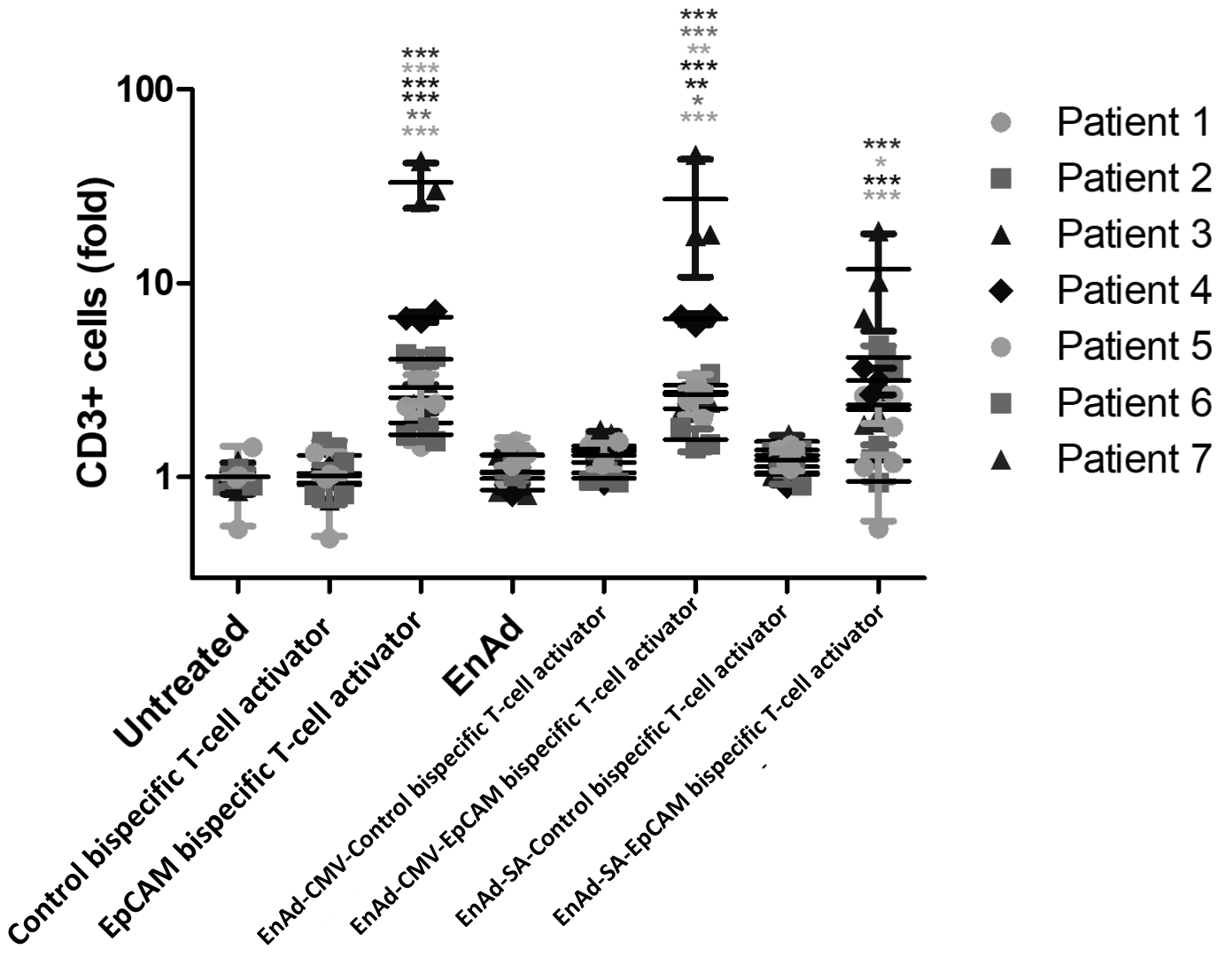


FIGURE 67B

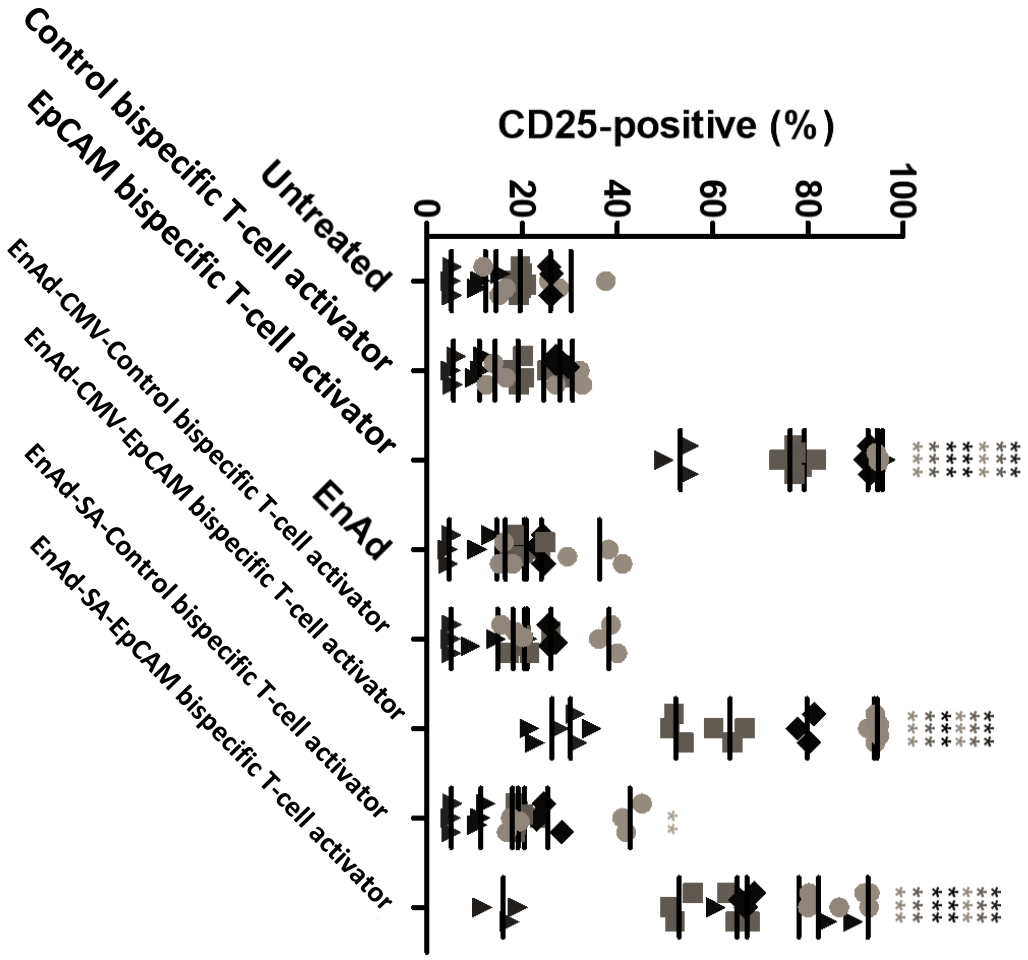
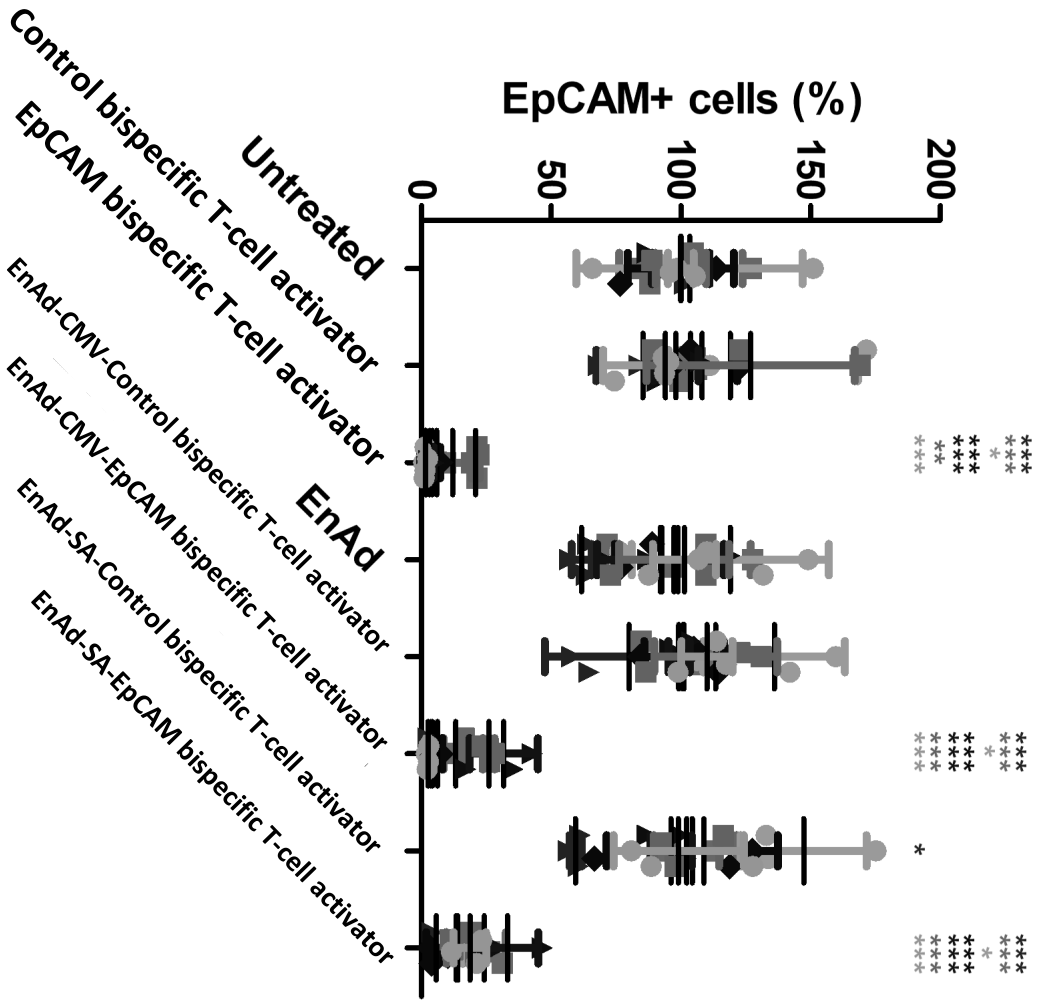

CD25-positive (%)
0
20
40
60
80
100
Untreated
Control bispecific T-cell activator
EpCAM bispecific T-cell activator
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell activator
EnAd-SA-Control bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator

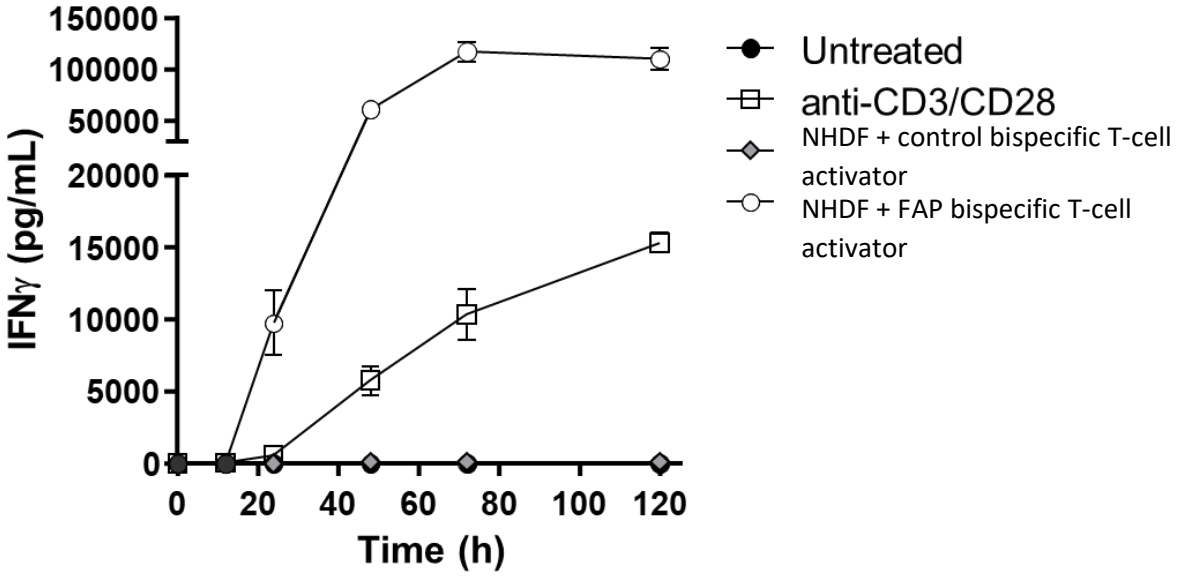
FIGURE 67C


EpCAM+ cells (%)
0
50
100
150
200
Untreated
Control bispecific T-cell activator
EpCAM bispecific T-cell activator
EnAd
EnAd-CMV-Control bispecific T-cell activator
EnAd-CMV-EpCAM bispecific T-cell activator
EnAd-SA-Control bispecific T-cell activator
EnAd-SA-EpCAM bispecific T-cell activator
****
****
****
****
****
*
****
****
****

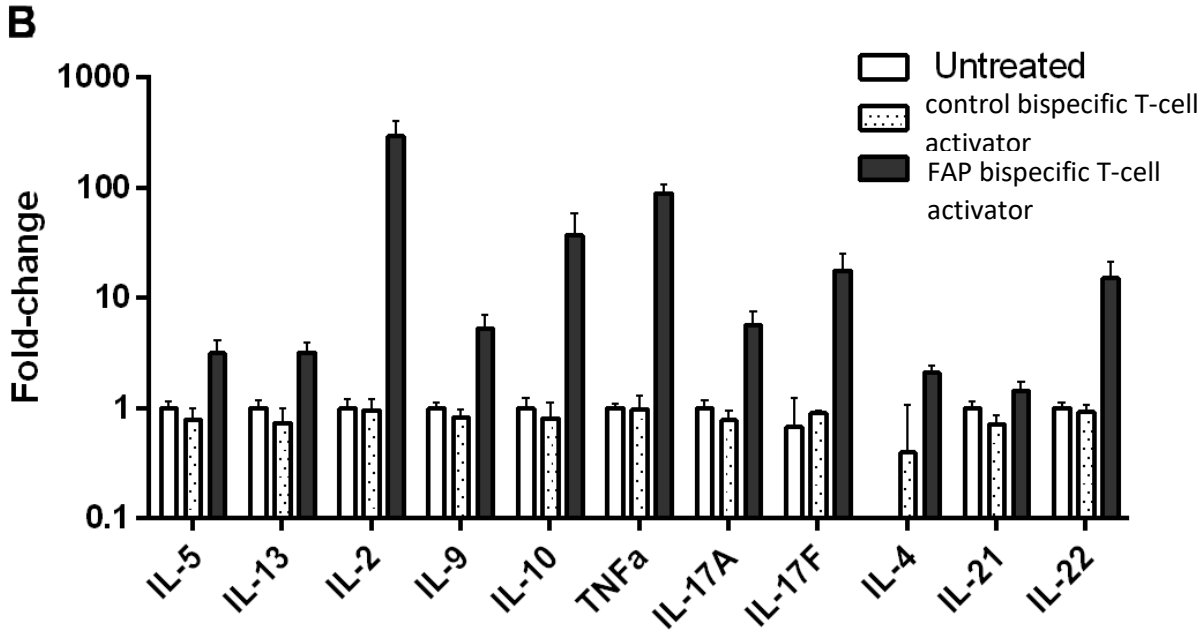
2017320776 18 Sep 2024

Figure 68

A

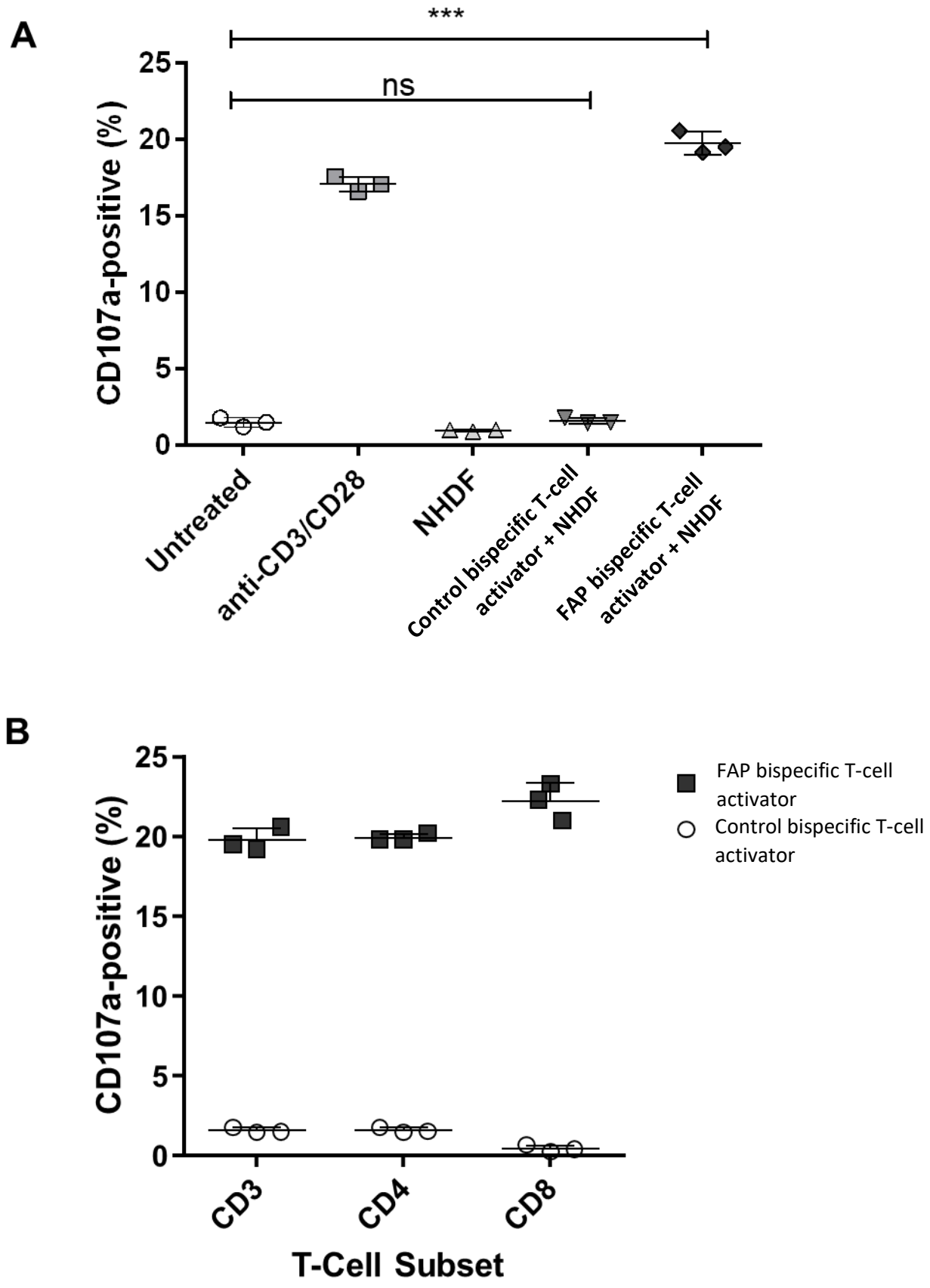


B



2017320776 18 Sep 2024

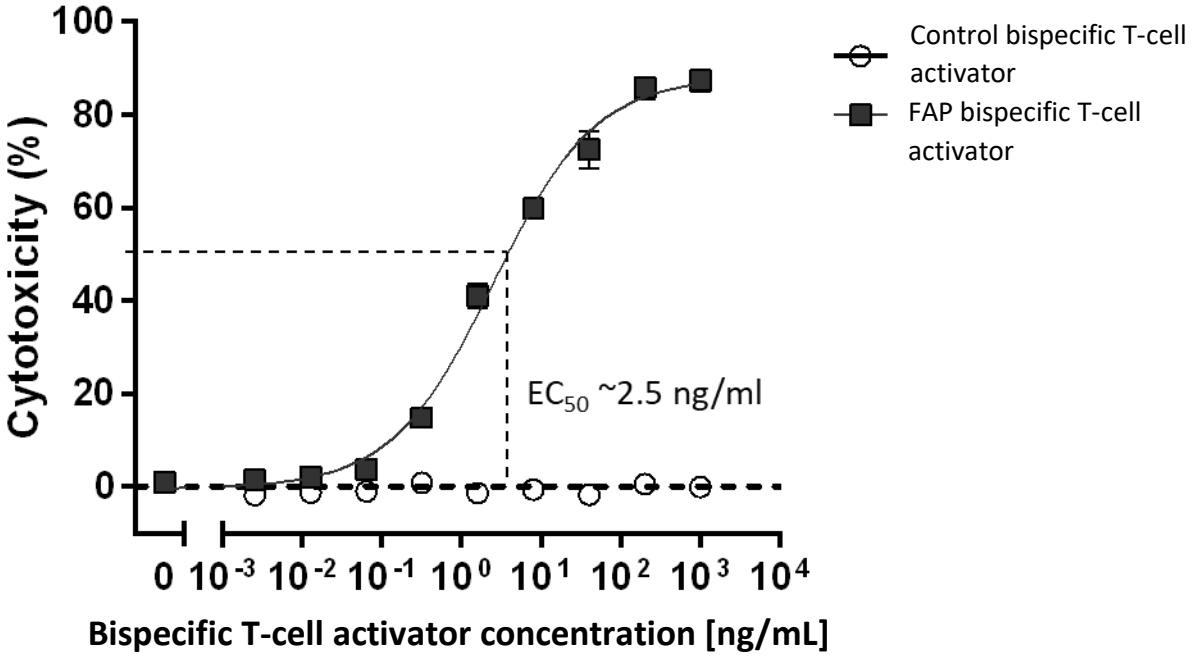
Figure 69



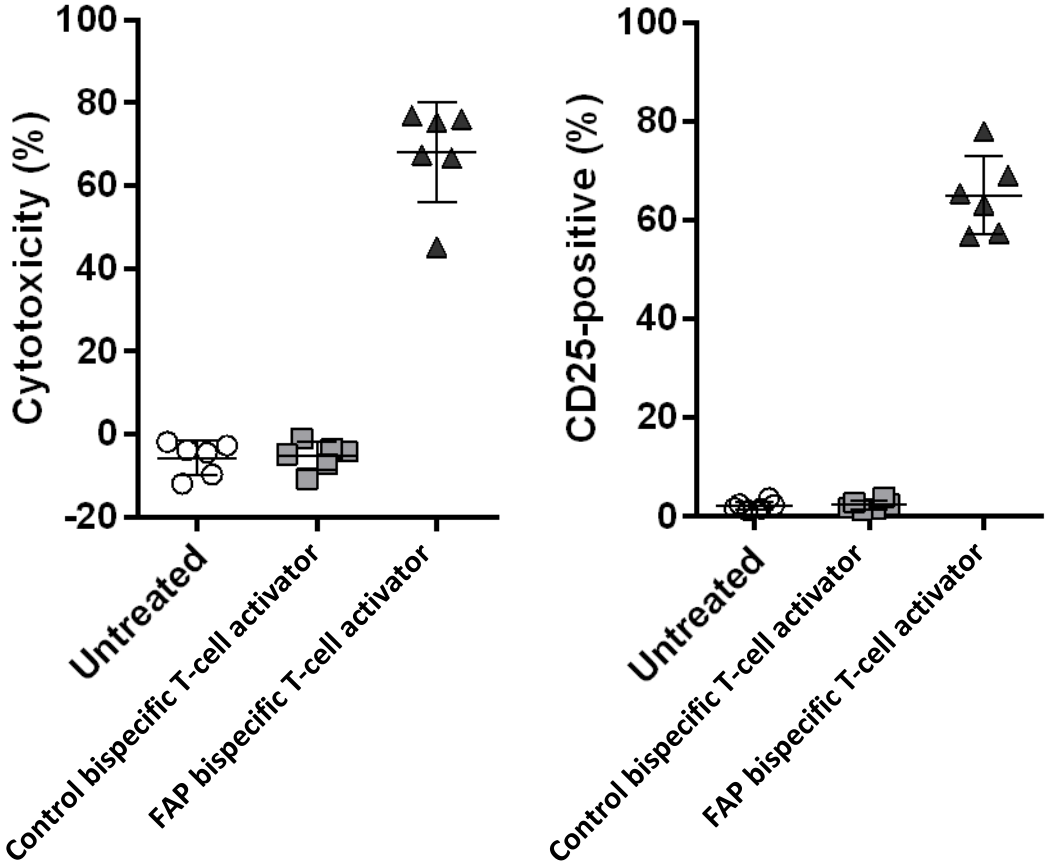
18 Sep 2024 2017320776

Figure 69

C

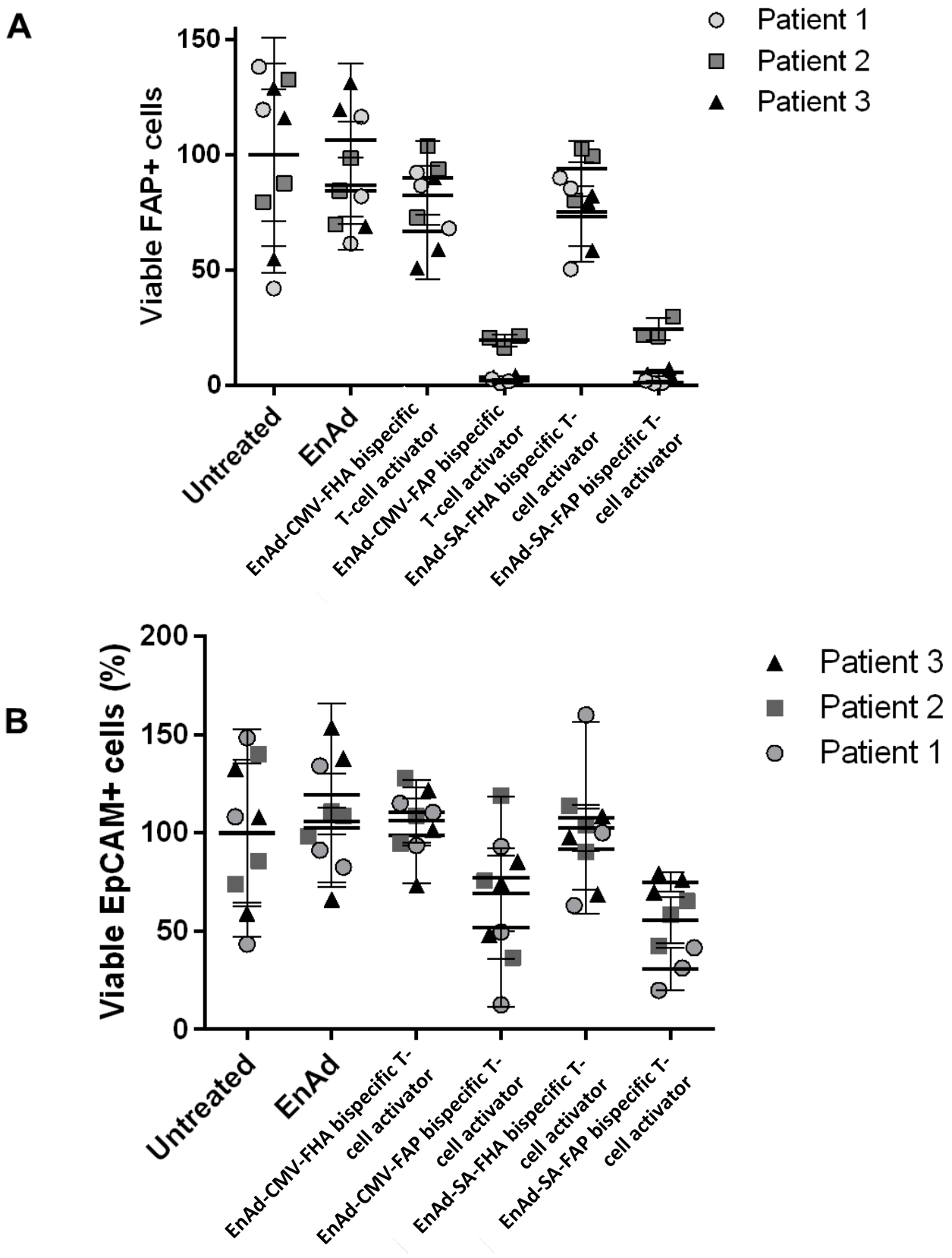


D



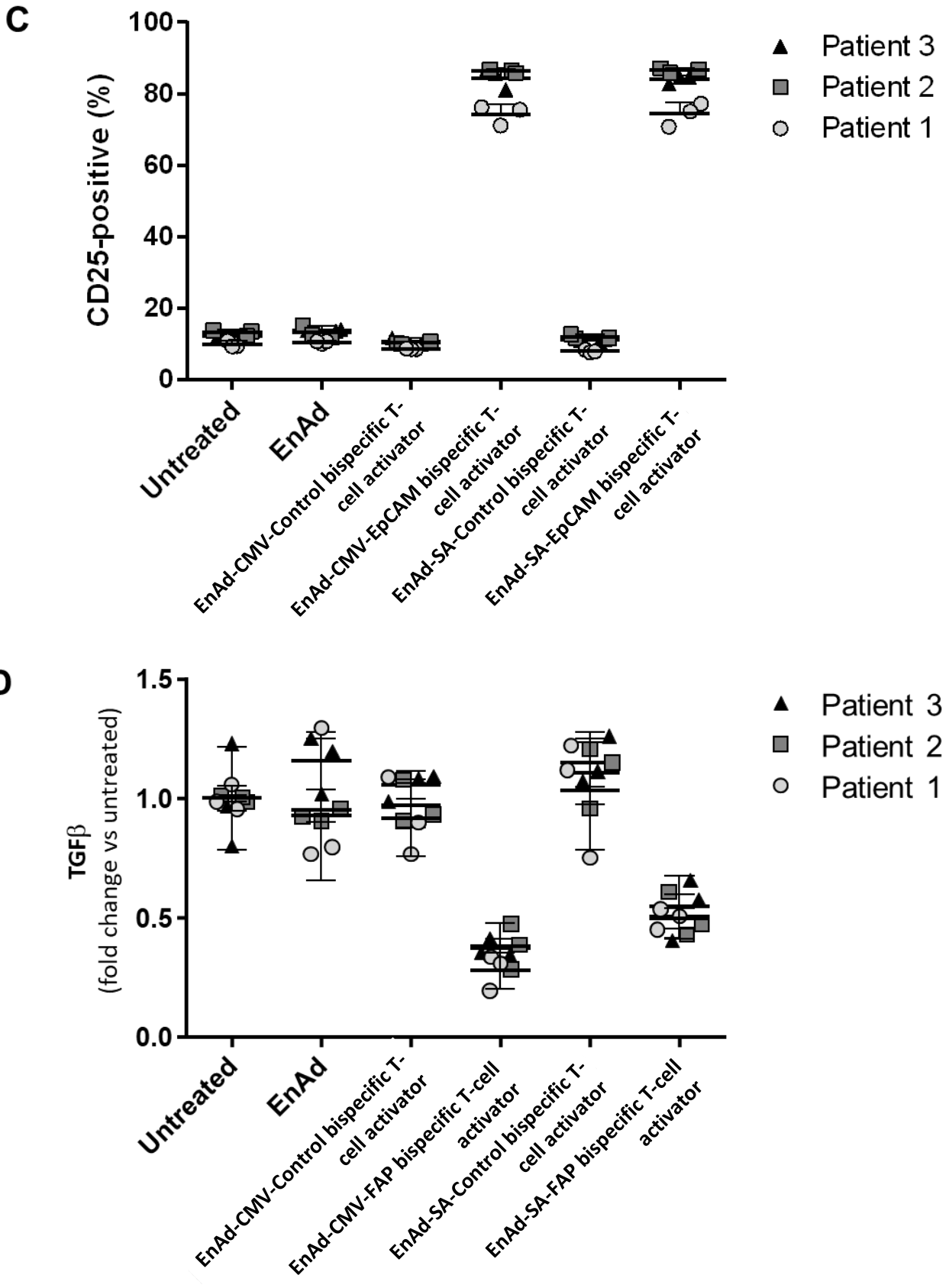
2017320776 18 Sep 2024

Figure 70



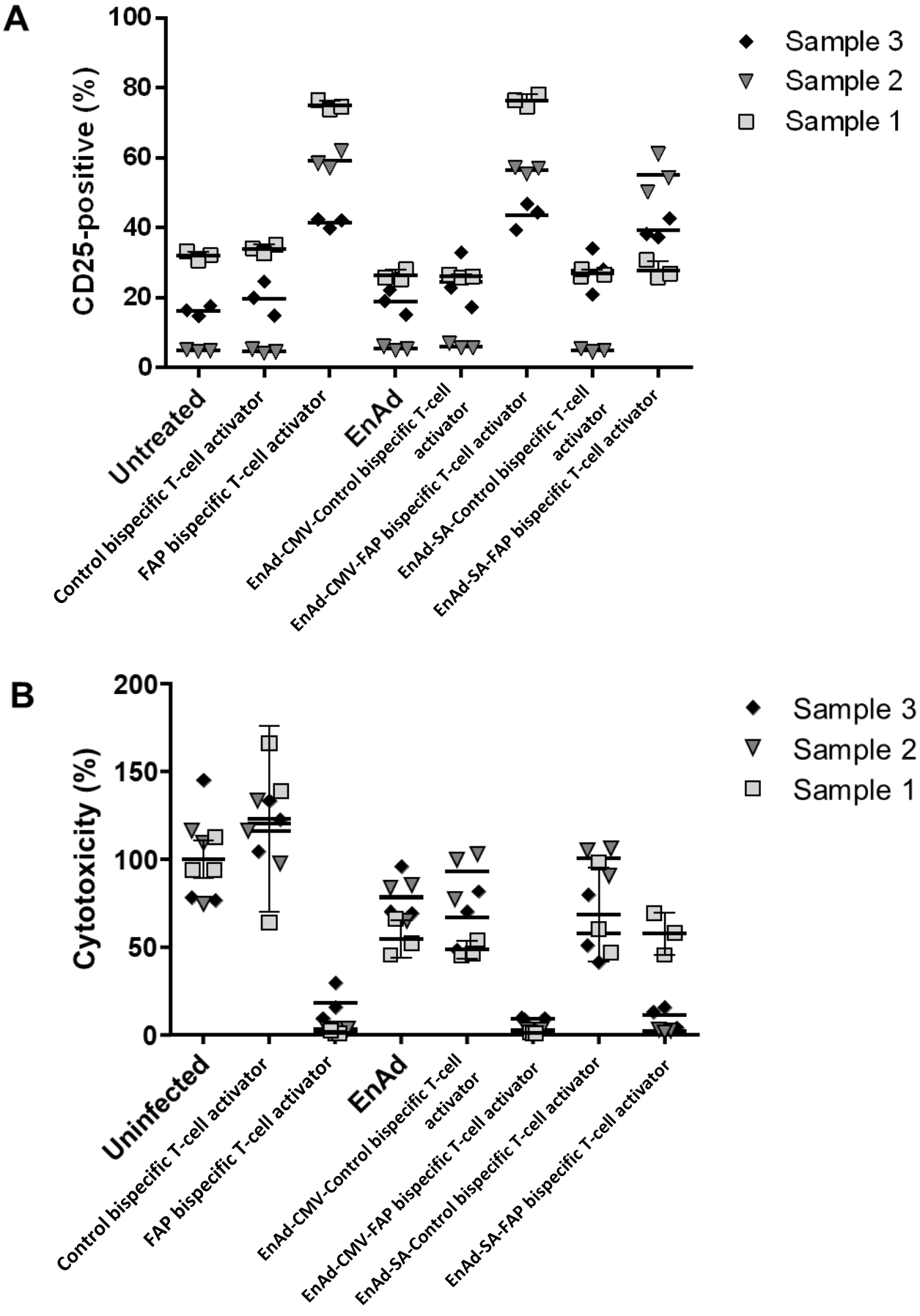
2017320776 18 Sep 2024

Figure 70



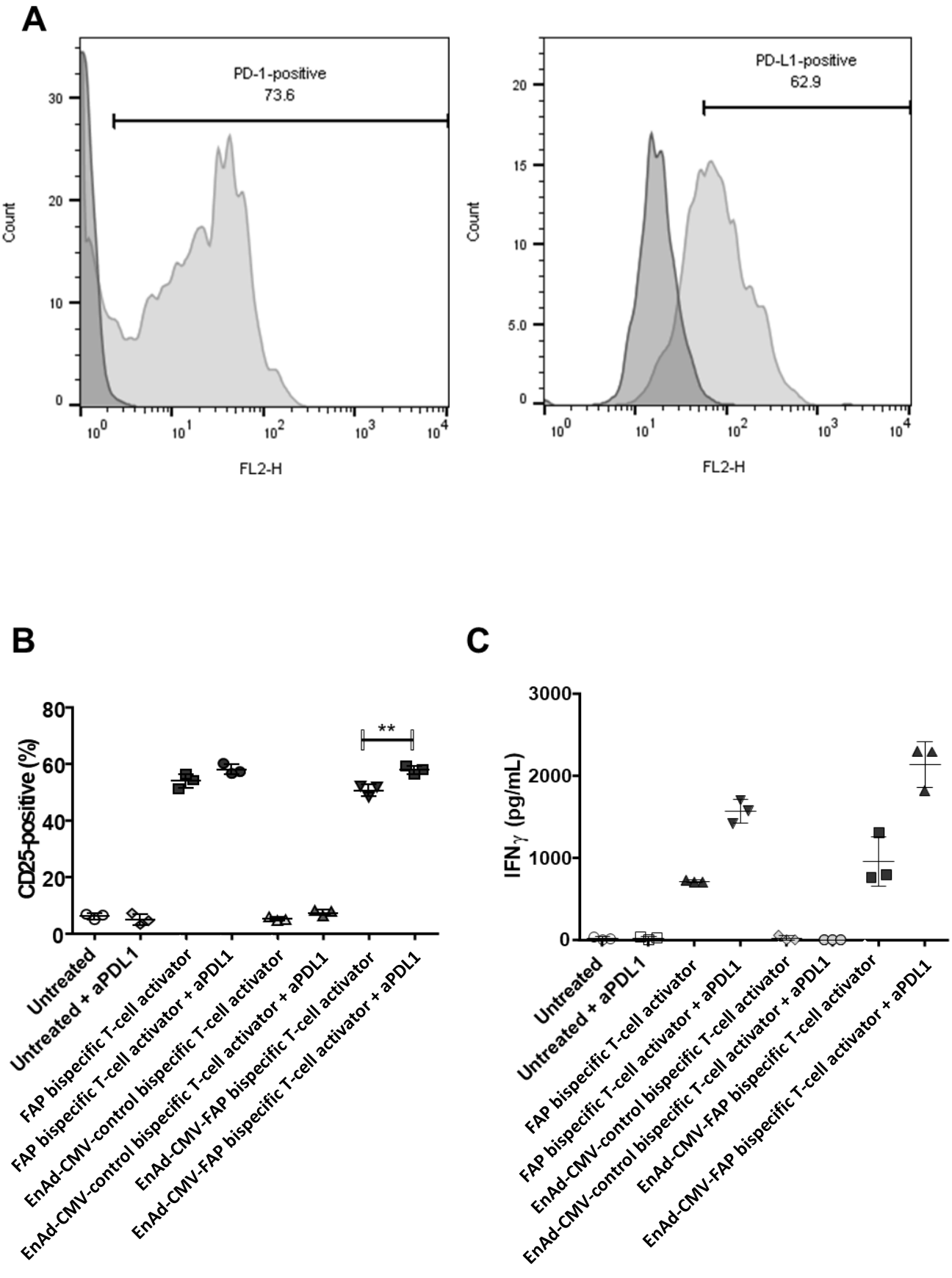
2017320776 18 Sep 2024

Figure 71



2017320776 18 Sep 2024

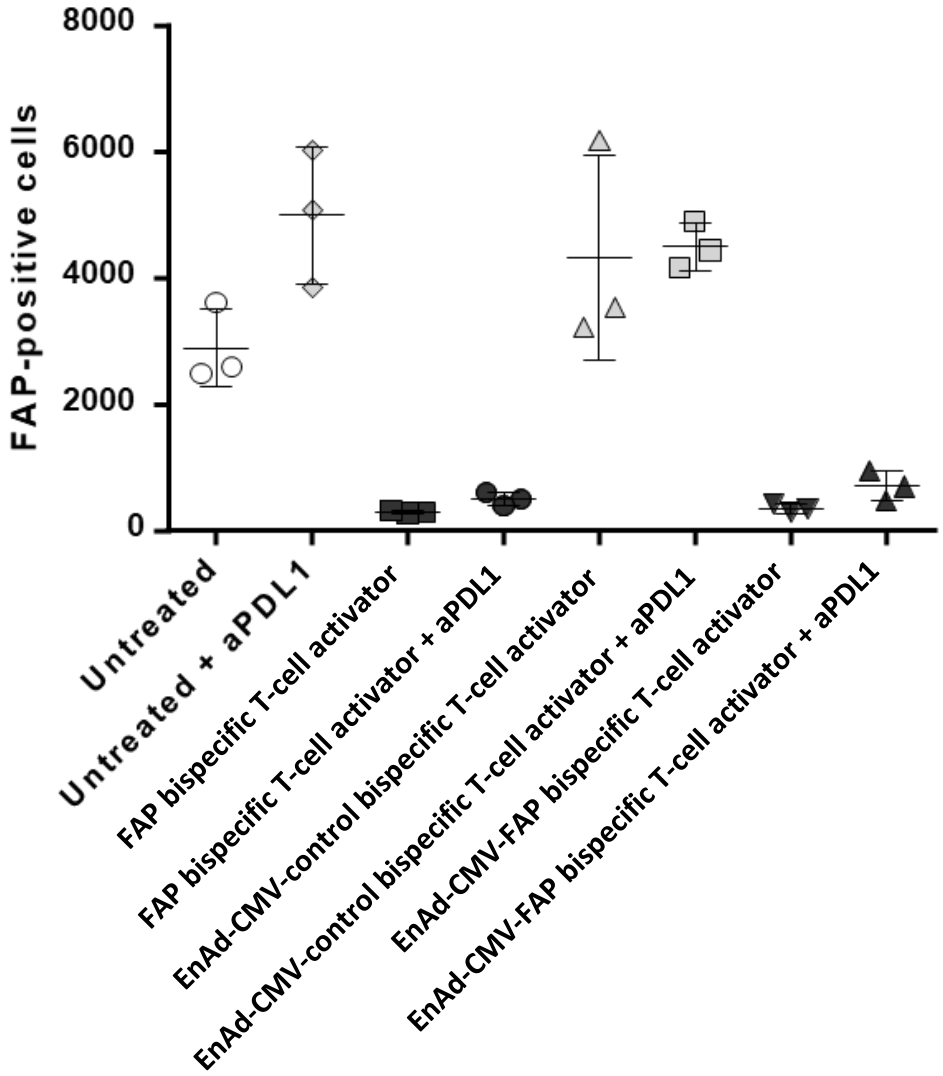
Figure 72



2017320776 18 Sep 2024

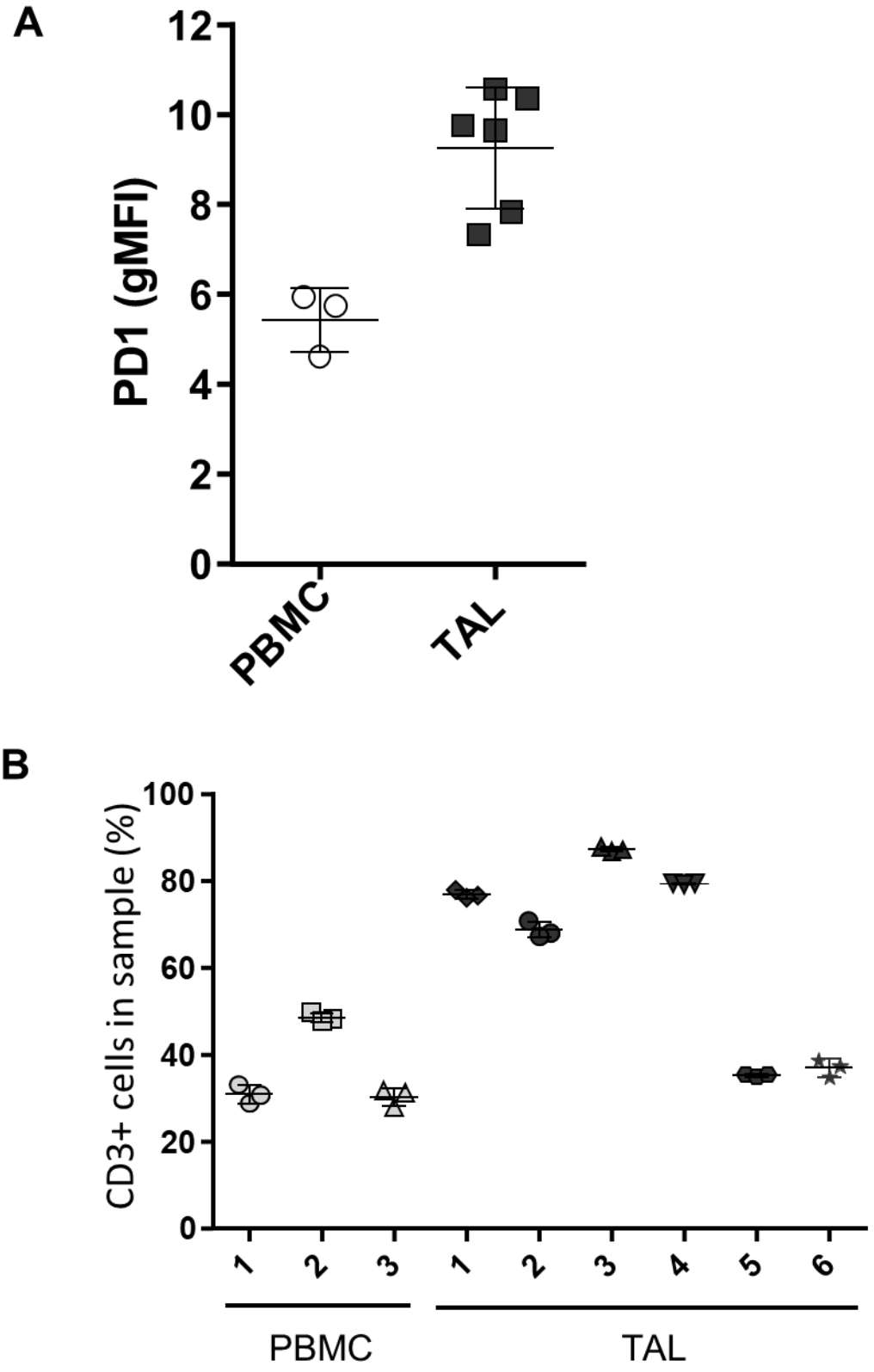
Figure 72

D



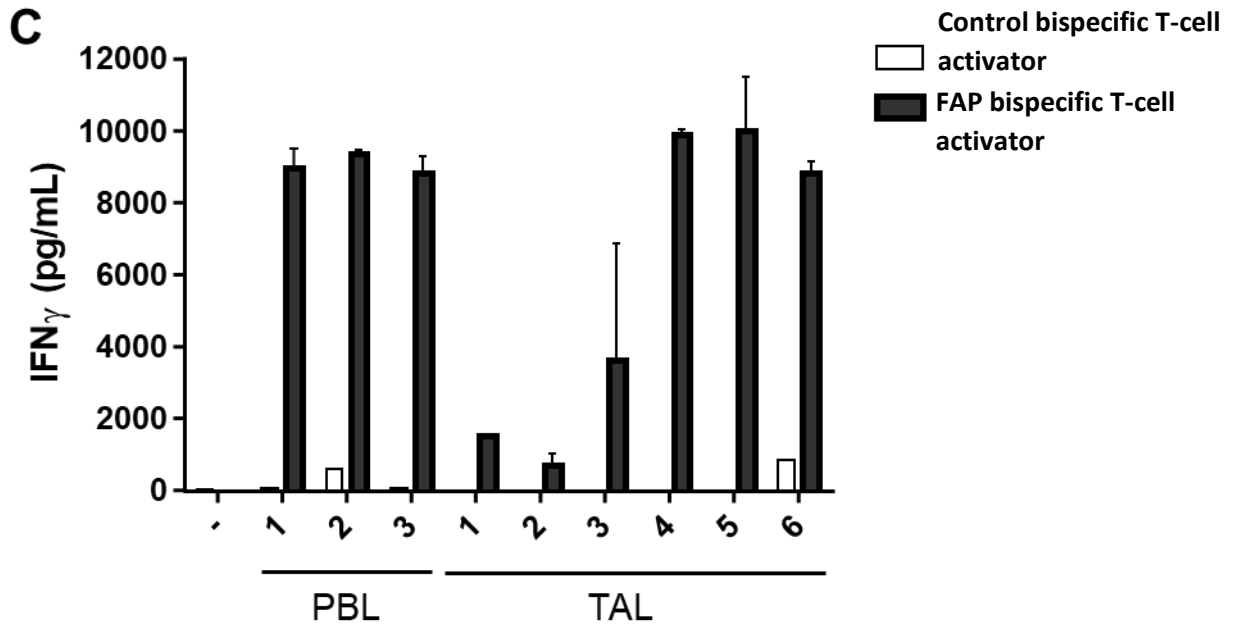
2017320776 18 Sep 2024

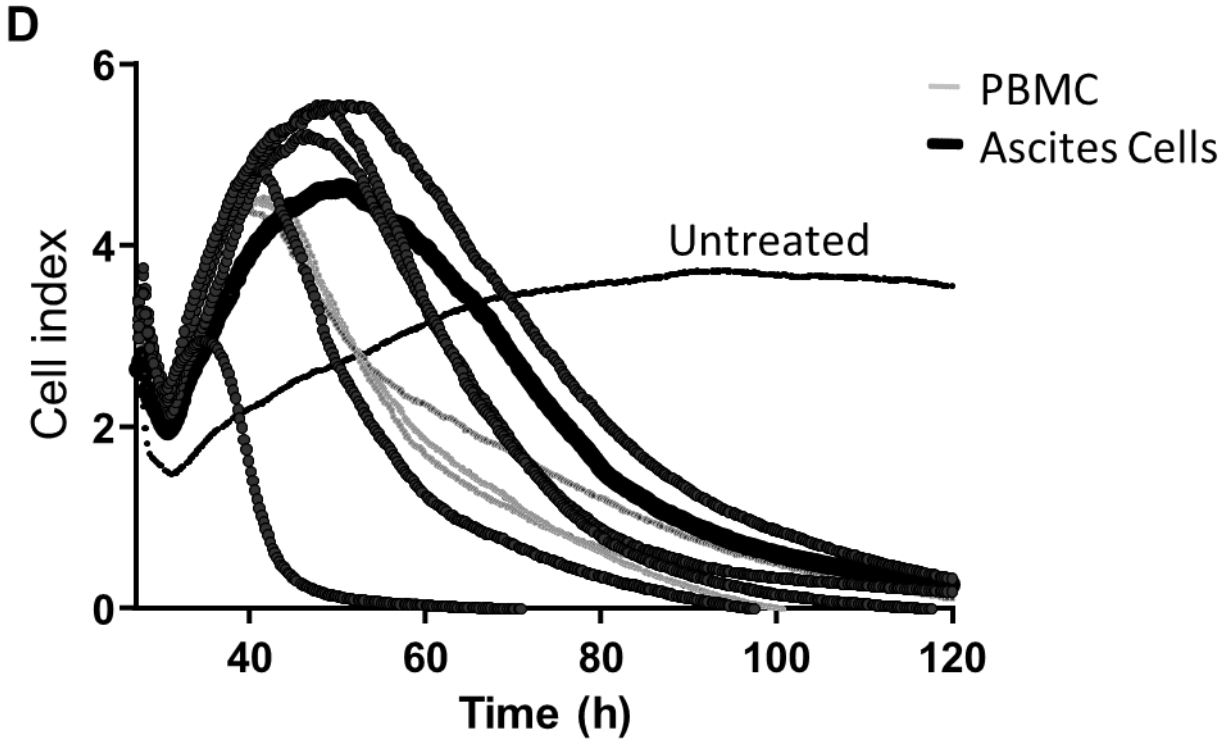
Figure 73



2017320776 18 Sep 2024

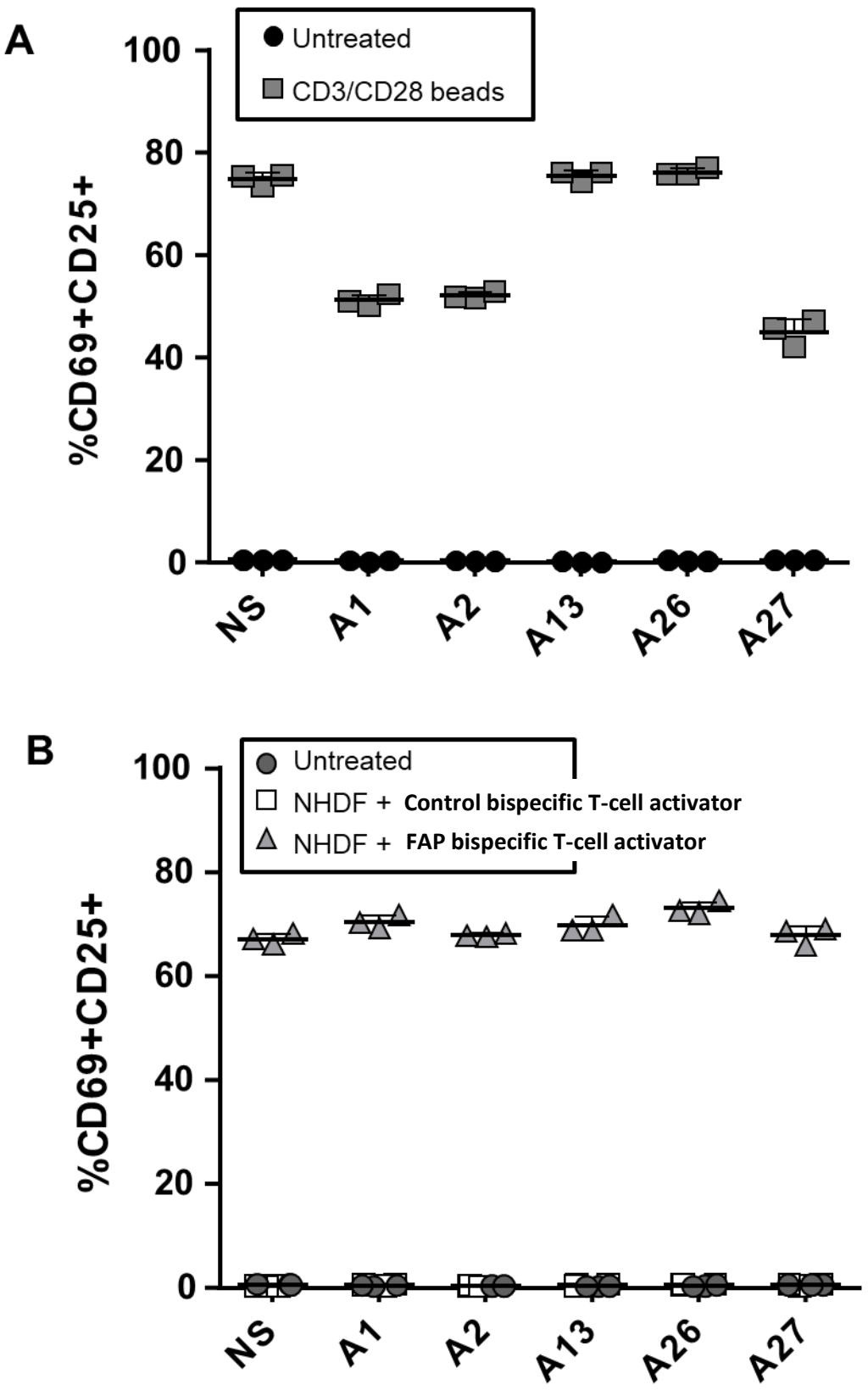
Figure 73





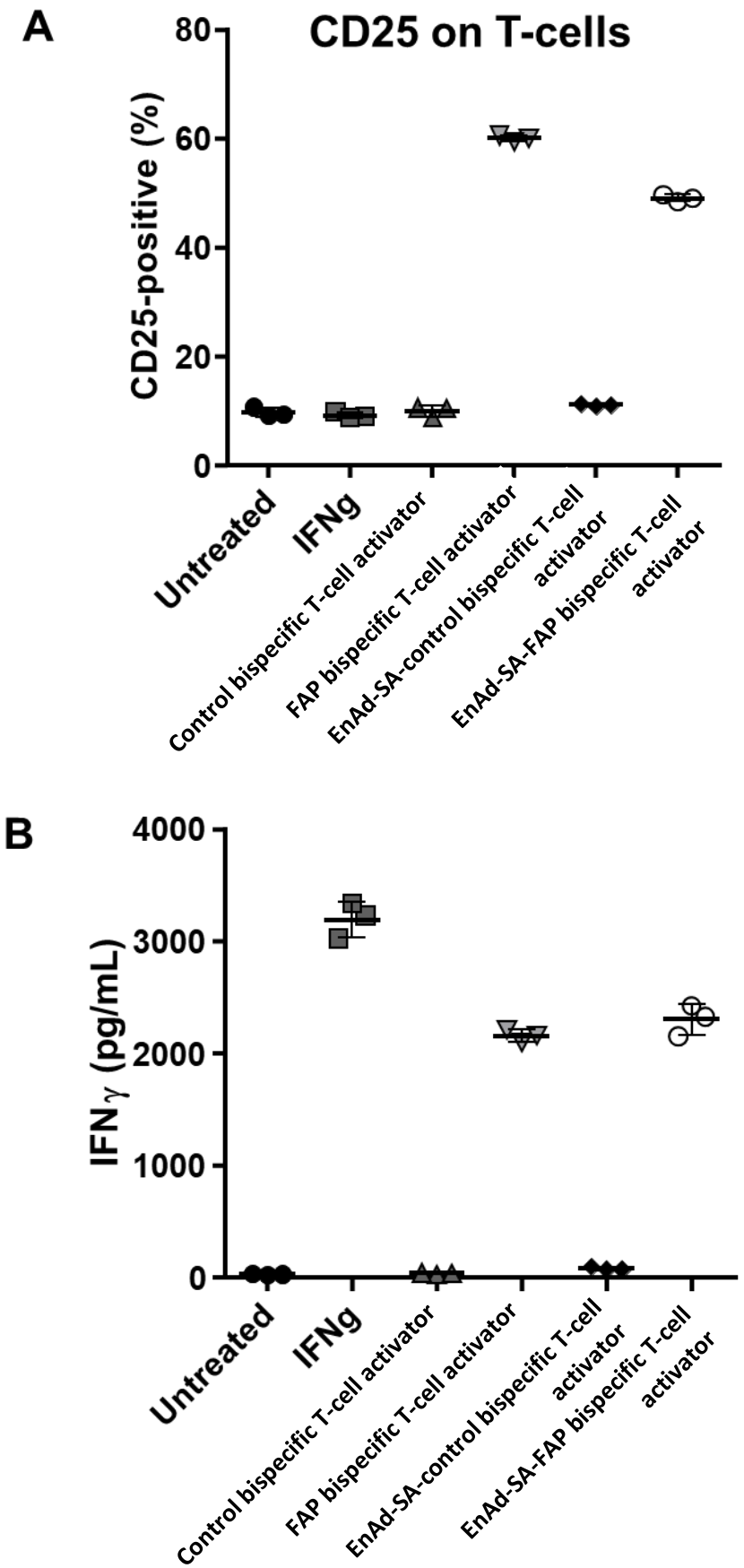
2017320776 18 Sep 2024

Figure 74



2017320776 18 Sep 2024

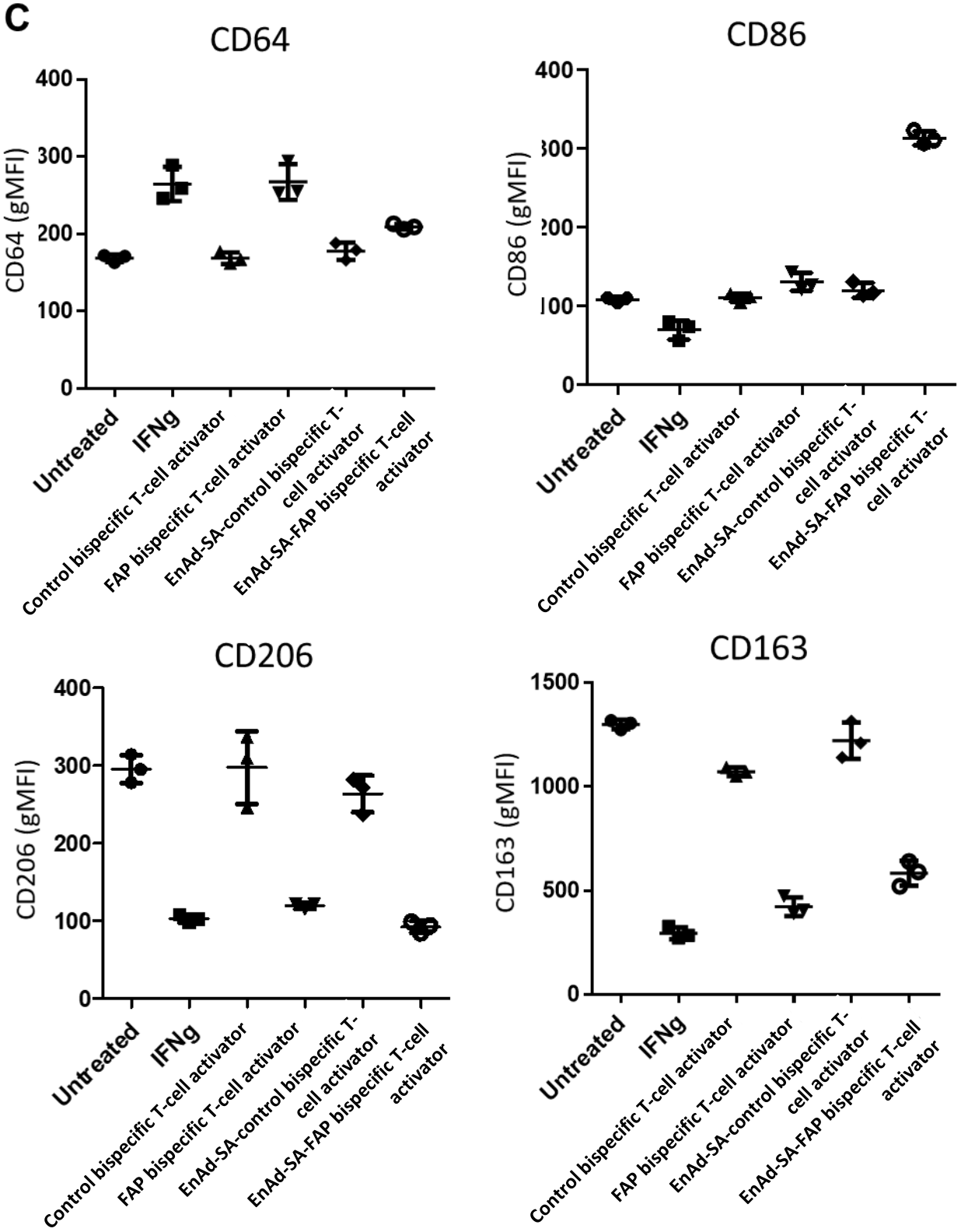
Figure 75



2017320776 18 Sep 2024

Figure 75

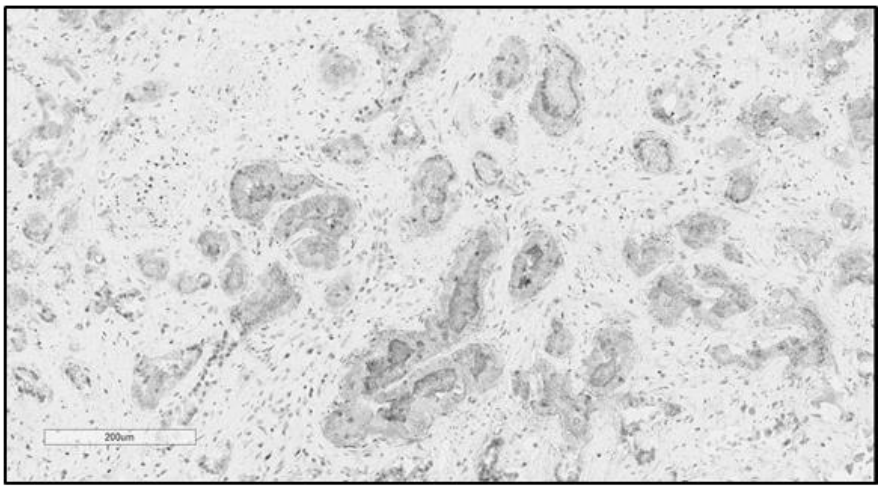
C



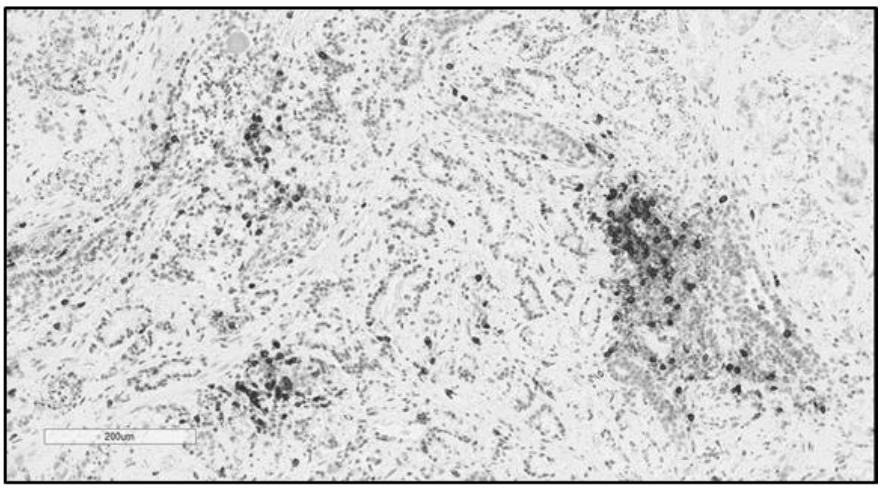
2017320776 18 Sep 2024

Figure 76

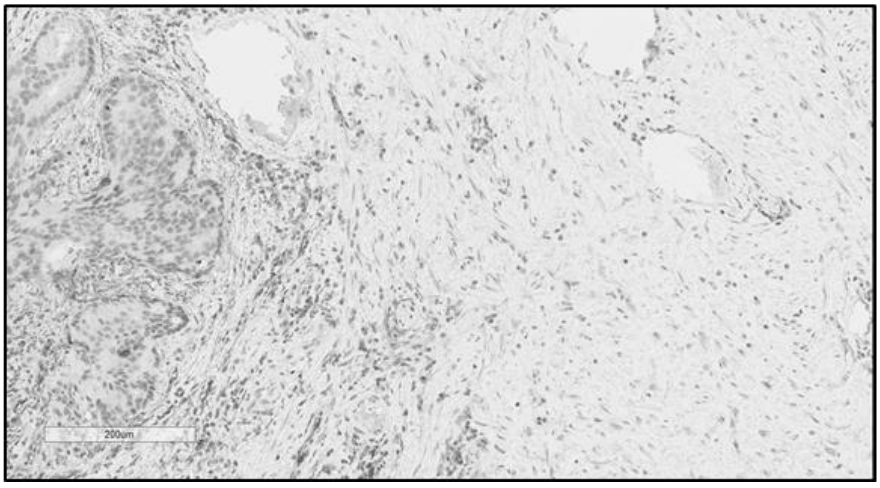
A



B



C

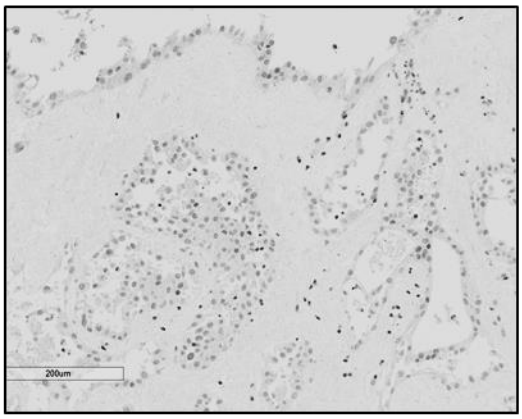


2017320776 18 Sep 2024

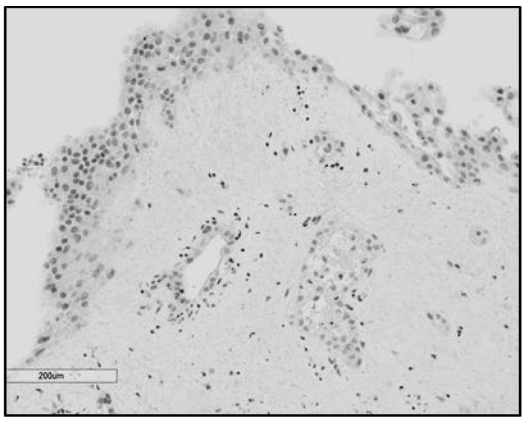
Figure 76

D

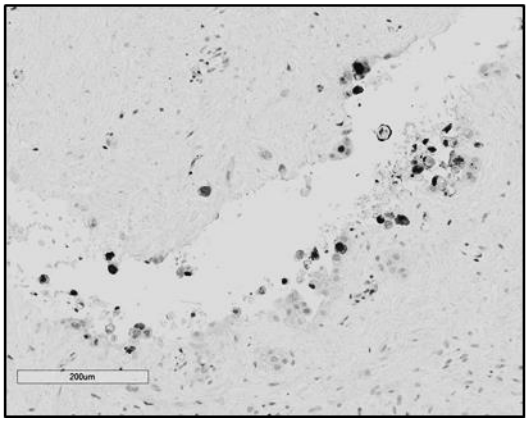
Untreated



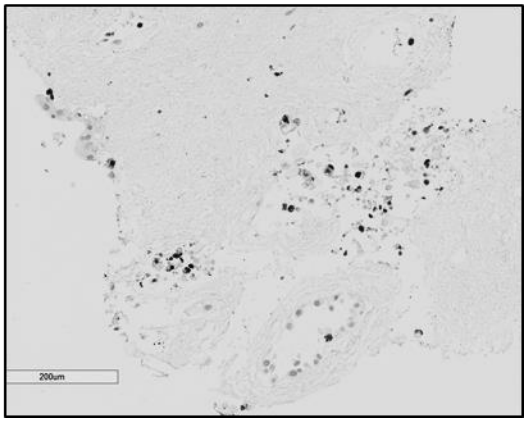
EnAd-CMV-control bispecific T-cell activator



EnAd-CMV-FAP bispecific T-cell activator

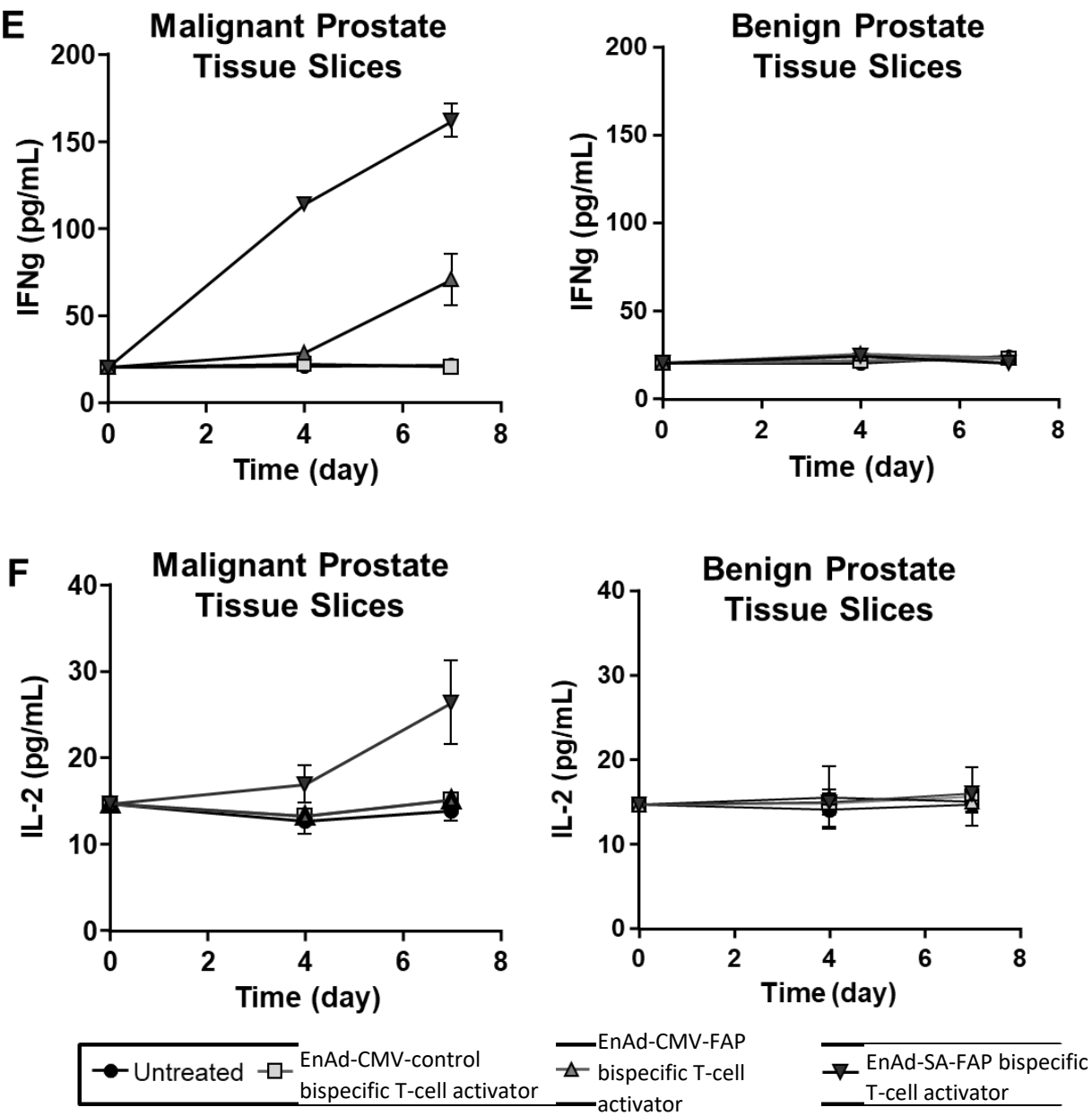


EnAd-SA-FAP bispecific T-cell activator



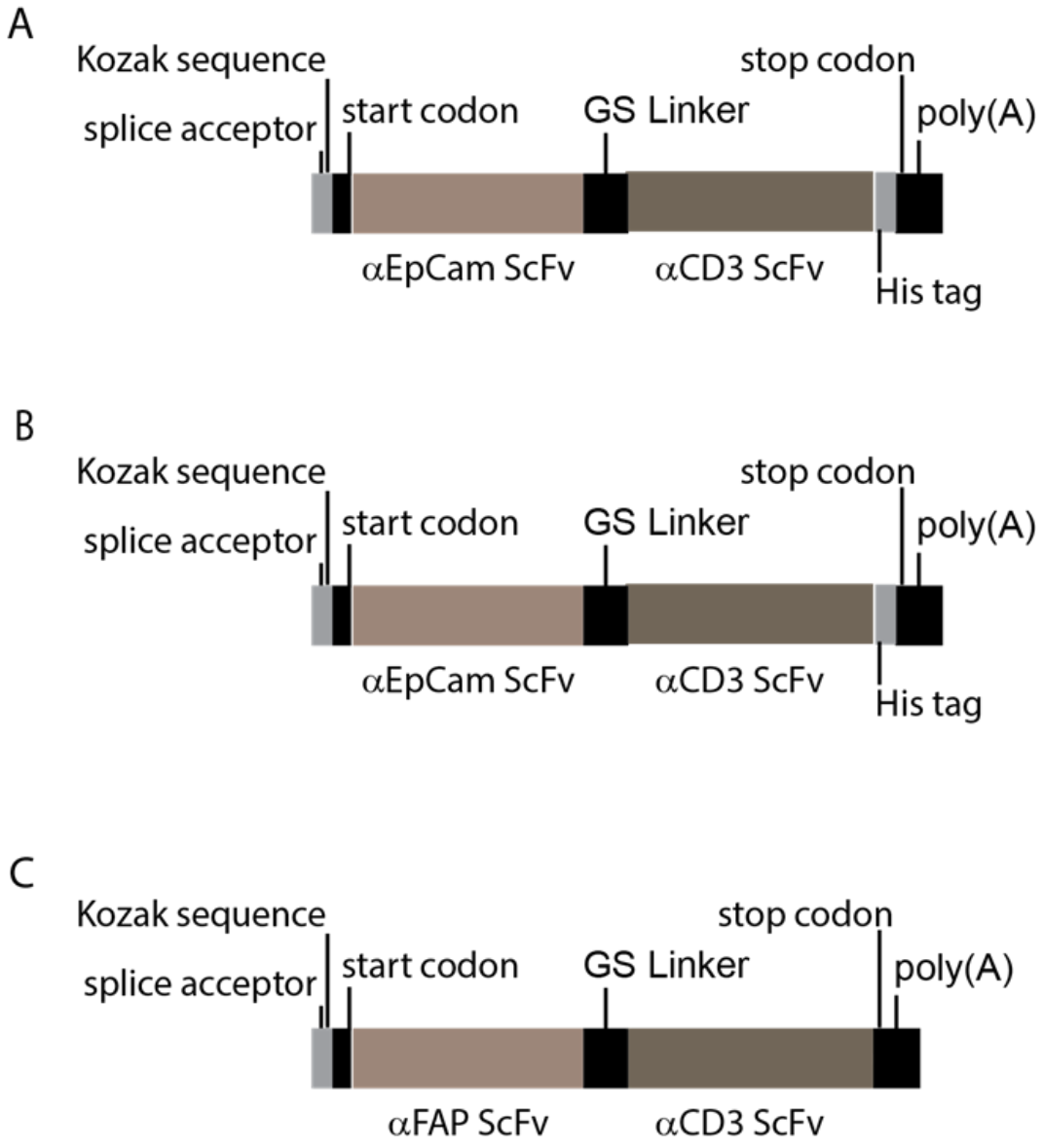
2017320776 18 Sep 2024

Figure 76



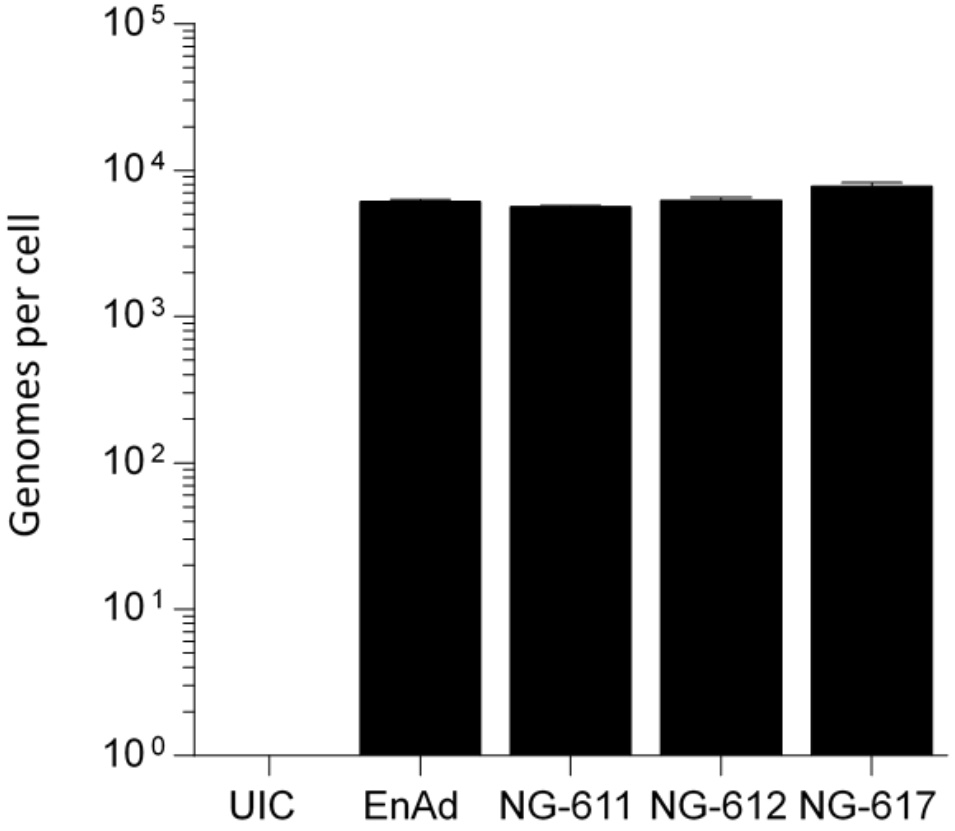
2017320776 18 Sep 2024

Figure 77



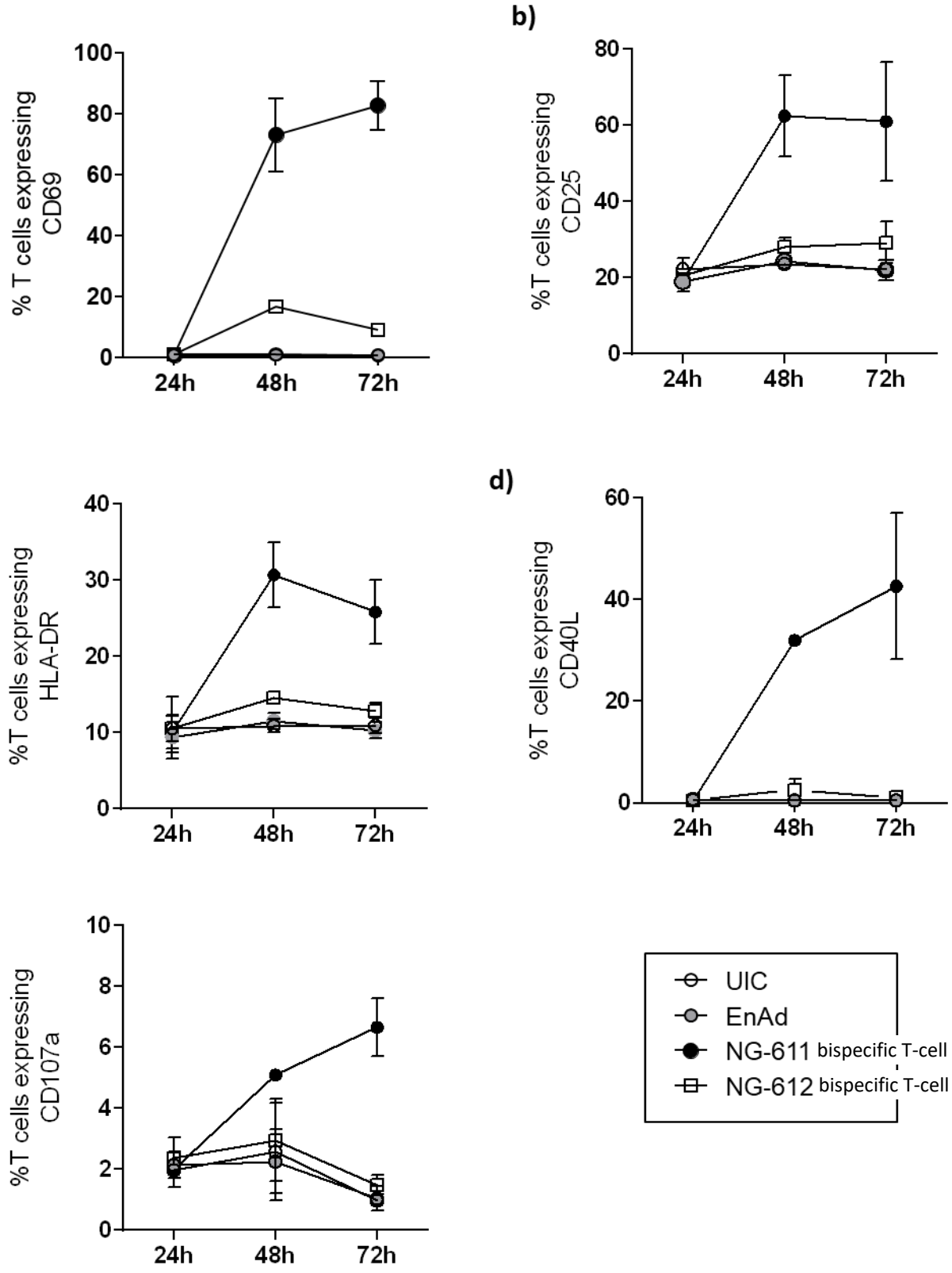
2017320776 18 Sep 2024

Figure 77D



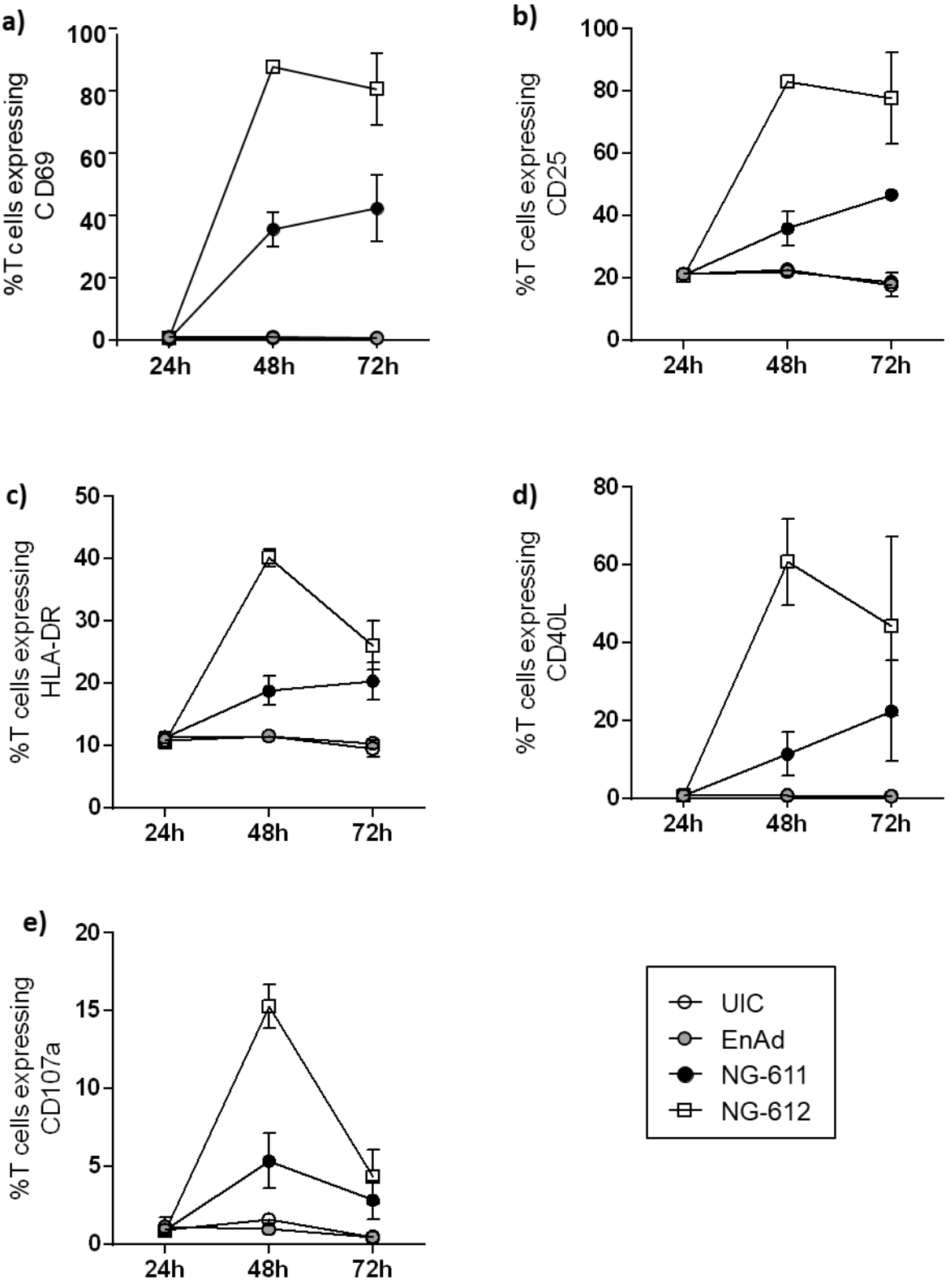
2017320776 18 Sep 2024

Figure 78



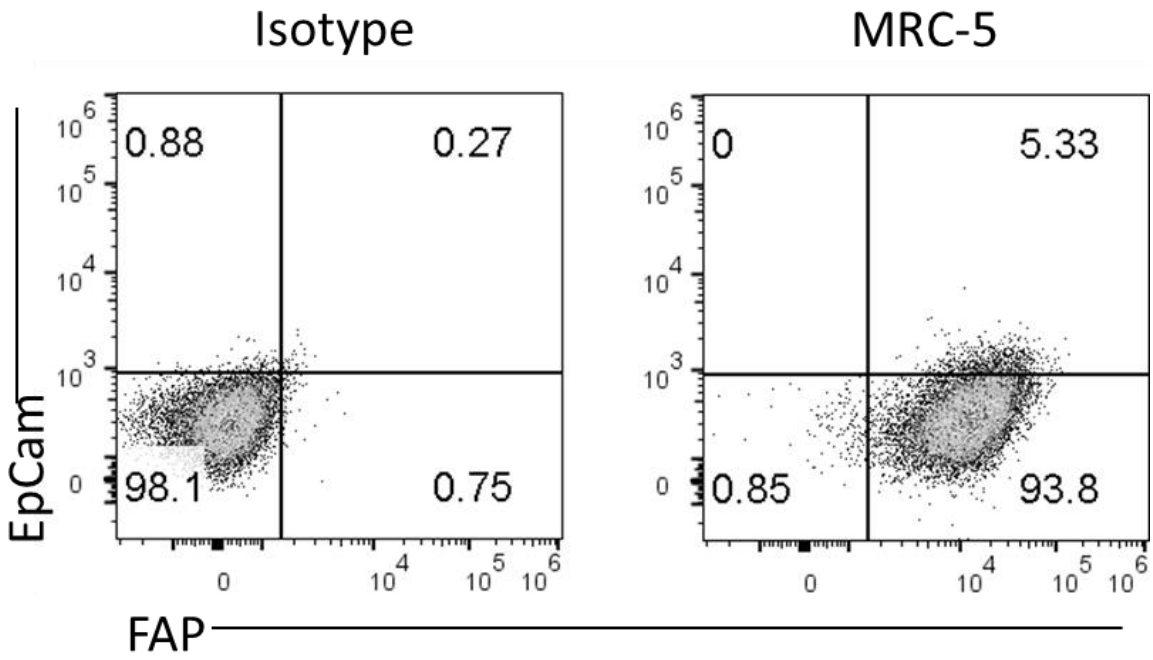
2017320776 18 Sep 2024

Figure 79



2017320776 18 Sep 2024

Figure 80



2017320776 18 Sep 2024

Figure 81A

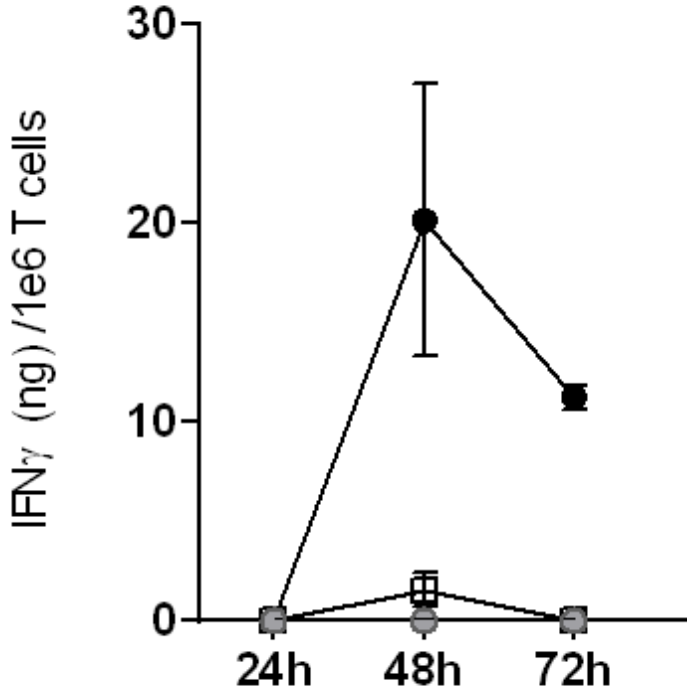
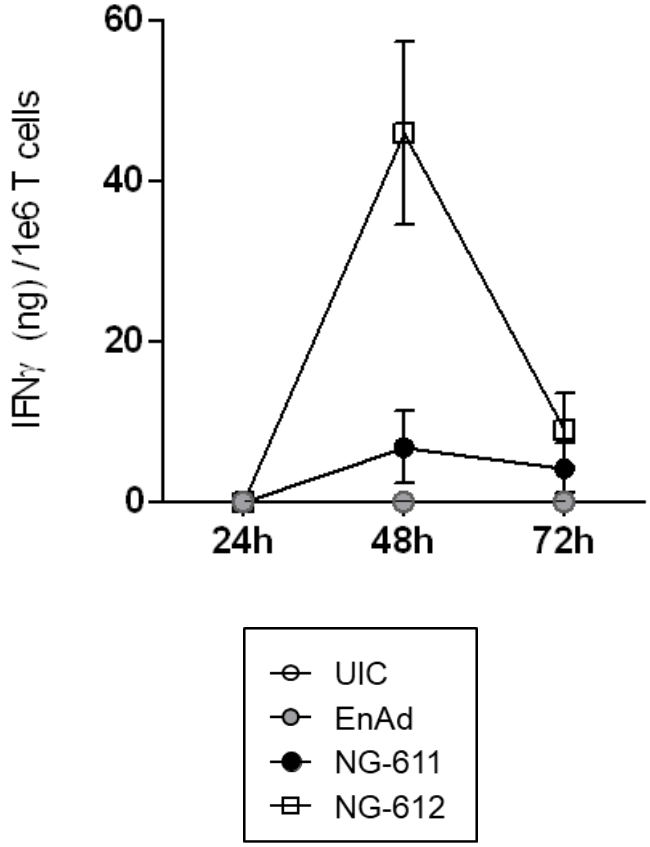


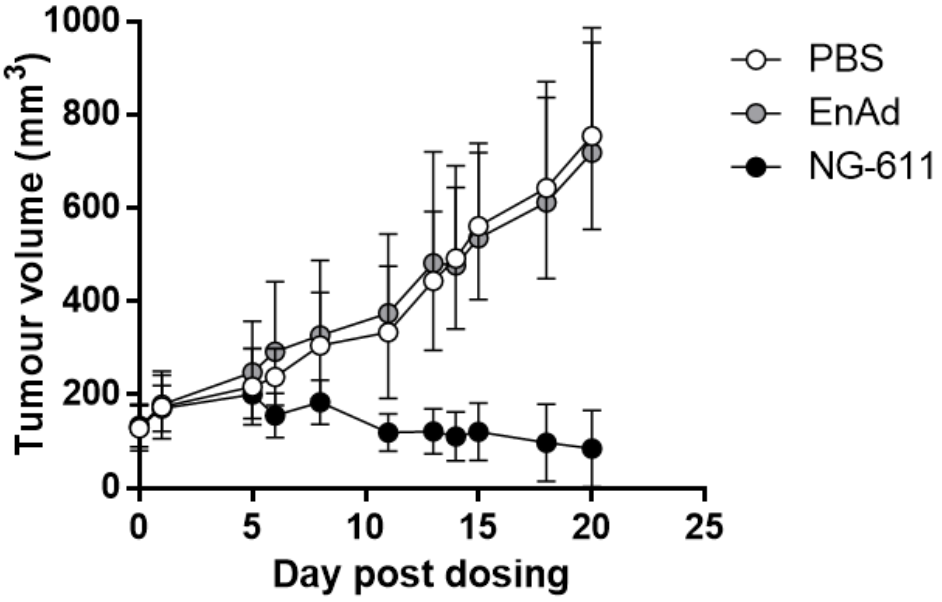
Figure 81B



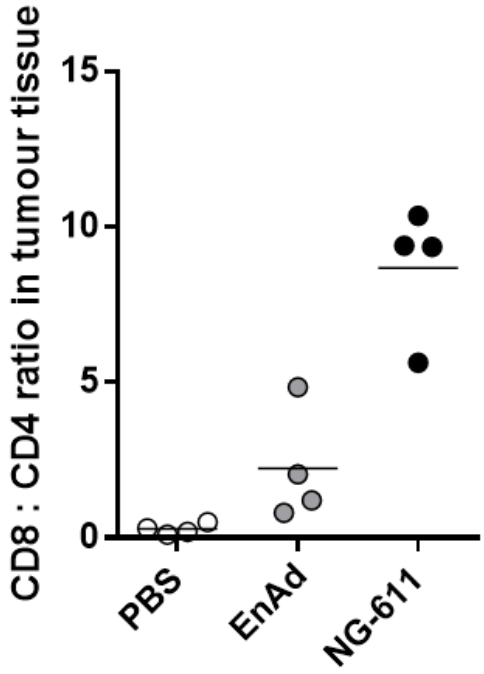
2017320776 18 Sep 2024

Figure 82

a)



b)



2017320776 18 Sep 2024

Figure 83

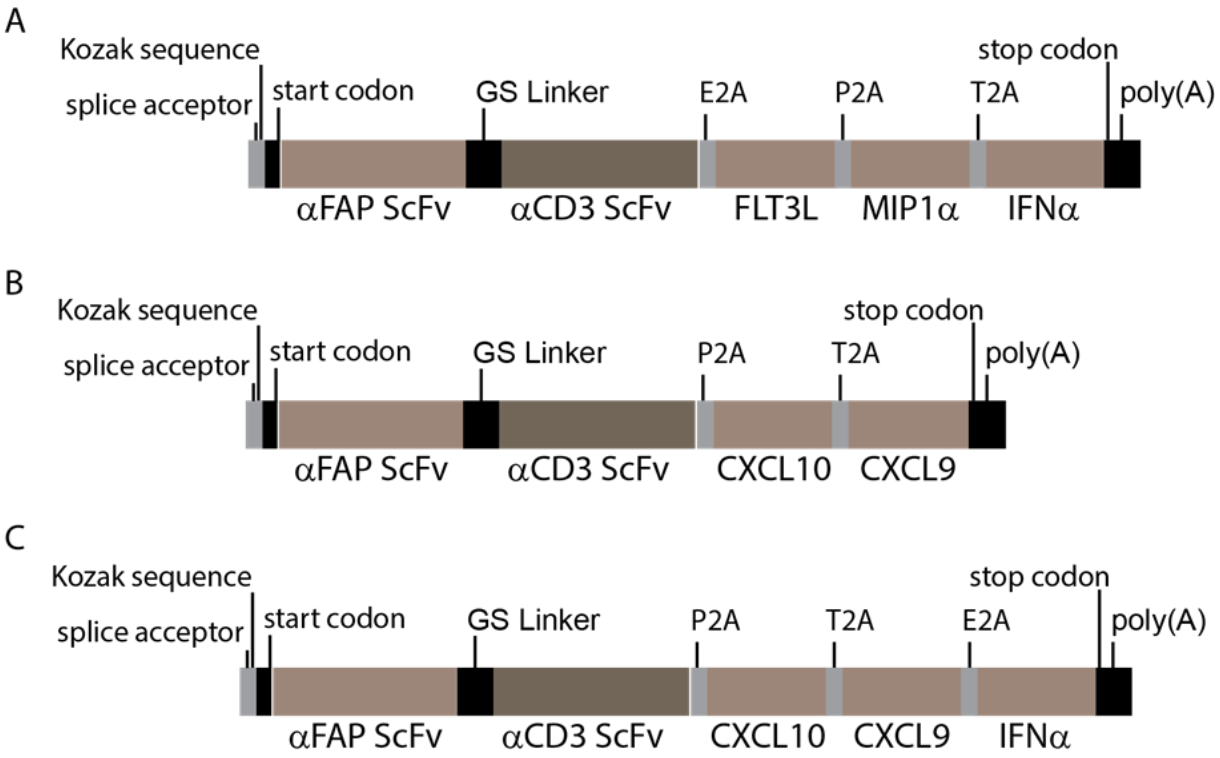
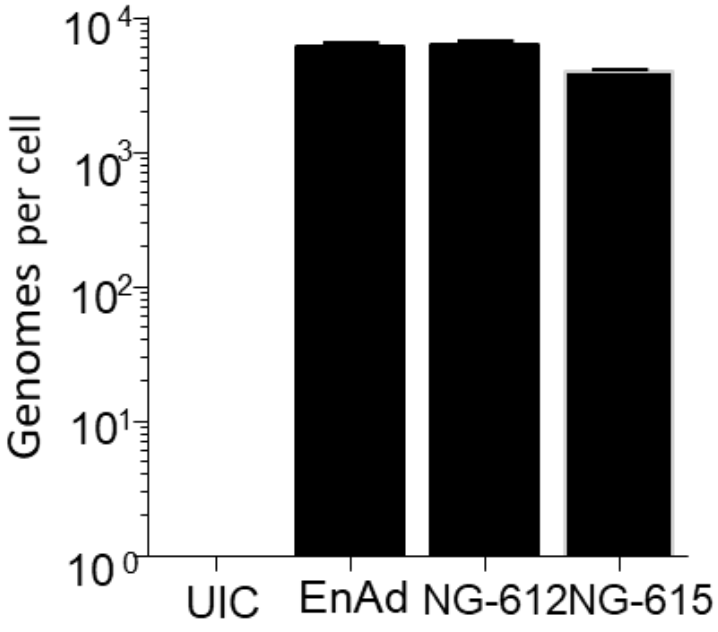
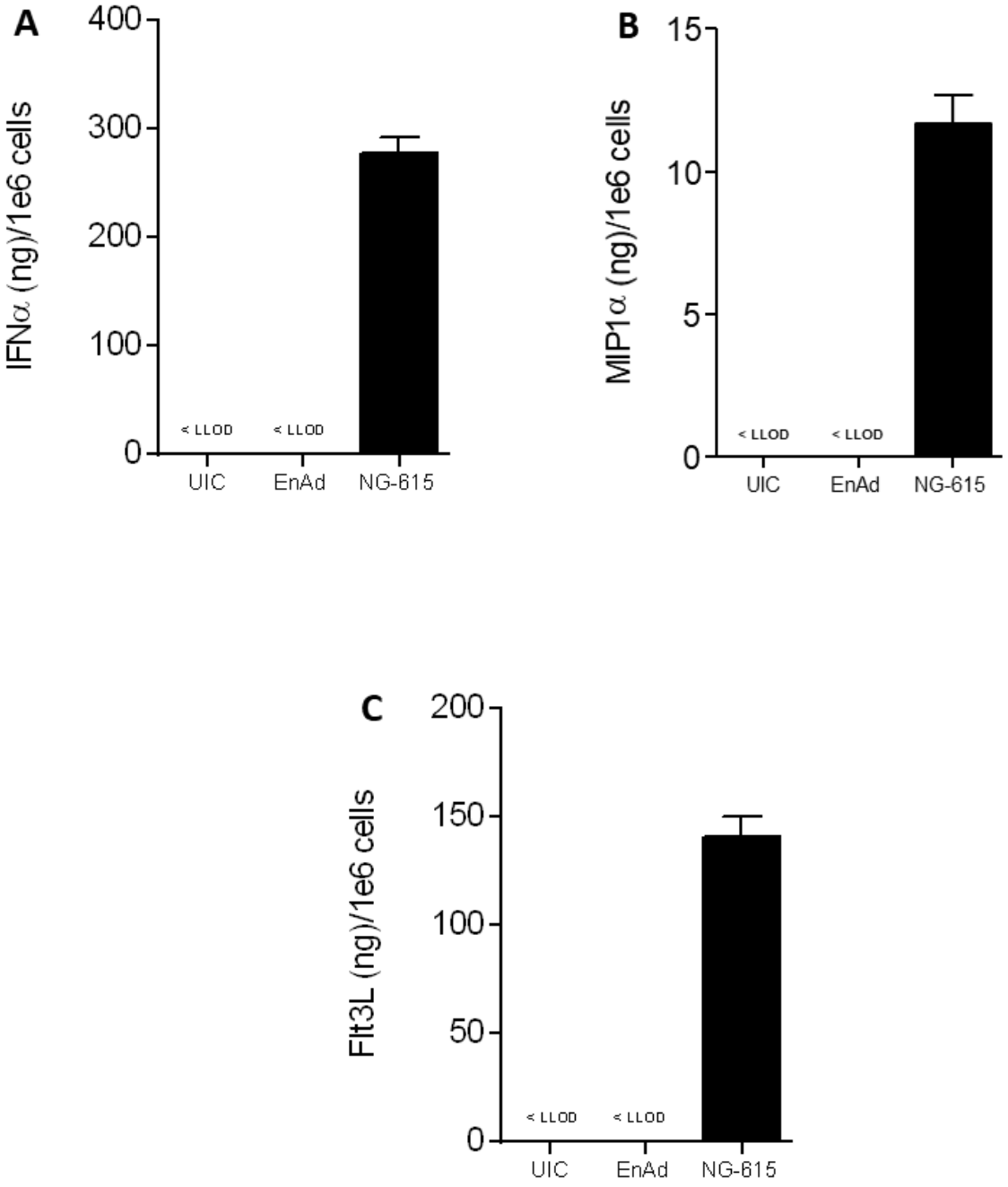


Figure 84



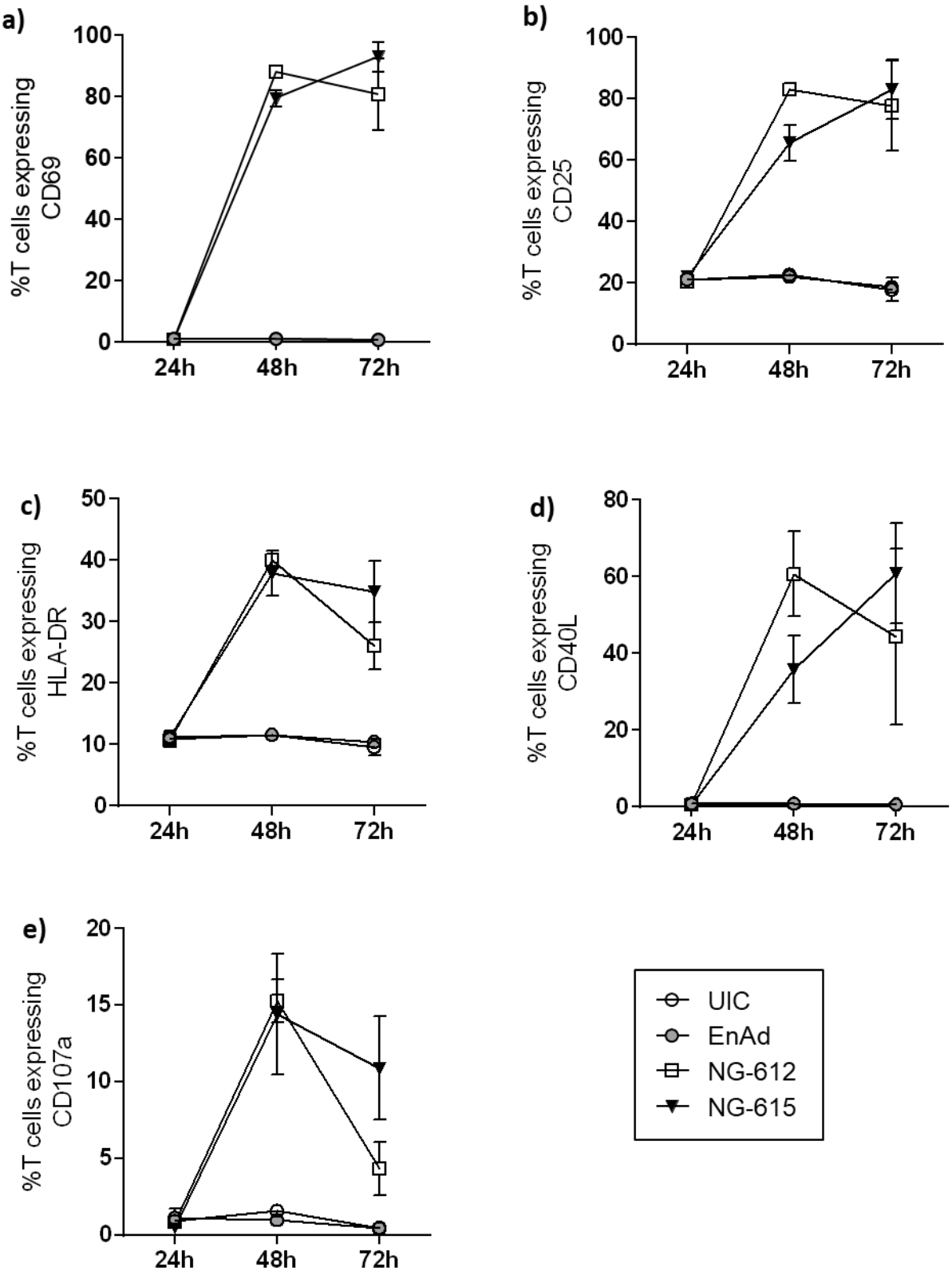
2017320776 18 Sep 2024

Figure 85



2017320776 18 Sep 2024

Figure 86



2017320776 18 Sep 2024

Figure 87

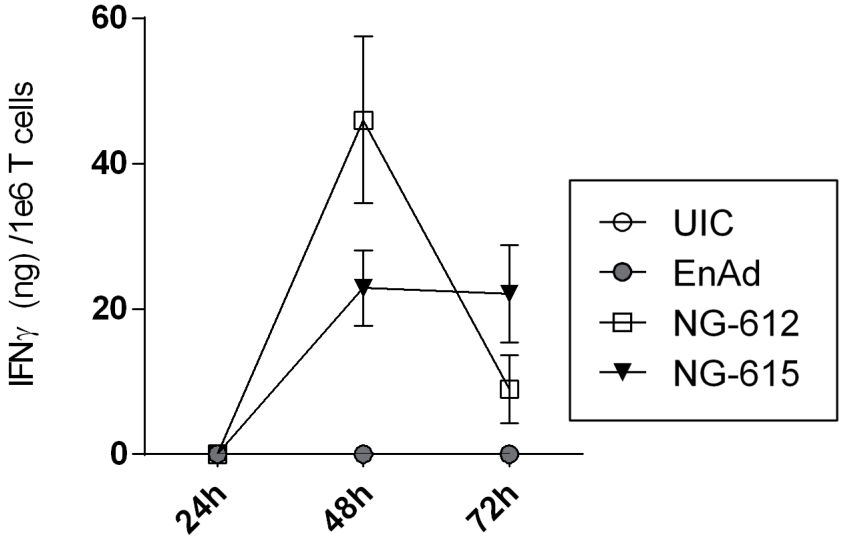


Figure 88

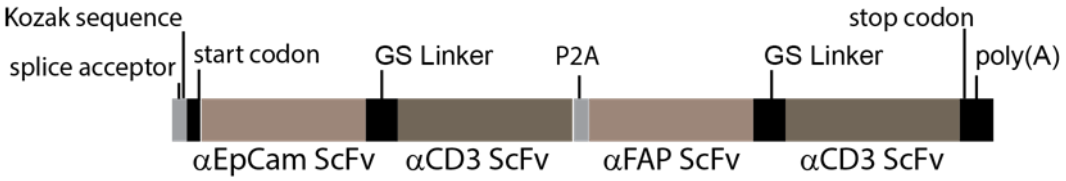
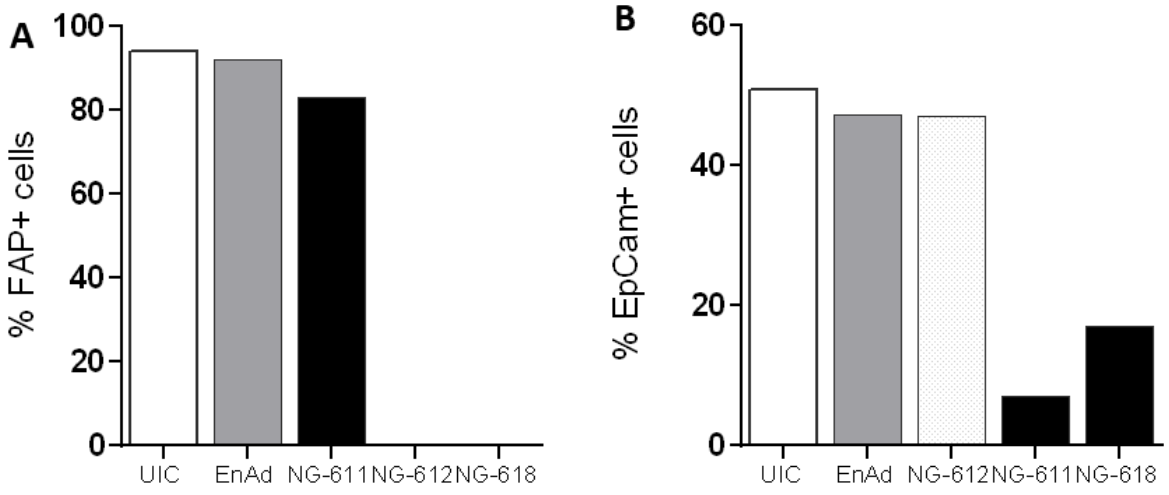
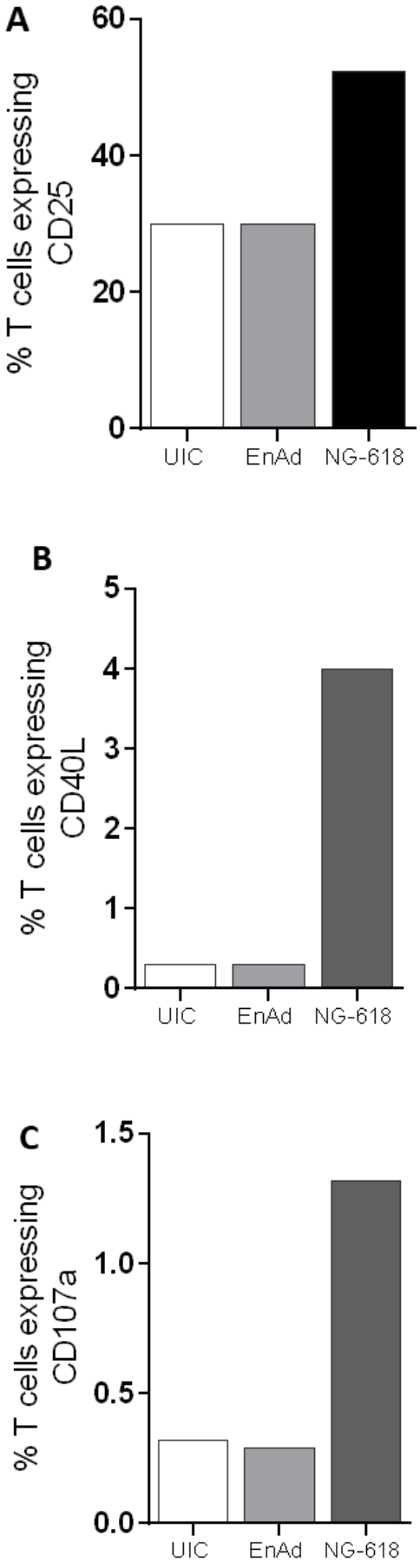


Figure 89



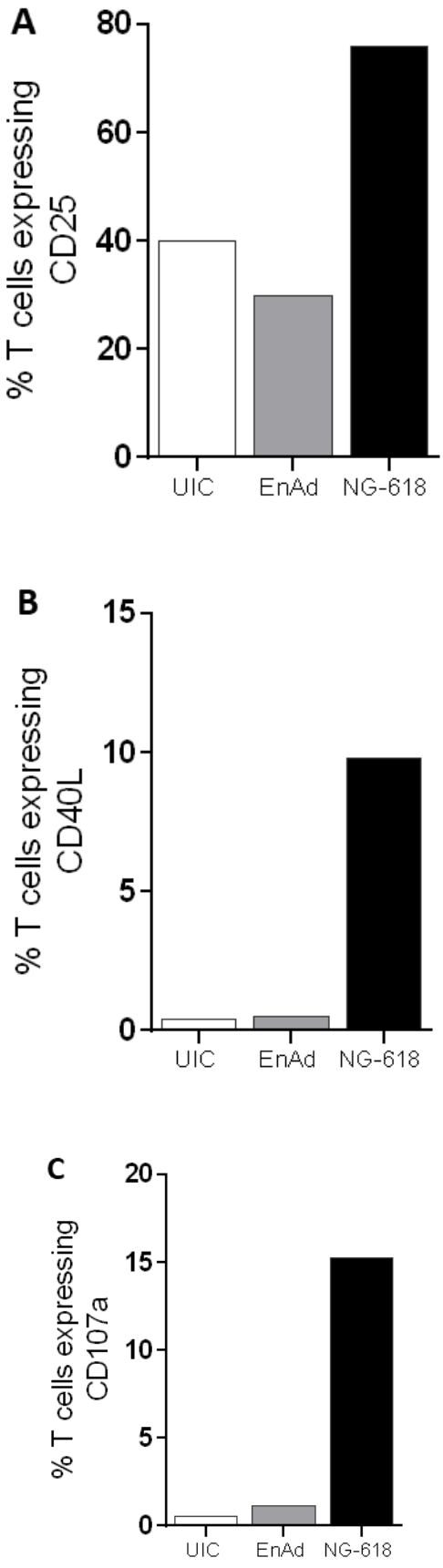
2017320776 18 Sep 2024

Figure 90



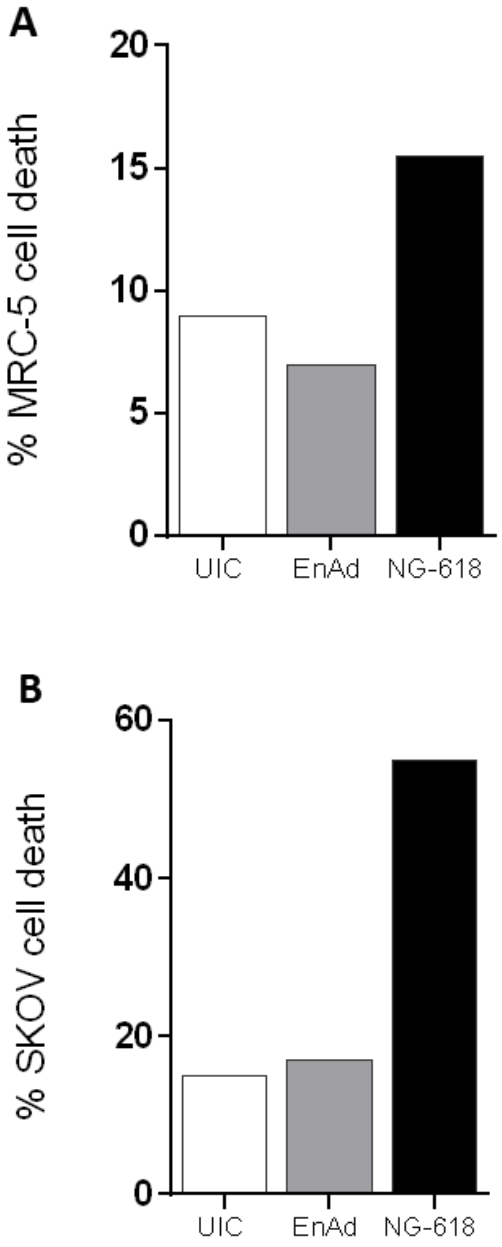
2017320776 18 Sep 2024

Figure 91



2017320776 18 Sep 2024

Figure 92



SEQUENCE LISTING

<110> PsiOxus Therapeutics Limited

<120> Adenovirus armed with bispecific T cell engager (BiTE)

<130> P000192_WO

<150> GB1614607.8
<151> 2016-08-29

<160> 298

<170> PatentIn version 3.5

<210> 1
<211> 1578
<212> DNA
<213> Artificial Sequence

<220>
<223> Anti-EpCAM BiTE DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 1
atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt gcatagcgaa 60

ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa ggtcaccatg 120

tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta cctcacgtgg 180

tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag cacccgcgag 240

tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac cctaaccatc 300

agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta ctcgtaccct 360

ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag cggcggggga 420

ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc cgaactggtc 480

cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt taccaattac 540

tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg cgacatcttc 600

ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac tctgactgcc 660

gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga agacagcgcg 720

gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg gggacaagga 780

actaccgtga ccgtctcctc cggcggcggt ggaagcgatg tgcaactcgt gcagtccggt 840

gcggaagtga aaaagccggg cgcgagcgtc aaagtgtcat gcaaggcgtc aggatatacg 900

tttactagat acactatgca ctgggtgcgc caggcacctg gtcagggcct tgaatggatc 960

ggctacatca atccgtcgag aggctacact aattacgcgg actcagtcaa agggcgcttc 1020

acgattacga ccgacaagtc cacctcgact gcatacatgg aactgtcctc gctgagaagc 1080

gaggacaccg ctacttacta ctgcgctaga tactacgatg atcactactg cctcgattac 1140

tggggccagg gaaccactgt cacggtgtca tcgggagagg gcacctcaac cggatcaggg 1200

ggatcgggag gctcgggcgg cgcagacgac atcgtcctga cccagtcgcc cgccaccttg 1260

tcgctgtccc caggagaaag agcgaccctg tcatgccggg cgtcgcaaag cgtgagctat 1320

atgaattggt atcagcagaa gccaggaaag gcgccgaaga gatggatcta cgacacctcc 1380

aaggtcgctt caggtgtccc ggctagattc tcaggatcgg gatcaggaac ggactactcc 1440

ctgaccatca attcactgga agcagaagat gcggccacct actactgtca gcagtggtcc 1500

tccaacccgc tgactttcgg aggcggaact aaggtcgaga tcaagcatca ccatcaccat 1560

caccaccatc accattag 1578

<210> 2
<211> 525
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-EpCAM BiTE protein sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 2

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Val Met Thr Gln Ser Pro Ser Ser Leu Thr Val
20 25 30

Thr Ala Gly Glu Lys Val Thr Met Ser Cys Lys Ser Ser Gln Ser Leu
35 40 45

Leu Asn Ser Gly Asn Gln Lys Asn Tyr Leu Thr Trp Tyr Gln Gln Lys

```
    50                  55                  60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu
65                  70                  75                  80

Ser Gly Val Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Ser Ser Val Gln Ala Glu Asp Leu Ala Val Tyr Tyr
            100                 105                 110

Cys Gln Asn Asp Tyr Ser Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140

Gly Gly Ser Glu Val Gln Leu Leu Glu Gln Ser Gly Ala Glu Leu Val
145                 150                 155                 160

Arg Pro Gly Thr Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Ala
                165                 170                 175

Phe Thr Asn Tyr Trp Leu Gly Trp Val Lys Gln Arg Pro Gly His Gly
            180                 185                 190

Leu Glu Trp Ile Gly Asp Ile Phe Pro Gly Ser Gly Asn Ile His Tyr
        195                 200                 205

Asn Glu Lys Phe Lys Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser
    210                 215                 220

Ser Thr Ala Tyr Met Gln Leu Ser Ser Leu Thr Phe Glu Asp Ser Ala
225                 230                 235                 240

Val Tyr Phe Cys Ala Arg Leu Arg Asn Trp Asp Glu Pro Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Gly Gly Gly Ser
```

```
            260                 265                 270

Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
        275                 280                 285

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg Tyr
    290                 295                 300

Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Ile
305                 310                 315                 320

Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser Val
                325                 330                 335

Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala Tyr
            340                 345                 350

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr Cys
        355                 360                 365

Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln Gly
    370                 375                 380

Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser Gly
385                 390                 395                 400

Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln Ser
                405                 410                 415

Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys
            420                 425                 430

Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys Pro
        435                 440                 445

Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala Ser
    450                 455                 460

Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Ser
```

465 470 475 480

Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys
485 490 495

Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys Val
500 505 510

Glu Ile Lys His His His His His His His His His His
515 520 525

<210> 3
<211> 1590
<212> DNA
<213> Artificial Sequence

<220>
<223> Anti-FAP BiTE DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 3
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaga tgtgcaactc 840

gtgcagtccg gtgcggaagt gaaaaagccg ggcgcgagcg tcaaagtgtc atgcaaggcg 900

tcaggatata cgtttactag atacactatg cactgggtgc gccaggcacc tggtcagggc 960

cttgaatgga tcggctacat caatccgtcg agaggctaca ctaattacgc ggactcagtc 1020

aaagggcgct tcacgattac gaccgacaag tccacctcga ctgcatacat ggaactgtcc 1080

tcgctgagaa gcgaggacac cgctacttac tactgcgcta gatactacga tgatcactac 1140

tgcctcgatt actggggcca gggaaccact gtcacggtgt catcgggaga gggcacctca 1200

accggatcag ggggatcggg aggctcgggc ggcgcagacg acatcgtcct gacccagtcg 1260

cccgccacct tgtcgctgtc cccaggagaa agagcgaccc tgtcatgccg ggcgtcgcaa 1320

agcgtgagct atatgaattg gtatcagcag aagccaggaa aggcgccgaa gagatggatc 1380

tacgacacct ccaaggtcgc ttcaggtgtc ccggctagat tctcaggatc gggatcagga 1440

acggactact ccctgaccat caattcactg gaagcagaag atgcggccac ctactactgt 1500

cagcagtggt cctccaaccc gctgactttc ggaggcggaa ctaaggtcga gatcaagcat 1560

caccatcacc atcaccacca tcaccattag 1590

<210> 4
<211> 529
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP BiTE amino acid sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 4

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val
20 25 30

Ser Leu Gly Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu
35 40 45

Leu Tyr Ser Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys

```
    50                  55                  60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu
65                  70                  75                  80

Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Gln Gln Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys
        115                 120                 125

Val Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140

Gly Gly Ser Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys
145                 150                 155                 160

Pro Gly Ala Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe
                165                 170                 175

Thr Glu Tyr Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu
            180                 185                 190

Glu Trp Ile Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn
        195                 200                 205

Gln Lys Phe Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser
    210                 215                 220

Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val
225                 230                 235                 240

Tyr Tyr Cys Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His
                245                 250                 255

Ala Met Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser Gly
```

```
            260                 265                 270

Gly Gly Gly Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys
        275                 280                 285

Lys Pro Gly Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr
    290                 295                 300

Phe Thr Arg Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly
305                 310                 315                 320

Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr
                325                 330                 335

Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr
            340                 345                 350

Ser Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala
        355                 360                 365

Thr Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr
    370                 375                 380

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser
385                 390                 395                 400

Thr Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val
                405                 410                 415

Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala
            420                 425                 430

Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr
        435                 440                 445

Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser
    450                 455                 460

Lys Val Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly
```

465 470 475 480

Thr Asp Tyr Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala
485 490 495

Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly
500 505 510

Gly Thr Lys Val Glu Ile Lys His His His His His His His His His
515 520 525

His

<210> 5
<211> 1629
<212> DNA
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) BiTE DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 5
atgggttggt catgcatcat cctgtttctc gtcgcaactg cgaccggcgt gcattcggaa 60

ctggacatcg tgatgaccca ggcacctgca tcactggcag tgagcctggg acagagagcc 120

accatttcat gccgggccag caagagcgtg tcgtcatccg gatacaatta tctgcactgg 180

tatcagcaga aaccaggaca acctccaaag ctactcatct acctggcgtc gaacctcgaa 240

tcgggcgtcc cagctagatt ctcagggagc ggttcgggaa ccgatttcac cctgaacatc 300

caccctgtgg aggaggaaga cgcggcaacg tactattgcc agcattcccg cgagttccct 360

ctcactttcg gtgcgggaac taagctggag atcaagtcca gcggcggcgg aggtagcggt 420

ggaggtggcg gaggaagctc ccggtcgtcg ctggaggtgc agctgcaaca atccggcccg 480

gaactggtca agccaggcgc atccgtcaag atttcatgca agacctcggg gtacaccttc 540

accgggtaca cgatgcattg ggtcaggcag agccacggca agtccctgga atggatcgga 600

ggaatcaacc ccaaaaacgg cggcatcatc tacaaccaaa agttccaggg aaaagccact 660

ctgaccgtgg acaagtcgtc gagcacggcc agcatggagc tgcggtccct cacttccgac 720

gactcagccg tgtattactg cgcgagacgg gtctacgatg actacccata ctactacgct 780

atggactact ggggacaagg aaccagcgtg accgtctcat cggcgaaaac tactccgccg 840

tcggtgacgt cgggaggtgg tggaagcgac gtgcagctcg tccagtcggg tgccgaggtg 900

aagaagccag gagcctccgt gaaggtctcg tgcaaagcca gcggctacac ttttactagg 960

tacactatgc actgggtgcg gcaagcgccg ggacaaggtc tggagtggat cggatacatc 1020

aatccgtcgc ggggatacac taattacgcg gactccgtca agggacggtt tactatcact 1080

acggataagt ccactagcac cgcctacatg gaactgtcct cgctgcggtc ggaagacact 1140

gcgacctact actgcgctag atattacgat gaccactact gcctcgacta ttgggggcag 1200

ggcactacgg tcaccgtctc gtcgggagaa ggaacctcaa ctggatcggg cggatcggga 1260

ggctccggag gagccgacga catcgtgctt acccagtcgc ctgcgaccct gtccctgtcc 1320

ccaggagaga gagcgactct ttcatgcagg gcttcccaat cagtctccta catgaattgg 1380

tatcaacaaa aacccggcaa ggccccgaaa cgctggatct acgatacttc aaaggtggcc 1440

agcggtgtgc ctgcccgctt ctccgggtcg gggtccggca ccgattactc gttgactatc 1500

aatagcctgg aggccgagga cgctgcaact tactactgcc agcagtggtc ctccaaccct 1560

ctcaccttcg gaggcgggac caaggtggaa atcaaacatc accatcacca tcaccaccat 1620

caccattag 1629

<210> 6
<211> 542
<212> PRT
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) BiTE amino acid sequence with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 6

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu
20 25 30

```
Ala Val Ser Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys
        35                  40                  45

Ser Val Ser Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys
    50                  55                  60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu
65                  70                  75                  80

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
                85                  90                  95

Thr Leu Asn Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr
            100                 105                 110

Cys Gln His Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly
    130                 135                 140

Gly Ser Ser Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro
145                 150                 155                 160

Glu Leu Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser
                165                 170                 175

Gly Tyr Thr Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His
            180                 185                 190

Gly Lys Ser Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly
        195                 200                 205

Ile Ile Tyr Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp
    210                 215                 220

Lys Ser Ser Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp
225                 230                 235                 240
```

```
Asp Ser Ala Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro
                245                 250                 255

Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
            260                 265                 270

Ser Ser Ala Lys Thr Thr Pro Pro Ser Val Thr Ser Gly Gly Gly Gly
        275                 280                 285

Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly
    290                 295                 300

Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg
305                 310                 315                 320

Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp
                325                 330                 335

Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser
            340                 345                 350

Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala
        355                 360                 365

Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr
    370                 375                 380

Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln
385                 390                 395                 400

Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser
                405                 410                 415

Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln
            420                 425                 430

Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser
        435                 440                 445
```

```
Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
    450                 455                 460


Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala
465                 470                 475                 480


Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr
                485                 490                 495


Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
            500                 505                 510


Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys
        515                 520                 525


Val Glu Ile Lys His His His His His His His His His His
    530                 535                 540


<210>  7
<211>  243
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Anti-CD3 ScFv amino acid sequence

<400>  7

Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                   10                  15


Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg Tyr
            20                  25                  30


Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Ile
        35                  40                  45


Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser Val
    50                  55                  60


Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala Tyr
```

65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr Cys
85 90 95

Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln Gly
100 105 110

Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser Gly
115 120 125

Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln Ser
130 135 140

Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys
145 150 155 160

Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys Pro
165 170 175

Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala Ser
180 185 190

Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Ser
195 200 205

Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys
210 215 220

Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys Val
225 230 235 240

Glu Ile Lys

<210> 8
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-CD3 VH

<400> 8

```
Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                   10                  15


Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg Tyr
            20                  25                  30


Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Ile
        35                  40                  45


Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser Val
    50                  55                  60


Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala Tyr
65                  70                  75                  80


Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr Cys
                85                  90                  95


Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln Gly
            100                 105                 110


Thr Thr Val Thr Val Ser Ser
        115
```

<210> 9
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-CD3 VL

<400> 9

```
Asp Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
1               5                   10                  15


Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Tyr Met
```

```
            20                  25                  30

Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr
        35                  40                  45

Asp Thr Ser Lys Val Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
    50                  55                  60

Gly Ser Gly Thr Asp Tyr Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu
65                  70                  75                  80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
                85                  90                  95

Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
            100                 105
```

<210> 10
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-CD3 ScFv linker sequence

<400> 10

```
Gly Glu Gly Thr Ser Thr Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly
1               5                   10                  15

Ala Asp
```

<210> 11
<211> 252
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP ScFv

<400> 11

```
Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val Ser Leu Gly
```

```
1               5                   10                  15

Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu Leu Tyr Ser
            20                  25                  30

Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
        35                  40                  45

Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu Ser Gly Val
    50                  55                  60

Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe Thr Leu Thr
65                  70                  75                  80

Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr Cys Gln Gln
                85                  90                  95

Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys Val Glu Ile
            100                 105                 110

Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
        115                 120                 125

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
    130                 135                 140

Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe Thr Glu Tyr
145                 150                 155                 160

Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
                165                 170                 175

Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn Gln Lys Phe
            180                 185                 190

Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser Thr Ala Tyr
        195                 200                 205

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
```

210 215 220

Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His Ala Met Asp
225 230 235 240

Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
245 250

<210> 12
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP VL domain

<400> 12

Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu Leu Tyr Ser
20 25 30

Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu Ser Gly Val
50 55 60

Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe Thr Leu Thr
65 70 75 80

Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr Cys Gln Gln
85 90 95

Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys Val Glu Ile
100 105 110

Lys

<210> 13
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP VH domain

<400> 13

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                   10                  15


Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe Thr Glu Tyr
            20                  25                  30


Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
        35                  40                  45


Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn Gln Lys Phe
    50                  55                  60


Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser Thr Ala Tyr
65                  70                  75                  80


Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95


Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His Ala Met Asp
            100                 105                 110


Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
        115                 120
```

<210> 14
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP and Anti-EpCAM linker sequence

<400> 14

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10 15

<210> 15
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> BiTe leader sequence

<400> 15

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser

<210> 16
<211> 248
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-EpCAM ScFv

<400> 16

Glu Leu Val Met Thr Gln Ser Pro Ser Ser Leu Thr Val Thr Ala Gly
1 5 10 15

Glu Lys Val Thr Met Ser Cys Lys Ser Ser Gln Ser Leu Leu Asn Ser
20 25 30

Gly Asn Gln Lys Asn Tyr Leu Thr Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
50 55 60

Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
65 70 75 80

```
Ile Ser Ser Val Gln Ala Glu Asp Leu Ala Val Tyr Tyr Cys Gln Asn
                85                  90                  95


Asp Tyr Ser Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile
            100                 105                 110


Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
        115                 120                 125


Glu Val Gln Leu Leu Glu Gln Ser Gly Ala Glu Leu Val Arg Pro Gly
    130                 135                 140


Thr Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Ala Phe Thr Asn
145                 150                 155                 160


Tyr Trp Leu Gly Trp Val Lys Gln Arg Pro Gly His Gly Leu Glu Trp
                165                 170                 175


Ile Gly Asp Ile Phe Pro Gly Ser Gly Asn Ile His Tyr Asn Glu Lys
            180                 185                 190


Phe Lys Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser Ser Thr Ala
        195                 200                 205


Tyr Met Gln Leu Ser Ser Leu Thr Phe Glu Asp Ser Ala Val Tyr Phe
    210                 215                 220


Cys Ala Arg Leu Arg Asn Trp Asp Glu Pro Met Asp Tyr Trp Gly Gln
225                 230                 235                 240


Gly Thr Thr Val Thr Val Ser Ser
                245
```

<210> 17
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-EpCAM VL

<400> 17

```
Glu Leu Val Met Thr Gln Ser Pro Ser Ser Leu Thr Val Thr Ala Gly
1               5                  10                  15


Glu Lys Val Thr Met Ser Cys Lys Ser Ser Gln Ser Leu Leu Asn Ser
            20                  25                  30


Gly Asn Gln Lys Asn Tyr Leu Thr Trp Tyr Gln Gln Lys Pro Gly Gln
        35                  40                  45


Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
    50                  55                  60


Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
65                  70                  75                  80


Ile Ser Ser Val Gln Ala Glu Asp Leu Ala Val Tyr Tyr Cys Gln Asn
                85                  90                  95


Asp Tyr Ser Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile
            100                 105                 110


Lys
```

<210> 18
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-EpCAM VH

<400> 18

```
Glu Val Gln Leu Leu Glu Gln Ser Gly Ala Glu Leu Val Arg Pro Gly
1               5                  10                  15


Thr Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Ala Phe Thr Asn
            20                  25                  30
```

```
Tyr Trp Leu Gly Trp Val Lys Gln Arg Pro Gly His Gly Leu Glu Trp
        35                  40                  45


Ile Gly Asp Ile Phe Pro Gly Ser Gly Asn Ile His Tyr Asn Glu Lys
    50                  55                  60


Phe Lys Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser Ser Thr Ala
65                  70                  75                  80


Tyr Met Gln Leu Ser Ser Leu Thr Phe Glu Asp Ser Ala Val Tyr Phe
                85                  90                  95


Cys Ala Arg Leu Arg Asn Trp Asp Glu Pro Met Asp Tyr Trp Gly Gln
            100                 105                 110


Gly Thr Thr Val Thr Val Ser Ser
        115                 120


<210>  19
<211>  542
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Control BiTe (Anti-FHA)

<400>  19

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1               5                   10                  15


Val His Ser Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu
            20                  25                  30


Ala Val Ser Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys
        35                  40                  45


Ser Val Ser Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys
    50                  55                  60


Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu
```

```
65                  70                  75                  80

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
                85                  90                  95

Thr Leu Asn Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr
            100                 105                 110

Cys Gln His Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly
    130                 135                 140

Gly Ser Ser Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro
145                 150                 155                 160

Glu Leu Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser
                165                 170                 175

Gly Tyr Thr Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His
            180                 185                 190

Gly Lys Ser Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly
        195                 200                 205

Ile Ile Tyr Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp
    210                 215                 220

Lys Ser Ser Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp
225                 230                 235                 240

Asp Ser Ala Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro
                245                 250                 255

Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
            260                 265                 270

Ser Ser Ala Lys Thr Thr Pro Pro Ser Val Thr Ser Gly Gly Gly Gly
```

```
        275                 280                 285

Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly
    290                 295                 300

Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg
305                 310                 315                 320

Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp
                325                 330                 335

Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser
            340                 345                 350

Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala
        355                 360                 365

Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr
    370                 375                 380

Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln
385                 390                 395                 400

Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser
                405                 410                 415

Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln
            420                 425                 430

Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser
        435                 440                 445

Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
    450                 455                 460

Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala
465                 470                 475                 480

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr
```

485 490 495

Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
500 505 510

Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys
515 520 525

Val Glu Ile Lys His His His His His His His His His His
530 535 540

<210> 20
<211> 265
<212> PRT
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) ScFv

<400> 20

Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu Ala Val Ser
1 5 10 15

Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys Ser Val Ser
20 25 30

Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val
50 55 60

Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Asn
65 70 75 80

Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr Cys Gln His
85 90 95

Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile
100 105 110

```
Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly Gly Ser Ser
        115                 120                 125


Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro Glu Leu Val
    130                 135                 140


Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser Gly Tyr Thr
145                 150                 155                 160


Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His Gly Lys Ser
                165                 170                 175


Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly Ile Ile Tyr
            180                 185                 190


Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser
        195                 200                 205


Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp Asp Ser Ala
    210                 215                 220


Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro Tyr Tyr Tyr
225                 230                 235                 240


Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala
                245                 250                 255


Lys Thr Thr Pro Pro Ser Val Thr Ser
            260                 265


<210>  21
<211>  113
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Control (Anti-FHA) VL

<400>  21

Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu Ala Val Ser
```

1 5 10 15

Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys Ser Val Ser
20 25 30

Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val
50 55 60

Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Asn
65 70 75 80

Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr Cys Gln His
85 90 95

Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile
100 105 110

Lys

<210> 22
<211> 133
<212> PRT
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) VH

<400> 22

Glu Val Gln Leu Gln Gln Ser Gly Pro Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Thr Ser Gly Tyr Thr Phe Thr Gly Tyr
20 25 30

Thr Met His Trp Val Arg Gln Ser His Gly Lys Ser Leu Glu Trp Ile
35 40 45

```
Gly Gly Ile Asn Pro Lys Asn Gly Gly Ile Ile Tyr Asn Gln Lys Phe
    50                  55                  60


Gln Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Ser
65                  70                  75                  80


Met Glu Leu Arg Ser Leu Thr Ser Asp Asp Ser Ala Val Tyr Tyr Cys
                85                  90                  95


Ala Arg Arg Val Tyr Asp Asp Tyr Pro Tyr Tyr Tyr Ala Met Asp Tyr
            100                 105                 110


Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Lys Thr Thr Pro
        115                 120                 125


Pro Ser Val Thr Ser
    130


<210>  23
<211>  19
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Control (Anti-FHA) ScFv linker sequence

<400>  23

Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly Gly Ser Ser Arg
1               5                   10                  15


Ser Ser Leu



<210>  24
<211>  10
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Deca-His Tag sequence

<400>  24
```

```
His His His His His His His His His His
1               5                   10


<210>  25
<211>  786
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  FAP BiTE-P2A-RFP

<400>  25

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1               5                   10                  15


Val His Ser Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val
            20                  25                  30


Ser Leu Gly Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu
        35                  40                  45


Leu Tyr Ser Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys
    50                  55                  60


Pro Gly Gln Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu
65                  70                  75                  80


Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe
                85                  90                  95


Thr Leu Thr Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr
            100                 105                 110


Cys Gln Gln Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys
        115                 120                 125


Val Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140


Gly Gly Ser Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys
```

```
145                 150                 155                 160

Pro Gly Ala Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe
                165                 170                 175

Thr Glu Tyr Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu
            180                 185                 190

Glu Trp Ile Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn
        195                 200                 205

Gln Lys Phe Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser
    210                 215                 220

Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val
225                 230                 235                 240

Tyr Tyr Cys Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His
                245                 250                 255

Ala Met Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser Gly
            260                 265                 270

Gly Gly Gly Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys
        275                 280                 285

Lys Pro Gly Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr
    290                 295                 300

Phe Thr Arg Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly
305                 310                 315                 320

Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr
                325                 330                 335

Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr
            340                 345                 350

Ser Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala
```

```
        355                 360                 365

Thr Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr
    370                 375                 380

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser
385                 390                 395                 400

Thr Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val
                405                 410                 415

Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala
            420                 425                 430

Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr
        435                 440                 445

Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser
    450                 455                 460

Lys Val Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly
465                 470                 475                 480

Thr Asp Tyr Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala
                485                 490                 495

Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly
            500                 505                 510

Gly Thr Lys Val Glu Ile Lys His His His His His His His His His
        515                 520                 525

His Arg Arg Lys Arg Gly Ser Gly Ala Thr Asn Phe Ser Leu Leu Lys
    530                 535                 540

Gln Ala Gly Asp Val Glu Glu Asn Pro Gly Pro Met Ser Glu Leu Ile
545                 550                 555                 560

Lys Glu Asn Met His Met Lys Leu Tyr Met Glu Gly Thr Val Asn Asn
```

```
                565                 570                 575

His His Phe Lys Cys Thr Ser Glu Gly Glu Gly Lys Pro Tyr Glu Gly
            580                 585                 590

Thr Gln Thr Met Lys Ile Lys Val Val Glu Gly Gly Pro Leu Pro Phe
        595                 600                 605

Ala Phe Asp Ile Leu Ala Thr Ser Phe Met Tyr Gly Ser Lys Ala Phe
    610                 615                 620

Ile Asn His Thr Gln Gly Ile Pro Asp Phe Phe Lys Gln Ser Phe Pro
625                 630                 635                 640

Glu Gly Phe Thr Trp Glu Arg Ile Thr Thr Tyr Glu Asp Gly Gly Val
                645                 650                 655

Leu Thr Ala Thr Gln Asp Thr Ser Phe Gln Asn Gly Cys Ile Ile Tyr
            660                 665                 670

Asn Val Lys Ile Asn Gly Val Asn Phe Pro Ser Asn Gly Pro Val Met
        675                 680                 685

Gln Lys Lys Thr Arg Gly Trp Glu Ala Asn Thr Glu Met Leu Tyr Pro
    690                 695                 700

Ala Asp Gly Gly Leu Arg Gly His Ser Gln Met Ala Leu Lys Leu Val
705                 710                 715                 720

Gly Gly Gly Tyr Leu His Cys Ser Phe Lys Thr Thr Tyr Arg Ser Lys
                725                 730                 735

Lys Pro Ala Lys Asn Leu Lys Met Pro Gly Phe His Phe Val Asp His
            740                 745                 750

Arg Leu Glu Arg Ile Lys Glu Ala Asp Lys Glu Thr Tyr Val Glu Gln
        755                 760                 765

His Glu Met Ala Val Ala Lys Tyr Cys Asp Leu Pro Ser Lys Leu Gly
```

770 775 780

His Arg
785

<210> 26
<211> 799
<212> PRT
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) BiTE-P2A-RFP

<400> 26

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu
20 25 30

Ala Val Ser Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys
35 40 45

Ser Val Ser Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu
65 70 75 80

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
85 90 95

Thr Leu Asn Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr
100 105 110

Cys Gln His Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys
115 120 125

Leu Glu Ile Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly
130 135 140

```
Gly Ser Ser Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro
145                 150                 155                 160


Glu Leu Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser
                165                 170                 175


Gly Tyr Thr Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His
            180                 185                 190


Gly Lys Ser Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly
        195                 200                 205


Ile Ile Tyr Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp
    210                 215                 220


Lys Ser Ser Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp
225                 230                 235                 240


Asp Ser Ala Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro
                245                 250                 255


Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
            260                 265                 270


Ser Ser Ala Lys Thr Thr Pro Pro Ser Val Thr Ser Gly Gly Gly Gly
        275                 280                 285


Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly
    290                 295                 300


Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg
305                 310                 315                 320


Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp
                325                 330                 335


Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser
            340                 345                 350
```

```
Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala
        355                 360                 365

Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr
    370                 375                 380

Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln
385                 390                 395                 400

Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser
                405                 410                 415

Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln
            420                 425                 430

Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser
        435                 440                 445

Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
    450                 455                 460

Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala
465                 470                 475                 480

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr
                485                 490                 495

Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
            500                 505                 510

Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys
        515                 520                 525

Val Glu Ile Lys His His His His His His His His His His Arg Arg
    530                 535                 540

Lys Arg Gly Ser Gly Ala Thr Asn Phe Ser Leu Leu Lys Gln Ala Gly
545                 550                 555                 560
```

```
Asp Val Glu Glu Asn Pro Gly Pro Met Ser Glu Leu Ile Lys Glu Asn
                565                 570                 575

Met His Met Lys Leu Tyr Met Glu Gly Thr Val Asn Asn His His Phe
            580                 585                 590

Lys Cys Thr Ser Glu Gly Glu Gly Lys Pro Tyr Glu Gly Thr Gln Thr
        595                 600                 605

Met Lys Ile Lys Val Val Glu Gly Gly Pro Leu Pro Phe Ala Phe Asp
    610                 615                 620

Ile Leu Ala Thr Ser Phe Met Tyr Gly Ser Lys Ala Phe Ile Asn His
625                 630                 635                 640

Thr Gln Gly Ile Pro Asp Phe Phe Lys Gln Ser Phe Pro Glu Gly Phe
                645                 650                 655

Thr Trp Glu Arg Ile Thr Thr Tyr Glu Asp Gly Gly Val Leu Thr Ala
            660                 665                 670

Thr Gln Asp Thr Ser Phe Gln Asn Gly Cys Ile Ile Tyr Asn Val Lys
        675                 680                 685

Ile Asn Gly Val Asn Phe Pro Ser Asn Gly Pro Val Met Gln Lys Lys
    690                 695                 700

Thr Arg Gly Trp Glu Ala Asn Thr Glu Met Leu Tyr Pro Ala Asp Gly
705                 710                 715                 720

Gly Leu Arg Gly His Ser Gln Met Ala Leu Lys Leu Val Gly Gly Gly
                725                 730                 735

Tyr Leu His Cys Ser Phe Lys Thr Thr Tyr Arg Ser Lys Lys Pro Ala
            740                 745                 750

Lys Asn Leu Lys Met Pro Gly Phe His Phe Val Asp His Arg Leu Glu
        755                 760                 765
```

Arg Ile Lys Glu Ala Asp Lys Glu Thr Tyr Val Glu Gln His Glu Met
770 775 780

Ala Val Ala Lys Tyr Cys Asp Leu Pro Ser Lys Leu Gly His Arg
785 790 795

<210> 27
<211> 945
<212> DNA
<213> Artificial Sequence

<220>
<223> Human EpCAM DNA coding sequence

<400> 27
atggctccgc cgcaagtgct cgcctttgga ctgctcctgg ccgctgctac tgccaccttt 60

gctgccgctc aggaagaatg cgtgtgcgaa aactacaaac tggcagtgaa ctgcttcgtg 120

aacaataacc gccaatgcca gtgcaccagc gtgggcgcgc agaacactgt catctgcagc 180

aagctggccg caaaatgcct ggtcatgaaa gcggagatga acggatcgaa gctgggtcgg 240

cgcgctaagc cggaaggagc gctacaaaat aacgacgggc tgtacgatcc ggattgcgac 300

gaaagcggtc tgtttaaggc aaagcagtgt aatgggacca gcatgtgttg gtgcgtgaac 360

actgccggag tgcgccgcac tgacaaggat accgaaatta cgtgctcgga gcgcgtgaga 420

acgtattgga tcatcatcga gttgaagcat aaagctagag agaagccgta cgatagcaag 480

tccctgcgca ccgctctcca aaaagaaatt accactagat accaactcga cccgaaattc 540

atcacttcaa tcctgtacga aaacaacgtg attacgatcg acctggtgca gaactccagc 600

caaaagacgc agaacgacgt ggacattgca gacgtggctt actactttga aaaggacgtg 660

aaggggaat cactatttca ttccaagaaa atggacctga ccgtcaacgg agagcagctc 720

gacctggacc caggtcagac tctgatctac tacgtggacg agaaggcacc ggagttttcg 780

atgcagggcc tgaaagccgg agtcatcgcc gtgatcgtgg tggtggtgat tgccgtcgtc 840

gccgggatcg tggtgctcgt gattagccgc aaaaagagaa tggctaagta tgaaaaggca 900

gagatcaagg aaatgggaga aatgcaccgc gaactcaacg catag 945

<210> 28

<211> 314
<212> PRT
<213> Artificial Sequence

<220>
<223> Human EpCAM amino acid sequence

<400> 28

```
Met Ala Pro Pro Gln Val Leu Ala Phe Gly Leu Leu Leu Ala Ala Ala
1               5                  10                  15


Thr Ala Thr Phe Ala Ala Ala Gln Glu Glu Cys Val Cys Glu Asn Tyr
            20                  25                  30


Lys Leu Ala Val Asn Cys Phe Val Asn Asn Asn Arg Gln Cys Gln Cys
        35                  40                  45


Thr Ser Val Gly Ala Gln Asn Thr Val Ile Cys Ser Lys Leu Ala Ala
    50                  55                  60


Lys Cys Leu Val Met Lys Ala Glu Met Asn Gly Ser Lys Leu Gly Arg
65                  70                  75                  80


Arg Ala Lys Pro Glu Gly Ala Leu Gln Asn Asn Asp Gly Leu Tyr Asp
                85                  90                  95


Pro Asp Cys Asp Glu Ser Gly Leu Phe Lys Ala Lys Gln Cys Asn Gly
            100                 105                 110


Thr Ser Met Cys Trp Cys Val Asn Thr Ala Gly Val Arg Arg Thr Asp
        115                 120                 125


Lys Asp Thr Glu Ile Thr Cys Ser Glu Arg Val Arg Thr Tyr Trp Ile
    130                 135                 140


Ile Ile Glu Leu Lys His Lys Ala Arg Glu Lys Pro Tyr Asp Ser Lys
145                 150                 155                 160


Ser Leu Arg Thr Ala Leu Gln Lys Glu Ile Thr Thr Arg Tyr Gln Leu
                165                 170                 175
```

```
Asp Pro Lys Phe Ile Thr Ser Ile Leu Tyr Glu Asn Asn Val Ile Thr
            180                 185                 190


Ile Asp Leu Val Gln Asn Ser Ser Gln Lys Thr Gln Asn Asp Val Asp
        195                 200                 205


Ile Ala Asp Val Ala Tyr Tyr Phe Glu Lys Asp Val Lys Gly Glu Ser
    210                 215                 220


Leu Phe His Ser Lys Lys Met Asp Leu Thr Val Asn Gly Glu Gln Leu
225                 230                 235                 240


Asp Leu Asp Pro Gly Gln Thr Leu Ile Tyr Tyr Val Asp Glu Lys Ala
                245                 250                 255


Pro Glu Phe Ser Met Gln Gly Leu Lys Ala Gly Val Ile Ala Val Ile
            260                 265                 270


Val Val Val Val Ile Ala Val Val Ala Gly Ile Val Val Leu Val Ile
        275                 280                 285


Ser Arg Lys Lys Arg Met Ala Lys Tyr Glu Lys Ala Glu Ile Lys Glu
    290                 295                 300


Met Gly Glu Met His Arg Glu Leu Asn Ala
305                 310
```

<210> 29
<211> 2283
<212> DNA
<213> Artificial Sequence

<220>
<223> Human FAP DNA coding sequence

<400> 29

```
atgaagacct gggtgaaaat cgtgtttgga gtcgcaacca gcgccgtgct ggccctgttg       60

gtgatgtgca tcgtgctgcg cccgtcacgc gtgcataaca gcgaagaaaa caccatgaga      120

gctctgacgc taaaggacat cctgaatggc acttttttcct ataagacttt cttcccgaat      180
```

tggattagcg ggcaggagta cctgcaccaa tcggcggata acaatatcgt gctctacaac 240

atcgaaactg gccagagcta caccatcctg tcgaatagaa ctatgaaatc ggtgaatgcg 300

tcgaactacg gacttagccc ggaccgccag ttcgtgtacc tagaatcgga ctacagcaag 360

ctgtggcggt acagctacac tgctacgtac tacatctacg acctgtcgaa tggcgagttc 420

gtgagaggaa acgaactccc ccgcccgatc caatacctgt gctggagccc tgtgggaagc 480

aagctggcgt acgtgtatca gaacaacatc tacctcaagc agaggccggg cgacccacct 540

ttccagatca cttttaacgg tcgggagaac aagattttca atggaatccc ggattgggtg 600

tacgaagaag agatgctggc gaccaaatat gcgctctggt ggtcgccaaa cggaaaattt 660

ctagcatacg ccgagttcaa tgacaccgac atccccgtca tcgcctacag ctactacgga 720

gatgagcaat acccacgcac tattaatatc ccgtacccga aagccggcgc taaaaatccg 780

gtcgtgcgga tcttcatcat cgacactacc tatccagctt acgtgggacc gcaagaggtc 840

cctgtgccag ccatgatcgc cagcagcgat tactacttct cctggctgac ttgggtcact 900

gacgagaggg tgtgcctcca atggctcaag cgcgtgcaga acgtgagcgt gctgtccatc 960

tgcgacttca gagaagattg gcaaacgtgg gactgtccga aaactcaaga gcatatcgag 1020

gagagcagaa ccggatgggc agggggttc ttcgtgtcca ccccggtgtt cagctacgat 1080

gcgatctcgt actacaagat tttctccgat aaggacgggt acaaacatat ccactacatc 1140

aaggacaccg tggagaatgc gatccaaatc actagcggaa aatgggaagc gattaacatt 1200

ttccgggtga cgcaagactc attgttctat tcatccaatg aatttgaaga gtaccctggc 1260

cggaggaaca tctaccgcat ctccatcgga tcatacccac catcaaagaa gtgcgtgacc 1320

tgccatctcc gcaaggagcg ctgccaatac tacaccgcgt ccttctccga ttacgcgaag 1380

tactacgccc tggtgtgcta cggcccggga atcccaatct cgaccctaca tgatgggcgc 1440

accgaccagg agatcaaaat cctggaggaa aacaaggagc tcgaaaatgc tctgaaaaat 1500

attcaactac cgaaggagga aatcaagaag ctggaggtgg atgaaattac tctgtggtac 1560

aaaatgatcc tgccgccaca gttcgaccgc tccaagaagt acccgctgct gatccaggtg 1620

tacggaggac cctgctcaca gtcggtgcgc tcagtgtttg ctgtgaattg gatcagctac 1680

ctcgcatcaa aggaggggat ggtcatcgcg cttgtggacg gaagaggtac tgcattccag 1740

ggggacaaac tgctctacgc ggtgtaccgc aagctgggcg tctacgaggt ggaggaccaa 1800

atcacggcgg tcagaaagtt catcgagatg ggtttcatcg acgagaagag gatcgccatc 1860

tggggctggt cgtacggagg ttacgtgtcg tcactcgctc tggcgagcgg gactggattg 1920

ttcaaatgcg gtatcgcagt cgcccccgtg tcgtcatggg aatactacgc ctcggtgtat 1980

accgaacgct ttatgggact ccctactaaa gacgataacc tagagcacta caaaaactcg 2040

acggtgatgg cacgcgcaga gtactttcgc aatgtggatt acctcctgat ccacggaacc 2100

gccgatgata atgtccactt ccagaactca gcccaaatcg cgaaagccct ggtgaacgct 2160

caagtggact ttcaagcaat gtggtattca gaccagaacc acggactatc cggcctatcg 2220

actaatcacc tgtacaccca tatgacccat ttccttaaac agtgtttcag cctgtccgat 2280

tag 2283

<210> 30
<211> 760
<212> PRT
<213> Artificial Sequence

<220>
<223> Human FAP amino acid sequence

<400> 30

Met Lys Thr Trp Val Lys Ile Val Phe Gly Val Ala Thr Ser Ala Val
1 5 10 15

Leu Ala Leu Leu Val Met Cys Ile Val Leu Arg Pro Ser Arg Val His
20 25 30

Asn Ser Glu Glu Asn Thr Met Arg Ala Leu Thr Leu Lys Asp Ile Leu
35 40 45

Asn Gly Thr Phe Ser Tyr Lys Thr Phe Phe Pro Asn Trp Ile Ser Gly
50 55 60

Gln Glu Tyr Leu His Gln Ser Ala Asp Asn Asn Ile Val Leu Tyr Asn
65 70 75 80

Ile Glu Thr Gly Gln Ser Tyr Thr Ile Leu Ser Asn Arg Thr Met Lys

```
                85                  90                  95

Ser Val Asn Ala Ser Asn Tyr Gly Leu Ser Pro Asp Arg Gln Phe Val
            100                 105                 110

Tyr Leu Glu Ser Asp Tyr Ser Lys Leu Trp Arg Tyr Ser Tyr Thr Ala
        115                 120                 125

Thr Tyr Tyr Ile Tyr Asp Leu Ser Asn Gly Glu Phe Val Arg Gly Asn
    130                 135                 140

Glu Leu Pro Arg Pro Ile Gln Tyr Leu Cys Trp Ser Pro Val Gly Ser
145                 150                 155                 160

Lys Leu Ala Tyr Val Tyr Gln Asn Asn Ile Tyr Leu Lys Gln Arg Pro
                165                 170                 175

Gly Asp Pro Pro Phe Gln Ile Thr Phe Asn Gly Arg Glu Asn Lys Ile
            180                 185                 190

Phe Asn Gly Ile Pro Asp Trp Val Tyr Glu Glu Glu Met Leu Ala Thr
        195                 200                 205

Lys Tyr Ala Leu Trp Trp Ser Pro Asn Gly Lys Phe Leu Ala Tyr Ala
    210                 215                 220

Glu Phe Asn Asp Thr Asp Ile Pro Val Ile Ala Tyr Ser Tyr Tyr Gly
225                 230                 235                 240

Asp Glu Gln Tyr Pro Arg Thr Ile Asn Ile Pro Tyr Pro Lys Ala Gly
                245                 250                 255

Ala Lys Asn Pro Val Val Arg Ile Phe Ile Ile Asp Thr Thr Tyr Pro
            260                 265                 270

Ala Tyr Val Gly Pro Gln Glu Val Pro Val Pro Ala Met Ile Ala Ser
        275                 280                 285

Ser Asp Tyr Tyr Phe Ser Trp Leu Thr Trp Val Thr Asp Glu Arg Val
```

```
    290                 295                 300

Cys Leu Gln Trp Leu Lys Arg Val Gln Asn Val Ser Val Leu Ser Ile
305                 310                 315                 320

Cys Asp Phe Arg Glu Asp Trp Gln Thr Trp Asp Cys Pro Lys Thr Gln
                325                 330                 335

Glu His Ile Glu Glu Ser Arg Thr Gly Trp Ala Gly Gly Phe Phe Val
            340                 345                 350

Ser Thr Pro Val Phe Ser Tyr Asp Ala Ile Ser Tyr Tyr Lys Ile Phe
        355                 360                 365

Ser Asp Lys Asp Gly Tyr Lys His Ile His Tyr Ile Lys Asp Thr Val
    370                 375                 380

Glu Asn Ala Ile Gln Ile Thr Ser Gly Lys Trp Glu Ala Ile Asn Ile
385                 390                 395                 400

Phe Arg Val Thr Gln Asp Ser Leu Phe Tyr Ser Ser Asn Glu Phe Glu
                405                 410                 415

Glu Tyr Pro Gly Arg Arg Asn Ile Tyr Arg Ile Ser Ile Gly Ser Tyr
            420                 425                 430

Pro Pro Ser Lys Lys Cys Val Thr Cys His Leu Arg Lys Glu Arg Cys
        435                 440                 445

Gln Tyr Tyr Thr Ala Ser Phe Ser Asp Tyr Ala Lys Tyr Tyr Ala Leu
    450                 455                 460

Val Cys Tyr Gly Pro Gly Ile Pro Ile Ser Thr Leu His Asp Gly Arg
465                 470                 475                 480

Thr Asp Gln Glu Ile Lys Ile Leu Glu Glu Asn Lys Glu Leu Glu Asn
                485                 490                 495

Ala Leu Lys Asn Ile Gln Leu Pro Lys Glu Glu Ile Lys Lys Leu Glu
```

```
            500                 505                 510

Val Asp Glu Ile Thr Leu Trp Tyr Lys Met Ile Leu Pro Pro Gln Phe
        515                 520                 525

Asp Arg Ser Lys Lys Tyr Pro Leu Leu Ile Gln Val Tyr Gly Gly Pro
    530                 535                 540

Cys Ser Gln Ser Val Arg Ser Val Phe Ala Val Asn Trp Ile Ser Tyr
545                 550                 555                 560

Leu Ala Ser Lys Glu Gly Met Val Ile Ala Leu Val Asp Gly Arg Gly
                565                 570                 575

Thr Ala Phe Gln Gly Asp Lys Leu Leu Tyr Ala Val Tyr Arg Lys Leu
            580                 585                 590

Gly Val Tyr Glu Val Glu Asp Gln Ile Thr Ala Val Arg Lys Phe Ile
        595                 600                 605

Glu Met Gly Phe Ile Asp Glu Lys Arg Ile Ala Ile Trp Gly Trp Ser
    610                 615                 620

Tyr Gly Gly Tyr Val Ser Ser Leu Ala Leu Ala Ser Gly Thr Gly Leu
625                 630                 635                 640

Phe Lys Cys Gly Ile Ala Val Ala Pro Val Ser Ser Trp Glu Tyr Tyr
                645                 650                 655

Ala Ser Val Tyr Thr Glu Arg Phe Met Gly Leu Pro Thr Lys Asp Asp
            660                 665                 670

Asn Leu Glu His Tyr Lys Asn Ser Thr Val Met Ala Arg Ala Glu Tyr
        675                 680                 685

Phe Arg Asn Val Asp Tyr Leu Leu Ile His Gly Thr Ala Asp Asp Asn
    690                 695                 700

Val His Phe Gln Asn Ser Ala Gln Ile Ala Lys Ala Leu Val Asn Ala
```

705 710 715 720

Gln Val Asp Phe Gln Ala Met Trp Tyr Ser Asp Gln Asn His Gly Leu
725 730 735

Ser Gly Leu Ser Thr Asn His Leu Tyr Thr His Met Thr His Phe Leu
740 745 750

Lys Gln Cys Phe Ser Leu Ser Asp
755 760

<210> 31
<211> 571
<212> DNA
<213> Artificial Sequence

<220>
<223> CMV promoter sequence

<400> 31
agtaatcaat tacggggtca ttagttcata gcccatatat ggagttccgc gttacataac 60

ttacggtaaa tggcccgcct ggctgaccgc ccaacgaccc ccgcccattg acgtcaataa 120

tgacgtatgt tcccatagta acgccaatag ggactttcca ttgacgtcaa tgggtggagt 180

atttacggta aactgcccac ttggcagtac atcaagtgta tcatatgcca agtacgcccc 240

ctattgacgt caatgacggt aaatggcccg cctggcatta tgcccagtac atgaccttat 300

gggactttcc tacttggcag tacatctacg tattagtcat cgctattacc atgctgatgc 360

ggttttggca gtacatcaat gggcgtggat agcggtttga ctcacgggga tttccaagtc 420

tccaccccat tgacgtcaat gggagtttgt tttggcacca aaatcaacgg gactttccaa 480

aatgtcgtaa caactccgcc ccattgacgc aaatgggcgg taggcgtgta cggtgggagg 540

tctatataag cagagctggt ttagtgaacc g 571

<210> 32
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
<223> SV40 late polyadenylation sequence

<400> 32
cagacatgat aagatacatt gatgagtttg gacaaaccac aactagaatg cagtgaaaaa 60

aatgctttat ttgtgaaatt tgtgatgcta ttgctttatt tgtaaccatt ataagctgca 120

ataaacaagt taacaacaac aattgcattc attttatgtt tcaggttcag ggggaggtgt 180

gggaggtttt tt 192

<210> 33

<400> 33
000

<210> 34
<211> 34883
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-601 (EnAd-CMV-EpCAMBiTE)

<400> 34
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt cattttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccagggg ctcccgccag atctagtaat caattacggg 29400

gtcattagtt catagcccat atatggagtt ccgcgttaca taacttacgg taaatggccc 29460

gcctggctga ccgcccaacg acccccgccc attgacgtca ataatgacgt atgttcccat 29520

agtaacgcca atagggactt tccattgacg tcaatgggtg gagtatttac ggtaaactgc 29580

ccacttggca gtacatcaag tgtatcatat gccaagtacg ccccctattg acgtcaatga 29640

cggtaaatgg cccgcctggc attatgccca gtacatgacc ttatgggact ttcctacttg 29700

gcagtacatc tacgtattag tcatcgctat taccatgctg atgcggtttt ggcagtacat 29760

caatgggcgt ggatagcggt ttgactcacg gggatttcca agtctccacc ccattgacgt 29820

caatgggagt ttgttttggc accaaaatca acgggacttt ccaaaatgtc gtaacaactc 29880

cgccccattg acgcaaatgg gcggtaggcg tgtacggtgg gaggtctata taagcagagc 29940

tggtttagtg aaccgtcaga tcagatcttt gtcgatccta ccatccactc gacacacccg 30000

ccagcggccg ctgccaagct tccgagctct cgaattcaaa ggaggtaccc accatgggat 30060

ggagctgcat catcctattc ctcgtggcga cggccactgg agtgcatagc gaactggtga 30120

tgactcagtc cccgtcatcc ctgacggtga ccgccggcga gaaggtcacc atgtcgtgca 30180

agtcctcgca aagcctgctt aacagcggca accagaaaaa ctacctcacg tggtatcagc 30240

aaaagccagg tcaaccccca aaactgctca tctactgggc gagcacccgc gagtcggggg 30300

tgccagaccg gttcaccggc tccgggtcag gaactgattt caccctaacc atcagctcgg 30360

tgcaagcgga ggacctggcc gtgtactact gccaaaatga ttactcgtac cctctgacct 30420

ttggagcggg caccaagctc gaaatcaagg gcggtggagg aagcggcggg ggaggctcag 30480

gtgggggagg atcagaagtc caactgctgg agcagtcagg agccgaactg gtccgcccgg 30540

gaacctccgt caagatttcc tgtaaggctt ccggctacgc ttttaccaat tactggctgg 30600

gctgggtcaa gcaaagaccg gggcatggcc tggagtggat cggcgacatc ttcccaggga 30660

gcggcaacat ccactacaac gagaagttca aggggaaagc gactctgact gccgacaaat 30720

catccagcac cgcctacatg cagctgtcgt cgctcacttt cgaagacagc gcggtgtact 30780

tttgtgctcg gctccggaac tgggatgaac caatggacta ctggggacaa ggaactaccg 30840

tgaccgtctc ctccggcggc ggtggaagcg atgtgcaact cgtgcagtcc ggtgcggaag 30900

tgaaaaagcc gggcgcgagc gtcaaagtgt catgcaaggc gtcaggatat acgtttacta 30960

gatacactat gcactgggtg cgccaggcac ctggtcaggg ccttgaatgg atcggctaca 31020

tcaatccgtc gagaggctac actaattacg cggactcagt caaagggcgc ttcacgatta 31080

cgaccgacaa gtccacctcg actgcataca tggaactgtc ctcgctgaga agcgaggaca 31140

ccgctactta ctactgcgct agatactacg atgatcacta ctgcctcgat tactggggcc 31200

agggaaccac tgtcacggtg tcatcgggag agggcacctc aaccggatca gggggatcgg 31260

gaggctcggg cggcgcagac gacatcgtcc tgacccagtc gcccgccacc ttgtcgctgt 31320

ccccaggaga aagagcgacc ctgtcatgcc gggcgtcgca aagcgtgagc tatatgaatt 31380

ggtatcagca gaagccagga aaggcgccga agagatggat ctacgacacc tccaaggtcg 31440

cttcaggtgt cccggctaga ttctcaggat cgggatcagg aacggactac tccctgacca 31500

tcaattcact ggaagcagaa gatgcggcca cctactactg tcagcagtgg tcctccaacc 31560

cgctgacttt cggaggcgga actaaggtcg agatcaagca tcaccatcac catcaccacc 31620

atcaccatta ggctagcttg actgactgag atacagcgta ccttcagctc acagacatga 31680

taagatacat tgatgagttt ggacaaacca caactagaat gcagtgaaaa aaatgcttta 31740

tttgtgaaat ttgtgatgct attgctttat ttgtaaccat tataagctgc aataaacaag 31800

ttaacaacaa caattgcatt cattttatgt ttcaggttca gggggaggtg tgggaggttt 31860

tttaaagcaa gtaaaacctc tacaaatgtg gtagtcgtca gctatcctgc aggaacttgt 31920

ttatttgaaa atcaattcac aaaatccgag tagttatttt gcctcccccc tcccatttaa 31980

cagaatacac caatctctcc ccacgcacag ctttaaacat ttggatacca ttagatatag 32040

acatggtttt agattccaca ttccaaacag tttcagagcg agccaatctg gggtcagtga 32100

tagataaaaa tccatcggga tagtctttta aagcgctttc acagtccaac tgctgcggat 32160

gcgactccgg agtctggatc acggtcatct ggaagaagaa cgatgggaat cataatccga 32220

aaacggtatc ggacgattgt gtctcatcaa acccacaagc agccgctgtc tgcgtcgctc 32280

cgtgcgactg ctgtttatgg gatcagggtc cacagtgtcc tgaagcatga ttttaatagc 32340

ccttaacatc aactttctgg tgcgatgcgc gcagcaacgc attctgattt cactcaaatc 32400

tttgcagtag gtacaacaca ttattacaat attgtttaat aaaccataat taaaagcgct 32460

ccagccaaaa ctcatatctg atataatcgc ccctgcatga ccatcatacc aaagtttaat 32520

ataaattaaa tgacgttccc tcaaaaacac actacccaca tacatgatct cttttggcat 32580

gtgcatatta acaatctgtc tgtaccatgg acaacgttgg ttaatcatgc aacccaatat 32640

aaccttccgg aaccacactg ccaacaccgc tcccccagcc atgcattgaa gtgaaccctg 32700

ctgattacaa tgacaatgaa gaacccaatt ctctcgaccg tgaatcactt gagaatgaaa 32760

aatatctata gtggcacaac atagacataa atgcatgcat cttctcataa tttttaactc 32820

ctcaggattt agaaacatat cccagggaat aggaagctct tgcagaacag taaagctggc 32880

agaacaagga agaccacgaa cacaacttac actatgcata gtcatagtat cacaatctgg 32940

caacagcggg tggtcttcag tcatagaagc tcgggtttca ttttcctcac aacgtggtaa 33000

ctgggctctg gtgtaagggt gatgtctggc gcatgatgtc gagcgtgcgc gcaaccttgt 33060

cataatggag ttgcttcctg acattctcgt attttgtata gcaaaacgcg gccctggcag 33120

aacacactct tcttcgcctt ctatcctgcc gcttagcgtg ttccgtgtga tagttcaagt 33180

acaaccacac tcttaagttg gtcaaaagaa tgctggcttc agttgtaatc aaaactccat 33240

cgcatctaat cgttctgagg aaatcatcca agcaatgcaa ctggattgtg tttcaagcag 33300

gagaggagag ggaagagacg gaagaaccat gttaattttt attccaaacg atctcgcagt 33360

acttcaaatt gtagatcgcg cagatggcat ctctcgcccc cactgtgttg gtgaaaaagc 33420

acagctagat caaaagaaat gcgattttca aggtgctcaa cggtggcttc cagcaaagcc 33480

tccacgcgca catccaagaa caaaagaata ccaaaagaag gagcattttc taactcctca 33540

atcatcatat tacattcctg caccattccc agataatttt cagctttcca gccttgaatt 33600

attcgtgtca gttcttgtgg taaatccaat ccacacatta caaacaggtc ccggagggcg 33660

ccctccacca ccattcttaa acacaccctc ataatgacaa aatatcttgc tcctgtgtca 33720

cctgtagcga attgagaatg gcaacatcaa ttgacatgcc cttggctcta agttcttctt 33780

taagttctag ttgtaaaaac tctctcatat tatcaccaaa ctgcttagcc agaagccccc 33840

cgggaacaag agcaggggac gctacagtgc agtacaagcg cagacctccc caattggctc 33900

cagcaaaaac aagattggaa taagcatatt gggaaccgcc agtaatatca tcgaagttgc 33960

tggaaatata atcaggcaga gtttcttgta aaaattgaat aaaagaaaaa tttgccaaaa 34020

aaacattcaa aacctctggg atgcaaatgc aataggttac cgcgctgcgc tccaacattg 34080

ttagttttga attagtctgc aaaaataaaa aaaaaaacaa gcgtcatatc atagtagcct 34140

gacgaacaga tggataaatc agtctttcca tcacaagaca agccacaggg tctccagctc 34200

gaccctcgta aaacctgtca tcatgattaa acaacagcac cgaaagttcc tcgcggtgac 34260

cagcatgaat aattcttgat gaagcataca atccagacat gttagcatca gttaacgaga 34320

aaaaacagcc aacatagcct ttgggtataa ttatgcttaa tcgtaagtat agcaaagcca 34380

cccctcgcgg atacaaagta aaaggcacag gagaataaaa aatataatta tttctctgct 34440

gctgttcagg caacgtcgcc cccggtccct ctaaatacac atacaaagcc tcatcagcca 34500

tggcttacca gacaaagtac agcgggcaca caaagcacaa gctctaaagt gactctccaa 34560

cctctccaca atatatatat acacaagccc taaactgacg taatgggagt aaagtgtaaa 34620

aaatcccgcc aaacccaaca cacaccccga aactgcgtca ccagggaaaa gtacagtttc 34680

acttccgcaa tcccaacagg cgtaacttcc tctttctcac ggtacgtgat atcccactaa 34740

cttgcaacgt cattttccca cggtcgcacc gccccttta gccgttaacc ccacagccaa 34800

tcaccacacg atccacactt tttaaaatca cctcatttac atattggcac cattccatct 34860

ataaggtata ttatatagat aga 34883

<210> 35
<211> 34204
<212> DNA
<213> Artificial Sequence

<220>

<223> NG-602 (EnAd-SA-EpCAMBiTE)

<400> 35
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

ctttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatggga tggagctgca tcatcctatt 29400

cctcgtggcg acggccactg gagtgcatag cgaactggtg atgactcagt ccccgtcatc 29460

cctgacggtg accgccggcg agaaggtcac catgtcgtgc aagtcctcgc aaagcctgct 29520

taacagcggc aaccagaaaa actacctcac gtggtatcag caaaagccag gtcaaccccc 29580

aaaactgctc atctactggg cgagcacccg cgagtcgggg gtgccagacc ggttcaccgg 29640

ctccgggtca ggaactgatt tcaccctaac catcagctcg gtgcaagcgg aggacctggc 29700

cgtgtactac tgccaaaatg attactcgta ccctctgacc tttggagcgg gcaccaagct 29760

cgaaatcaag ggcggtggag gaagcggcgg gggaggctca ggtgggggag gatcagaagt 29820

ccaactgctg gagcagtcag gagccgaact ggtccgcccg ggaacctccg tcaagatttc 29880

ctgtaaggct tccggctacg cttttaccaa ttactggctg ggctgggtca agcaaagacc 29940

ggggcatggc ctggagtgga tcggcgacat cttcccaggg agcggcaaca tccactacaa 30000

cgagaagttc aaggggaaag cgactctgac tgccgacaaa tcatccagca ccgcctacat 30060

gcagctgtcg tcgctcactt tcgaagacag cgcggtgtac ttttgtgctc ggctccggaa 30120

ctgggatgaa ccaatggact actggggaca aggaactacc gtgaccgtct cctccggcgg 30180

cggtggaagc gatgtgcaac tcgtgcagtc cggtgcggaa gtgaaaaagc cgggcgcgag 30240

cgtcaaagtg tcatgcaagg cgtcaggata tacgtttact agatacacta tgcactgggt 30300

gcgccaggca cctggtcagg gccttgaatg gatcggctac atcaatccgt cgagaggcta 30360

cactaattac gcggactcag tcaaagggcg cttcacgatt acgaccgaca agtccacctc 30420

gactgcatac atggaactgt cctcgctgag aagcgaggac accgctactt actactgcgc 30480

tagatactac gatgatcact actgcctcga ttactggggc cagggaacca ctgtcacggt 30540

gtcatcggga gagggcacct caaccggatc agggggatcg ggaggctcgg gcggcgcaga 30600

cgacatcgtc ctgacccagt cgcccgccac cttgtcgctg tccccaggag aaagagcgac 30660

cctgtcatgc cgggcgtcgc aaagcgtgag ctatatgaat tggtatcagc agaagccagg 30720

aaaggcgccg aagagatgga tctacgacac ctccaaggtc gcttcaggtg tcccggctag 30780

attctcagga tcgggatcag gaacggacta ctccctgacc atcaattcac tggaagcaga 30840

agatgcggcc acctactact gtcagcagtg gtcctccaac ccgctgactt tcggaggcgg 30900

aactaaggtc gagatcaagc atcaccatca ccatcaccac catcaccatt aggctagctt 30960

gactgactga gatacagcgt accttcagct cacagacatg ataagataca ttgatgagtt 31020

tggacaaacc acaactagaa tgcagtgaaa aaaatgcttt atttgtgaaa tttgtgatgc 31080

tattgcttta tttgtaacca ttataagctg caataaacaa gttaacaaca acaattgcat 31140

tcattttatg tttcaggttc agggggaggt gtgggaggtt ttttaaagca agtaaaacct 31200

ctacaaatgt ggtagtcgtc agctatcctg caggaacttg tttatttgaa aatcaattca 31260

caaaatccga gtagttattt tgcctccccc ttcccattta acagaataca ccaatctctc 31320

cccacgcaca gctttaaaca tttggatacc attagatata gacatggttt tagattccac 31380

attccaaaca gtttcagagc gagccaatct ggggtcagtg atagataaaa atccatcggg 31440

atagtctttt aaagcgcttt cacagtccaa ctgctgcgga tgcgactccg gagtctggat 31500

cacggtcatc tggaagaaga acgatgggaa tcataatccg aaaacggtat cggacgattg 31560

tgtctcatca aacccacaag cagccgctgt ctgcgtcgct ccgtgcgact gctgtttatg 31620

ggatcagggt ccacagtgtc ctgaagcatg attttaatag cccttaacat caactttctg 31680

gtgcgatgcg cgcagcaacg cattctgatt tcactcaaat ctttgcagta ggtacaacac 31740

attattacaa tattgtttaa taaaccataa ttaaaagcgc tccagccaaa actcatatct 31800

gatataatcg cccctgcatg accatcatac caaagtttaa tataaattaa atgacgttcc 31860

ctcaaaaaca cactacccac atacatgatc tcttttggca tgtgcatatt aacaatctgt 31920

ctgtaccatg gacaacgttg gttaatcatg caacccaata taaccttccg gaaccacact 31980

gccaacaccg ctccccccagc catgcattga agtgaaccct gctgattaca atgacaatga 32040

agaacccaat tctctcgacc gtgaatcact tgagaatgaa aaatatctat agtggcacaa 32100

catagacata aatgcatgca tcttctcata atttttaact cctcaggatt tagaaacata 32160

tcccagggaa taggaagctc ttgcagaaca gtaaagctgg cagaacaagg aagaccacga 32220

acacaactta cactatgcat agtcatagta tcacaatctg gcaacagcgg gtggtcttca 32280

gtcatagaag ctcgggtttc attttcctca caacgtggta actgggctct ggtgtaaggg 32340

tgatgtctgg cgcatgatgt cgagcgtgcg cgcaaccttg tcataatgga gttgcttcct 32400

gacattctcg tattttgtat agcaaaacgc ggccctggca gaacacactc ttcttcgcct 32460

tctatcctgc cgcttagcgt gttccgtgtg atagttcaag tacaaccaca ctcttaagtt 32520

ggtcaaaaga atgctggctt cagttgtaat caaaactcca tcgcatctaa tcgttctgag 32580

gaaatcatcc aagcaatgca actggattgt gtttcaagca ggagaggaga gggaagagac 32640

ggaagaacca tgttaatttt tattccaaac gatctcgcag tacttcaaat tgtagatcgc 32700

gcagatggca tctctcgccc ccactgtgtt ggtgaaaaag cacagctaga tcaaaagaaa 32760

tgcgattttc aaggtgctca acggtggctt ccagcaaagc ctccacgcgc acatccaaga 32820

acaaaagaat accaaaagaa ggagcatttt ctaactcctc aatcatcata ttacattcct 32880

gcaccattcc cagataattt tcagctttcc agccttgaat tattcgtgtc agttcttgtg 32940

gtaaatccaa tccacacatt acaaacaggt cccggagggc gccctccacc accattctta 33000

aacacaccct cataatgaca aaatatcttg ctcctgtgtc acctgtagcg aattgagaat 33060

ggcaacatca attgacatgc ccttggctct aagttcttct ttaagttcta gttgtaaaaa 33120

ctctctcata ttatcaccaa actgcttagc cagaagcccc ccgggaacaa gagcagggga 33180

cgctacagtg cagtacaagc gcagacctcc ccaattggct ccagcaaaaa caagattgga 33240

ataagcatat tgggaaccgc cagtaatatc atcgaagttg ctggaaatat aatcaggcag 33300

agtttcttgt aaaaattgaa taaaagaaaa atttgccaaa aaaacattca aaacctctgg 33360

gatgcaaatg caataggtta ccgcgctgcg ctccaacatt gttagttttg aattagtctg 33420

caaaaataaa aaaaaaaaca agcgtcatat catagtagcc tgacgaacag atggataaat 33480

cagtctttcc atcacaagac aagccacagg gtctccagct cgaccctcgt aaaacctgtc 33540

atcatgatta aacaacagca ccgaaagttc ctcgcggtga ccagcatgaa taattcttga 33600

tgaagcatac aatccagaca tgttagcatc agttaacgag aaaaaacagc caacatagcc 33660

tttgggtata attatgctta atcgtaagta tagcaaagcc acccctcgcg gatacaaagt 33720

aaaaggcaca ggagaataaa aaatataatt atttctctgc tgctgttcag gcaacgtcgc 33780

ccccggtccc tctaaataca catacaaagc ctcatcagcc atggcttacc agacaaagta 33840

cagcgggcac acaaagcaca agctctaaag tgactctcca acctctccac aatatatata 33900

tacacaagcc ctaaactgac gtaatgggag taaagtgtaa aaaatcccgc caaacccaac 33960

acacaccccg aaactgcgtc accagggaaa agtacagttt cacttccgca atcccaacag 34020

gcgtaacttc ctctttctca cggtacgtga tatcccacta acttgcaacg tcattttccc 34080

acggtcgcac cgccccttttt agccgttaac cccacagcca atcaccacac gatccacact 34140

ttttaaaatc acctcattta catattggca ccattccatc tataaggtat attatataga 34200

taga 34204

<210> 36
<211> 34895
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-605 (EnAd-CMV-FAPBiTE)

<400> 36
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccagggg ctcccgccag atctagtaat caattacggg 29400

gtcattagtt catagcccat atatggagtt ccgcgttaca taacttacgg taaatggccc 29460

gcctggctga ccgcccaacg acccccgccc attgacgtca ataatgacgt atgttcccat 29520

agtaacgcca atagggactt tccattgacg tcaatgggtg gagtatttac ggtaaactgc 29580

ccacttggca gtacatcaag tgtatcatat gccaagtacg ccccctattg acgtcaatga 29640

cggtaaatgg cccgcctggc attatgccca gtacatgacc ttatgggact ttcctacttg 29700

gcagtacatc tacgtattag tcatcgctat taccatgctg atgcggtttt ggcagtacat 29760

caatgggcgt ggatagcggt ttgactcacg gggatttcca agtctccacc ccattgacgt 29820

caatgggagt ttgttttggc accaaaatca acgggacttt ccaaaatgtc gtaacaactc 29880

cgccccattg acgcaaatgg gcggtaggcg tgtacggtgg gaggtctata taagcagagc 29940

tggtttagtg aaccgtcaga tcagatcttt gtcgatccta ccatccactc gacacacccg 30000

ccagcggccg ctgccaagct tccgagctct cgaattcaaa ggaggtaccc accatgggct 30060

ggagctgcat catcttgttc ctggtcgcaa ctgctaccgg agtccattcg gacatcgtca 30120

tgacccaaag ccctgactcg ctcgctgtgt cactgggaga gcgggcgact atcaactgca 30180

aatcatccca gagcctgctg tattcacgca atcagaaaaa ctacctggcc tggtatcagc 30240

agaagccggg ccagcctccc aagctgctga tcttctgggc ctccacccgc gaaagcggcg 30300

tgccggaccg cttcagcgga agcggattcg gaactgactt tactctgacc attagctcct 30360

tgcaggcgga ggacgtggcc gtctactact gccagcagta tttctcctat ccgctcacct 30420

ttgggcaagg caccaaggtg gagattaagg gaggggggcgg cagcggggga ggcggcagcg 30480

gcggcggggg atcgcaggtc cagctcgtcc aatccggagc cgaagtcaag aagccgggag 30540

cgtcggtcaa ggtcagctgc aaaacttcgc gctacacctt cactgagtac acgatccact 30600

gggtccgcca ggcgcccggc cagcggctgg agtggatcgg cgggatcaac ccaaacaacg 30660

gaatcccaaa ttacaatcag aaatttaaag ggcgggtgac tatcaccgtg gatacctcgg 30720

cctccacggc gtacatggag ctctcatcac tcagatcgga ggacaccgcg gtctattact 30780

gcgcccgccg ccggatcgct tatggatacg atgaaggaca tgcgatggat tactggggcc 30840

agggcaccct cgtcacggtg tcgtcaggag gcggcggttc agatgtgcaa ctcgtgcagt 30900

ccggtgcgga agtgaaaaag ccgggcgcga gcgtcaaagt gtcatgcaag gcgtcaggat 30960

atacgtttac tagatacact atgcactggg tgcgccaggc acctggtcag ggccttgaat 31020

ggatcggcta catcaatccg tcgagaggct acactaatta cgcggactca gtcaaagggc 31080

gcttcacgat tacgaccgac aagtccacct cgactgcata catggaactg tcctcgctga 31140

gaagcgagga caccgctact tactactgcg ctagatacta cgatgatcac tactgcctcg 31200

attactgggg ccagggaacc actgtcacgg tgtcatcggg agagggcacc tcaaccggat 31260

caggggggatc gggaggctcg ggcggcgcag acgacatcgt cctgacccag tcgcccgcca 31320

ccttgtcgct gtccccagga gaaagagcga ccctgtcatg ccgggcgtcg caaagcgtga 31380

gctatatgaa ttggtatcag cagaagccag gaaaggcgcc gaagagatgg atctacgaca 31440

cctccaaggt cgcttcaggt gtcccggcta gattctcagg atcgggatca ggaacggact 31500

actccctgac catcaattca ctggaagcag aagatgcggc cacctactac tgtcagcagt 31560

ggtcctccaa cccgctgact ttcggaggcg gaactaaggt cgagatcaag catcaccatc 31620

accatcacca ccatcaccat taggctagct tgactgactg agatacagcg taccttcagc 31680

tcacagacat gataagatac attgatgagt ttggacaaac cacaactaga atgcagtgaa 31740

aaaaatgctt tatttgtgaa atttgtgatg ctattgcttt atttgtaacc attataagct 31800

gcaataaaca agttaacaac aacaattgca ttcattttat gtttcaggtt caggggggagg 31860

tgtgggaggt tttttaaagc aagtaaaacc tctacaaatg tggtagtcgt cagctatcct 31920

gcaggaactt gtttatttga aaatcaattc acaaaatccg agtagttatt ttgcctcccc 31980

cttcccattt aacagaatac accaatctct ccccacgcac agctttaaac atttggatac 32040

cattagatat agacatggtt ttagattcca cattccaaac agtttcagag cgagccaatc 32100

tggggtcagt gatagataaa aatccatcgg gatagtcttt taaagcgctt tcacagtcca 32160

actgctgcgg atgcgactcc ggagtctgga tcacggtcat ctggaagaag aacgatggga 32220

atcataatcc gaaaacggta tcggacgatt gtgtctcatc aaacccacaa gcagccgctg 32280

tctgcgtcgc tccgtgcgac tgctgtttat gggatcaggg tccacagtgt cctgaagcat 32340

gattttaata gcccttaaca tcaactttct ggtgcgatgc gcgcagcaac gcattctgat 32400

ttcactcaaa tctttgcagt aggtacaaca cattattaca atattgttta ataaaccata 32460

attaaaagcg ctccagccaa aactcatatc tgatataatc gcccctgcat gaccatcata 32520

ccaaagttta atataaatta aatgacgttc cctcaaaaac acactaccca catacatgat 32580

ctcttttggc atgtgcatat taacaatctg tctgtaccat ggacaacgtt ggttaatcat 32640

gcaacccaat ataaccttcc ggaaccacac tgccaacacc gctcccccag ccatgcattg 32700

aagtgaaccc tgctgattac aatgacaatg aagaacccaa ttctctcgac cgtgaatcac 32760

ttgagaatga aaaatatcta tagtggcaca acatagacat aaatgcatgc atcttctcat 32820

aatttttaac tcctcaggat ttagaaacat atcccaggga ataggaagct cttgcagaac 32880

agtaaagctg gcagaacaag gaagaccacg aacacaactt acactatgca tagtcatagt 32940

atcacaatct ggcaacagcg ggtggtcttc agtcatagaa gctcgggttt cattttcctc 33000

acaacgtggt aactgggctc tggtgtaagg gtgatgtctg gcgcatgatg tcgagcgtgc 33060

gcgcaacctt gtcataatgg agttgcttcc tgacattctc gtattttgta tagcaaaacg 33120

cggccctggc agaacacact cttcttcgcc ttctatcctg ccgcttagcg tgttccgtgt 33180

gatagttcaa gtacaaccac actcttaagt tggtcaaaag aatgctggct tcagttgtaa 33240

tcaaaactcc atcgcatcta atcgttctga ggaaatcatc caagcaatgc aactggattg 33300

tgtttcaagc aggagaggag agggaagaga cggaagaacc atgttaattt ttattccaaa 33360

cgatctcgca gtacttcaaa ttgtagatcg cgcagatggc atctctcgcc cccactgtgt 33420

tggtgaaaaa gcacagctag atcaaaagaa atgcgatttt caaggtgctc aacggtggct 33480

tccagcaaag cctccacgcg cacatccaag aacaaaagaa taccaaaaga aggagcattt 33540

tctaactcct caatcatcat attacattcc tgcaccattc ccagataatt ttcagctttc 33600

cagccttgaa ttattcgtgt cagttcttgt ggtaaatcca atccacacat tacaaacagg 33660

tcccggaggg cgccctccac caccattctt aaacacaccc tcataatgac aaaatatctt 33720

gctcctgtgt cacctgtagc gaattgagaa tggcaacatc aattgacatg cccttggctc 33780

taagttcttc tttaagttct agttgtaaaa actctctcat attatcacca aactgcttag 33840

ccagaagccc cccgggaaca agagcagggg acgctacagt gcagtacaag cgcagacctc 33900

cccaattggc tccagcaaaa acaagattgg aataagcata ttgggaaccg ccagtaatat 33960

catcgaagtt gctggaaata taatcaggca gagtttcttg taaaaattga ataaaagaaa 34020

aatttgccaa aaaaacattc aaaacctctg ggatgcaaat gcaataggtt accgcgctgc 34080

gctccaacat tgttagtttt gaattagtct gcaaaaataa aaaaaaaaac aagcgtcata 34140

tcatagtagc ctgacgaaca gatggataaa tcagtctttc catcacaaga caagccacag 34200

ggtctccagc tcgaccctcg taaaacctgt catcatgatt aaacaacagc accgaaagtt 34260

cctcgcggtg accagcatga ataattcttg atgaagcata caatccagac atgttagcat 34320

cagttaacga gaaaaaacag ccaacatagc ctttgggtat aattatgctt aatcgtaagt 34380

atagcaaagc cacccctcgc ggatacaaag taaaaggcac aggagaataa aaaatataat 34440

tatttctctg ctgctgttca ggcaacgtcg cccccggtcc ctctaaatac acatacaaag 34500

cctcatcagc catggcttac cagacaaagt acagcgggca cacaaagcac aagctctaaa 34560

gtgactctcc aacctctcca caatatatat atacacaagc cctaaactga cgtaatggga 34620

gtaaagtgta aaaaatcccg ccaaacccaa cacacacccc gaaactgcgt caccagggaa 34680

aagtacagtt tcacttccgc aatcccaaca ggcgtaactt cctctttctc acggtacgtg 34740

atatcccact aacttgcaac gtcattttcc cacggtcgca ccgccccttt tagccgttaa 34800

ccccacagcc aatcaccaca cgatccacac tttttaaaat cacctcattt acatattggc 34860

accattccat ctataaggta tattatatag ataga 34895

<210> 37
<211> 34216
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-606 (EnAd-SA-FAPBiTE)

<400> 37
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

aggggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac caccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggttttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cagatgtgca actcgtgcag tccggtgcgg aagtgaaaaa 30240

gccgggcgcg agcgtcaaag tgtcatgcaa ggcgtcagga tatacgttta ctagatacac 30300

tatgcactgg gtgcgccagg cacctggtca gggccttgaa tggatcggct acatcaatcc 30360

gtcgagaggc tacactaatt acgcggactc agtcaaaggg cgcttcacga ttacgaccga 30420

caagtccacc tcgactgcat acatggaact gtcctcgctg agaagcgagg acaccgctac 30480

ttactactgc gctagatact acgatgatca ctactgcctc gattactggg gccagggaac 30540

cactgtcacg gtgtcatcgg gagagggcac ctcaaccgga tcaggggggat cgggaggctc 30600

gggcggcgca gacgacatcg tcctgaccca gtcgcccgcc accttgtcgc tgtccccagg 30660

agaaagagcg accctgtcat gccgggcgtc gcaaagcgtg agctatatga attggtatca 30720

gcagaagcca ggaaaggcgc cgaagagatg gatctacgac acctccaagg tcgcttcagg 30780

tgtcccggct agattctcag gatcgggatc aggaacggac tactccctga ccatcaattc 30840

actggaagca gaagatgcgg ccacctacta ctgtcagcag tggtcctcca acccgctgac 30900

tttcggaggc ggaactaagg tcgagatcaa gcatcaccat caccatcacc accatcacca 30960

ttaggctagc ttgactgact gagatacagc gtaccttcag ctcacagaca tgataagata 31020

cattgatgag tttggacaaa ccacaactag aatgcagtga aaaaaatgct ttatttgtga 31080

aatttgtgat gctattgctt tatttgtaac cattataagc tgcaataaac aagttaacaa 31140

caacaattgc attcatttta tgtttcaggt tcaggggggag gtgtgggagg ttttttaaag 31200

caagtaaaac ctctacaaat gtggtagtcg tcagctatcc tgcaggaact tgtttatttg 31260

aaaatcaatt cacaaaatcc gagtagttat tttgcctccc ccttcccatt taacagaata 31320

caccaatctc tccccacgca cagctttaaa catttggata ccattagata tagacatggt 31380

tttagattcc acattccaaa cagtttcaga gcgagccaat ctggggtcag tgatagataa 31440

aaatccatcg ggatagtctt ttaaagcgct ttcacagtcc aactgctgcg gatgcgactc 31500

cggagtctgg atcacggtca tctggaagaa gaacgatggg aatcataatc cgaaaacggt 31560

atcggacgat tgtgtctcat caaacccaca agcagccgct gtctgcgtcg ctccgtgcga 31620

ctgctgttta tgggatcagg gtccacagtg tcctgaagca tgattttaat agcccttaac 31680

atcaactttc tggtgcgatg cgcgcagcaa cgcattctga tttcactcaa atctttgcag 31740

taggtacaac acattattac aatattgttt aataaaccat aattaaaagc gctccagcca 31800

aaactcatat ctgatataat cgcccctgca tgaccatcat accaaagttt aatataaatt 31860

aaatgacgtt ccctcaaaaa cacactaccc acatacatga tctcttttgg catgtgcata 31920

ttaacaatct gtctgtacca tggacaacgt tggttaatca tgcaacccaa tataaccttc 31980

cggaaccaca ctgccaacac cgctccccca gccatgcatt gaagtgaacc ctgctgatta 32040

caatgacaat gaagaaccca attctctcga ccgtgaatca cttgagaatg aaaaatatct 32100

atagtggcac aacatagaca taaatgcatg catcttctca taatttttaa ctcctcagga 32160

tttagaaaca tatcccaggg aataggaagc tcttgcagaa cagtaaagct ggcagaacaa 32220

ggaagaccac gaacacaact tacactatgc atagtcatag tatcacaatc tggcaacagc 32280

gggtggtctt cagtcataga agctcgggtt tcattttcct cacaacgtgg taactgggct 32340

ctggtgtaag ggtgatgtct ggcgcatgat gtcgagcgtg cgcgcaacct tgtcataatg 32400

gagttgcttc ctgacattct cgtattttgt atagcaaaac gcggccctgg cagaacacac 32460

tcttcttcgc cttctatcct gccgcttagc gtgttccgtg tgatagttca agtacaacca 32520

cactcttaag ttggtcaaaa gaatgctggc ttcagttgta atcaaaactc catcgcatct 32580

aatcgttctg aggaaatcat ccaagcaatg caactggatt gtgtttcaag caggagagga 32640

gagggaagag acggaagaac catgttaatt tttattccaa acgatctcgc agtacttcaa 32700

attgtagatc gcgcagatgg catctctcgc ccccactgtg ttggtgaaaa agcacagcta 32760

gatcaaaaga aatgcgattt tcaaggtgct caacggtggc ttccagcaaa gcctccacgc 32820

gcacatccaa gaacaaaaga ataccaaaag aaggagcatt ttctaactcc tcaatcatca 32880

tattacattc ctgcaccatt cccagataat tttcagcttt ccagccttga attattcgtg 32940

tcagttcttg tggtaaatcc aatccacaca ttacaaacag gtcccggagg gcgccctcca 33000

ccaccattct taaacacacc ctcataatga caaaatatct tgctcctgtg tcacctgtag 33060

cgaattgaga atggcaacat caattgacat gcccttggct ctaagttctt ctttaagttc 33120

tagttgtaaa aactctctca tattatcacc aaactgctta gccagaagcc ccccgggaac 33180

aagagcaggg gacgctacag tgcagtacaa gcgcagacct ccccaattgg ctccagcaaa 33240

aacaagattg gaataagcat attgggaacc gccagtaata tcatcgaagt tgctggaaat 33300

ataatcaggc agagtttctt gtaaaaattg aataaaagaa aaatttgcca aaaaaacatt 33360

caaaacctct gggatgcaaa tgcaataggt taccgcgctg cgctccaaca ttgttagttt 33420

tgaattagtc tgcaaaaata aaaaaaaaaa caagcgtcat atcatagtag cctgacgaac 33480

agatggataa atcagtcttt ccatcacaag acaagccaca gggtctccag ctcgaccctc 33540

gtaaaacctg tcatcatgat taaacaacag caccgaaagt tcctcgcggt gaccagcatg 33600

aataattctt gatgaagcat acaatccaga catgttagca tcagttaacg agaaaaaaca 33660

gccaacatag cctttgggta taattatgct taatcgtaag tatagcaaag ccacccctcg 33720

cggatacaaa gtaaaaggca caggagaata aaaaatataa ttatttctct gctgctgttc 33780

aggcaacgtc gcccccggtc cctctaaata cacatacaaa gcctcatcag ccatggctta 33840

ccagacaaag tacagcgggc acacaaagca caagctctaa agtgactctc caacctctcc 33900

acaatatata tatacacaag ccctaaactg acgtaatggg agtaaagtgt aaaaaatccc 33960

gccaaaccca acacacaccc cgaaactgcg tcaccaggga aaagtacagt ttcacttccg 34020

caatcccaac aggcgtaact tcctctttct cacggtacgt gatatcccac taacttgcaa 34080

cgtcattttc ccacggtcgc accgcccctt ttagccgtta accccacagc caatcaccac 34140

acgatccaca ctttttaaaa tcacctcatt tacatattgg caccattcca tctataaggt 34200

atattatata gataga 34216

<210> 38
<211> 32326
<212> DNA
<213> Artificial Sequence

<220>
<223> EnAd genome

<400> 38
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttaact tgtttatttg aaaatcaatt cacaaaatcc gagtagttat 29400

tttgcctccc ccttcccatt taacagaata caccaatctc tccccacgca cagctttaaa 29460

catttggata ccattagata tagacatggt tttagattcc acattccaaa cagtttcaga 29520

gcgagccaat ctggggtcag tgatagataa aaatccatcg ggatagtctt ttaaagcgct 29580

ttcacagtcc aactgctgcg gatgcgactc cggagtctgg atcacggtca tctggaagaa 29640

gaacgatggg aatcataatc cgaaaacggt atcggacgat tgtgtctcat caaacccaca 29700

agcagccgct gtctgcgtcg ctccgtgcga ctgctgttta tgggatcagg gtccacagtg 29760

tcctgaagca tgattttaat agcccttaac atcaactttc tggtgcgatg cgcgcagcaa 29820

cgcattctga tttcactcaa atctttgcag taggtacaac acattattac aatattgttt 29880

aataaaccat aattaaaagc gctccagcca aaactcatat ctgatataat cgcccctgca 29940

tgaccatcat accaaagttt aatataaatt aaatgacgtt ccctcaaaaa cacactaccc 30000

acatacatga tctcttttgg catgtgcata ttaacaatct gtctgtacca tggacaacgt 30060

tggttaatca tgcaacccaa tataaccttc cggaaccaca ctgccaacac cgctccccca 30120

gccatgcatt gaagtgaacc ctgctgatta caatgacaat gaagaaccca attctctcga 30180

ccgtgaatca cttgagaatg aaaaatatct atagtggcac aacatagaca taaatgcatg 30240

catcttctca taatttttaa ctcctcagga tttagaaaca tatcccaggg aataggaagc 30300

tcttgcagaa cagtaaagct ggcagaacaa ggaagaccac gaacacaact tacactatgc 30360

atagtcatag tatcacaatc tggcaacagc gggtggtctt cagtcataga agctcgggtt 30420

tcattttcct cacaacgtgg taactgggct ctggtgtaag ggtgatgtct ggcgcatgat 30480

gtcgagcgtg cgcgcaacct tgtcataatg gagttgcttc ctgacattct cgtattttgt 30540

atagcaaaac gcggccctgg cagaacacac tcttcttcgc cttctatcct gccgcttagc 30600

gtgttccgtg tgatagttca agtacaacca cactcttaag ttggtcaaaa gaatgctggc 30660

ttcagttgta atcaaaactc catcgcatct aatcgttctg aggaaatcat ccaagcaatg 30720

caactggatt gtgtttcaag caggagagga gagggaagag acggaagaac catgttaatt 30780

tttattccaa acgatctcgc agtacttcaa attgtagatc gcgcagatgg catctctcgc 30840

ccccactgtg ttggtgaaaa agcacagcta gatcaaaaga aatgcgattt tcaaggtgct 30900

caacggtggc ttccagcaaa gcctccacgc gcacatccaa gaacaaaaga ataccaaaag 30960

aaggagcatt ttctaactcc tcaatcatca tattacattc ctgcaccatt cccagataat 31020

tttcagcttt ccagccttga attattcgtg tcagttcttg tggtaaatcc aatccacaca 31080

ttacaaacag gtcccggagg gcgccctcca ccaccattct taaacacacc ctcataatga 31140

caaaatatct tgctcctgtg tcacctgtag cgaattgaga atggcaacat caattgacat 31200

gcccttggct ctaagttctt ctttaagttc tagttgtaaa aactctctca tattatcacc 31260

aaactgctta gccagaagcc ccccgggaac aagagcaggg gacgctacag tgcagtacaa 31320

gcgcagacct ccccaattgg ctccagcaaa aacaagattg gaataagcat attgggaacc 31380

gccagtaata tcatcgaagt tgctggaaat ataatcaggc agagtttctt gtaaaaattg 31440

aataaaagaa aaatttgcca aaaaaacatt caaaacctct gggatgcaaa tgcaataggt 31500

taccgcgctg cgctccaaca ttgttagttt tgaattagtc tgcaaaaata aaaaaaaaaa 31560

caagcgtcat atcatagtag cctgacgaac agatggataa atcagtcttt ccatcacaag 31620

acaagccaca gggtctccag ctcgaccctc gtaaaacctg tcatcatgat taaacaacag 31680

caccgaaagt tcctcgcggt gaccagcatg aataattctt gatgaagcat acaatccaga 31740

catgttagca tcagttaacg agaaaaaaca gccaacatag cctttgggta taattatgct 31800

taatcgtaag tatagcaaag ccacccctcg cggatacaaa gtaaaaggca caggagaata 31860

aaaaatataa ttatttctct gctgctgttc aggcaacgtc gcccccggtc cctctaaata 31920

cacatacaaa gcctcatcag ccatggctta ccagacaaag tacagcgggc acacaaagca 31980

caagctctaa agtgactctc caacctctcc acaatatata tatacacaag ccctaaactg 32040

acgtaatggg agtaaagtgt aaaaaatccc gccaaaccca acacacaccc cgaaactgcg 32100

tcaccaggga aaagtacagt ttcacttccg caatcccaac aggcgtaact tcctctttct 32160

cacggtacgt gatatcccac taacttgcaa cgtcattttc ccacggtcgc accgcccctt 32220

ttagccgtta accccacagc caatcaccac acgatccaca ctttttaaaa tcacctcatt 32280

tacatattgg caccattcca tctataaggt atattatata gataga 32326

<210> 39
<211> 201
<212> DNA
<213> Artificial Sequence

<220>
<223> Bx DNA sequence corresponding to and including bp 28166-28366 of the EnAd genome

<400> 39
aaaatgatta ataaaaaatc acttacttga aatcagcaat aaggtctctg ttgaaatttt 60

ctcccagcag cacctcactt ccctcttccc aactctggta ttctaaaccc cgttcagcgg 120

catactttct ccatacttta aaggggatgt caaattttag ctcctctcct gtacccacaa 180

tcttcatgtc tttcttccca g 201

<210> 40
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> By DNA sequence corresponding to and including bp 29345-29379 of the EnAd genome

<400> 40
caaataaagt ttaacttgtt tatttgaaaa tcaat 35

<210> 41
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> His Tag

<400> 41

His His His His His His
1 5

<210> 42
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Splice acceptor

<400> 42
tttctctctt cagg 14

<210> 43
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
<223> SV40 poly Adenylation sequence

<400> 43
cagacatgat aagatacatt gatgagtttg gacaaaccac aactagaatg cagtgaaaaa 60

aatgctttat ttgtgaaatt tgtgatgcta ttgctttatt tgtaaccatt ataagctgca 120

ataaacaagt taacaacaac aattgcattc attttatgtt tcaggttcag ggggaggtgt 180

gggaggtttt tt 192

<210> 44
<211> 1539
<212> DNA
<213> Artificial Sequence

<220>
<223> EpCam BiTE nucleic acid sequence (OKT3)

<400> 44
atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt gcatagcgaa 60

ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa ggtcaccatg 120

tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta cctcacgtgg 180

tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag cacccgcgag 240

tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac cctaaccatc 300

agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta ctcgtaccct 360

ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag cggcgggga 420

ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc cgaactggtc 480

cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt taccaattac 540

tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg cgacatcttc 600

ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac tctgactgcc 660

gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga agacagcgcg 720

gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg gggacaagga 780

actaccgtga ccgtctcctc cggcggcggt ggaagccagg tgcagctgca gcagtctggg 840

gctgaactgg caagacctgg ggcctcagtg aagatgtcct gcaaggcttc tggctacacc 900

tttactaggt acacgatgca ctgggtaaaa cagaggcctg gacagggtct ggaatggatt 960

ggatacatta atcctagccg tggttatact aattacaatc agaagttcaa ggacaaggcc 1020

acattgacta cagacaaatc ctccagcaca gcctacatgc aactgagcag cctgacatct 1080

gaggactctg cagtctatta ctgtgcaaga tattatgatg atcattactg ccttgactac 1140

tggggccaag gcaccactct cacagtctcc tcaggtggcg gtggctcggg cggtggtgga 1200

tctggtggcg gcggatctga tatcgtgctc actcagtctc cagcaatcat gtctgcatct 1260

ccaggggaga aggtcaccat gacctgcagt gccagctcaa gtgtaagtta catgaactgg 1320

taccagcaga agtcaggcac ctcccccaaa agatggattt atgacacatc caaactggct 1380

tctggagtcc ctgctcactt caggggcagt gggtctggga cctcttactc tctcacaatc 1440

agcggcatgg aggctgaaga tgctgccact tattactgcc agcagtggag tagtaaccca 1500

ttcacgttcg gctcggggac aaagttggaa ataaaccgg 1539

<210> 45
<211> 1551
<212> DNA
<213> Artificial Sequence

<220>
<223> FAP BiTE nucleic acid sequence (OKT3)

<400> 45
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca ggtgcagctg 840

cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc ctgcaaggct 900

tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc tggacagggt 960

ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa tcagaagttc 1020

aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat gcaactgagc 1080

agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga tgatcattac 1140

tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg cggtggctcg 1200

ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc tccagcaatc 1260

atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc aagtgtaagt 1320

tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat ttatgacaca 1380

tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg gacctcttac 1440

tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg ccagcagtgg 1500

agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg g 1551

<210> 46
<211> 1557
<212> DNA
<213> Artificial Sequence

<220>
<223> FAP BiTE nucleic acid sequence (aCD3)

<400> 46
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaga tgtgcaactc 840

gtgcagtccg gtgcggaagt gaaaaagccg ggcgcgagcg tcaaagtgtc atgcaaggcg 900

tcaggatata cgtttactag atacactatg cactgggtgc gccaggcacc tggtcagggc 960

cttgaatgga tcggctacat caatccgtcg agaggctaca ctaattacgc ggactcagtc 1020

aaagggcgct tcacgattac gaccgacaag tccacctcga ctgcatacat ggaactgtcc 1080

tcgctgagaa gcgaggacac cgctacttac tactgcgcta gatactacga tgatcactac 1140

tgcctcgatt actggggcca gggaaccact gtcacggtgt catcgggaga gggcacctca 1200

accggatcag ggggatcggg aggctcgggc ggcgcagacg acatcgtcct gacccagtcg 1260

cccgccacct tgtcgctgtc cccaggagaa agagcgaccc tgtcatgccg ggcgtcgcaa 1320

agcgtgagct atatgaattg gtatcagcag aagccaggaa aggcgccgaa gagatggatc 1380

tacgacacct ccaaggtcgc ttcaggtgtc ccggctagat tctcaggatc gggatcagga 1440

acggactact ccctgaccat caattcactg gaagcagaag atgcggccac ctactactgt 1500

cagcagtggt cctccaaccc gctgactttc ggaggcggaa ctaaggtcga gatcaag 1557

<210> 47
<211> 1856
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-611 Transgene cassette

<400> 47
caggcccacc atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt 60

gcatagcgaa ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa 120

ggtcaccatg tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta 180

cctcacgtgg tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag 240

cacccgcgag tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac 300

cctaaccatc agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta 360

ctcgtaccct ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag 420

cggcggggga ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc 480

cgaactggtc cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt 540

taccaattac tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg 600

cgacatcttc ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac 660

tctgactgcc gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga 720

agacagcgcg gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg 780

gggacaagga actaccgtga ccgtctcctc cggcggcggt ggaagccagg tgcagctgca 840

gcagtctggg gctgaactgg caagacctgg ggcctcagtg aagatgtcct gcaaggcttc 900

tggctacacc tttactaggt acacgatgca ctgggtaaaa cagaggcctg gacagggtct 960

ggaatggatt ggatacatta atcctagccg tggttatact aattacaatc agaagttcaa 1020

ggacaaggcc acattgacta cagacaaatc ctccagcaca gcctacatgc aactgagcag 1080

cctgacatct gaggactctg cagtctatta ctgtgcaaga tattatgatg atcattactg 1140

ccttgactac tggggccaag gcaccactct cacagtctcc tcaggtggcg gtggctcggg 1200

cggtggtgga tctggtggcg gcggatctga tatcgtgctc actcagtctc cagcaatcat 1260

gtctgcatct ccaggggaga aggtcaccat gacctgcagt gccagctcaa gtgtaagtta 1320

catgaactgg taccagcaga agtcaggcac ctcccccaaa agatggattt atgacacatc 1380

caaactggct tctggagtcc ctgctcactt caggggcagt gggtctggga cctcttactc 1440

tctcacaatc agcggcatgg aggctgaaga tgctgccact tattactgcc agcagtggag 1500

tagtaaccca ttcacgttcg gctcggggac aaagttggaa ataaaccggc atcaccatca 1560

ccatcaccac catcaccatt aggctagctt gactgactga gatacagcgt accttcagct 1620

cacagacatg ataagataca ttgatgagtt tggacaaacc acaactagaa tgcagtgaaa 1680

aaaatgcttt atttgtgaaa tttgtgatgc tattgcttta tttgtaacca ttataagctg 1740

caataaacaa gttaacaaca acaattgcat tcattttatg tttcaggttc agggggaggt 1800

gtgggaggtt ttttaaagca agtaaaacct ctacaaatgt ggtagtcgtc agctat 1856

<210> 48
<211> 1868
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-612 Transgene cassette

<400> 48
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc 240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac 300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt 360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag 420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga 480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac 540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg 600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat 660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga 720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc 780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca 840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc 900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc 960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa 1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat 1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga 1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg 1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc 1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc 1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat 1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg 1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg 1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg 1560

gcatcaccat caccatcacc accatcacca ttaggctagc ttgactgact gagatacagc 1620

gtaccttcag ctcacagaca tgataagata cattgatgag tttggacaaa ccacaactag 1680

aatgcagtga aaaaaatgct ttatttgtga aatttgtgat gctattgctt tatttgtaac 1740

cattataagc tgcaataaac aagttaacaa caacaattgc attcatttta tgtttcaggt 1800

tcaggggggag gtgtgggagg ttttttaaag caagtaaaac ctctacaaat gtggtagtcg 1860

tcagctat 1868

<210> 49
<211> 1878
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-613 Transgene cassette

<400> 49
tttctctctt caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg 60

ctaccggagt ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac 120

tgggagagcg ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc 180

agaaaaacta cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct 240

tctgggcctc cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa 300

ctgactttac tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc 360

agcagtattt ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag 420

ggggcggcag cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat 480

ccggagccga agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct 540

acaccttcac tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt 600

ggatcggcgg gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc 660

gggtgactat caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca 720

gatcggagga caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg 780

aaggacatgc gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg 840

gcggttcaca ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag 900

tgaagatgtc ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa 960

aacagaggcc tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata 1020

ctaattacaa tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca 1080

cagcctacat gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa 1140

gatattatga tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct 1200

cctcaggtgg cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc 1260

tcactcagtc tccagcaatc atgtctgcat ctccaggggа gaaggtcacc atgacctgca 1320

gtgccagctc aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca 1380

aaagatggat ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca 1440

gtgggtctgg gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca 1500

cttattactg ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg 1560

aaataaaccg gcatcaccat caccatcacc accatcacca ttaggctagc ttgactgact 1620

gagatacagc gtaccttcag ctcacagaca tgataagata cattgatgag tttggacaaa 1680

ccacaactag aatgcagtga aaaaaatgct ttatttgtga aatttgtgat gctattgctt 1740

tatttgtaac cattataagc tgcaataaac aagttaacaa caacaattgc attcatttta 1800

tgtttcaggt tcaggggggag gtgtgggagg ttttttaaag caagtaaaac ctctacaaat 1860

gtggtagtcg tcagctat 1878

<210> 50
<211> 19

<212> DNA
<213> Artificial Sequence

<220>
<223> Restriction site insert (Bx)

<400> 50
gcggccgcta tggccggcc 19

<210> 51
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Restriction site insert (By)

<400> 51
gcgatcgcta ccctgcagg 19

<210> 52
<211> 572
<212> DNA
<213> Artificial Sequence

<220>
<223> CMV promoter sequence

<400> 52
agtaatcaat tacggggtca ttagttcata gcccatatat ggagttccgc gttacataac 60

ttacggtaaa tggcccgcct ggctgaccgc ccaacgaccc ccgcccattg acgtcaataa 120

tgacgtatgt tcccatagta acgccaatag ggactttcca ttgacgtcaa tgggtggagt 180

atttacggta aactgcccac ttggcagtac atcaagtgta tcatatgcca agtacgcccc 240

ctattgacgt caatgacggt aaatggcccg cctggcatta tgcccagtac atgaccttat 300

gggactttcc tacttggcag tacatctacg tattagtcat cgctattacc atgctgatgc 360

ggttttggca gtacatcaat gggcgtggat agcggtttga ctcacgggga tttccaagtc 420

tccaccccat tgacgtcaat gggagtttgt tttggcacca aaatcaacgg gactttccaa 480

aatgtcgtaa caactccgcc ccattgacgc aaatgggcgg taggcgtgta cggtgggagg 540

tctatataag cagagctggt ttagtgaacc gt 572

<210> 53
<211> 505
<212> DNA
<213> Artificial Sequence

<220>
<223> PGK promoter sequence

<400> 53
ctaccgggta ggggaggcgc ttttcccaag gcagtctgga gcatgcgctt tagcagcccc 60

gctgggcact tggcgctaca caagtggcct ctggcctcgc acacattcca catccaccgg 120

taggcgccaa ccggctccgt tctttggtgg ccccttcgcg ccaccttcta cccctcccct 180

agtcaggaag ttcccccccg ccccgcagct cgcgtcatgc aggacgtgac aaatggaagt 240

agcacgtctc actagtctcg tgcaaatgga cagcaccgct gagcaatgga agcgggtagg 300

cccttggggc agcggccaat agcagctttg ctccttcgct ttctgggctc agaggctggg 360

aaggggtggg tccgggggcg ggctcagggg cgggctcagg ggcggggcgg gcgcccgaag 420

gtcctccgga ggcccggcat tccgcacgct tcaaaagcgc acgtctgccg cgctgttctc 480

ttcttcctca tctccgggcc tttcg 505

<210> 54
<211> 367
<212> DNA
<213> Artificial Sequence

<220>
<223> CBA promoter sequence

<400> 54
gtcgaggtga gccccacgtt ctgcttcact ctccccatct ccccccccctc cccaccccca 60

attttgtatt tatttatttt ttaattattt tatgcagcga tgggggcggg gggggggggg 120

gcgcgcgcca ggcggggcgg ggcggggcga ggggcggggc ggggcgaggc ggagaggtgc 180

ggcggcagcc aatcagagcg gcgcgctccg aaagtttcct tttatggcga ggcggcggcg 240

gcggcggccc tataaaaagc gaagcgcgcg gcgggcggga gtcgctgcgt tgccttcgcc 300

ccgtgccccg ctccgcgccg cctcgcgccg cccgccccgg ctctgactga ccgcgttact 360

cccacag 367

<210> 55

<400> 55
000

<210> 56
<211> 16
<212> DNA
<213> Artificial Sequence

<220>
<223> splice acceptor (SA) DNA sequence

<400> 56
cctttctctc ttcagg 16

<210> 57
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> branched splice acceptor (bSA) DNA sequence

<400> 57
tgctaatcct ttctctcttc agg 23

<210> 58

<400> 58
000

<210> 59
<211> 13
<212> RNA
<213> Artificial Sequence

<220>
<223> Example of start codon

<220>
<221> misc_feature
<222> (11)..(11)
<223> R is adenine or guanine

<400> 59
gccgccrcca ugg 13

<210> 60
<211> 551
<212> DNA
<213> Artificial Sequence

<220>
<223> Internal Ribosome Entry Sequence (IRES)

<400> 60
cgttactggc cgaagccgct tggaataagg ccggtgtgcg tttgtctata tgttattttc 60

caccatattg ccgtcttttg gcaatgtgag ggcccggaaa cctggccctg tcttcttgac 120

gagcattcct aggggtcttt cccctctcgc caaaggaatg caaggtctgt tgaatgtcgt 180

gaaggaagca gttcctctgg aagcttcttg aagacaaaca acgtctgtag cgacccttg 240

caggcagcgg aacccccac ctggcgacag gtgcctctgc ggccaaaagc cacgtgtata 300

agatacacct gcaaaggcgg cacaacccca gtgccacgtt gtgagttgga tagttgtgga 360

aagagtcaaa tggctcccct caagcgtatt caacaagggg ctgaaggatg cccagaaggt 420

accccattgt atgggatctg atctggggcc tcggtgcaca tgcttttcat gtgtttagtc 480

gaggttaaaa aacgtctagg ccccccgaac cacggggacg tggttttcct ttgaaaaaca 540

cgatgataat a 551

<210> 61
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> P2A peptide

<400> 61

Gly Ser Gly Ala Thr Asn Phe Ser Leu Leu Lys Gln Ala Gly Asp Val
1 5 10 15

Glu Glu Asn Pro Gly Pro
20

<210> 62
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> F2A peptide

<400> 62

Gly Ser Gly Glu Gly Arg Gly Ser Leu Leu Thr Cys Gly Asp Val Glu
1   5   10   15

Glu Asn Pro Gly Pro
            20

<210> 63
<211> 23
<212> PRT
<213> Artificial Sequence

<220>
<223> E2A peptide

<400> 63

Gly Ser Gly Gln Cys Thr Asn Tyr Ala Leu Leu Lys Leu Ala Gly Asp
1   5   10   15

Val Glu Ser Asn Pro Gly Pro
            20

<210> 64
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> T2A peptide

<400> 64

Gly Ser Gly Val Lys Gln Thr Leu Asn Phe Asp Leu Leu Lys Leu Ala
1   5   10   15

Gly Asp Val Glu Ser Asn Pro Gly Pro
            20   25

<210> 65
<211> 192

<212> DNA
<213> Artificial Sequence

<220>
<223> polyadenylation (polyA) sequence

<400> 65
cagacatgat aagatacatt gatgagtttg gacaaaccac aactagaatg cagtgaaaaa 60

aatgctttat ttgtgaaatt tgtgatgcta ttgctttatt tgtaaccatt ataagctgca 120

ataaacaagt taacaacaac aattgcattc attttatgtt tcaggttcag ggggaggtgt 180

gggaggtttt tt 192

<210> 66
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> Leader sequence

<400> 66

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser

<210> 67
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> Leader sequence

<400> 67

Met Asp Trp Thr Trp Arg Val Phe Cys Leu Leu Ala Val Ala Pro Gly
1 5 10 15

Ala His Ser

<210> 68
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN gamma amino acid sequence

<400> 68

```
Met Lys Tyr Thr Ser Tyr Ile Leu Ala Phe Gln Leu Cys Ile Val Leu
1               5                  10                  15


Gly Ser Leu Gly Cys Tyr Cys Gln Asp Pro Tyr Val Lys Glu Ala Glu
            20                  25                  30


Asn Leu Lys Lys Tyr Phe Asn Ala Gly His Ser Asp Val Ala Asp Asn
        35                  40                  45


Gly Thr Leu Phe Leu Gly Ile Leu Lys Asn Trp Lys Glu Glu Ser Asp
    50                  55                  60


Arg Lys Ile Met Gln Ser Gln Ile Val Ser Phe Tyr Phe Lys Leu Phe
65                  70                  75                  80


Lys Asn Phe Lys Asp Asp Gln Ser Ile Gln Lys Ser Val Glu Thr Ile
                85                  90                  95


Lys Glu Asp Met Asn Val Lys Phe Phe Asn Ser Asn Lys Lys Lys Arg
            100                 105                 110


Asp Asp Phe Glu Lys Leu Thr Asn Tyr Ser Val Thr Asp Leu Asn Val
        115                 120                 125


Gln Arg Lys Ala Ile His Glu Leu Ile Gln Val Met Ala Glu Leu Ser
    130                 135                 140


Pro Ala Ala Lys Thr Gly Lys Arg Lys Arg Ser Gln Met Leu Phe Arg
145                 150                 155                 160


Gly Arg Arg Ala Ser Gln
                165
```

<210> 69
<211> 188
<212> PRT
<213> Artificial Sequence

<220>
<223> IFN alpha amino acid sequence

<400> 69

```
Met Ala Leu Thr Phe Ala Leu Leu Val Ala Leu Leu Val Leu Ser Cys
1               5                   10                  15


Lys Ser Ser Cys Ser Val Gly Cys Asp Leu Pro Gln Thr His Ser Leu
            20                  25                  30


Gly Ser Arg Arg Thr Leu Met Leu Leu Ala Gln Met Arg Arg Ile Ser
        35                  40                  45


Leu Phe Ser Cys Leu Lys Asp Arg His Asp Phe Gly Phe Pro Gln Glu
    50                  55                  60


Glu Phe Gly Asn Gln Phe Gln Lys Ala Glu Thr Ile Pro Val Leu His
65                  70                  75                  80


Glu Met Ile Gln Gln Ile Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser
                85                  90                  95


Ala Ala Trp Asp Glu Thr Leu Leu Asp Lys Phe Tyr Thr Glu Leu Tyr
            100                 105                 110


Gln Gln Leu Asn Asp Leu Glu Ala Cys Val Ile Gln Gly Val Gly Val
        115                 120                 125


Thr Glu Thr Pro Leu Met Lys Glu Asp Ser Ile Leu Ala Val Arg Lys
    130                 135                 140


Tyr Phe Gln Arg Ile Thr Leu Tyr Leu Lys Glu Lys Lys Tyr Ser Pro
145                 150                 155                 160
```

```
Cys Ala Trp Glu Val Val Arg Ala Glu Ile Met Arg Ser Phe Ser Leu
                165                 170                 175


Ser Thr Asn Leu Gln Glu Ser Leu Arg Ser Lys Glu
            180                 185


<210>  70
<211>  233
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  TNF alpha amino acid sequence

<400>  70

Met Ser Thr Glu Ser Met Ile Arg Asp Val Glu Leu Ala Glu Glu Ala
1               5                   10                  15


Leu Pro Lys Lys Thr Gly Gly Pro Gln Gly Ser Arg Arg Cys Leu Phe
            20                  25                  30


Leu Ser Leu Phe Ser Phe Leu Ile Val Ala Gly Ala Thr Thr Leu Phe
        35                  40                  45


Cys Leu Leu His Phe Gly Val Ile Gly Pro Gln Arg Glu Glu Phe Pro
    50                  55                  60


Arg Asp Leu Ser Leu Ile Ser Pro Leu Ala Gln Ala Val Arg Ser Ser
65                  70                  75                  80


Ser Arg Thr Pro Ser Asp Lys Pro Val Ala His Val Val Ala Asn Pro
                85                  90                  95


Gln Ala Glu Gly Gln Leu Gln Trp Leu Asn Arg Arg Ala Asn Ala Leu
            100                 105                 110


Leu Ala Asn Gly Val Glu Leu Arg Asp Asn Gln Leu Val Val Pro Ser
        115                 120                 125


Glu Gly Leu Tyr Leu Ile Tyr Ser Gln Val Leu Phe Lys Gly Gln Gly
    130                 135                 140
```

```
Cys Pro Ser Thr His Val Leu Leu Thr His Thr Ile Ser Arg Ile Ala
145                 150                 155                 160


Val Ser Tyr Gln Thr Lys Val Asn Leu Leu Ser Ala Ile Lys Ser Pro
                165                 170                 175


Cys Gln Arg Glu Thr Pro Glu Gly Ala Glu Ala Lys Pro Trp Tyr Glu
            180                 185                 190


Pro Ile Tyr Leu Gly Gly Val Phe Gln Leu Glu Lys Gly Asp Arg Leu
        195                 200                 205


Ser Ala Glu Ile Asn Arg Pro Asp Tyr Leu Asp Phe Ala Glu Ser Gly
    210                 215                 220


Gln Val Tyr Phe Gly Ile Ile Ala Leu
225                 230


<210>  71
<211>  5288
<212>  DNA
<213>  Artificial Sequence

<220>
<223>  DNA sequence corresponding to E2B region of the EnAd genome (bp
       10355-5068)

<400>  71
ctatggcatc tcgatccagc agacctcctc gtttcgcggg tttggacggc tcctggaata       60

gggtatgaga cgatgggcgt ccagcgctgc cagggttcgg tccttccagg gtctcagtgt      120

tcgagtcagg gttgtttccg tcacagtgaa ggggtgtgcg cctgcttggg cgcttgccag      180

ggtgcgcttc agactcatcc tgctggtcga aaacttctgt cgcttggcgc cctgtatgtc      240

ggccaagtag cagtttacca tgagttcgta gttgagcgcc tcggctgcgt ggcctttggc      300

gcggagctta cctttggaag ttttcttgca taccgggcag tataggcatt tcagcgcata      360

caacttgggc gcaaggaaaa cggattctgg ggagtatgca tctgcgccgc aggaggcgca      420

aacagtttca cattccacca gccaggttaa atccggttca ttggggtcaa aaacaagttt      480
```

tccgccatat tttttgatgc gtttcttacc tttggtctcc atgagttcgt gtcctcgttg 540

agtgacaaac aggctgtccg tgtccccgta gactgatttt acaggcctct tctccagtgg 600

agtgcctcgg tcttcttcgt acaggaactc tgaccactct gatacaaagg cgcgcgtcca 660

ggccagcaca aaggaggcta tgtgggaggg gtagcgatcg ttgtcaacca gggggtccac 720

cttttccaaa gtatgcaaac acatgtcacc ctcttcaaca tccaggaatg tgattggctt 780

gtaggtgtat ttcacgtgac ctggggtccc cgctgggggg gtataaaagg gggcggttct 840

ttgctcttcc tcactgtctt ccggatcgct gtccaggaac gtcagctgtt ggggtaggta 900

ttccctctcg aaggcgggca tgacctctgc actcaggttg tcagtttcta agaacgagga 960

ggatttgata ttgacagtgc cggttgagat gcctttcatg aggttttcgt ccatctggtc 1020

agaaaacaca atttttttat tgtcaagttt ggtggcaaat gatccataca gggcgttgga 1080

taaaagtttg gcaatggatc gcatggtttg gttcttttcc ttgtccgcgc gctctttggc 1140

ggcgatgttg agttggacat actcgcgtgc caggcacttc cattcgggga agatagttgt 1200

taattcatct ggcacgattc tcacttgcca ccctcgatta tgcaaggtaa ttaaatccac 1260

actggtggcc acctcgcctc gaaggggttc attggtccaa cagagcctac ctcctttcct 1320

agaacagaaa gggggaagtg ggtctagcat aagttcatcg ggagggtctg catccatggt 1380

aaagattccc ggaagtaaat ccttatcaaa atagctgatg ggagtggggt catctaaggc 1440

catttgccat tctcgagctg ccagtgcgcg ctcatatggg ttaaggggac tgccccatgg 1500

catgggatgg gtgagtgcag aggcatacat gccacagatg tcatagacgt agatgggatc 1560

ctcaaagatg cctatgtagg ttggatagca tcgcccccct ctgatacttg ctcgcacata 1620

gtcatatagt tcatgtgatg gcgctagcag ccccggaccc aagttggtgc gattgggttt 1680

ttctgttctg tagacgatct ggcgaaagat ggcgtgagaa ttggaagaga tggtgggtct 1740

ttgaaaaatg ttgaaatggg catgaggtag acctacagag tctctgacaa agtgggcata 1800

agattcttga agcttggtta ccagttcggc ggtgacaagt acgtctaggg cgcagtagtc 1860

aagtgtttct tgaatgatgt cataacctgg ttggtttttc ttttcccaca gttcgcggtt 1920

gagaaggtat tcttcgcgat ccttccagta ctcttctagc ggaaacccgt ctttgtctgc 1980

acggtaagat cctagcatgt agaactgatt aactgccttg taagggcagc agcccttctc 2040

tacgggtaga gagtatgctt gagcagcttt tcgtagcgaa gcgtgagtaa gggcaaaggt 2100

gtctctgacc atgactttga ggaattggta tttgaagtcg atgtcgtcac aggctccctg 2160

ttcccagagt tggaagtcta cccgtttctt gtaggcgggg ttgggcaaag cgaaagtaac 2220

atcattgaag agaatcttgc cggccctggg catgaaattg cgagtgatgc gaaaaggctg 2280

tggtacttcc gctcggttat tgataacctg ggcagctagg acgatctcgt cgaaaccgtt 2340

gatgttgtgt cctacgatgt ataattctat gaaacgcggc gtgcctctga cgtgaggtag 2400

cttactgagc tcatcaaagg ttaggtctgt ggggtcagat aaggcgtagt gttcgagagc 2460

ccattcgtgc aggtgaggat tcgctttaag gaaggaggac cagaggtcca ctgccagtgc 2520

tgtttgtaac tggtcccggt actgacgaaa atgccgtccg actgccattt tttctggggt 2580

gacgcaatag aaggtttggg ggtcctgccg ccagcgatcc cacttgagtt ttatggcgag 2640

gtcataggcg atgttgacga gccgctggtc tccagagagt ttcatgacca gcatgaaggg 2700

gattagctgc ttgccaaagg accccatcca ggtgtaggtt tccacatcgt aggtgagaaa 2760

gagcctttct gtgcgaggat gagagccaat cgggaagaac tggatctcct gccaccagtt 2820

ggaggaatgg ctgttgatgt gatggaagta gaactccctg cgacgcgccg agcattcatg 2880

cttgtgcttg tacagacggc cgcagtagtc gcagcgttgc acgggttgta tctcgtgaat 2940

gagttgtacc tggcttccct tgacgagaaa tttcagtggg aagccgaggc ctggcgattg 3000

tatctcgtgc tttactatgt tgtctgcatc ggcctgttca tcttctgtct cgatggtggt 3060

catgctgacg agccctcgcg ggaggcaagt ccagacctcg gcgcggcagg ggcggagctc 3120

gaggacgaga gcgcgcaggc tggagctgtc cagggtcctg agacgctgcg gactcaggtt 3180

agtaggcagt gtcaggagat taacttgcat gatcttttgg agggcgtgcg ggaggttcag 3240

atagtacttg atctcaacgg gtccgttggt ggagatgtcg atggcttgca gggttccgtg 3300

tcccttgggc gctaccaccg tgcccttgtt tttcattttg gacggcggtg gctctgttgc 3360

ttcttgcatg tttagaagcg gtgtcgaggg cgcgcaccgg gcggcagggg cggctcggga 3420

cccggcggca tggctggcag tggtacgtcg gcgccgcgcg cgggtaggtt ctggtactgc 3480

gccctgagaa gactcgcatg cgcgacgacg cggcggttga catcctggat ctgacgcctc 3540

tgggtgaaag ctaccggccc cgtgagcttg aacctgaaag agagttcaac agaatcaatc 3600

tcggtatcgt tgacggcggc ttgcctaagg atttcttgca cgtcaccaga gttgtcctgg 3660

taggcgatct ccgccatgaa ctgctcgatc tcttcctctt gaagatctcc gcggcccgct 3720

ctctcgacgg tggccgcgag gtcgttggag atgcgcccaa tgagttgaga gaatgcattc 3780

atgcccgcct cgttccagac gcggctgtag accacggccc ccacgggatc tctcgcgcgc 3840

atgaccacct gggcgaggtt gagctccacg tggcgggtga agaccgcata gttgcatagg 3900

cgctggaaaa ggtagttgag tgtggtggcg atgtgctcgg tgacgaagaa atacatgatc 3960

catcgtctca gcggcatctc gctgacatcg cccagagctt ccaagcgctc catggcctcg 4020

tagaagtcca cggcaaaatt aaaaaactgg gagtttcgcg cggacacggt caactcctct 4080

tccagaagac ggataagttc ggcgatggtg gtgcgcacct cgcgctcgaa agcccctggg 4140

atttcttcct caatctcttc ttcttccact aacatctctt cctcttcagg tggggctgca 4200

ggaggagggg gaacgcggcg acgccggcgg cgcacgggca gacggtcgat gaatctttca 4260

atgacctctc cgcggcggcg gcgcatggtt tcagtgacgg cgcggccgtt ctcgcgcggt 4320

cgcagagtaa aaacaccgcc gcgcatctcc ttaaagtggt gactgggagg ttctccgttt 4380

gggagggaga gggcgctgat tatacatttt attaattggc ccgtagggac tgcacgcaga 4440

gatctgatcg tgtcaagatc cacgggatct gaaaaccttt cgacgaaagc gtctaaccag 4500

tcacagtcac aaggtaggct gagtacggct tcttgtgggc gggggtggtt atgtgttcgg 4560

tctgggtctt ctgtttcttc ttcatctcgg gaaggtgaga cgatgctgct ggtgatgaaa 4620

ttaaagtagg cagttctaag acggcggatg gtggcgagga gcaccaggtc tttgggtccg 4680

gcttgctgga tacgcaggcg attggccatt ccccaagcat tatcctgaca tctagcaaga 4740

tctttgtagt agtcttgcat gagccgttct acgggcactt cttcctcacc cgttctgcca 4800

tgcatacgtg tgagtccaaa tccgcgcatt ggttgtacca gtgccaagtc agctacgact 4860

ctttcggcga ggatggcttg ctgtacttgg gtaagggtgg cttgaaagtc atcaaaatcc 4920

acaaagcggt ggtaagctcc tgtattaatg gtgtaagcac agttggccat gactgaccag 4980

ttaactgtct ggtgaccagg gcgcacgagc tcggtgtatt taaggcgcga ataggcgcgg 5040

gtgtcaaaga tgtaatcgtt gcaggtgcgc accagatact ggtaccctat aagaaaatgc 5100

ggcggtggtt ggcggtagag aggccatcgt tctgtagctg gagcgccagg ggcgaggtct 5160

tccaacataa ggcggtgata gccgtagatg tacctggaca tccaggtgat tcctgcggcg 5220

gtagtagaag cccgaggaaa ctcgcgtacg cggttccaaa tgttgcgtag cggcatgaag 5280

tagttcat 5288

<210> 72
<211> 1548
<212> DNA
<213> Artificial Sequence

<220>
<223> Anti-EpCAM BiTE DNA coding sequence, with N-terminal signal sequence and C-terminal deca-His affinity tag

<400> 72
atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt gcatagcgaa 60

ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa ggtcaccatg 120

tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta cctcacgtgg 180

tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag cacccgcgag 240

tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac cctaaccatc 300

agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta ctcgtaccct 360

ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag cggcggggga 420

ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc cgaactggtc 480

cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt taccaattac 540

tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg cgacatcttc 600

ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac tctgactgcc 660

gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga agacagcgcg 720

gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg gggacaagga 780

actaccgtga ccgtctcctc cggcggcggt ggaagcgatg tgcaactcgt gcagtccggt 840

gcggaagtga aaaagccggg cgcgagcgtc aaagtgtcat gcaaggcgtc aggatatacg 900

tttactagat acactatgca ctgggtgcgc caggcacctg gtcagggcct tgaatggatc 960

ggctacatca atccgtcgag aggctacact aattacgcgg actcagtcaa agggcgcttc 1020

acgattacga ccgacaagtc cacctcgact gcatacatgg aactgtcctc gctgagaagc 1080

gaggacaccg ctacttacta ctgcgctaga tactacgatg atcactactg cctcgattac 1140

tggggccagg gaaccactgt cacggtgtca tcgggagagg gcacctcaac cggatcaggg 1200

ggatcgggag gctcgggcgg cgcagacgac atcgtcctga cccagtcgcc cgccaccttg 1260

tcgctgtccc caggagaaag agcgaccctg tcatgccggg cgtcgcaaag cgtgagctat 1320

atgaattggt atcagcagaa gccaggaaag gcgccgaaga gatggatcta cgacacctcc 1380

aaggtcgctt caggtgtccc ggctagattc tcaggatcgg gatcaggaac ggactactcc 1440

ctgaccatca attcactgga agcagaagat gcggccacct actactgtca gcagtggtcc 1500

tccaacccgc tgactttcgg aggcggaact aaggtcgaga tcaagtag 1548

<210> 73
<211> 515
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-EpCAM BiTE protein sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag

<400> 73

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Val Met Thr Gln Ser Pro Ser Ser Leu Thr Val
20 25 30

Thr Ala Gly Glu Lys Val Thr Met Ser Cys Lys Ser Ser Gln Ser Leu
35 40 45

Leu Asn Ser Gly Asn Gln Lys Asn Tyr Leu Thr Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu
65 70 75 80

Ser Gly Val Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe
85 90 95

```
Thr Leu Thr Ile Ser Ser Val Gln Ala Glu Asp Leu Ala Val Tyr Tyr
            100                 105                 110


Cys Gln Asn Asp Tyr Ser Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys
        115                 120                 125


Leu Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140


Gly Gly Ser Glu Val Gln Leu Leu Glu Gln Ser Gly Ala Glu Leu Val
145                 150                 155                 160


Arg Pro Gly Thr Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Ala
                165                 170                 175


Phe Thr Asn Tyr Trp Leu Gly Trp Val Lys Gln Arg Pro Gly His Gly
            180                 185                 190


Leu Glu Trp Ile Gly Asp Ile Phe Pro Gly Ser Gly Asn Ile His Tyr
        195                 200                 205


Asn Glu Lys Phe Lys Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser
    210                 215                 220


Ser Thr Ala Tyr Met Gln Leu Ser Ser Leu Thr Phe Glu Asp Ser Ala
225                 230                 235                 240


Val Tyr Phe Cys Ala Arg Leu Arg Asn Trp Asp Glu Pro Met Asp Tyr
                245                 250                 255


Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Gly Gly Gly Ser
            260                 265                 270


Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
        275                 280                 285


Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg Tyr
    290                 295                 300
```

```
Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Ile
305                 310                 315                 320


Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser Val
                325                 330                 335


Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala Tyr
            340                 345                 350


Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr Cys
        355                 360                 365


Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln Gly
    370                 375                 380


Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser Gly
385                 390                 395                 400


Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln Ser
                405                 410                 415


Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys
            420                 425                 430


Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys Pro
        435                 440                 445


Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala Ser
    450                 455                 460


Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Ser
465                 470                 475                 480


Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys
                485                 490                 495


Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys Val
            500                 505                 510
```

Glu Ile Lys
515

<210> 74
<211> 1560
<212> DNA
<213> Artificial Sequence

<220>
<223> Anti-FAP BiTE DNA coding sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag

<400> 74
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaga tgtgcaactc 840

gtgcagtccg gtgcggaagt gaaaaagccg ggcgcgagcg tcaaagtgtc atgcaaggcg 900

tcaggatata cgtttactag atacactatg cactgggtgc gccaggcacc tggtcagggc 960

cttgaatgga tcggctacat caatccgtcg agaggctaca ctaattacgc ggactcagtc 1020

aaagggcgct tcacgattac gaccgacaag tccacctcga ctgcatacat ggaactgtcc 1080

tcgctgagaa gcgaggacac cgctacttac tactgcgcta gatactacga tgatcactac 1140

tgcctcgatt actggggcca gggaaccact gtcacggtgt catcgggaga gggcacctca 1200

accggatcag ggggatcggg aggctcgggc ggcgcagacg acatcgtcct gacccagtcg 1260

cccgccacct tgtcgctgtc cccaggagaa agagcgaccc tgtcatgccg ggcgtcgcaa 1320

agcgtgagct atatgaattg gtatcagcag aagccaggaa aggcgccgaa gagatggatc 1380

tacgacacct ccaaggtcgc ttcaggtgtc ccggctagat tctcaggatc gggatcagga 1440

acggactact ccctgaccat caattcactg gaagcagaag atgcggccac ctactactgt 1500

cagcagtggt cctccaaccc gctgactttc ggaggcggaa ctaaggtcga gatcaagtag 1560

<210> 75
<211> 519
<212> PRT
<213> Artificial Sequence

<220>
<223> Anti-FAP BiTE amino acid sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag

<400> 75

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val
20 25 30

Ser Leu Gly Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu
35 40 45

Leu Tyr Ser Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu
65 70 75 80

Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe
85 90 95

Thr Leu Thr Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr

```
            100                 105                 110

Cys Gln Gln Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys
        115                 120                 125

Val Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140

Gly Gly Ser Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys
145                 150                 155                 160

Pro Gly Ala Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe
                165                 170                 175

Thr Glu Tyr Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu
            180                 185                 190

Glu Trp Ile Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn
        195                 200                 205

Gln Lys Phe Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser
    210                 215                 220

Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val
225                 230                 235                 240

Tyr Tyr Cys Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His
                245                 250                 255

Ala Met Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser Gly
            260                 265                 270

Gly Gly Gly Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys
        275                 280                 285

Lys Pro Gly Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr
    290                 295                 300

Phe Thr Arg Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly
```

```
305                 310                 315                 320

Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr
                325                 330                 335

Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr
            340                 345                 350

Ser Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala
        355                 360                 365

Thr Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr
    370                 375                 380

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser
385                 390                 395                 400

Thr Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val
                405                 410                 415

Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala
            420                 425                 430

Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr
        435                 440                 445

Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser
    450                 455                 460

Lys Val Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly
465                 470                 475                 480

Thr Asp Tyr Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala
                485                 490                 495

Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly
            500                 505                 510

Gly Thr Lys Val Glu Ile Lys
```

515

<210> 76
<211> 1599
<212> DNA
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) BiTE DNA coding sequence, with N-terminal signal sequence without C-terminal deca-His affinity tag

<400> 76
atgggttggt catgcatcat cctgtttctc gtcgcaactg cgaccggcgt gcattcggaa 60

ctggacatcg tgatgaccca ggcacctgca tcactggcag tgagcctggg acagagagcc 120

accatttcat gccgggccag caagagcgtg tcgtcatccg gatacaatta tctgcactgg 180

tatcagcaga aaccaggaca acctccaaag ctactcatct acctggcgtc gaacctcgaa 240

tcgggcgtcc cagctagatt ctcagggagc ggttcgggaa ccgatttcac cctgaacatc 300

caccctgtgg aggaggaaga cgcggcaacg tactattgcc agcattcccg cgagttccct 360

ctcactttcg gtgcgggaac taagctggag atcaagtcca gcggcggcgg aggtagcggt 420

ggaggtggcg gaggaagctc ccggtcgtcg ctggaggtgc agctgcaaca atccggcccg 480

gaactggtca agccaggcgc atccgtcaag atttcatgca agacctcggg gtacaccttc 540

accgggtaca cgatgcattg ggtcaggcag agccacggca agtccctgga atggatcgga 600

ggaatcaacc ccaaaaacgg cggcatcatc tacaaccaaa agttccaggg aaaagccact 660

ctgaccgtgg acaagtcgtc gagcacggcc agcatggagc tgcggtccct cacttccgac 720

gactcagccg tgtattactg cgcgagacgg gtctacgatg actacccata ctactacgct 780

atggactact ggggacaagg aaccagcgtg accgtctcat cggcgaaaac tactccgccg 840

tcggtgacgt cgggaggtgg tggaagcgac gtgcagctcg tccagtcggg tgccgaggtg 900

aagaagccag gagcctccgt gaaggtctcg tgcaaagcca gcggctacac ttttactagg 960

tacactatgc actgggtgcg gcaagcgccg ggacaaggtc tggagtggat cggatacatc 1020

aatccgtcgc ggggatacac taattacgcg gactccgtca agggacggtt tactatcact 1080

acggataagt ccactagcac cgcctacatg gaactgtcct cgctgcggtc ggaagacact 1140

gcgacctact actgcgctag atattacgat gaccactact gcctcgacta ttgggggcag 1200

ggcactacgg tcaccgtctc gtcgggagaa ggaacctcaa ctggatcggg cggatcggga 1260

ggctccggag gagccgacga catcgtgctt acccagtcgc ctgcgaccct gtccctgtcc 1320

ccaggagaga gagcgactct ttcatgcagg gcttcccaat cagtctccta catgaattgg 1380

tatcaacaaa aacccggcaa ggccccgaaa cgctggatct acgatacttc aaaggtggcc 1440

agcggtgtgc ctgcccgctt ctccgggtcg gggtccggca ccgattactc gttgactatc 1500

aatagcctgg aggccgagga cgctgcaact tactactgcc agcagtggtc ctccaaccct 1560

ctcaccttcg gaggcgggac caaggtggaa atcaaatag 1599

<210> 77
<211> 532
<212> PRT
<213> Artificial Sequence

<220>
<223> Control (Anti-FHA) BiTE amino acid sequence with N-terminal signal sequence without C-terminal deca-His tag

<400> 77

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu
20 25 30

Ala Val Ser Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys
35 40 45

Ser Val Ser Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu
65 70 75 80

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
85 90 95

Thr Leu Asn Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr

```
            100                 105                 110

Cys Gln His Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly
    130                 135                 140

Gly Ser Ser Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro
145                 150                 155                 160

Glu Leu Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser
                165                 170                 175

Gly Tyr Thr Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His
            180                 185                 190

Gly Lys Ser Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly
        195                 200                 205

Ile Ile Tyr Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp
    210                 215                 220

Lys Ser Ser Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp
225                 230                 235                 240

Asp Ser Ala Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro
                245                 250                 255

Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
            260                 265                 270

Ser Ser Ala Lys Thr Thr Pro Pro Ser Val Thr Ser Gly Gly Gly Gly
        275                 280                 285

Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly
    290                 295                 300

Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg
```

```
305                 310                 315                 320

Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp
                325                 330                 335

Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser
            340                 345                 350

Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala
        355                 360                 365

Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr
    370                 375                 380

Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln
385                 390                 395                 400

Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser
                405                 410                 415

Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln
            420                 425                 430

Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser
        435                 440                 445

Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
    450                 455                 460

Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala
465                 470                 475                 480

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr
                485                 490                 495

Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
            500                 505                 510

Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys
```

515 520 525

Val Glu Ile Lys
530

<210> 78
<211> 532
<212> PRT
<213> Artificial Sequence

<220>
<223> Control BiTe (Anti-FHA) without C-terminal deca-His tag

<400> 78

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Asp Ile Val Met Thr Gln Ala Pro Ala Ser Leu
20 25 30

Ala Val Ser Leu Gly Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Lys
35 40 45

Ser Val Ser Ser Ser Gly Tyr Asn Tyr Leu His Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu
65 70 75 80

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
85 90 95

Thr Leu Asn Ile His Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr
100 105 110

Cys Gln His Ser Arg Glu Phe Pro Leu Thr Phe Gly Ala Gly Thr Lys
115 120 125

Leu Glu Ile Lys Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Gly
130 135 140

```
Gly Ser Ser Arg Ser Ser Leu Glu Val Gln Leu Gln Gln Ser Gly Pro
145                 150                 155                 160

Glu Leu Val Lys Pro Gly Ala Ser Val Lys Ile Ser Cys Lys Thr Ser
                165                 170                 175

Gly Tyr Thr Phe Thr Gly Tyr Thr Met His Trp Val Arg Gln Ser His
            180                 185                 190

Gly Lys Ser Leu Glu Trp Ile Gly Gly Ile Asn Pro Lys Asn Gly Gly
        195                 200                 205

Ile Ile Tyr Asn Gln Lys Phe Gln Gly Lys Ala Thr Leu Thr Val Asp
    210                 215                 220

Lys Ser Ser Ser Thr Ala Ser Met Glu Leu Arg Ser Leu Thr Ser Asp
225                 230                 235                 240

Asp Ser Ala Val Tyr Tyr Cys Ala Arg Arg Val Tyr Asp Asp Tyr Pro
                245                 250                 255

Tyr Tyr Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
            260                 265                 270

Ser Ser Ala Lys Thr Thr Pro Pro Ser Val Thr Ser Gly Gly Gly Gly
        275                 280                 285

Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly
    290                 295                 300

Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg
305                 310                 315                 320

Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp
                325                 330                 335

Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Ala Asp Ser
            340                 345                 350
```

```
Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr Ser Thr Ala
        355                 360                 365

Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Thr Tyr Tyr
    370                 375                 380

Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln
385                 390                 395                 400

Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser Thr Gly Ser
                405                 410                 415

Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val Leu Thr Gln
            420                 425                 430

Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser
        435                 440                 445

Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
    450                 455                 460

Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Val Ala
465                 470                 475                 480

Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr
                485                 490                 495

Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
            500                 505                 510

Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly Gly Thr Lys
        515                 520                 525

Val Glu Ile Lys
    530
```

<210> 79
<211> 34853
<212> DNA

<213> Artificial Sequence

<220>
<223> NG-601 (EnAd-CMV-EpCAMBiTE) without deca-His affinity tag

<400> 79
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccagggg ctcccgccag atctagtaat caattacggg 29400

gtcattagtt catagcccat atatggagtt ccgcgttaca taacttacgg taaatggccc 29460

gcctggctga ccgcccaacg acccccgccc attgacgtca ataatgacgt atgttcccat 29520

agtaacgcca atagggactt tccattgacg tcaatgggtg gagtatttac ggtaaactgc 29580

ccacttggca gtacatcaag tgtatcatat gccaagtacg ccccctattg acgtcaatga 29640

cggtaaatgg cccgcctggc attatgccca gtacatgacc ttatgggact ttcctacttg 29700

gcagtacatc tacgtattag tcatcgctat taccatgctg atgcggtttt ggcagtacat 29760

caatgggcgt ggatagcggt ttgactcacg gggatttcca agtctccacc ccattgacgt 29820

caatgggagt ttgttttggc accaaaatca acgggacttt ccaaaatgtc gtaacaactc 29880

cgccccattg acgcaaatgg gcggtaggcg tgtacggtgg gaggtctata taagcagagc 29940

tggtttagtg aaccgtcaga tcagatcttt gtcgatccta ccatccactc gacacacccg 30000

ccagcggccg ctgccaagct tccgagctct cgaattcaaa ggaggtaccc accatgggat 30060

ggagctgcat catcctattc ctcgtggcga cggccactgg agtgcatagc gaactggtga 30120

tgactcagtc cccgtcatcc ctgacggtga ccgccggcga gaaggtcacc atgtcgtgca 30180

agtcctcgca aagcctgctt aacagcggca accagaaaaa ctacctcacg tggtatcagc 30240

aaaagccagg tcaaccccca aaactgctca tctactgggc gagcacccgc gagtcggggg 30300

tgccagaccg gttcaccggc tccgggtcag gaactgattt caccctaacc atcagctcgg 30360

tgcaagcgga ggacctggcc gtgtactact gccaaaatga ttactcgtac cctctgacct 30420

ttggagcggg caccaagctc gaaatcaagg gcggtggagg aagcggcggg ggaggctcag 30480

gtgggggagg atcagaagtc caactgctgg agcagtcagg agccgaactg gtccgcccgg 30540

gaacctccgt caagatttcc tgtaaggctt ccggctacgc ttttaccaat tactggctgg 30600

gctgggtcaa gcaaagaccg gggcatggcc tggagtggat cggcgacatc ttcccaggga 30660

gcggcaacat ccactacaac gagaagttca aggggaaagc gactctgact gccgacaaat 30720

catccagcac cgcctacatg cagctgtcgt cgctcacttt cgaagacagc gcggtgtact 30780

tttgtgctcg gctccggaac tgggatgaac caatggacta ctggggacaa ggaactaccg 30840

tgaccgtctc ctccggcggc ggtggaagcg atgtgcaact cgtgcagtcc ggtgcggaag 30900

tgaaaaagcc gggcgcgagc gtcaaagtgt catgcaaggc gtcaggatat acgtttacta 30960

gatacactat gcactgggtg cgccaggcac ctggtcaggg ccttgaatgg atcggctaca 31020

tcaatccgtc gagaggctac actaattacg cggactcagt caaagggcgc ttcacgatta 31080

cgaccgacaa gtccacctcg actgcataca tggaactgtc ctcgctgaga agcgaggaca 31140

ccgctactta ctactgcgct agatactacg atgatcacta ctgcctcgat tactggggcc 31200

agggaaccac tgtcacggtg tcatcgggag agggcacctc aaccggatca gggggatcgg 31260

gaggctcggg cggcgcagac gacatcgtcc tgacccagtc gcccgccacc ttgtcgctgt 31320

ccccaggaga aagagcgacc ctgtcatgcc gggcgtcgca aagcgtgagc tatatgaatt 31380

ggtatcagca gaagccagga aaggcgccga agagatggat ctacgacacc tccaaggtcg 31440

cttcaggtgt cccggctaga ttctcaggat cgggatcagg aacggactac tccctgacca 31500

tcaattcact ggaagcagaa gatgcggcca cctactactg tcagcagtgg tcctccaacc 31560

cgctgacttt cggaggcgga actaaggtcg agatcaagta ggctagcttg actgactgag 31620

atacagcgta ccttcagctc acagacatga taagatacat tgatgagttt ggacaaacca 31680

caactagaat gcagtgaaaa aaatgcttta tttgtgaaat ttgtgatgct attgctttat 31740

ttgtaaccat tataagctgc aataaacaag ttaacaacaa caattgcatt cattttatgt 31800

ttcaggttca gggggaggtg tgggaggttt tttaaagcaa gtaaaacctc tacaaatgtg 31860

gtagtcgtca gctatcctgc aggaacttgt ttatttgaaa atcaattcac aaaatccgag 31920

tagttatttt gcctcccccc tcccatttaa cagaatacac caatctctcc ccacgcacag 31980

ctttaaacat ttggatacca ttagatatag acatggtttt agattccaca ttccaaacag 32040

tttcagagcg agccaatctg gggtcagtga tagataaaaa tccatcggga tagtctttta 32100

aagcgctttc acagtccaac tgctgcggat gcgactccgg agtctggatc acggtcatct 32160

ggaagaagaa cgatgggaat cataatccga aaacggtatc ggacgattgt gtctcatcaa 32220

acccacaagc agccgctgtc tgcgtcgctc cgtgcgactg ctgtttatgg gatcagggtc 32280

cacagtgtcc tgaagcatga ttttaatagc ccttaacatc aactttctgg tgcgatgcgc 32340

gcagcaacgc attctgattt cactcaaatc tttgcagtag gtacaacaca ttattacaat 32400

attgtttaat aaaccataat taaaagcgct ccagccaaaa ctcatatctg atataatcgc 32460

ccctgcatga ccatcatacc aaagtttaat ataaattaaa tgacgttccc tcaaaaacac 32520

actacccaca tacatgatct cttttggcat gtgcatatta acaatctgtc tgtaccatgg 32580

acaacgttgg ttaatcatgc aacccaatat aaccttccgg aaccacactg ccaacaccgc 32640

tcccccagcc atgcattgaa gtgaaccctg ctgattacaa tgacaatgaa gaacccaatt 32700

ctctcgaccg tgaatcactt gagaatgaaa aatatctata gtggcacaac atagacataa 32760

atgcatgcat cttctcataa tttttaactc ctcaggattt agaaacatat cccagggaat 32820

aggaagctct tgcagaacag taaagctggc agaacaagga agaccacgaa cacaacttac 32880

actatgcata gtcatagtat cacaatctgg caacagcggg tggtcttcag tcatagaagc 32940

tcgggtttca ttttcctcac aacgtggtaa ctgggctctg gtgtaagggt gatgtctggc 33000

gcatgatgtc gagcgtgcgc gcaaccttgt cataatggag ttgcttcctg acattctcgt 33060

attttgtata gcaaaacgcg gccctggcag aacacactct tcttcgcctt ctatcctgcc 33120

gcttagcgtg ttccgtgtga tagttcaagt acaaccacac tcttaagttg gtcaaaagaa 33180

tgctggcttc agttgtaatc aaaactccat cgcatctaat cgttctgagg aaatcatcca 33240

agcaatgcaa ctggattgtg tttcaagcag gagaggagag ggaagagacg gaagaaccat 33300

gttaattttt attccaaacg atctcgcagt acttcaaatt gtagatcgcg cagatggcat 33360

ctctcgcccc cactgtgttg gtgaaaaagc acagctagat caaaagaaat gcgattttca 33420

aggtgctcaa cggtggcttc cagcaaagcc tccacgcgca catccaagaa caaaagaata 33480

ccaaaagaag gagcattttc taactcctca atcatcatat tacattcctg caccattccc 33540

agataatttt cagctttcca gccttgaatt attcgtgtca gttcttgtgg taaatccaat 33600

ccacacatta caaacaggtc ccggagggcg ccctccacca ccattcttaa acacaccctc 33660

ataatgacaa aatatcttgc tcctgtgtca cctgtagcga attgagaatg gcaacatcaa 33720

ttgacatgcc cttggctcta agttcttctt taagttctag ttgtaaaaac tctctcatat 33780

tatcaccaaa ctgcttagcc agaagccccc cgggaacaag agcaggggac gctacagtgc 33840

agtacaagcg cagacctccc caattggctc cagcaaaaac aagattggaa taagcatatt 33900

gggaaccgcc agtaatatca tcgaagttgc tggaaatata atcaggcaga gtttcttgta 33960

aaaattgaat aaaagaaaaa tttgccaaaa aaacattcaa aacctctggg atgcaaatgc 34020

aataggttac cgcgctgcgc tccaacattg ttagttttga attagtctgc aaaaataaaa 34080

aaaaaaacaa gcgtcatatc atagtagcct gacgaacaga tggataaatc agtctttcca 34140

tcacaagaca agccacaggg tctccagctc gaccctcgta aaacctgtca tcatgattaa 34200

acaacagcac cgaaagttcc tcgcggtgac cagcatgaat aattcttgat gaagcataca 34260

atccagacat gttagcatca gttaacgaga aaaaacagcc aacatagcct ttgggtataa 34320

ttatgcttaa tcgtaagtat agcaaagcca cccctcgcgg atacaaagta aaaggcacag 34380

gagaataaaa aatataatta tttctctgct gctgttcagg caacgtcgcc cccggtccct 34440

ctaaatacac atacaaagcc tcatcagcca tggcttacca gacaaagtac agcgggcaca 34500

caaagcacaa gctctaaagt gactctccaa cctctccaca atatatatat acacaagccc 34560

taaactgacg taatgggagt aaagtgtaaa aaatcccgcc aaacccaaca cacaccccga 34620

aactgcgtca ccagggaaaa gtacagtttc acttccgcaa tcccaacagg cgtaacttcc 34680

tctttctcac ggtacgtgat atcccactaa cttgcaacgt cattttccca cggtcgcacc 34740

gcccctttta gccgttaacc ccacagccaa tcaccacacg atccacactt tttaaaatca 34800

cctcatttac atattggcac cattccatct ataaggtata ttatatagat aga 34853

<210> 80
<211> 34174
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-602 (EnAd-SA-EpCAMBiTE) without deca-His affinity tag

<400> 80
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agttttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatggga tggagctgca tcatcctatt 29400

cctcgtggcg acggccactg gagtgcatag cgaactggtg atgactcagt ccccgtcatc 29460

cctgacggtg accgccggcg agaaggtcac catgtcgtgc aagtcctcgc aaagcctgct 29520

taacagcggc aaccagaaaa actacctcac gtggtatcag caaaagccag gtcaaccccc 29580

aaaactgctc atctactggg cgagcacccg cgagtcgggg gtgccagacc ggttcaccgg 29640

ctccgggtca ggaactgatt tcaccctaac catcagctcg gtgcaagcgg aggacctggc 29700

cgtgtactac tgccaaaatg attactcgta ccctctgacc tttggagcgg gcaccaagct 29760

cgaaatcaag ggcggtggag gaagcggcgg gggaggctca ggtgggggag gatcagaagt 29820

ccaactgctg gagcagtcag gagccgaact ggtccgcccg ggaacctccg tcaagatttc 29880

ctgtaaggct tccggctacg cttttaccaa ttactggctg ggctgggtca agcaaagacc 29940

ggggcatggc ctggagtgga tcggcgacat cttcccaggg agcggcaaca tccactacaa 30000

cgagaagttc aaggggaaag cgactctgac tgccgacaaa tcatccagca ccgcctacat 30060

gcagctgtcg tcgctcactt tcgaagacag cgcggtgtac ttttgtgctc ggctccggaa 30120

ctgggatgaa ccaatggact actggggaca aggaactacc gtgaccgtct cctccggcgg 30180

cggtggaagc gatgtgcaac tcgtgcagtc cggtgcggaa gtgaaaaagc cgggcgcgag 30240

cgtcaaagtg tcatgcaagg cgtcaggata tacgtttact agatacacta tgcactgggt 30300

gcgccaggca cctggtcagg gccttgaatg gatcggctac atcaatccgt cgagaggcta 30360

cactaattac gcggactcag tcaaagggcg cttcacgatt acgaccgaca agtccacctc 30420

gactgcatac atggaactgt cctcgctgag aagcgaggac accgctactt actactgcgc 30480

tagatactac gatgatcact actgcctcga ttactggggc cagggaacca ctgtcacggt 30540

gtcatcggga gagggcacct caaccggatc agggggatcg ggaggctcgg gcggcgcaga 30600

cgacatcgtc ctgacccagt cgcccgccac cttgtcgctg tccccaggag aaagagcgac 30660

cctgtcatgc cgggcgtcgc aaagcgtgag ctatatgaat tggtatcagc agaagccagg 30720

aaaggcgccg aagagatgga tctacgacac ctccaaggtc gcttcaggtg tcccggctag 30780

attctcagga tcgggatcag gaacggacta ctccctgacc atcaattcac tggaagcaga 30840

agatgcggcc acctactact gtcagcagtg gtcctccaac ccgctgactt tcggaggcgg 30900

aactaaggtc gagatcaagt aggctagctt gactgactga gatacagcgt accttcagct 30960

cacagacatg ataagataca ttgatgagtt tggacaaacc acaactagaa tgcagtgaaa 31020

aaaatgcttt atttgtgaaa tttgtgatgc tattgcttta tttgtaacca ttataagctg 31080

caataaacaa gttaacaaca acaattgcat tcattttatg tttcaggttc agggggaggt 31140

gtgggaggtt ttttaaagca agtaaaacct ctacaaatgt ggtagtcgtc agctatcctg 31200

caggaacttg tttatttgaa aatcaattca caaaatccga gtagttattt tgcctccccc 31260

ttcccattta acagaataca ccaatctctc cccacgcaca gctttaaaca tttggatacc 31320

attagatata gacatggttt tagattccac attccaaaca gtttcagagc gagccaatct 31380

ggggtcagtg atagataaaa atccatcggg atagtctttt aaagcgcttt cacagtccaa 31440

ctgctgcgga tgcgactccg gagtctggat cacggtcatc tggaagaaga acgatgggaa 31500

tcataatccg aaaacggtat cggacgattg tgtctcatca aacccacaag cagccgctgt 31560

ctgcgtcgct ccgtgcgact gctgtttatg ggatcagggt ccacagtgtc ctgaagcatg 31620

attttaatag cccttaacat caactttctg gtgcgatgcg cgcagcaacg cattctgatt 31680

tcactcaaat ctttgcagta ggtacaacac attattacaa tattgtttaa taaaccataa 31740

ttaaaagcgc tccagccaaa actcatatct gatataatcg cccctgcatg accatcatac 31800

caaagtttaa tataaattaa atgacgttcc ctcaaaaaca cactacccac atacatgatc 31860

tcttttggca tgtgcatatt aacaatctgt ctgtaccatg gacaacgttg gttaatcatg 31920

caacccaata taaccttccg gaaccacact gccaacaccg ctcccccagc catgcattga 31980

agtgaaccct gctgattaca atgacaatga agaacccaat tctctcgacc gtgaatcact 32040

tgagaatgaa aaatatctat agtggcacaa catagacata aatgcatgca tcttctcata 32100

atttttaact cctcaggatt tagaaacata tcccagggaa taggaagctc ttgcagaaca 32160

gtaaagctgg cagaacaagg aagaccacga acacaactta cactatgcat agtcatagta 32220

tcacaatctg gcaacagcgg gtggtcttca gtcatagaag ctcgggtttc attttcctca 32280

caacgtggta actgggctct ggtgtaaggg tgatgtctgg cgcatgatgt cgagcgtgcg 32340

cgcaaccttg tcataatgga gttgcttcct gacattctcg tattttgtat agcaaaacgc 32400

ggccctggca gaacacactc ttcttcgcct tctatcctgc cgcttagcgt gttccgtgtg 32460

atagttcaag tacaaccaca ctcttaagtt ggtcaaaaga atgctggctt cagttgtaat 32520

caaaactcca tcgcatctaa tcgttctgag gaaatcatcc aagcaatgca actggattgt 32580

gtttcaagca ggagaggaga gggaagagac ggaagaacca tgttaatttt tattccaaac 32640

gatctcgcag tacttcaaat tgtagatcgc gcagatggca tctctcgccc ccactgtgtt 32700

ggtgaaaaag cacagctaga tcaaaagaaa tgcgattttc aaggtgctca acggtggctt 32760

ccagcaaagc ctccacgcgc acatccaaga acaaaagaat accaaaagaa ggagcatttt 32820

ctaactcctc aatcatcata ttacattcct gcaccattcc cagataattt tcagctttcc 32880

agccttgaat tattcgtgtc agttcttgtg gtaaatccaa tccacacatt acaaacaggt 32940

cccggagggc gccctccacc accattctta aacacaccct cataatgaca aaatatcttg 33000

ctcctgtgtc acctgtagcg aattgagaat ggcaacatca attgacatgc ccttggctct 33060

aagttcttct ttaagttcta gttgtaaaaa ctctctcata ttatcaccaa actgcttagc 33120

cagaagcccc ccgggaacaa gagcagggga cgctacagtg cagtacaagc gcagacctcc 33180

ccaattggct ccagcaaaaa caagattgga ataagcatat tgggaaccgc cagtaatatc 33240

atcgaagttg ctggaaatat aatcaggcag agtttcttgt aaaaattgaa taaaagaaaa 33300

atttgccaaa aaaacattca aaacctctgg gatgcaaatg caataggtta ccgcgctgcg 33360

ctccaacatt gttagttttg aattagtctg caaaaataaa aaaaaaaaca agcgtcatat 33420

catagtagcc tgacgaacag atggataaat cagtctttcc atcacaagac aagccacagg 33480

gtctccagct cgaccctcgt aaaacctgtc atcatgatta aacaacagca ccgaaagttc 33540

ctcgcggtga ccagcatgaa taattcttga tgaagcatac aatccagaca tgttagcatc 33600

agttaacgag aaaaaacagc caacatagcc tttgggtata attatgctta atcgtaagta 33660

tagcaaagcc acccctcgcg gatacaaagt aaaaggcaca ggagaataaa aaatataatt 33720

atttctctgc tgctgttcag gcaacgtcgc ccccggtccc tctaaataca catacaaagc 33780

ctcatcagcc atggcttacc agacaaagta cagcgggcac acaaagcaca agctctaaag 33840

tgactctcca acctctccac aatatatata tacacaagcc ctaaactgac gtaatgggag 33900

taaagtgtaa aaaatcccgc caaacccaac acacaccccg aaactgcgtc accagggaaa 33960

agtacagttt cacttccgca atcccaacag gcgtaacttc ctctttctca cggtacgtga 34020

tatcccacta acttgcaacg tcattttccc acggtcgcac cgccccttt agccgttaac 34080

cccacagcca atcaccacac gatccacact ttttaaaatc acctcattta catattggca 34140

ccattccatc tataaggtat attatataga taga 34174

<210> 81
<211> 34865
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-605 (EnAd-CMV-FAPBiTE) without deca-His tag

<400> 81
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

aggggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac caccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccagggg ctcccgccag atctagtaat caattacggg 29400

gtcattagtt catagcccat atatggagtt ccgcgttaca taacttacgg taaatggccc 29460

gcctggctga ccgcccaacg acccccgccc attgacgtca ataatgacgt atgttcccat 29520

agtaacgcca atagggactt tccattgacg tcaatgggtg gagtatttac ggtaaactgc 29580

ccacttggca gtacatcaag tgtatcatat gccaagtacg ccccctattg acgtcaatga 29640

cggtaaatgg cccgcctggc attatgccca gtacatgacc ttatgggact ttcctacttg 29700

gcagtacatc tacgtattag tcatcgctat taccatgctg atgcggtttt ggcagtacat 29760

caatgggcgt ggatagcggt ttgactcacg gggatttcca agtctccacc ccattgacgt 29820

caatgggagt ttgttttggc accaaaatca acgggacttt ccaaaatgtc gtaacaactc 29880

cgccccattg acgcaaatgg gcggtaggcg tgtacggtgg gaggtctata taagcagagc 29940

tggtttagtg aaccgtcaga tcagatcttt gtcgatccta ccatccactc gacacacccg 30000

ccagcggccg ctgccaagct tccgagctct cgaattcaaa ggaggtaccc accatgggct 30060

ggagctgcat catcttgttc ctggtcgcaa ctgctaccgg agtccattcg gacatcgtca 30120

tgacccaaag ccctgactcg ctcgctgtgt cactgggaga gcgggcgact atcaactgca 30180

aatcatccca gagcctgctg tattcacgca atcagaaaaa ctacctggcc tggtatcagc 30240

agaagccggg ccagcctccc aagctgctga tcttctgggc ctccacccgc gaaagcggcg 30300

tgccggaccg cttcagcgga agcggattcg gaactgactt tactctgacc attagctcct 30360

tgcaggcgga ggacgtggcc gtctactact gccagcagta tttctcctat ccgctcacct 30420

ttgggcaagg caccaaggtg gagattaagg gagggggcgg cagcggggga ggcggcagcg 30480

gcggcggggg atcgcaggtc cagctcgtcc aatccggagc cgaagtcaag aagccgggag 30540

cgtcggtcaa ggtcagctgc aaaacttcgc gctacacctt cactgagtac acgatccact 30600

gggtccgcca ggcgcccggc cagcggctgg agtggatcgg cgggatcaac ccaaacaacg 30660

gaatcccaaa ttacaatcag aaatttaaag ggcgggtgac tatcaccgtg gatacctcgg 30720

cctccacggc gtacatggag ctctcatcac tcagatcgga ggacaccgcg gtctattact 30780

gcgcccgccg ccggatcgct tatggatacg atgaaggaca tgcgatggat tactggggcc 30840

agggcaccct cgtcacggtg tcgtcaggag gcggcggttc agatgtgcaa ctcgtgcagt 30900

ccggtgcgga agtgaaaaag ccgggcgcga gcgtcaaagt gtcatgcaag gcgtcaggat 30960

atacgtttac tagatacact atgcactggg tgcgccaggc acctggtcag ggccttgaat 31020

ggatcggcta catcaatccg tcgagaggct acactaatta cgcggactca gtcaaagggc 31080

gcttcacgat tacgaccgac aagtccacct cgactgcata catggaactg tcctcgctga 31140

gaagcgagga caccgctact tactactgcg ctagatacta cgatgatcac tactgcctcg 31200

attactgggg ccagggaacc actgtcacgg tgtcatcggg agagggcacc tcaaccggat 31260

caggggggatc gggaggctcg ggcggcgcag acgacatcgt cctgacccag tcgcccgcca 31320

ccttgtcgct gtccccagga gaaagagcga ccctgtcatg ccgggcgtcg caaagcgtga 31380

gctatatgaa ttggtatcag cagaagccag gaaaggcgcc gaagagatgg atctacgaca 31440

cctccaaggt cgcttcaggt gtcccggcta gattctcagg atcgggatca ggaacggact 31500

actccctgac catcaattca ctggaagcag aagatgcggc cacctactac tgtcagcagt 31560

ggtcctccaa cccgctgact ttcggaggcg gaactaaggt cgagatcaag taggctagct 31620

tgactgactg agatacagcg taccttcagc tcacagacat gataagatac attgatgagt 31680

ttggacaaac cacaactaga atgcagtgaa aaaaatgctt tatttgtgaa atttgtgatg 31740

ctattgcttt atttgtaacc attataagct gcaataaaca agttaacaac aacaattgca 31800

ttcattttat gtttcaggtt caggggggagg tgtgggaggt tttttaaagc aagtaaaacc 31860

tctacaaatg tggtagtcgt cagctatcct gcaggaactt gtttatttga aaatcaattc 31920

acaaaatccg agtagttatt ttgcctcccc cttcccattt aacagaatac accaatctct 31980

ccccacgcac agctttaaac atttggatac cattagatat agacatggtt ttagattcca 32040

cattccaaac agtttcagag cgagccaatc tggggtcagt gatagataaa aatccatcgg 32100

gatagtcttt taaagcgctt tcacagtcca actgctgcgg atgcgactcc ggagtctgga 32160

tcacggtcat ctggaagaag aacgatggga atcataatcc gaaaacggta tcggacgatt 32220

gtgtctcatc aaacccacaa gcagccgctg tctgcgtcgc tccgtgcgac tgctgtttat 32280

gggatcaggg tccacagtgt cctgaagcat gattttaata gcccttaaca tcaactttct 32340

ggtgcgatgc gcgcagcaac gcattctgat ttcactcaaa tctttgcagt aggtacaaca 32400

cattattaca atattgttta ataaaccata attaaaagcg ctccagccaa aactcatatc 32460

tgatataatc gcccctgcat gaccatcata ccaaagttta atataaatta aatgacgttc 32520

cctcaaaaac acactaccca catacatgat ctcttttggc atgtgcatat taacaatctg 32580

tctgtaccat ggacaacgtt ggttaatcat gcaacccaat ataaccttcc ggaaccacac 32640

tgccaacacc gctcccccag ccatgcattg aagtgaaccc tgctgattac aatgacaatg 32700

aagaacccaa ttctctcgac cgtgaatcac ttgagaatga aaaatatcta tagtggcaca 32760

acatagacat aaatgcatgc atcttctcat aatttttaac tcctcaggat ttagaaacat 32820

atcccaggga ataggaagct cttgcagaac agtaaagctg gcagaacaag gaagaccacg 32880

aacacaactt acactatgca tagtcatagt atcacaatct ggcaacagcg ggtggtcttc 32940

agtcatagaa gctcgggttt cattttcctc acaacgtggt aactgggctc tggtgtaagg 33000

gtgatgtctg gcgcatgatg tcgagcgtgc gcgcaacctt gtcataatgg agttgcttcc 33060

tgacattctc gtattttgta tagcaaaacg cggccctggc agaacacact cttcttcgcc 33120

ttctatcctg ccgcttagcg tgttccgtgt gatagttcaa gtacaaccac actcttaagt 33180

tggtcaaaag aatgctggct tcagttgtaa tcaaaactcc atcgcatcta atcgttctga 33240

ggaaatcatc caagcaatgc aactggattg tgtttcaagc aggagaggag agggaagaga 33300

cggaagaacc atgttaattt ttattccaaa cgatctcgca gtacttcaaa ttgtagatcg 33360

cgcagatggc atctctcgcc cccactgtgt tggtgaaaaa gcacagctag atcaaaagaa 33420

atgcgatttt caaggtgctc aacggtggct tccagcaaag cctccacgcg cacatccaag 33480

aacaaaagaa taccaaaaga aggagcattt tctaactcct caatcatcat attacattcc 33540

tgcaccattc ccagataatt ttcagctttc cagccttgaa ttattcgtgt cagttcttgt 33600

ggtaaatcca atccacacat tacaaacagg tcccggaggg cgccctccac caccattctt 33660

aaacacaccc tcataatgac aaaatatctt gctcctgtgt cacctgtagc gaattgagaa 33720

tggcaacatc aattgacatg cccttggctc taagttcttc tttaagttct agttgtaaaa 33780

actctctcat attatcacca aactgcttag ccagaagccc cccgggaaca agagcagggg 33840

acgctacagt gcagtacaag cgcagacctc cccaattggc tccagcaaaa acaagattgg 33900

aataagcata ttgggaaccg ccagtaatat catcgaagtt gctggaaata taatcaggca 33960

gagtttcttg taaaaattga ataaaagaaa aatttgccaa aaaaacattc aaaacctctg 34020

ggatgcaaat gcaataggtt accgcgctgc gctccaacat tgttagtttt gaattagtct 34080

gcaaaaataa aaaaaaaaac aagcgtcata tcatagtagc ctgacgaaca gatggataaa 34140

tcagtctttc catcacaaga caagccacag ggtctccagc tcgaccctcg taaaacctgt 34200

catcatgatt aaacaacagc accgaaagtt cctcgcggtg accagcatga ataattcttg 34260

atgaagcata caatccagac atgttagcat cagttaacga gaaaaaacag ccaacatagc 34320

ctttgggtat aattatgctt aatcgtaagt atagcaaagc cacccctcgc ggatacaaag 34380

taaaaggcac aggagaataa aaaatataat tatttctctg ctgctgttca ggcaacgtcg 34440

cccccggtcc ctctaaatac acatacaaag cctcatcagc catggcttac cagacaaagt 34500

acagcgggca cacaaagcac aagctctaaa gtgactctcc aacctctcca caatatatat 34560

atacacaagc cctaaactga cgtaatggga gtaaagtgta aaaaatcccg ccaaacccaa 34620

cacacacccc gaaactgcgt caccagggaa aagtacagtt tcacttccgc aatcccaaca 34680

ggcgtaactt cctctttctc acggtacgtg atatcccact aacttgcaac gtcattttcc 34740

cacggtcgca ccgccccttt tagccgttaa ccccacagcc aatcaccaca cgatccacac 34800

tttttaaaat cacctcattt acatattggc accattccat ctataaggta tattatatag 34860

ataga 34865

<210> 82
<211> 34186
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-606 (EnAd-SA-FAPBiTE) without deca-His tag

<400> 82
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cagatgtgca actcgtgcag tccggtgcgg aagtgaaaaa 30240

gccgggcgcg agcgtcaaag tgtcatgcaa ggcgtcagga tatacgttta ctagatacac 30300

tatgcactgg gtgcgccagg cacctggtca gggccttgaa tggatcggct acatcaatcc 30360

gtcgagaggc tacactaatt acgcggactc agtcaaaggg cgcttcacga ttacgaccga 30420

caagtccacc tcgactgcat acatggaact gtcctcgctg agaagcgagg acaccgctac 30480

ttactactgc gctagatact acgatgatca ctactgcctc gattactggg gccagggaac 30540

cactgtcacg gtgtcatcgg gagagggcac ctcaaccgga tcaggggggat cgggaggctc 30600

gggcggcgca gacgacatcg tcctgaccca gtcgcccgcc accttgtcgc tgtccccagg 30660

agaaagagcg accctgtcat gccgggcgtc gcaaagcgtg agctatatga attggtatca 30720

gcagaagcca ggaaaggcgc cgaagagatg gatctacgac acctccaagg tcgcttcagg 30780

tgtcccggct agattctcag gatcgggatc aggaacggac tactccctga ccatcaattc 30840

actggaagca gaagatgcgg ccacctacta ctgtcagcag tggtcctcca acccgctgac 30900

tttcggaggc ggaactaagg tcgagatcaa gtaggctagc ttgactgact gagatacagc 30960

gtaccttcag ctcacagaca tgataagata cattgatgag tttggacaaa ccacaactag 31020

aatgcagtga aaaaaatgct ttatttgtga aatttgtgat gctattgctt tatttgtaac 31080

cattataagc tgcaataaac aagttaacaa caacaattgc attcatttta tgtttcaggt 31140

tcaggggggag gtgtgggagg ttttttaaag caagtaaaac ctctacaaat gtggtagtcg 31200

tcagctatcc tgcaggaact tgtttatttg aaaatcaatt cacaaaatcc gagtagttat 31260

tttgcctccc ccttcccatt taacagaata caccaatctc tccccacgca cagctttaaa 31320

catttggata ccattagata tagacatggt tttagattcc acattccaaa cagtttcaga 31380

gcgagccaat ctggggtcag tgatagataa aaatccatcg ggatagtctt ttaaagcgct 31440

ttcacagtcc aactgctgcg gatgcgactc cggagtctgg atcacggtca tctggaagaa 31500

gaacgatggg aatcataatc cgaaaacggt atcggacgat tgtgtctcat caaacccaca 31560

agcagccgct gtctgcgtcg ctccgtgcga ctgctgttta tgggatcagg gtccacagtg 31620

tcctgaagca tgattttaat agcccttaac atcaactttc tggtgcgatg cgcgcagcaa 31680

cgcattctga tttcactcaa atctttgcag taggtacaac acattattac aatattgttt 31740

aataaaccat aattaaaagc gctccagcca aaactcatat ctgatataat cgcccctgca 31800

tgaccatcat accaaagttt aatataaatt aaatgacgtt ccctcaaaaa cacactaccc 31860

acatacatga tctcttttgg catgtgcata ttaacaatct gtctgtacca tggacaacgt 31920

tggttaatca tgcaacccaa tataaccttc cggaaccaca ctgccaacac cgctccccca 31980

gccatgcatt gaagtgaacc ctgctgatta caatgacaat gaagaaccca attctctcga 32040

ccgtgaatca cttgagaatg aaaaatatct atagtggcac aacatagaca taaatgcatg 32100

catcttctca taatttttaa ctcctcagga tttagaaaca tatcccaggg aataggaagc 32160

tcttgcagaa cagtaaagct ggcagaacaa ggaagaccac gaacacaact tacactatgc 32220

atagtcatag tatcacaatc tggcaacagc gggtggtctt cagtcataga agctcgggtt 32280

tcattttcct cacaacgtgg taactgggct ctggtgtaag ggtgatgtct ggcgcatgat 32340

gtcgagcgtg cgcgcaacct tgtcataatg gagttgcttc ctgacattct cgtattttgt 32400

atagcaaaac gcggccctgg cagaacacac tcttcttcgc cttctatcct gccgcttagc 32460

gtgttccgtg tgatagttca agtacaacca cactcttaag ttggtcaaaa gaatgctggc 32520

ttcagttgta atcaaaactc catcgcatct aatcgttctg aggaaatcat ccaagcaatg 32580

caactggatt gtgtttcaag caggagagga gagggaagag acggaagaac catgttaatt 32640

tttattccaa acgatctcgc agtacttcaa attgtagatc gcgcagatgg catctctcgc 32700

ccccactgtg ttggtgaaaa agcacagcta gatcaaaaga aatgcgattt tcaaggtgct 32760

caacggtggc ttccagcaaa gcctccacgc gcacatccaa gaacaaaaga ataccaaaag 32820

aaggagcatt ttctaactcc tcaatcatca tattacattc ctgcaccatt cccagataat 32880

tttcagcttt ccagccttga attattcgtg tcagttcttg tggtaaatcc aatccacaca 32940

ttacaaacag gtcccggagg gcgccctcca ccaccattct taaacacacc ctcataatga 33000

caaaatatct tgctcctgtg tcacctgtag cgaattgaga atggcaacat caattgacat 33060

gcccttggct ctaagttctt ctttaagttc tagttgtaaa aactctctca tattatcacc 33120

aaactgctta gccagaagcc ccccgggaac aagagcaggg gacgctacag tgcagtacaa 33180

gcgcagacct ccccaattgg ctccagcaaa aacaagattg gaataagcat attgggaacc 33240

gccagtaata tcatcgaagt tgctggaaat ataatcaggc agagtttctt gtaaaaattg 33300

aataaaagaa aaatttgcca aaaaaacatt caaaacctct gggatgcaaa tgcaataggt 33360

taccgcgctg cgctccaaca ttgttagttt tgaattagtc tgcaaaaata aaaaaaaaaa 33420

caagcgtcat atcatagtag cctgacgaac agatggataa atcagtcttt ccatcacaag 33480

acaagccaca gggtctccag ctcgaccctc gtaaaacctg tcatcatgat taaacaacag 33540

caccgaaagt tcctcgcggt gaccagcatg aataattctt gatgaagcat acaatccaga 33600

catgttagca tcagttaacg agaaaaaaca gccaacatag cctttgggta taattatgct 33660

taatcgtaag tatagcaaag ccacccctcg cggatacaaa gtaaaaggca caggagaata 33720

aaaaatataa ttatttctct gctgctgttc aggcaacgtc gcccccggtc cctctaaata 33780

cacatacaaa gcctcatcag ccatggctta ccagacaaag tacagcgggc acacaaagca 33840

caagctctaa agtgactctc caacctctcc acaatatata tatacacaag ccctaaactg 33900

acgtaatggg agtaaagtgt aaaaaatccc gccaaaccca acacacaccc cgaaactgcg 33960

tcaccaggga aaagtacagt ttcacttccg caatcccaac aggcgtaact tcctctttct 34020

cacggtacgt gatatcccac taacttgcaa cgtcattttc ccacggtcgc accgcccctt 34080

ttagccgtta accccacagc caatcaccac acgatccaca ctttttaaaa tcacctcatt 34140

tacatattgg caccattcca tctataaggt atattatata gataga 34186

<210> 83
<211> 1539
<212> DNA
<213> Artificial Sequence

<220>
<223> EpCam BiTE nucleic acid sequence (OKT3)

<400> 83
atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt gcatagcgaa 60

ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa ggtcaccatg 120

tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta cctcacgtgg 180

tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag cacccgcgag 240

tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac cctaaccatc 300

agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta ctcgtaccct 360

ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag cggcggggga 420

ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc cgaactggtc 480

cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt taccaattac 540

tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg cgacatcttc 600

ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac tctgactgcc 660

gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga agacagcgcg 720

gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg gggacaagga 780

actaccgtga ccgtctcctc cggcggcggt ggaagccagg tgcagctgca gcagtctggg 840

gctgaactgg caagacctgg ggcctcagtg aagatgtcct gcaaggcttc tggctacacc 900

tttactaggt acacgatgca ctgggtaaaa cagaggcctg gacagggtct ggaatggatt 960

ggatacatta atcctagccg tggttatact aattacaatc agaagttcaa ggacaaggcc 1020

acattgacta cagacaaatc ctccagcaca gcctacatgc aactgagcag cctgacatct 1080

gaggactctg cagtctatta ctgtgcaaga tattatgatg atcattactg ccttgactac 1140

tggggccaag gcaccactct cacagtctcc tcaggtggcg gtggctcggg cggtggtgga 1200

tctggtggcg gcggatctga tatcgtgctc actcagtctc cagcaatcat gtctgcatct 1260

ccaggggaga aggtcaccat gacctgcagt gccagctcaa gtgtaagtta catgaactgg 1320

taccagcaga agtcaggcac ctcccccaaa agatggattt atgacacatc caaactggct 1380

tctggagtcc ctgctcactt caggggcagt gggtctggga cctcttactc tctcacaatc 1440

agcggcatgg aggctgaaga tgctgccact tattactgcc agcagtggag tagtaaccca 1500

ttcacgttcg gctcggggac aaagttggaa ataaaccgg 1539

<210> 84

<400> 84
000

<210> 85
<211> 1551
<212> DNA
<213> Artificial Sequence

<220>
<223> FAP BiTE nucleic acid sequence (OKT3)

<400> 85
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca ggtgcagctg 840

cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc ctgcaaggct 900

tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc tggacagggt 960

ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa tcagaagttc 1020

aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat gcaactgagc 1080

agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga tgatcattac 1140

tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg cggtggctcg 1200

ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc tccagcaatc 1260

atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc aagtgtaagt 1320

tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat ttatgacaca 1380

tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg gacctcttac 1440

tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg ccagcagtgg 1500

agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg g 1551

<210> 86

<400> 86
000

<210> 87
<211> 1557
<212> DNA
<213> Artificial Sequence

<220>
<223> FAP BiTE nucleic acid sequence (aCD3)

<400> 87
atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt ccattcggac 60

atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg ggcgactatc 120

aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta cctggcctgg 180

tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc cacccgcgaa 240

agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac tctgaccatt 300

agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt ctcctatccg 360

ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag cgggggaggc 420

ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga agtcaagaag 480

ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac tgagtacacg 540

atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg gatcaaccca 600

aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat caccgtggat 660

acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga caccgcggtc 720

tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc gatggattac 780

tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaga tgtgcaactc 840

gtgcagtccg gtgcggaagt gaaaaagccg ggcgcgagcg tcaaagtgtc atgcaaggcg 900

tcaggatata cgtttactag atacactatg cactgggtgc gccaggcacc tggtcagggc 960

cttgaatgga tcggctacat caatccgtcg agaggctaca ctaattacgc ggactcagtc 1020

aaagggcgct tcacgattac gaccgacaag tccacctcga ctgcatacat ggaactgtcc 1080

tcgctgagaa gcgaggacac cgctacttac tactgcgcta gatactacga tgatcactac 1140

tgcctcgatt actggggcca gggaaccact gtcacggtgt catcgggaga gggcacctca 1200

accggatcag ggggatcggg aggctcgggc ggcgcagacg acatcgtcct gacccagtcg 1260

cccgccacct tgtcgctgtc cccaggagaa agagcgaccc tgtcatgccg ggcgtcgcaa 1320

agcgtgagct atatgaattg gtatcagcag aagccaggaa aggcgccgaa gagatggatc 1380

tacgacacct ccaaggtcgc ttcaggtgtc ccggctagat tctcaggatc gggatcagga 1440

acggactact ccctgaccat caattcactg gaagcagaag atgcggccac ctactactgt 1500

cagcagtggt cctccaaccc gctgactttc ggaggcggaa ctaaggtcga gatcaag 1557

<210> 88
<211> 1856
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-611 Transgene cassette

<400> 88
caggcccacc atgggatgga gctgcatcat cctattcctc gtggcgacgg ccactggagt 60

gcatagcgaa ctggtgatga ctcagtcccc gtcatccctg acggtgaccg ccggcgagaa 120

ggtcaccatg tcgtgcaagt cctcgcaaag cctgcttaac agcggcaacc agaaaaacta 180

cctcacgtgg tatcagcaaa agccaggtca acccccaaaa ctgctcatct actgggcgag 240

cacccgcgag tcgggggtgc cagaccggtt caccggctcc gggtcaggaa ctgatttcac 300

cctaaccatc agctcggtgc aagcggagga cctggccgtg tactactgcc aaaatgatta 360

ctcgtaccct ctgacctttg gagcgggcac caagctcgaa atcaagggcg gtggaggaag 420

cggcgggga ggctcaggtg ggggaggatc agaagtccaa ctgctggagc agtcaggagc 480

cgaactggtc cgcccgggaa cctccgtcaa gatttcctgt aaggcttccg gctacgcttt 540

taccaattac tggctgggct gggtcaagca aagaccgggg catggcctgg agtggatcgg 600

cgacatcttc ccagggagcg gcaacatcca ctacaacgag aagttcaagg ggaaagcgac 660

tctgactgcc gacaaatcat ccagcaccgc ctacatgcag ctgtcgtcgc tcactttcga 720

agacagcgcg gtgtactttt gtgctcggct ccggaactgg gatgaaccaa tggactactg 780

gggacaagga actaccgtga ccgtctcctc cggcggcggt ggaagccagg tgcagctgca 840

gcagtctggg gctgaactgg caagacctgg ggcctcagtg aagatgtcct gcaaggcttc 900

tggctacacc tttactaggt acacgatgca ctgggtaaaa cagaggcctg gacagggtct 960

ggaatggatt ggatacatta atcctagccg tggttatact aattacaatc agaagttcaa 1020

ggacaaggcc acattgacta cagacaaatc ctccagcaca gcctacatgc aactgagcag 1080

cctgacatct gaggactctg cagtctatta ctgtgcaaga tattatgatg atcattactg 1140

ccttgactac tggggccaag gcaccactct cacagtctcc tcaggtggcg gtggctcggg 1200

cggtggtgga tctggtggcg gcggatctga tatcgtgctc actcagtctc cagcaatcat 1260

gtctgcatct ccaggggaga aggtcaccat gacctgcagt gccagctcaa gtgtaagtta 1320

catgaactgg taccagcaga agtcaggcac ctcccccaaa agatggattt atgacacatc 1380

caaactggct tctggagtcc ctgctcactt caggggcagt gggtctggga cctcttactc 1440

tctcacaatc agcggcatgg aggctgaaga tgctgccact tattactgcc agcagtggag 1500

tagtaaccca ttcacgttcg gctcggggac aaagttggaa ataaaccggc atcaccatca 1560

ccatcaccac catcaccatt aggctagctt gactgactga gatacagcgt accttcagct 1620

cacagacatg ataagataca ttgatgagtt tggacaaacc acaactagaa tgcagtgaaa 1680

aaaatgcttt atttgtgaaa tttgtgatgc tattgcttta tttgtaacca ttataagctg 1740

caataaacaa gttaacaaca acaattgcat tcattttatg tttcaggttc agggggaggt 1800

gtgggaggtt ttttaaagca agtaaaacct ctacaaatgt ggtagtcgtc agctat 1856

<210> 89
<211> 1868
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-612 Transgene cassette

<400> 89
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc 240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac 300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt 360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag 420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga 480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac 540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg 600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat 660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga 720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc 780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca 840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc 900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc 960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa 1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat 1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga 1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg 1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc 1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc 1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat 1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg 1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg 1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg 1560

gcatcaccat caccatcacc accatcacca ttaggctagc ttgactgact gagatacagc 1620

gtaccttcag ctcacagaca tgataagata cattgatgag tttggacaaa ccacaactag 1680

aatgcagtga aaaaaatgct ttatttgtga aatttgtgat gctattgctt tatttgtaac 1740

cattataagc tgcaataaac aagttaacaa caacaattgc attcatttta tgtttcaggt 1800

tcaggggggag gtgtgggagg ttttttaaag caagtaaaac ctctacaaat gtggtagtcg 1860

tcagctat 1868

<210> 90
<211> 1878
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-613 Transgene cassette

<400> 90
tttctctctt caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg 60

ctaccggagt ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac 120

tgggagagcg ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc 180

agaaaaacta cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct 240

tctgggcctc cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa 300

ctgactttac tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc 360

agcagtattt ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag 420

ggggcggcag cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat 480

ccggagccga agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct 540

acaccttcac tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt 600

ggatcggcgg gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc 660

gggtgactat caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca 720

gatcggagga caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg 780

aaggacatgc gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg 840

gcggttcaca ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag 900

tgaagatgtc ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa 960

aacagaggcc tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata 1020

ctaattacaa tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca 1080

cagcctacat gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa 1140

gatattatga tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct 1200

cctcaggtgg cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc 1260

tcactcagtc tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca 1320

gtgccagctc aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca 1380

aaagatggat ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca 1440

gtgggtctgg gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca 1500

cttattactg ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg 1560

aaataaaccg gcatcaccat caccatcacc accatcacca ttaggctagc ttgactgact 1620

gagatacagc gtaccttcag ctcacagaca tgataagata cattgatgag tttggacaaa 1680

ccacaactag aatgcagtga aaaaaatgct ttatttgtga aatttgtgat gctattgctt 1740

tatttgtaac cattataagc tgcaataaac aagttaacaa caacaattgc attcatttta 1800

tgtttcaggt tcaggggggag gtgtgggagg ttttttaaag caagtaaaac ctctacaaat 1860

gtggtagtcg tcagctat 1878

<210> 91
<211> 1884
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-614 Transgene cassette

<400> 91
tttctctctt caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg 60

ctaccggagt ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac 120

tgggagagcg ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc 180

agaaaaacta cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct 240

tctgggcctc cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa 300

ctgactttac tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc 360

agcagtattt ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag 420

ggggcggcag cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat 480

ccggagccga agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct 540

acaccttcac tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt 600

ggatcggcgg gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc 660

gggtgactat caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca 720

gatcggagga caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg 780

aaggacatgc gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg 840

gcggttcaga tgtgcaactc gtgcagtccg gtgcggaagt gaaaaagccg ggcgcgagcg 900

tcaaagtgtc atgcaaggcg tcaggatata cgtttactag atacactatg cactgggtgc 960

gccaggcacc tggtcagggc cttgaatgga tcggctacat caatccgtcg agaggctaca 1020

ctaattacgc ggactcagtc aaagggcgct tcacgattac gaccgacaag tccacctcga 1080

ctgcatacat ggaactgtcc tcgctgagaa gcgaggacac cgctacttac tactgcgcta 1140

gatactacga tgatcactac tgcctcgatt actggggcca gggaaccact gtcacggtgt 1200

catcgggaga gggcacctca accggatcag ggggatcggg aggctcgggc ggcgcagacg 1260

acatcgtcct gacccagtcg cccgccacct tgtcgctgtc cccaggagaa agagcgaccc 1320

tgtcatgccg ggcgtcgcaa agcgtgagct atatgaattg gtatcagcag aagccaggaa 1380

aggcgccgaa gagatggatc tacgacacct ccaaggtcgc ttcaggtgtc ccggctagat 1440

tctcaggatc gggatcagga acggactact ccctgaccat caattcactg gaagcagaag 1500

atgcggccac ctactactgt cagcagtggt cctccaaccc gctgactttc ggaggcggaa 1560

ctaaggtcga gatcaagcat caccatcacc atcaccacca tcaccattag gctagcttga 1620

ctgactgaga tacagcgtac cttcagctca cagacatgat aagatacatt gatgagtttg 1680

gacaaaccac aactagaatg cagtgaaaaa aatgctttat ttgtgaaatt tgtgatgcta 1740

ttgctttatt tgtaaccatt ataagctgca ataaacaagt taacaacaac aattgcattc 1800

attttatgtt tcaggttcag ggggaggtgt gggaggtttt ttaaagcaag taaaacctct 1860

acaaatgtgg tagtcgtcag ctat 1884

<210> 92
<211> 1838
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-617 Transgene cassette

<400> 92
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

```
cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc      240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac      300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt      360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag      420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga      480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac      540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg      600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat      660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga      720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc      780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca      840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc      900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc      960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa     1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat     1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga     1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg     1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc     1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc     1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat     1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg     1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg     1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg     1560

gtaggctagc ttgactgact gagatacagc gtaccttcag ctcacagaca tgataagata     1620

cattgatgag tttggacaaa ccacaactag aatgcagtga aaaaaatgct ttatttgtga     1680

aatttgtgat gctattgctt tatttgtaac cattataagc tgcaataaac aagttaacaa     1740
```

caacaattgc attcatttta tgtttcaggt tcagggggag gtgtgggagg ttttttaaag 1800

caagtaaaac ctctacaaat gtggtagtcg tcagctat 1838

<210> 93
<211> 513
<212> PRT
<213> Artificial Sequence

<220>
<223> EpCam BiTE amino acid sequence (OKT3)

<400> 93

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1 5 10 15

Val His Ser Glu Leu Val Met Thr Gln Ser Pro Ser Ser Leu Thr Val
20 25 30

Thr Ala Gly Glu Lys Val Thr Met Ser Cys Lys Ser Ser Gln Ser Leu
35 40 45

Leu Asn Ser Gly Asn Gln Lys Asn Tyr Leu Thr Trp Tyr Gln Gln Lys
50 55 60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu
65 70 75 80

Ser Gly Val Pro Asp Arg Phe Thr Gly Ser Gly Ser Gly Thr Asp Phe
85 90 95

Thr Leu Thr Ile Ser Ser Val Gln Ala Glu Asp Leu Ala Val Tyr Tyr
100 105 110

Cys Gln Asn Asp Tyr Ser Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys
115 120 125

Leu Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
130 135 140

Gly Gly Ser Glu Val Gln Leu Leu Glu Gln Ser Gly Ala Glu Leu Val

```
145                 150                 155                 160

Arg Pro Gly Thr Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Ala
                165                 170                 175

Phe Thr Asn Tyr Trp Leu Gly Trp Val Lys Gln Arg Pro Gly His Gly
            180                 185                 190

Leu Glu Trp Ile Gly Asp Ile Phe Pro Gly Ser Gly Asn Ile His Tyr
        195                 200                 205

Asn Glu Lys Phe Lys Gly Lys Ala Thr Leu Thr Ala Asp Lys Ser Ser
    210                 215                 220

Ser Thr Ala Tyr Met Gln Leu Ser Ser Leu Thr Phe Glu Asp Ser Ala
225                 230                 235                 240

Val Tyr Phe Cys Ala Arg Leu Arg Asn Trp Asp Glu Pro Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Gly Gly Gly Ser
            260                 265                 270

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Ala Arg Pro Gly Ala
        275                 280                 285

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Arg Tyr
    290                 295                 300

Thr Met His Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
305                 310                 315                 320

Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr Asn Gln Lys Phe
                325                 330                 335

Lys Asp Lys Ala Thr Leu Thr Thr Asp Lys Ser Ser Ser Thr Ala Tyr
            340                 345                 350

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
```

```
        355                 360                 365

Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr Trp Gly Gln Gly
    370                 375                 380

Thr Thr Leu Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly
385                 390                 395                 400

Ser Gly Gly Gly Gly Ser Asp Ile Val Leu Thr Gln Ser Pro Ala Ile
                405                 410                 415

Met Ser Ala Ser Pro Gly Glu Lys Val Thr Met Thr Cys Ser Ala Ser
            420                 425                 430

Ser Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys Ser Gly Thr Ser
        435                 440                 445

Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Leu Ala Ser Gly Val Pro
    450                 455                 460

Ala His Phe Arg Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile
465                 470                 475                 480

Ser Gly Met Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp
                485                 490                 495

Ser Ser Asn Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Asn
            500                 505                 510

Arg
```

<210> 94
<211> 517
<212> PRT
<213> Artificial Sequence

<220>
<223> FAP BiTE amino acid sequence (OKT3)

<400> 94

```
Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1               5                  10                  15

Val His Ser Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val
            20                  25                  30

Ser Leu Gly Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu
        35                  40                  45

Leu Tyr Ser Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys
    50                  55                  60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu
65                  70                  75                  80

Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Gln Gln Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys
        115                 120                 125

Val Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140

Gly Gly Ser Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys
145                 150                 155                 160

Pro Gly Ala Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe
                165                 170                 175

Thr Glu Tyr Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu
            180                 185                 190

Glu Trp Ile Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn
        195                 200                 205
```

```
Gln Lys Phe Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser
    210                 215                 220

Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val
225                 230                 235                 240

Tyr Tyr Cys Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His
                245                 250                 255

Ala Met Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser Gly
            260                 265                 270

Gly Gly Gly Ser Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Ala
        275                 280                 285

Arg Pro Gly Ala Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr
    290                 295                 300

Phe Thr Arg Tyr Thr Met His Trp Val Lys Gln Arg Pro Gly Gln Gly
305                 310                 315                 320

Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr
                325                 330                 335

Asn Gln Lys Phe Lys Asp Lys Ala Thr Leu Thr Thr Asp Lys Ser Ser
            340                 345                 350

Ser Thr Ala Tyr Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala
        355                 360                 365

Val Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr
    370                 375                 380

Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser Gly Gly Gly Gly Ser
385                 390                 395                 400

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Asp Ile Val Leu Thr Gln
                405                 410                 415
```

```
Ser Pro Ala Ile Met Ser Ala Ser Pro Gly Glu Lys Val Thr Met Thr
            420                 425                 430


Cys Ser Ala Ser Ser Ser Val Ser Tyr Met Asn Trp Tyr Gln Gln Lys
        435                 440                 445


Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr Asp Thr Ser Lys Leu Ala
    450                 455                 460


Ser Gly Val Pro Ala His Phe Arg Gly Ser Gly Ser Gly Thr Ser Tyr
465                 470                 475                 480


Ser Leu Thr Ile Ser Gly Met Glu Ala Glu Asp Ala Ala Thr Tyr Tyr
                485                 490                 495


Cys Gln Gln Trp Ser Ser Asn Pro Phe Thr Phe Gly Ser Gly Thr Lys
            500                 505                 510


Leu Glu Ile Asn Arg
        515


<210>  95
<211>  519
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  FAP BiTE amino acid sequence (aCD3)

<400>  95

Met Gly Trp Ser Cys Ile Ile Leu Phe Leu Val Ala Thr Ala Thr Gly
1               5                   10                  15


Val His Ser Asp Ile Val Met Thr Gln Ser Pro Asp Ser Leu Ala Val
            20                  25                  30


Ser Leu Gly Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Leu
        35                  40                  45


Leu Tyr Ser Arg Asn Gln Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys
```

```
    50                  55                  60

Pro Gly Gln Pro Pro Lys Leu Leu Ile Phe Trp Ala Ser Thr Arg Glu
65                  70                  75                  80

Ser Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Phe Gly Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Gln Gln Tyr Phe Ser Tyr Pro Leu Thr Phe Gly Gln Gly Thr Lys
        115                 120                 125

Val Glu Ile Lys Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
    130                 135                 140

Gly Gly Ser Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys
145                 150                 155                 160

Pro Gly Ala Ser Val Lys Val Ser Cys Lys Thr Ser Arg Tyr Thr Phe
                165                 170                 175

Thr Glu Tyr Thr Ile His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu
            180                 185                 190

Glu Trp Ile Gly Gly Ile Asn Pro Asn Asn Gly Ile Pro Asn Tyr Asn
        195                 200                 205

Gln Lys Phe Lys Gly Arg Val Thr Ile Thr Val Asp Thr Ser Ala Ser
    210                 215                 220

Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val
225                 230                 235                 240

Tyr Tyr Cys Ala Arg Arg Arg Ile Ala Tyr Gly Tyr Asp Glu Gly His
                245                 250                 255

Ala Met Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser Gly
```

```
            260                 265                 270

Gly Gly Gly Ser Asp Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys
        275                 280                 285

Lys Pro Gly Ala Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr
    290                 295                 300

Phe Thr Arg Tyr Thr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly
305                 310                 315                 320

Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr Thr Asn Tyr
                325                 330                 335

Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Thr Thr Asp Lys Ser Thr
            340                 345                 350

Ser Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala
        355                 360                 365

Thr Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys Leu Asp Tyr
    370                 375                 380

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser Gly Glu Gly Thr Ser
385                 390                 395                 400

Thr Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Asp Asp Ile Val
                405                 410                 415

Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala
            420                 425                 430

Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Tyr Met Asn Trp Tyr
        435                 440                 445

Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Trp Ile Tyr Asp Thr Ser
    450                 455                 460

Lys Val Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Gly
```

465 470 475 480

Thr Asp Tyr Ser Leu Thr Ile Asn Ser Leu Glu Ala Glu Asp Ala Ala
485 490 495

Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr Phe Gly Gly
500 505 510

Gly Thr Lys Val Glu Ile Lys
515

<210> 96
<211> 34198
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-611 Genome

<400> 96
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac caccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatggga tggagctgca tcatcctatt 29400

cctcgtggcg acggccactg gagtgcatag cgaactggtg atgactcagt ccccgtcatc 29460

cctgacggtg accgccggcg agaaggtcac catgtcgtgc aagtcctcgc aaagcctgct 29520

taacagcggc aaccagaaaa actacctcac gtggtatcag caaaagccag gtcaaccccc 29580

aaaactgctc atctactggg cgagcacccg cgagtcgggg gtgccagacc ggttcaccgg 29640

ctccgggtca ggaactgatt tcaccctaac catcagctcg gtgcaagcgg aggacctggc 29700

cgtgtactac tgccaaaatg attactcgta ccctctgacc tttggagcgg gcaccaagct 29760

cgaaatcaag ggcggtggag gaagcggcgg gggaggctca ggtgggggag gatcagaagt 29820

ccaactgctg gagcagtcag gagccgaact ggtccgcccg ggaacctccg tcaagatttc 29880

ctgtaaggct tccggctacg cttttaccaa ttactggctg ggctgggtca agcaaagacc 29940

ggggcatggc ctggagtgga tcggcgacat cttcccaggg agcggcaaca tccactacaa 30000

cgagaagttc aaggggaaag cgactctgac tgccgacaaa tcatccagca ccgcctacat 30060

gcagctgtcg tcgctcactt tcgaagacag cgcggtgtac ttttgtgctc ggctccggaa 30120

ctgggatgaa ccaatggact actggggaca aggaactacc gtgaccgtct cctccggcgg 30180

cggtggaagc caggtgcagc tgcagcagtc tggggctgaa ctggcaagac ctggggcctc 30240

agtgaagatg tcctgcaagg cttctggcta cacctttact aggtacacga tgcactgggt 30300

aaaacagagg cctggacagg gtctggaatg gattggatac attaatccta gccgtggtta 30360

tactaattac aatcagaagt tcaaggacaa ggccacattg actacagaca aatcctccag 30420

cacagcctac atgcaactga gcagcctgac atctgaggac tctgcagtct attactgtgc 30480

aagatattat gatgatcatt actgccttga ctactggggc caaggcacca ctctcacagt 30540

ctcctcaggt ggcggtggct cgggcggtgg tggatctggt ggcggcggat ctgatatcgt 30600

gctcactcag tctccagcaa tcatgtctgc atctccaggg gagaaggtca ccatgacctg 30660

cagtgccagc tcaagtgtaa gttacatgaa ctggtaccag cagaagtcag gcacctcccc 30720

caaaagatgg atttatgaca catccaaact ggcttctgga gtccctgctc acttcagggg 30780

cagtgggtct gggacctctt actctctcac aatcagcggc atggaggctg aagatgctgc 30840

cacttattac tgccagcagt ggagtagtaa cccattcacg ttcggctcgg ggacaaagtt 30900

ggaaataaac cggcatcacc atcaccatca ccaccatcac cattaggcta gcttgactga 30960

ctgagataca gcgtaccttc agctcacaga catgataaga tacattgatg agtttggaca 31020

aaccacaact agaatgcagt gaaaaaaatg ctttatttgt gaaatttgtg atgctattgc 31080

tttatttgta accattataa gctgcaataa acaagttaac aacaacaatt gcattcattt 31140

tatgtttcag gttcaggggg aggtgtggga ggtttttaa agcaagtaaa acctctacaa 31200

atgtggtagt cgtcagctat cctgcaggaa cttgtttatt tgaaaatcaa ttcacaaaat 31260

ccgagtagtt attttgcctc ccccttccca tttaacagaa tacaccaatc tctccccacg 31320

cacagcttta aacatttgga taccattaga tatagacatg gttttagatt ccacattcca 31380

aacagtttca gagcgagcca atctggggtc agtgatagat aaaaatccat cgggatagtc 31440

ttttaaagcg ctttcacagt ccaactgctg cggatgcgac tccggagtct ggatcacggt 31500

catctggaag aagaacgatg ggaatcataa tccgaaaacg gtatcggacg attgtgtctc 31560

atcaaaccca caagcagccg ctgtctgcgt cgctccgtgc gactgctgtt tatgggatca 31620

gggtccacag tgtcctgaag catgatttta atagccctta acatcaactt tctggtgcga 31680

tgcgcgcagc aacgcattct gatttcactc aaatctttgc agtaggtaca acacattatt 31740

acaatattgt ttaataaacc ataattaaaa gcgctccagc caaaactcat atctgatata 31800

atcgcccctg catgaccatc ataccaaagt ttaatataaa ttaaatgacg ttccctcaaa 31860

aacacactac ccacatacat gatctctttt ggcatgtgca tattaacaat ctgtctgtac 31920

catggacaac gttggttaat catgcaaccc aatataacct tccggaacca cactgccaac 31980

accgctcccc cagccatgca ttgaagtgaa ccctgctgat tacaatgaca atgaagaacc 32040

caattctctc gaccgtgaat cacttgagaa tgaaaaatat ctatagtggc acaacataga 32100

cataaatgca tgcatcttct cataattttt aactcctcag gatttagaaa catatcccag 32160

ggaataggaa gctcttgcag aacagtaaag ctggcagaac aaggaagacc acgaacacaa 32220

cttacactat gcatagtcat agtatcacaa tctggcaaca gcgggtggtc ttcagtcata 32280

gaagctcggg tttcattttc ctcacaacgt ggtaactggg ctctggtgta agggtgatgt 32340

ctggcgcatg atgtcgagcg tgcgcgcaac cttgtcataa tggagttgct tcctgacatt 32400

ctcgtatttt gtatagcaaa acgcggccct ggcagaacac actcttcttc gccttctatc 32460

ctgccgctta gcgtgttccg tgtgatagtt caagtacaac cacactctta agttggtcaa 32520

aagaatgctg gcttcagttg taatcaaaac tccatcgcat ctaatcgttc tgaggaaatc 32580

atccaagcaa tgcaactgga ttgtgtttca agcaggagag gagagggaag agacggaaga 32640

accatgttaa tttttattcc aaacgatctc gcagtacttc aaattgtaga tcgcgcagat 32700

ggcatctctc gcccccactg tgttggtgaa aaagcacagc tagatcaaaa gaaatgcgat 32760

tttcaaggtg ctcaacggtg gcttccagca aagcctccac gcgcacatcc aagaacaaaa 32820

gaataccaaa agaaggagca ttttctaact cctcaatcat catattacat tcctgcacca 32880

ttcccagata attttcagct ttccagcctt gaattattcg tgtcagttct tgtggtaaat 32940

ccaatccaca cattacaaac aggtcccgga gggcgccctc caccaccatt cttaaacaca 33000

ccctcataat gacaaaatat cttgctcctg tgtcacctgt agcgaattga gaatggcaac 33060

atcaattgac atgcccttgg ctctaagttc ttctttaagt tctagttgta aaaactctct 33120

catattatca ccaaactgct tagccagaag ccccccggga acaagagcag gggacgctac 33180

agtgcagtac aagcgcagac ctccccaatt ggctccagca aaaacaagat tggaataagc 33240

atattgggaa ccgccagtaa tatcatcgaa gttgctggaa atataatcag gcagagtttc 33300

ttgtaaaaat tgaataaaag aaaaatttgc caaaaaaaca ttcaaaacct ctgggatgca 33360

aatgcaatag gttaccgcgc tgcgctccaa cattgttagt tttgaattag tctgcaaaaa 33420

taaaaaaaaa aacaagcgtc atatcatagt agcctgacga acagatggat aaatcagtct 33480

ttccatcaca agacaagcca cagggtctcc agctcgaccc tcgtaaaacc tgtcatcatg 33540

attaaacaac agcaccgaaa gttcctcgcg gtgaccagca tgaataattc ttgatgaagc 33600

atacaatcca gacatgttag catcagttaa cgagaaaaaa cagccaacat agcctttggg 33660

tataattatg cttaatcgta agtatagcaa agccacccct cgcggataca aagtaaaagg 33720

cacaggagaa taaaaaatat aattatttct ctgctgctgt tcaggcaacg tcgcccccgg 33780

tccctctaaa tacacataca aagcctcatc agccatggct taccagacaa agtacagcgg 33840

gcacacaaag cacaagctct aaagtgactc tccaacctct ccacaatata tatatacaca 33900

agccctaaac tgacgtaatg ggagtaaagt gtaaaaaatc ccgccaaacc caacacacac 33960

cccgaaactg cgtcaccagg gaaaagtaca gtttcacttc cgcaatccca acaggcgtaa 34020

cttcctcttt ctcacggtac gtgatatccc actaacttgc aacgtcattt tcccacggtc 34080

gcaccgcccc ttttagccgt taaccccaca gccaatcacc acacgatcca cacttttaa 34140

aatcacctca tttacatatt ggcaccattc catctataag gtatattata tagataga 34198

<210> 97
<211> 34210
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-612 Genome

<400> 97
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg aactggcaag 30240

acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta ctaggtacac 30300

gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat acattaatcc 30360

tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat tgactacaga 30420

caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg actctgcagt 30480

ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg gccaaggcac 30540

cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg gtggcggcgg 30600

atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag gggagaaggt 30660

caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc agcagaagtc 30720

aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg gagtccctgc 30780

tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg gcatggaggc 30840

tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca cgttcggctc 30900

ggggacaaag ttggaaataa accggcatca ccatcaccat caccaccatc accattaggc 30960

tagcttgact gactgagata cagcgtacct tcagctcaca gacatgataa gatacattga 31020

tgagtttgga caaaccacaa ctagaatgca gtgaaaaaaa tgctttattt gtgaaatttg 31080

tgatgctatt gctttatttg taaccattat aagctgcaat aaacaagtta acaacaacaa 31140

ttgcattcat tttatgtttc aggttcaggg ggaggtgtgg gaggtttttt aaagcaagta 31200

aaacctctac aaatgtggta gtcgtcagct atcctgcagg aacttgttta tttgaaaatc 31260

aattcacaaa atccgagtag ttattttgcc tccccccttcc catttaacag aatacaccaa 31320

tctctcccca cgcacagctt taaacatttg gataccatta gatatagaca tggttttaga 31380

ttccacattc caaacagttt cagagcgagc caatctgggg tcagtgatag ataaaaatcc 31440

atcgggatag tcttttaaag cgctttcaca gtccaactgc tgcggatgcg actccggagt 31500

ctggatcacg gtcatctgga agaagaacga tgggaatcat aatccgaaaa cggtatcgga 31560

cgattgtgtc tcatcaaacc cacaagcagc cgctgtctgc gtcgctccgt gcgactgctg 31620

tttatgggat cagggtccac agtgtcctga agcatgattt taatagccct taacatcaac 31680

tttctggtgc gatgcgcgca gcaacgcatt ctgatttcac tcaaatcttt gcagtaggta 31740

caacacatta ttacaatatt gtttaataaa ccataattaa aagcgctcca gccaaaactc 31800

atatctgata taatcgcccc tgcatgacca tcataccaaa gtttaatata aattaaatga 31860

cgttccctca aaaacacact acccacatac atgatctctt ttggcatgtg catattaaca 31920

atctgtctgt accatggaca acgttggtta atcatgcaac ccaatataac cttccggaac 31980

cacactgcca acaccgctcc cccagccatg cattgaagtg aaccctgctg attacaatga 32040

caatgaagaa cccaattctc tcgaccgtga atcacttgag aatgaaaaat atctatagtg 32100

gcacaacata gacataaatg catgcatctt ctcataattt ttaactcctc aggatttaga 32160

aacatatccc agggaatagg aagctcttgc agaacagtaa agctggcaga acaaggaaga 32220

ccacgaacac aacttacact atgcatagtc atagtatcac aatctggcaa cagcgggtgg 32280

tcttcagtca tagaagctcg ggtttcattt tcctcacaac gtggtaactg ggctctggtg 32340

taagggtgat gtctggcgca tgatgtcgag cgtgcgcgca accttgtcat aatggagttg 32400

cttcctgaca ttctcgtatt ttgtatagca aaacgcggcc ctggcagaac acactcttct 32460

tcgccttcta tcctgccgct tagcgtgttc cgtgtgatag ttcaagtaca accacactct 32520

taagttggtc aaaagaatgc tggcttcagt tgtaatcaaa actccatcgc atctaatcgt 32580

tctgaggaaa tcatccaagc aatgcaactg gattgtgttt caagcaggag aggagaggga 32640

agagacggaa gaaccatgtt aatttttatt ccaaacgatc tcgcagtact tcaaattgta 32700

gatcgcgcag atggcatctc tcgcccccac tgtgttggtg aaaaagcaca gctagatcaa 32760

aagaaatgcg attttcaagg tgctcaacgg tggcttccag caaagcctcc acgcgcacat 32820

ccaagaacaa aagaatacca aaagaaggag cattttctaa ctcctcaatc atcatattac 32880

attcctgcac cattcccaga taattttcag ctttccagcc ttgaattatt cgtgtcagtt 32940

cttgtggtaa atccaatcca cacattacaa acaggtcccg gagggcgccc tccaccacca 33000

ttcttaaaca caccctcata atgacaaaat atcttgctcc tgtgtcacct gtagcgaatt 33060

gagaatggca acatcaattg acatgccctt ggctctaagt tcttctttaa gttctagttg 33120

taaaaactct ctcatattat caccaaactg cttagccaga agccccccgg gaacaagagc 33180

aggggacgct acagtgcagt acaagcgcag acctccccaa ttggctccag caaaaacaag 33240

attggaataa gcatattggg aaccgccagt aatatcatcg aagttgctgg aaatataatc 33300

aggcagagtt tcttgtaaaa attgaataaa agaaaaattt gccaaaaaaa cattcaaaac 33360

ctctgggatg caaatgcaat aggttaccgc gctgcgctcc aacattgtta gttttgaatt 33420

agtctgcaaa aataaaaaaa aaaacaagcg tcatatcata gtagcctgac gaacagatgg 33480

ataaatcagt ctttccatca caagacaagc cacagggtct ccagctcgac cctcgtaaaa 33540

cctgtcatca tgattaaaca acagcaccga aagttcctcg cggtgaccag catgaataat 33600

tcttgatgaa gcatacaatc cagacatgtt agcatcagtt aacgagaaaa aacagccaac 33660

atagcctttg ggtataatta tgcttaatcg taagtatagc aaagccaccc ctcgcggata 33720

caaagtaaaa ggcacaggag aataaaaaat ataattattt ctctgctgct gttcaggcaa 33780

cgtcgccccc ggtccctcta aatacacata caaagcctca tcagccatgg cttaccagac 33840

aaagtacagc gggcacacaa agcacaagct ctaaagtgac tctccaacct ctccacaata 33900

tatatataca caagccctaa actgacgtaa tgggagtaaa gtgtaaaaaa tcccgccaaa 33960

cccaacacac accccgaaac tgcgtcacca gggaaaagta cagtttcact tccgcaatcc 34020

caacaggcgt aacttcctct ttctcacggt acgtgatatc ccactaactt gcaacgtcat 34080

tttcccacgg tcgcaccgcc ccttttagcc gttaacccca cagccaatca ccacacgatc 34140

cacacttttt aaaatcacct catttacata ttggcaccat tccatctata aggtatatta 34200

tatagataga 34210

<210> 98
<211> 34220
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-613 Genome

<400> 98
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agttttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

aggggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgctttctc tcttcaggcc caccatgggc tggagctgca 29400

tcatcttgtt cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa 29460

gccctgactc gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc 29520

agagcctgct gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg 29580

gccagcctcc caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc 29640

gcttcagcgg aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg 29700

aggacgtggc cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag 29760

gcaccaaggt ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg 29820

gatcgcaggt ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca 29880

aggtcagctg caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc 29940

aggcgcccgg ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa 30000

attacaatca gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg 30060

cgtacatgga gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc 30120

gccggatcgc ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc 30180

tcgtcacggt gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg 30240

aactggcaag acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta 30300

ctaggtacac gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat 30360

acattaatcc tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat 30420

tgactacaga caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg 30480

actctgcagt ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg 30540

gccaaggcac cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg 30600

gtggcggcgg atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag 30660

gggagaaggt caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc 30720

agcagaagtc aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg 30780

gagtccctgc tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg 30840

gcatggaggc tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca 30900

cgttcggctc ggggacaaag ttggaaataa accggcatca ccatcaccat caccaccatc 30960

accattaggc tagcttgact gactgagata cagcgtacct tcagctcaca gacatgataa 31020

gatacattga tgagtttgga caaaccacaa ctagaatgca gtgaaaaaaa tgctttattt 31080

gtgaaatttg tgatgctatt gctttatttg taaccattat aagctgcaat aaacaagtta 31140

acaacaacaa ttgcattcat tttatgtttc aggttcaggg ggaggtgtgg gaggtttttt 31200

aaagcaagta aaacctctac aaatgtggta gtcgtcagct atcctgcagg aacttgttta 31260

tttgaaaatc aattcacaaa atccgagtag ttattttgcc tccccttcc catttaacag 31320

aatacaccaa tctctcccca cgcacagctt taaacatttg gataccatta gatatagaca 31380

tggttttaga ttccacattc caaacagttt cagagcgagc caatctgggg tcagtgatag 31440

ataaaaatcc atcgggatag tcttttaaag cgctttcaca gtccaactgc tgcggatgcg 31500

actccggagt ctggatcacg gtcatctgga agaagaacga tgggaatcat aatccgaaaa 31560

cggtatcgga cgattgtgtc tcatcaaacc cacaagcagc cgctgtctgc gtcgctccgt 31620

gcgactgctg tttatgggat cagggtccac agtgtcctga agcatgattt taatagccct 31680

taacatcaac tttctggtgc gatgcgcgca gcaacgcatt ctgatttcac tcaaatcttt 31740

gcagtaggta caacacatta ttacaatatt gtttaataaa ccataattaa aagcgctcca 31800

gccaaaactc atatctgata taatcgcccc tgcatgacca tcataccaaa gtttaatata 31860

aattaaatga cgttccctca aaaacacact acccacatac atgatctctt ttggcatgtg 31920

catattaaca atctgtctgt accatggaca acgttggtta atcatgcaac ccaatataac 31980

cttccggaac cacactgcca acaccgctcc cccagccatg cattgaagtg aaccctgctg 32040

attacaatga caatgaagaa cccaattctc tcgaccgtga atcacttgag aatgaaaaat 32100

atctatagtg gcacaacata gacataaatg catgcatctt ctcataattt ttaactcctc 32160

aggatttaga aacatatccc agggaatagg aagctcttgc agaacagtaa agctggcaga 32220

acaaggaaga ccacgaacac aacttacact atgcatagtc atagtatcac aatctggcaa 32280

cagcgggtgg tcttcagtca tagaagctcg ggtttcattt tcctcacaac gtggtaactg 32340

ggctctggtg taagggtgat gtctggcgca tgatgtcgag cgtgcgcgca accttgtcat 32400

aatggagttg cttcctgaca ttctcgtatt ttgtatagca aaacgcggcc ctggcagaac 32460

acactcttct tcgccttcta tcctgccgct tagcgtgttc cgtgtgatag ttcaagtaca 32520

accacactct taagttggtc aaaagaatgc tggcttcagt tgtaatcaaa actccatcgc 32580

atctaatcgt tctgaggaaa tcatccaagc aatgcaactg gattgtgttt caagcaggag 32640

aggagaggga agagacggaa gaaccatgtt aatttttatt ccaaacgatc tcgcagtact 32700

tcaaattgta gatcgcgcag atggcatctc tcgcccccac tgtgttggtg aaaaagcaca 32760

gctagatcaa aagaaatgcg attttcaagg tgctcaacgg tggcttccag caaagcctcc 32820

acgcgcacat ccaagaacaa aagaatacca aaagaaggag cattttctaa ctcctcaatc 32880

atcatattac attcctgcac cattcccaga taattttcag ctttccagcc ttgaattatt 32940

cgtgtcagtt cttgtggtaa atccaatcca cacattacaa acaggtcccg gagggcgccc 33000

tccaccacca ttcttaaaca caccctcata atgacaaaat atcttgctcc tgtgtcacct 33060

gtagcgaatt gagaatggca acatcaattg acatgccctt ggctctaagt tcttctttaa 33120

gttctagttg taaaaactct ctcatattat caccaaactg cttagccaga agccccccgg 33180

gaacaagagc aggggacgct acagtgcagt acaagcgcag acctccccaa ttggctccag 33240

caaaaacaag attggaataa gcatattggg aaccgccagt aatatcatcg aagttgctgg 33300

aaatataatc aggcagagtt tcttgtaaaa attgaataaa agaaaaattt gccaaaaaaa 33360

cattcaaaac ctctgggatg caaatgcaat aggttaccgc gctgcgctcc aacattgtta 33420

gttttgaatt agtctgcaaa aataaaaaaa aaaacaagcg tcatatcata gtagcctgac 33480

gaacagatgg ataaatcagt ctttccatca caagacaagc cacagggtct ccagctcgac 33540

cctcgtaaaa cctgtcatca tgattaaaca acagcaccga aagttcctcg cggtgaccag 33600

catgaataat tcttgatgaa gcatacaatc cagacatgtt agcatcagtt aacgagaaaa 33660

aacagccaac atagcctttg ggtataatta tgcttaatcg taagtatagc aaagccaccc 33720

ctcgcggata caaagtaaaa ggcacaggag aataaaaaat ataattattt ctctgctgct 33780

gttcaggcaa cgtcgccccc ggtccctcta aatacacata caaagcctca tcagccatgg 33840

cttaccagac aaagtacagc gggcacacaa agcacaagct ctaaagtgac tctccaacct 33900

ctccacaata tatatataca caagccctaa actgacgtaa tgggagtaaa gtgtaaaaaa 33960

tcccgccaaa cccaacacac accccgaaac tgcgtcacca gggaaaagta cagtttcact 34020

tccgcaatcc caacaggcgt aacttcctct ttctcacggt acgtgatatc ccactaactt 34080

gcaacgtcat tttcccacgg tcgcaccgcc ccttttagcc gttaacccca cagccaatca 34140

ccacacgatc cacacttttt aaaatcacct catttacata ttggcaccat tccatctata 34200

aggtatatta tatagataga 34220

<210> 99
<211> 34226
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-614 Genome

<400> 99
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgctttctc tcttcaggcc caccatgggc tggagctgca 29400

tcatcttgtt cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa 29460

gccctgactc gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc 29520

agagcctgct gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg 29580

gccagcctcc caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc 29640

gcttcagcgg aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg 29700

aggacgtggc cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag 29760

gcaccaaggt ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg 29820

gatcgcaggt ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca 29880

aggtcagctg caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc 29940

aggcgcccgg ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa 30000

attacaatca gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg 30060

cgtacatgga gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc 30120

gccggatcgc ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc 30180

tcgtcacggt gtcgtcagga ggcggcggtt cagatgtgca actcgtgcag tccggtgcgg 30240

aagtgaaaaa gccgggcgcg agcgtcaaag tgtcatgcaa ggcgtcagga tatacgttta 30300

ctagatacac tatgcactgg gtgcgccagg cacctggtca gggccttgaa tggatcggct 30360

acatcaatcc gtcgagaggc tacactaatt acgcggactc agtcaaaggg cgcttcacga 30420

ttacgaccga caagtccacc tcgactgcat acatggaact gtcctcgctg agaagcgagg 30480

acaccgctac ttactactgc gctagatact acgatgatca ctactgcctc gattactggg 30540

gccagggaac cactgtcacg gtgtcatcgg gagagggcac ctcaaccgga tcaggggat 30600

cgggaggctc gggcggcgca gacgacatcg tcctgaccca gtcgcccgcc accttgtcgc 30660

tgtccccagg agaaagagcg accctgtcat gccgggcgtc gcaaagcgtg agctatatga 30720

attggtatca gcagaagcca ggaaaggcgc cgaagagatg gatctacgac acctccaagg 30780

tcgcttcagg tgtcccggct agattctcag gatcgggatc aggaacggac tactccctga 30840

ccatcaattc actggaagca gaagatgcgg ccacctacta ctgtcagcag tggtcctcca 30900

acccgctgac tttcggaggc ggaactaagg tcgagatcaa gcatcaccat caccatcacc 30960

accatcacca ttaggctagc ttgactgact gagatacagc gtaccttcag ctcacagaca 31020

tgataagata cattgatgag tttggacaaa ccacaactag aatgcagtga aaaaaatgct 31080

ttatttgtga aatttgtgat gctattgctt tatttgtaac cattataagc tgcaataaac 31140

aagttaacaa caacaattgc attcatttta tgtttcaggt tcagggggag gtgtgggagg 31200

ttttttaaag caagtaaaac ctctacaaat gtggtagtcg tcagctatcc tgcaggaact 31260

tgtttatttg aaaatcaatt cacaaaatcc gagtagttat tttgcctccc ccttcccatt 31320

taacagaata caccaatctc tccccacgca cagctttaaa catttggata ccattagata 31380

tagacatggt tttagattcc acattccaaa cagtttcaga gcgagccaat ctggggtcag 31440

tgatagataa aaatccatcg ggatagtctt ttaaagcgct ttcacagtcc aactgctgcg 31500

gatgcgactc cggagtctgg atcacggtca tctggaagaa gaacgatggg aatcataatc 31560

cgaaaacggt atcggacgat tgtgtctcat caaacccaca agcagccgct gtctgcgtcg 31620

ctccgtgcga ctgctgttta tgggatcagg gtccacagtg tcctgaagca tgattttaat 31680

agcccttaac atcaactttc tggtgcgatg cgcgcagcaa cgcattctga tttcactcaa 31740

atctttgcag taggtacaac acattattac aatattgttt aataaaccat aattaaaagc 31800

gctccagcca aaactcatat ctgatataat cgcccctgca tgaccatcat accaaagttt 31860

aatataaatt aaatgacgtt ccctcaaaaa cacactaccc acatacatga tctcttttgg 31920

catgtgcata ttaacaatct gtctgtacca tggacaacgt tggttaatca tgcaacccaa 31980

tataaccttc cggaaccaca ctgccaacac cgctccccca gccatgcatt gaagtgaacc 32040

ctgctgatta caatgacaat gaagaaccca attctctcga ccgtgaatca cttgagaatg 32100

aaaaatatct atagtggcac aacatagaca taaatgcatg catcttctca taatttttaa 32160

ctcctcagga tttagaaaca tatcccaggg aataggaagc tcttgcagaa cagtaaagct 32220

ggcagaacaa ggaagaccac gaacacaact tacactatgc atagtcatag tatcacaatc 32280

tggcaacagc gggtggtctt cagtcataga agctcgggtt tcattttcct cacaacgtgg 32340

taactgggct ctggtgtaag ggtgatgtct ggcgcatgat gtcgagcgtg cgcgcaacct 32400

tgtcataatg gagttgcttc ctgacattct cgtattttgt atagcaaaac gcggccctgg 32460

cagaacacac tcttcttcgc cttctatcct gccgcttagc gtgttccgtg tgatagttca 32520

agtacaacca cactcttaag ttggtcaaaa gaatgctggc ttcagttgta atcaaaactc 32580

catcgcatct aatcgttctg aggaaatcat ccaagcaatg caactggatt gtgtttcaag 32640

caggagagga gagggaagag acggaagaac catgttaatt tttattccaa acgatctcgc 32700

agtacttcaa attgtagatc gcgcagatgg catctctcgc ccccactgtg ttggtgaaaa 32760

agcacagcta gatcaaaaga aatgcgattt tcaaggtgct caacggtggc ttccagcaaa 32820

gcctccacgc gcacatccaa gaacaaaaga ataccaaaag aaggagcatt ttctaactcc 32880

tcaatcatca tattacattc ctgcaccatt cccagataat tttcagcttt ccagccttga 32940

attattcgtg tcagttcttg tggtaaatcc aatccacaca ttacaaacag gtcccggagg 33000

gcgccctcca ccaccattct taaacacacc ctcataatga caaaatatct tgctcctgtg 33060

tcacctgtag cgaattgaga atggcaacat caattgacat gcccttggct ctaagttctt 33120

ctttaagttc tagttgtaaa aactctctca tattatcacc aaactgctta gccagaagcc 33180

ccccgggaac aagagcaggg gacgctacag tgcagtacaa gcgcagacct ccccaattgg 33240

ctccagcaaa aacaagattg gaataagcat attgggaacc gccagtaata tcatcgaagt 33300

tgctggaaat ataatcaggc agagtttctt gtaaaaattg aataaaagaa aaatttgcca 33360

aaaaaacatt caaaacctct gggatgcaaa tgcaataggt taccgcgctg cgctccaaca 33420

ttgttagttt tgaattagtc tgcaaaaata aaaaaaaaaa caagcgtcat atcatagtag 33480

cctgacgaac agatggataa atcagtcttt ccatcacaag acaagccaca gggtctccag 33540

ctcgaccctc gtaaaacctg tcatcatgat taaacaacag caccgaaagt tcctcgcggt 33600

gaccagcatg aataattctt gatgaagcat acaatccaga catgttagca tcagttaacg 33660

agaaaaaaca gccaacatag cctttgggta taattatgct taatcgtaag tatagcaaag 33720

ccacccctcg cggatacaaa gtaaaaggca caggagaata aaaaatataa ttatttctct 33780

gctgctgttc aggcaacgtc gcccccggtc cctctaaata cacatacaaa gcctcatcag 33840

ccatggctta ccagacaaag tacagcgggc acacaaagca caagctctaa agtgactctc 33900

caacctctcc acaatatata tatacacaag ccctaaactg acgtaatggg agtaaagtgt 33960

aaaaaatccc gccaaaccca acacacaccc cgaaactgcg tcaccaggga aaagtacagt 34020

ttcacttccg caatcccaac aggcgtaact tcctctttct cacggtacgt gatatcccac 34080

taacttgcaa cgtcattttc ccacggtcgc accgcccctt ttagccgtta accccacagc 34140

caatcaccac acgatccaca ctttttaaaa tcacctcatt tacatattgg caccattcca 34200

tctataaggt atattatata gataga 34226

<210> 100
<211> 34180
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-617 Genome

<400> 100
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggagggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg aactggcaag 30240

acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta ctaggtacac 30300

gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat acattaatcc 30360

tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat tgactacaga 30420

caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg actctgcagt 30480

ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg gccaaggcac 30540

cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg gtggcggcgg 30600

atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag gggagaaggt 30660

caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc agcagaagtc 30720

aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg gagtccctgc 30780

tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg gcatggaggc 30840

tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca cgttcggctc 30900

ggggacaaag ttggaaataa accggtaggc tagcttgact gactgagata cagcgtacct 30960

tcagctcaca gacatgataa gatacattga tgagtttgga caaaccacaa ctagaatgca 31020

gtgaaaaaaa tgctttattt gtgaaatttg tgatgctatt gctttatttg taaccattat 31080

aagctgcaat aaacaagtta acaacaacaa ttgcattcat tttatgtttc aggttcaggg 31140

ggaggtgtgg gaggtttttt aaagcaagta aaacctctac aaatgtggta gtcgtcagct 31200

atcctgcagg aacttgttta tttgaaaatc aattcacaaa atccgagtag ttattttgcc 31260

tccccttcc catttaacag aatacaccaa tctctcccca cgcacagctt taaacatttg 31320

gataccatta gatatagaca tggttttaga ttccacattc caaacagttt cagagcgagc 31380

caatctgggg tcagtgatag ataaaaatcc atcgggatag tcttttaaag cgctttcaca 31440

gtccaactgc tgcggatgcg actccggagt ctggatcacg gtcatctgga agaagaacga 31500

tgggaatcat aatccgaaaa cggtatcgga cgattgtgtc tcatcaaacc cacaagcagc 31560

cgctgtctgc gtcgctccgt gcgactgctg tttatgggat cagggtccac agtgtcctga 31620

agcatgattt taatagccct taacatcaac tttctggtgc gatgcgcgca gcaacgcatt 31680

ctgatttcac tcaaatcttt gcagtaggta caacacatta ttacaatatt gtttaataaa 31740

ccataattaa aagcgctcca gccaaaactc atatctgata taatcgcccc tgcatgacca 31800

tcataccaaa gtttaatata aattaaatga cgttccctca aaaacacact acccacatac 31860

atgatctctt ttggcatgtg catattaaca atctgtctgt accatggaca acgttggtta 31920

atcatgcaac ccaatataac cttccggaac cacactgcca acaccgctcc cccagccatg 31980

cattgaagtg aaccctgctg attacaatga caatgaagaa cccaattctc tcgaccgtga 32040

atcacttgag aatgaaaaat atctatagtg gcacaacata gacataaatg catgcatctt 32100

ctcataattt ttaactcctc aggatttaga aacatatccc agggaatagg aagctcttgc 32160

agaacagtaa agctggcaga acaaggaaga ccacgaacac aacttacact atgcatagtc 32220

atagtatcac aatctggcaa cagcgggtgg tcttcagtca tagaagctcg ggtttcattt 32280

tcctcacaac gtggtaactg ggctctggtg taagggtgat gtctggcgca tgatgtcgag 32340

cgtgcgcgca accttgtcat aatggagttg cttcctgaca ttctcgtatt ttgtatagca 32400

aaacgcggcc ctggcagaac acactcttct tcgccttcta tcctgccgct tagcgtgttc 32460

cgtgtgatag ttcaagtaca accacactct taagttggtc aaaagaatgc tggcttcagt 32520

tgtaatcaaa actccatcgc atctaatcgt tctgaggaaa tcatccaagc aatgcaactg 32580

gattgtgttt caagcaggag aggagaggga agagacggaa gaaccatgtt aatttttatt 32640

ccaaacgatc tcgcagtact tcaaattgta gatcgcgcag atggcatctc tcgcccccac 32700

tgtgttggtg aaaaagcaca gctagatcaa aagaaatgcg attttcaagg tgctcaacgg 32760

tggcttccag caaagcctcc acgcgcacat ccaagaacaa aagaatacca aaagaaggag 32820

cattttctaa ctcctcaatc atcatattac attcctgcac cattcccaga taattttcag 32880

ctttccagcc ttgaattatt cgtgtcagtt cttgtggtaa atccaatcca cacattacaa 32940

acaggtcccg gagggcgccc tccaccacca ttcttaaaca caccctcata atgacaaaat 33000

atcttgctcc tgtgtcacct gtagcgaatt gagaatggca acatcaattg acatgccctt 33060

ggctctaagt tcttctttaa gttctagttg taaaaactct ctcatattat caccaaactg 33120

cttagccaga agcccccggg gaacaagagc aggggacgct acagtgcagt acaagcgcag 33180

acctccccaa ttggctccag caaaaacaag attggaataa gcatattggg aaccgccagt 33240

aatatcatcg aagttgctgg aaatataatc aggcagagtt tcttgtaaaa attgaataaa 33300

agaaaaattt gccaaaaaaa cattcaaaac ctctgggatg caaatgcaat aggttaccgc 33360

gctgcgctcc aacattgtta gttttgaatt agtctgcaaa aataaaaaaa aaaacaagcg 33420

tcatatcata gtagcctgac gaacagatgg ataaatcagt ctttccatca caagacaagc 33480

cacagggtct ccagctcgac cctcgtaaaa cctgtcatca tgattaaaca acagcaccga 33540

aagttcctcg cggtgaccag catgaataat tcttgatgaa gcatacaatc cagacatgtt 33600

agcatcagtt aacgagaaaa aacagccaac atagcctttg ggtataatta tgcttaatcg 33660

taagtatagc aaagccaccc ctcgcggata caaagtaaaa ggcacaggag aataaaaaat 33720

ataattattt ctctgctgct gttcaggcaa cgtcgccccc ggtccctcta aatacacata 33780

caaagcctca tcagccatgg cttaccagac aaagtacagc gggcacacaa agcacaagct 33840

ctaaagtgac tctccaacct ctccacaata tatatataca caagccctaa actgacgtaa 33900

tgggagtaaa gtgtaaaaaa tcccgccaaa cccaacacac accccgaaac tgcgtcacca 33960

gggaaaagta cagtttcact tccgcaatcc caacaggcgt aacttcctct ttctcacggt 34020

acgtgatatc ccactaactt gcaacgtcat tttcccacgg tcgcaccgcc ccttttagcc 34080

gttaacccca cagccaatca ccacacgatc cacacttttt aaaatcacct catttacata 34140

ttggcaccat tccatctata aggtatatta tatagataga 34180

<210> 101

<211> 35749
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-615 Genome

<400> 101
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggagggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg aactggcaag 30240

acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta ctaggtacac 30300

gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat acattaatcc 30360

tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat tgactacaga 30420

caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg actctgcagt 30480

ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg gccaaggcac 30540

cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg gtggcggcgg 30600

atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag gggagaaggt 30660

caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc agcagaagtc 30720

aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg gagtccctgc 30780

tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg gcatggaggc 30840

tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca cgttcggctc 30900

ggggacaaag ttggaaataa accggggaag cggacagtgt actaattatg ctctcttgaa 30960

attggctgga gatgttgaga gcaaccctgg acctacagtg ctggcgccag cctggagccc 31020

aacaacctat ctcctcctgc tgctgctgct gagctcggga ctcagtggga cccaggactg 31080

ctccttccaa cacagcccca tctcctccga cttcgctgtc aaaatccgtg agctgtctga 31140

ctacctgctt caagattacc cagtcaccgt ggcctccaac ctccaggacg aggagctctg 31200

cgggggcctc tggcggctgg tcctggcaca gcgctggatg gagcggctca agactgtcgc 31260

tgggtccaag atgcaaggct tgctggagcg cgtgaacacg gagatacact ttgtcaccaa 31320

atgtgccttt cagccccccc ccagctgtct tcgcttcgtc cagaccaaca tctcccgcct 31380

cctacaggag acctccgagc agctggtggc gctgaagccc tggatcactc gccagaactt 31440

ctcccggtgc ctggagctgc agtgtcagcc cgactcctca accctgccac ccccatggag 31500

tccccggccc ctggaggcca cagccccggg aagcggagct actaacttca gcctgctgaa 31560

gcaggctgga gacgtggagg agaaccctgg acctcaggtc tccactgctg cccttgccgt 31620

cctcctctgc accatggctc tctgcaacca ggtcctctct gcaccacttg ctgctgacac 31680

gccgaccgcc tgctgcttca gctacacctc ccgacagatt ccacagaatt tcatagctga 31740

ctactttgag acgagcagcc agtgctccaa gcccagtgtc atcttcctaa ccaagagagg 31800

ccggcaggtc tgtgctgacc ccagtgagga gtgggtccag aaatacgtca gtgacctgga 31860

gctgagtgcc ggaagcggag agggcagagg aagtctgcta acatgcggtg acgtcgagga 31920

gaatcctgga cctgccttga cctttgcttt actggtggcc ctcctggtgc tcagctgcaa 31980

gtcaagctgc tctgtgggct gtgatctgcc tcaaacccac agcctgggta gcaggaggac 32040

cttgatgctc ctggcacaga tgaggagaat ctctcttttc tcctgcttga aggacagaca 32100

tgactttgga tttccccagg aggagtttgg caaccagttc caaaaggctg aaaccatccc 32160

tgtcctccat gagatgatcc agcagatctt caatctcttc agcacaaagg actcatctgc 32220

tgcttgggat gagaccctcc tagacaaatt ctacactgaa ctctaccagc agctgaatga 32280

cctggaagcc tgtgtgatac agggggtggg ggtgacagag actcccctga tgaaggagga 32340

ctccattctg gctgtgagga aatacttcca aagaatcact ctctatctga aagagaagaa 32400

atacagccct tgtgcctggg aggttgtcag agcagaaatc atgagatctt tttctttgtc 32460

aacaaacttg caagaaagtt taagaagtaa ggaataagct agcttgactg actgagatac 32520

agcgtacctt cagctcacag acatgataag atacattgat gagtttggac aaaccacaac 32580

tagaatgcag tgaaaaaaat gctttatttg tgaaatttgt gatgctattg ctttatttgt 32640

aaccattata agctgcaata aacaagttaa caacaacaat tgcattcatt ttatgtttca 32700

ggttcagggg gaggtgtggg aggtttttta aagcaagtaa aacctctaca aatgtggtag 32760

tcgtcagcta tcctgcagga acttgtttat ttgaaaatca attcacaaaa tccgagtagt 32820

tattttgcct ccccttccc atttaacaga atacaccaat ctctccccac gcacagcttt 32880

aaacatttgg ataccattag atatagacat ggttttagat tccacattcc aaacagtttc 32940

agagcgagcc aatctggggt cagtgataga taaaaatcca tcgggatagt cttttaaagc 33000

gctttcacag tccaactgct gcggatgcga ctccggagtc tggatcacgg tcatctggaa 33060

gaagaacgat gggaatcata atccgaaaac ggtatcggac gattgtgtct catcaaaccc 33120

acaagcagcc gctgtctgcg tcgctccgtg cgactgctgt ttatgggatc agggtccaca 33180

gtgtcctgaa gcatgatttt aatagccctt aacatcaact ttctggtgcg atgcgcgcag 33240

caacgcattc tgatttcact caaatctttg cagtaggtac aacacattat tacaatattg 33300

tttaataaac cataattaaa agcgctccag ccaaaactca tatctgatat aatcgcccct 33360

gcatgaccat cataccaaag tttaatataa attaaatgac gttccctcaa aaacacacta 33420

cccacataca tgatctcttt tggcatgtgc atattaacaa tctgtctgta ccatggacaa 33480

cgttggttaa tcatgcaacc caatataacc ttccggaacc acactgccaa caccgctccc 33540

ccagccatgc attgaagtga accctgctga ttacaatgac aatgaagaac ccaattctct 33600

cgaccgtgaa tcacttgaga atgaaaaata tctatagtgg cacaacatag acataaatgc 33660

atgcatcttc tcataatttt taactcctca ggatttagaa acatatccca gggaatagga 33720

agctcttgca gaacagtaaa gctggcagaa caaggaagac cacgaacaca acttacacta 33780

tgcatagtca tagtatcaca atctggcaac agcgggtggt cttcagtcat agaagctcgg 33840

gtttcatttt cctcacaacg tggtaactgg gctctggtgt aagggtgatg tctggcgcat 33900

gatgtcgagc gtgcgcgcaa ccttgtcata atggagttgc ttcctgacat tctcgtattt 33960

tgtatagcaa aacgcggccc tggcagaaca cactcttctt cgccttctat cctgccgctt 34020

agcgtgttcc gtgtgatagt tcaagtacaa ccacactctt aagttggtca aaagaatgct 34080

ggcttcagtt gtaatcaaaa ctccatcgca tctaatcgtt ctgaggaaat catccaagca 34140

atgcaactgg attgtgtttc aagcaggaga ggagagggaa gagacggaag aaccatgtta 34200

atttttattc caaacgatct cgcagtactt caaattgtag atcgcgcaga tggcatctct 34260

cgcccccact gtgttggtga aaaagcacag ctagatcaaa agaaatgcga ttttcaaggt 34320

gctcaacggt ggcttccagc aaagcctcca cgcgcacatc caagaacaaa agaataccaa 34380

aagaaggagc attttctaac tcctcaatca tcatattaca ttcctgcacc attcccagat 34440

aattttcagc tttccagcct tgaattattc gtgtcagttc ttgtggtaaa tccaatccac 34500

acattacaaa caggtcccgg agggcgccct ccaccaccat tcttaaacac accctcataa 34560

tgacaaaata tcttgctcct gtgtcacctg tagcgaattg agaatggcaa catcaattga 34620

catgcccttg gctctaagtt cttctttaag ttctagttgt aaaaactctc tcatattatc 34680

accaaactgc ttagccagaa gccccccggg aacaagagca ggggacgcta cagtgcagta 34740

caagcgcaga cctccccaat tggctccagc aaaaacaaga ttggaataag catattggga 34800

accgccagta atatcatcga agttgctgga aatataatca ggcagagttt cttgtaaaaa 34860

ttgaataaaa gaaaaatttg ccaaaaaaac attcaaaacc tctgggatgc aaatgcaata 34920

ggttaccgcg ctgcgctcca acattgttag ttttgaatta gtctgcaaaa ataaaaaaaa 34980

aaacaagcgt catatcatag tagcctgacg aacagatgga taaatcagtc tttccatcac 35040

aagacaagcc acagggtctc cagctcgacc ctcgtaaaac ctgtcatcat gattaaacaa 35100

cagcaccgaa agttcctcgc ggtgaccagc atgaataatt cttgatgaag catacaatcc 35160

agacatgtta gcatcagtta acgagaaaaa acagccaaca tagcctttgg gtataattat 35220

gcttaatcgt aagtatagca aagccacccc tcgcggatac aaagtaaaag gcacaggaga 35280

ataaaaaata taattatttc tctgctgctg ttcaggcaac gtcgcccccg gtccctctaa 35340

atacacatac aaagcctcat cagccatggc ttaccagaca aagtacagcg ggcacacaaa 35400

gcacaagctc taaagtgact ctccaacctc tccacaatat atatatacac aagccctaaa 35460

ctgacgtaat gggagtaaag tgtaaaaaat cccgccaaac ccaacacaca ccccgaaact 35520

gcgtcaccag ggaaaagtac agtttcactt ccgcaatccc aacaggcgta acttcctctt 35580

tctcacggta cgtgatatcc cactaacttg caacgtcatt ttcccacggt cgcaccgccc 35640

cttttagccg ttaaccccac agccaatcac cacacgatcc acacttttta aaatcacctc 35700

atttacatat tggcaccatt ccatctataa ggtatattat atagataga 35749

<210> 102
<211> 34972
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-640 Genome

<400> 102
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggagggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg aactggcaag 30240

acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta ctaggtacac 30300

gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat acattaatcc 30360

tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat tgactacaga 30420

caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg actctgcagt 30480

ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg gccaaggcac 30540

cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg gtggcggcgg 30600

atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag gggagaaggt 30660

caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc agcagaagtc 30720

aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg gagtccctgc 30780

tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg gcatggaggc 30840

tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca cgttcggctc 30900

ggggacaaag ttggaaataa accggggaag cggagctact aacttcagcc tgctgaagca 30960

ggctggagac gtggaggaga accctggacc taatcaaact gccattctga tttgctgcct 31020

tatctttctg actctaagtg gcattcaagg agtacctctc tctagaactg tacgctgtac 31080

ctgcatcagc attagtaatc aacctgttaa tccaaggtct ttagaaaaac ttgaaattat 31140

tcctgcaagc caattttgtc cacgtgttga gatcattgct acaatgaaaa agaagggtga 31200

gaagagatgt ctgaatccag aatcgaaggc catcaagaat ttactgaaag cagttagcaa 31260

ggaaaggtct aaaagatctc ctggaagcgg agagggcaga ggaagtctgc taacatgcgg 31320

tgacgtcgag gagaatcctg gacctaagaa aagtggtgtt cttttcctct tgggcatcat 31380

cttgctggtt ctgattggag tgcaaggaac cccagtagtg agaaagggtc gctgttcctg 31440

catcagcacc aaccaaggga ctatccacct acaatccttg aaagacctta aacaatttgc 31500

cccaagccct tcctgcgaga aaattgaaat cattgctaca ctgaagaatg gagttcaaac 31560

atgtctaaac ccagattcag cagatgtgaa ggaactgatt aaaaagtggg agaaacaggt 31620

cagccaaaag aaaaagcaaa agaatgggaa aaaacatcaa aaaaagaaag ttctgaaagt 31680

tcgaaaatct caacgttctc gtcaaaagaa gactacataa gctagcttga ctgactgaga 31740

tacagcgtac cttcagctca cagacatgat aagatacatt gatgagtttg gacaaaccac 31800

aactagaatg cagtgaaaaa aatgctttat ttgtgaaatt tgtgatgcta ttgctttatt 31860

tgtaaccatt ataagctgca ataaacaagt taacaacaac aattgcattc attttatgtt 31920

tcaggttcag ggggaggtgt gggaggtttt ttaaagcaag taaaacctct acaaatgtgg 31980

tagtcgtcag ctatcctgca ggaacttgtt tatttgaaaa tcaattcaca aaatccgagt 32040

agttattttg cctccccctt cccatttaac agaatacacc aatctctccc cacgcacagc 32100

tttaaacatt tggataccat tagatataga catggtttta gattccacat tccaaacagt 32160

ttcagagcga gccaatctgg ggtcagtgat agataaaaat ccatcgggat agtcttttaa 32220

agcgctttca cagtccaact gctgcggatg cgactccgga gtctggatca cggtcatctg 32280

gaagaagaac gatgggaatc ataatccgaa aacggtatcg gacgattgtg tctcatcaaa 32340

cccacaagca gccgctgtct gcgtcgctcc gtgcgactgc tgtttatggg atcagggtcc 32400

acagtgtcct gaagcatgat tttaatagcc cttaacatca actttctggt gcgatgcgcg 32460

cagcaacgca ttctgatttc actcaaatct ttgcagtagg tacaacacat tattacaata 32520

ttgtttaata aaccataatt aaaagcgctc cagccaaaac tcatatctga tataatcgcc 32580

cctgcatgac catcatacca aagtttaata taaattaaat gacgttccct caaaaacaca 32640

ctacccacat acatgatctc ttttggcatg tgcatattaa caatctgtct gtaccatgga 32700

caacgttggt taatcatgca acccaatata accttccgga accacactgc caacaccgct 32760

cccccagcca tgcattgaag tgaaccctgc tgattacaat gacaatgaag aacccaattc 32820

tctcgaccgt gaatcacttg agaatgaaaa atatctatag tggcacaaca tagacataaa 32880

tgcatgcatc ttctcataat ttttaactcc tcaggattta gaaacatatc ccagggaata 32940

ggaagctctt gcagaacagt aaagctggca gaacaaggaa gaccacgaac acaacttaca 33000

ctatgcatag tcatagtatc acaatctggc aacagcgggt ggtcttcagt catagaagct 33060

cgggtttcat tttcctcaca acgtggtaac tgggctctgg tgtaagggtg atgtctggcg 33120

catgatgtcg agcgtgcgcg caaccttgtc ataatggagt tgcttcctga cattctcgta 33180

ttttgtatag caaaacgcgg ccctggcaga acacactctt cttcgccttc tatcctgccg 33240

cttagcgtgt tccgtgtgat agttcaagta caaccacact cttaagttgg tcaaaagaat 33300

gctggcttca gttgtaatca aaactccatc gcatctaatc gttctgagga aatcatccaa 33360

gcaatgcaac tggattgtgt ttcaagcagg agaggagagg gaagagacgg aagaaccatg 33420

ttaattttta ttccaaacga tctcgcagta cttcaaattg tagatcgcgc agatggcatc 33480

tctcgccccc actgtgttgg tgaaaaagca cagctagatc aaaagaaatg cgattttcaa 33540

ggtgctcaac ggtggcttcc agcaaagcct ccacgcgcac atccaagaac aaaagaatac 33600

caaaagaagg agcattttct aactcctcaa tcatcatatt acattcctgc accattccca 33660

gataattttc agctttccag ccttgaatta ttcgtgtcag ttcttgtggt aaatccaatc 33720

cacacattac aaacaggtcc cggagggcgc cctccaccac cattcttaaa cacaccctca 33780

taatgacaaa atatcttgct cctgtgtcac ctgtagcgaa ttgagaatgg caacatcaat 33840

tgacatgccc ttggctctaa gttcttcttt aagttctagt tgtaaaaact ctctcatatt 33900

atcaccaaac tgcttagcca gaagcccccc gggaacaaga gcaggggacg ctacagtgca 33960

gtacaagcgc agacctcccc aattggctcc agcaaaaaca agattggaat aagcatattg 34020

ggaaccgcca gtaatatcat cgaagttgct ggaaatataa tcaggcagag tttcttgtaa 34080

aaattgaata aaagaaaaat ttgccaaaaa aacattcaaa acctctggga tgcaaatgca 34140

ataggttacc gcgctgcgct ccaacattgt tagttttgaa ttagtctgca aaaataaaaa 34200

aaaaaacaag cgtcatatca tagtagcctg acgaacagat ggataaatca gtctttccat 34260

cacaagacaa gccacagggt ctccagctcg accctcgtaa aacctgtcat catgattaaa 34320

caacagcacc gaaagttcct cgcggtgacc agcatgaata attcttgatg aagcatacaa 34380

tccagacatg ttagcatcag ttaacgagaa aaaacagcca acatagcctt tgggtataat 34440

tatgcttaat cgtaagtata gcaaagccac ccctcgcgga tacaaagtaa aaggcacagg 34500

agaataaaaa atataattat ttctctgctg ctgttcaggc aacgtcgccc ccggtccctc 34560

taaatacaca tacaaagcct catcagccat ggcttaccag acaaagtaca gcgggcacac 34620

aaagcacaag ctctaaagtg actctccaac ctctccacaa tatatatata cacaagccct 34680

aaactgacgt aatgggagta aagtgtaaaa aatcccgcca aacccaacac acaccccgaa 34740

actgcgtcac cagggaaaag tacagtttca cttccgcaat cccaacaggc gtaacttcct 34800

ctttctcacg gtacgtgata tcccactaac ttgcaacgtc attttcccac ggtcgcaccg 34860

ccccttttag ccgttaaccc cacagccaat caccacacga tccacacttt ttaaaatcac 34920

ctcatttaca tattggcacc attccatcta taaggtatat tatatagata ga 34972

<210> 103
<211> 35602
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-641 Genome

<400> 103
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt ttttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc ccctcccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgcccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggc tggagctgca tcatcttgtt 29400

cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa gccctgactc 29460

gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc agagcctgct 29520

gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg gccagcctcc 29580

caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc gcttcagcgg 29640

aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg aggacgtggc 29700

cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag gcaccaaggt 29760

ggagattaag ggaggggggcg gcagcggggg aggcggcagc ggcggcgggg gatcgcaggt 29820

ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca aggtcagctg 29880

caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc aggcgcccgg 29940

ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa attacaatca 30000

gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg cgtacatgga 30060

gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc gccggatcgc 30120

ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc tcgtcacggt 30180

gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg aactggcaag 30240

acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta ctaggtacac 30300

gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat acattaatcc 30360

tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat tgactacaga 30420

caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg actctgcagt 30480

ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg gccaaggcac 30540

cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg gtggcggcgg 30600

atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag gggagaaggt 30660

caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc agcagaagtc 30720

aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg gagtccctgc 30780

tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg gcatggaggc 30840

tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca cgttcggctc 30900

ggggacaaag ttggaaataa accggggaag cggagctact aacttcagcc tgctgaagca 30960

ggctggagac gtggaggaga accctggacc taatcaaact gccattctga tttgctgcct 31020

tatctttctg actctaagtg gcattcaagg agtacctctc tctagaactg tacgctgtac 31080

ctgcatcagc attagtaatc aacctgttaa tccaaggtct ttagaaaaac ttgaaattat 31140

tcctgcaagc caattttgtc cacgtgttga gatcattgct acaatgaaaa agaagggtga 31200

gaagagatgt ctgaatccag aatcgaaggc catcaagaat ttactgaaag cagttagcaa 31260

ggaaaggtct aaaagatctc ctggaagcgg agagggcaga ggaagtctgc taacatgcgg 31320

tgacgtcgag gagaatcctg gacctaagaa aagtggtgtt cttttcctct tgggcatcat 31380

cttgctggtt ctgattggag tgcaaggaac cccagtagtg agaaagggtc gctgttcctg 31440

catcagcacc aaccaaggga ctatccacct acaatccttg aaagacctta aacaatttgc 31500

cccaagccct tcctgcgaga aaattgaaat cattgctaca ctgaagaatg gagttcaaac 31560

atgtctaaac ccagattcag cagatgtgaa ggaactgatt aaaaagtggg agaaacaggt 31620

cagccaaaag aaaaagcaaa agaatgggaa aaaacatcaa aaaaagaaag ttctgaaagt 31680

tcgaaaatct caacgttctc gtcaaaagaa gactacagga agcggacagt gtactaatta 31740

tgctctcttg aaattggctg gagatgttga gagcaaccct ggacctgcct tgacctttgc 31800

tttactggtg gccctcctgg tgctcagctg caagtcaagc tgctctgtgg gctgtgatct 31860

gcctcaaacc cacagcctgg gtagcaggag gaccttgatg ctcctggcac agatgaggag 31920

aatctctctt ttctcctgct tgaaggacag acatgacttt ggatttcccc aggaggagtt 31980

tggcaaccag ttccaaaagg ctgaaaccat ccctgtcctc catgagatga tccagcagat 32040

cttcaatctc ttcagcacaa aggactcatc tgctgcttgg gatgagaccc tcctagacaa 32100

attctacact gaactctacc agcagctgaa tgacctggaa gcctgtgtga tacaggggt 32160

gggggtgaca gagactcccc tgatgaagga ggactccatt ctggctgtga ggaaatactt 32220

ccaaagaatc actctctatc tgaaagagaa gaaatacagc ccttgtgcct gggaggttgt 32280

cagagcagaa atcatgagat ctttttcttt gtcaacaaac ttgcaagaaa gtttaagaag 32340

taaggaataa gctagcttga ctgactgaga tacagcgtac cttcagctca cagacatgat 32400

aagatacatt gatgagtttg gacaaaccac aactagaatg cagtgaaaaa aatgctttat 32460

ttgtgaaatt tgtgatgcta ttgctttatt tgtaaccatt ataagctgca ataaacaagt 32520

taacaacaac aattgcattc attttatgtt tcaggttcag ggggaggtgt gggaggtttt 32580

ttaaagcaag taaaacctct acaaatgtgg tagtcgtcag ctatcctgca ggaacttgtt 32640

tatttgaaaa tcaattcaca aaatccgagt agttattttg cctccccctt cccatttaac 32700

agaatacacc aatctctccc cacgcacagc tttaaacatt tggataccat tagatataga 32760

catggtttta gattccacat tccaaacagt ttcagagcga gccaatctgg ggtcagtgat 32820

agataaaaat ccatcgggat agtcttttaa agcgctttca cagtccaact gctgcggatg 32880

cgactccgga gtctggatca cggtcatctg gaagaagaac gatgggaatc ataatccgaa 32940

aacggtatcg gacgattgtg tctcatcaaa cccacaagca gccgctgtct gcgtcgctcc 33000

gtgcgactgc tgtttatggg atcagggtcc acagtgtcct gaagcatgat tttaatagcc 33060

cttaacatca actttctggt gcgatgcgcg cagcaacgca ttctgatttc actcaaatct 33120

ttgcagtagg tacaacacat tattacaata ttgtttaata aaccataatt aaaagcgctc 33180

cagccaaaac tcatatctga tataatcgcc cctgcatgac catcatacca aagtttaata 33240

taaattaaat gacgttccct caaaaacaca ctacccacat acatgatctc ttttggcatg 33300

tgcatattaa caatctgtct gtaccatgga caacgttggt taatcatgca acccaatata 33360

accttccgga accacactgc caacaccgct cccccagcca tgcattgaag tgaaccctgc 33420

tgattacaat gacaatgaag aacccaattc tctcgaccgt gaatcacttg agaatgaaaa 33480

atatctatag tggcacaaca tagacataaa tgcatgcatc ttctcataat ttttaactcc 33540

tcaggattta gaaacatatc ccagggaata ggaagctctt gcagaacagt aaagctggca 33600

gaacaaggaa gaccacgaac acaacttaca ctatgcatag tcatagtatc acaatctggc 33660

aacagcgggt ggtcttcagt catagaagct cgggtttcat tttcctcaca acgtggtaac 33720

tgggctctgg tgtaagggtg atgtctggcg catgatgtcg agcgtgcgcg caaccttgtc 33780

ataatggagt tgcttcctga cattctcgta ttttgtatag caaaacgcgg ccctggcaga 33840

acacactctt cttcgccttc tatcctgccg cttagcgtgt tccgtgtgat agttcaagta 33900

caaccacact cttaagttgg tcaaaagaat gctggcttca gttgtaatca aaactccatc 33960

gcatctaatc gttctgagga aatcatccaa gcaatgcaac tggattgtgt ttcaagcagg 34020

agaggagagg gaagagacgg aagaaccatg ttaattttta ttccaaacga tctcgcagta 34080

cttcaaattg tagatcgcgc agatggcatc tctcgccccc actgtgttgg tgaaaaagca 34140

cagctagatc aaaagaaatg cgattttcaa ggtgctcaac ggtggcttcc agcaaagcct 34200

ccacgcgcac atccaagaac aaaagaatac caaaagaagg agcattttct aactcctcaa 34260

tcatcatatt acattcctgc accattccca gataattttc agctttccag ccttgaatta 34320

ttcgtgtcag ttcttgtggt aaatccaatc cacacattac aaacaggtcc cggagggcgc 34380

cctccaccac cattcttaaa cacaccctca taatgacaaa atatcttgct cctgtgtcac 34440

ctgtagcgaa ttgagaatgg caacatcaat tgacatgccc ttggctctaa gttcttcttt 34500

aagttctagt tgtaaaaact ctctcatatt atcaccaaac tgcttagcca gaagcccccc 34560

gggaacaaga gcaggggacg ctacagtgca gtacaagcgc agacctcccc aattggctcc 34620

agcaaaaaca agattggaat aagcatattg ggaaccgcca gtaatatcat cgaagttgct 34680

ggaaatataa tcaggcagag tttcttgtaa aaattgaata aaagaaaaat ttgccaaaaa 34740

aacattcaaa acctctggga tgcaaatgca ataggttacc gcgctgcgct ccaacattgt 34800

tagttttgaa ttagtctgca aaaataaaaa aaaaaacaag cgtcatatca tagtagcctg 34860

acgaacagat ggataaatca gtctttccat cacaagacaa gccacagggt ctccagctcg 34920

accctcgtaa aacctgtcat catgattaaa caacagcacc gaaagttcct cgcggtgacc 34980

agcatgaata attcttgatg aagcatacaa tccagacatg ttagcatcag ttaacgagaa 35040

aaaacagcca acatagcctt tgggtataat tatgcttaat cgtaagtata gcaaagccac 35100

ccctcgcgga tacaaagtaa aaggcacagg agaataaaaa atataattat ttctctgctg 35160

ctgttcaggc aacgtcgccc ccggtccctc taaatacaca tacaaagcct catcagccat 35220

ggcttaccag acaaagtaca gcgggcacac aaagcacaag ctctaaagtg actctccaac 35280

ctctccacaa tatatatata cacaagccct aaactgacgt aatgggagta aagtgtaaaa 35340

aatcccgcca aacccaacac acaccccgaa actgcgtcac cagggaaaag tacagtttca 35400

cttccgcaat cccaacaggc gtaacttcct ctttctcacg gtacgtgata tcccactaac 35460

ttgcaacgtc attttcccac ggtcgcaccg ccccttttag ccgttaaccc cacagccaat 35520

caccacacga tccacacttt ttaaaatcac ctcatttaca tattggcacc attccatcta 35580

taaggtatat tatatagata ga 35602

<210> 104

<400> 104
000

<210> 105
<211> 537
<212> DNA
<213> Artificial Sequence

<220>
<223> Flt3L nucleic acid sequence

<400> 105
atgacagtgc tggcgccagc ctggagccca acaacctatc tcctcctgct gctgctgctg 60

agctcgggac tcagtgggac ccaggactgc tccttccaac acagccccat ctcctccgac 120

ttcgctgtca aaatccgtga gctgtctgac tacctgcttc aagattaccc agtcaccgtg 180

gcctccaacc tccaggacga ggagctctgc gggggcctct ggcggctggt cctggcacag 240

cgctggatgg agcggctcaa gactgtcgct gggtccaaga tgcaaggctt gctggagcgc 300

gtgaacacgg agatacactt tgtcaccaaa tgtgcctttc agcccccccc cagctgtctt 360

cgcttcgtcc agaccaacat ctcccgcctc ctacaggaga cctccgagca gctggtggcg 420

ctgaagccct ggatcactcg ccagaacttc tcccggtgcc tggagctgca gtgtcagccc 480

gactcctcaa ccctgccacc cccatggagt ccccggcccc tggaggccac agccccg 537

<210> 106

<400> 106
000

<210> 107
<211> 279
<212> DNA
<213> Artificial Sequence

<220>
<223> MIP1 alpha nucleic acid sequence

<400> 107
atgcaggtct ccactgctgc ccttgccgtc ctcctctgca ccatggctct ctgcaaccag 60

gtcctctctg caccacttgc tgctgacacg ccgaccgcct gctgcttcag ctacacctcc 120

cgacagattc cacagaattt catagctgac tactttgaga cgagcagcca gtgctccaag 180

cccagtgtca tcttcctaac caagagaggc cggcaggtct gtgctgaccc cagtgaggag 240

tgggtccaga aatacgtcag tgacctggag ctgagtgcc 279

<210> 108
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 108

Ser Pro Gln Tyr Pro Ser Pro Leu Thr Leu Thr Leu Pro Pro His Pro
1 5 10 15

Ser Leu

<210> 109
<211> 564
<212> DNA
<213> Artificial Sequence

<220>
<223> IFN alpha nucleic acid sequence

<400> 109
atggccttga cctttgcttt actggtggcc ctcctggtgc tcagctgcaa gtcaagctgc 60

tctgtgggct gtgatctgcc tcaaacccac agcctgggta gcaggaggac cttgatgctc 120

ctggcacaga tgaggagaat ctctcttttc tcctgcttga aggacagaca tgactttgga 180

tttccccagg aggagtttgg caaccagttc caaaaggctg aaaccatccc tgtcctccat 240

gagatgatcc agcagatctt caatctcttc agcacaaagg actcatctgc tgcttgggat 300

gagaccctcc tagacaaatt ctacactgaa ctctaccagc agctgaatga cctggaagcc 360

tgtgtgatac agggggtggg ggtgacagag actcccctga tgaaggagga ctccattctg 420

gctgtgagga aatacttcca aagaatcact ctctatctga aagagaagaa atacagccct 480

tgtgcctggg aggttgtcag agcagaaatc atgagatctt tttctttgtc aacaaacttg 540

caagaaagtt taagaagtaa ggaa 564

<210> 110
<211> 294
<212> DNA
<213> Artificial Sequence

<220>
<223> CXCL10 nucleic acid sequence

<400> 110
atgaatcaaa ctgccattct gatttgctgc cttatctttc tgactctaag tggcattcaa 60

ggagtacctc tctctagaac tgtacgctgt acctgcatca gcattagtaa tcaacctgtt 120

aatccaaggt ctttagaaaa acttgaaatt attcctgcaa gccaattttg tccacgtgtt 180

gagatcattg ctacaatgaa aaagaagggt gagaagagat gtctgaatcc agaatcgaag 240

gccatcaaga atttactgaa agcagttagc aaggaaaggt ctaaaagatc tcct 294

<210> 111
<211> 372
<212> DNA
<213> Artificial Sequence

<220>
<223> CXCL9 nucleic acid sequence

<400> 111
aagaaaagtg gtgttctttt cctcttgggc atcatcttgc tggttctgat tggagtgcaa 60

ggaaccccag tagtgagaaa gggtcgctgt tcctgcatca gcaccaacca agggactatc 120

cacctacaat ccttgaaaga ccttaaacaa tttgccccaa gcccttcctg cgagaaaatt 180

gaaatcattg ctacactgaa gaatggagtt caaacatgtc taaacccaga ttcagcagat 240

gtgaaggaac tgattaaaaa gtgggagaaa caggtcagcc aaaagaaaaa gcaaaagaat 300

gggaaaaaac atcaaaaaaa gaaagttctg aaagttcgaa aatctcaacg ttctcgtcaa 360

aagaagacta ca 372

<210> 112
<211> 3407
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-615 Transgene cassette

<400> 112
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc 240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac 300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt 360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag 420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga 480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac 540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg 600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat 660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga 720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc 780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca 840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc 900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc 960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa 1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat 1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga 1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg 1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc 1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc 1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat 1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg 1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg 1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg 1560

gggaagcgga cagtgtacta attatgctct cttgaaattg gctggagatg ttgagagcaa 1620

ccctggacct acagtgctgg cgccagcctg gagcccaaca acctatctcc tcctgctgct 1680

gctgctgagc tcgggactca gtgggaccca ggactgctcc ttccaacaca gccccatctc 1740

ctccgacttc gctgtcaaaa tccgtgagct gtctgactac ctgcttcaag attacccagt 1800

caccgtggcc tccaacctcc aggacgagga gctctgcggg ggcctctggc ggctggtcct 1860

ggcacagcgc tggatggagc ggctcaagac tgtcgctggg tccaagatgc aaggcttgct 1920

ggagcgcgtg aacacggaga tacactttgt caccaaatgt gcctttcagc ccccccccag 1980

ctgtcttcgc ttcgtccaga ccaacatctc ccgcctccta caggagacct ccgagcagct 2040

ggtggcgctg aagccctgga tcactcgcca gaacttctcc cggtgcctgg agctgcagtg 2100

tcagcccgac tcctcaaccc tgccaccccc atggagtccc cggcccctgg aggccacagc 2160

cccgggaagc ggagctacta acttcagcct gctgaagcag gctggagacg tggaggagaa 2220

ccctggacct caggtctcca ctgctgccct tgccgtcctc ctctgcacca tggctctctg 2280

caaccaggtc ctctctgcac cacttgctgc tgacacgccg accgcctgct gcttcagcta 2340

cacctcccga cagattccac agaatttcat agctgactac tttgagacga gcagccagtg 2400

ctccaagccc agtgtcatct tcctaaccaa gagaggccgg caggtctgtg ctgaccccag 2460

tgaggagtgg gtccagaaat acgtcagtga cctggagctg agtgccggaa gcggagaggg 2520

cagaggaagt ctgctaacat gcggtgacgt cgaggagaat cctggacctg ccttgacctt 2580

tgctttactg gtggccctcc tggtgctcag ctgcaagtca agctgctctg tgggctgtga 2640

tctgcctcaa acccacagcc tgggtagcag gaggaccttg atgctcctgg cacagatgag 2700

gagaatctct cttttctcct gcttgaagga cagacatgac tttggatttc cccaggagga 2760

gtttggcaac cagttccaaa aggctgaaac catccctgtc ctccatgaga tgatccagca 2820

gatcttcaat ctcttcagca caaaggactc atctgctgct tgggatgaga ccctcctaga 2880

caaattctac actgaactct accagcagct gaatgacctg gaagcctgtg tgatacaggg 2940

ggtgggggtg acagagactc ccctgatgaa ggaggactcc attctggctg tgaggaaata 3000

cttccaaaga atcactctct atctgaaaga gaagaaatac agcccttgtg cctgggaggt 3060

tgtcagagca gaaatcatga gatctttttc tttgtcaaca aacttgcaag aaagtttaag 3120

aagtaaggaa taagctagct tgactgactg agatacagcg taccttcagc tcacagacat 3180

gataagatac attgatgagt ttggacaaac cacaactaga atgcagtgaa aaaaatgctt 3240

tatttgtgaa atttgtgatg ctattgcttt atttgtaacc attataagct gcaataaaca 3300

agttaacaac aacaattgca ttcattttat gtttcaggtt caggggggagg tgtgggaggt 3360

tttttaaagc aagtaaaacc tctacaaatg tggtagtcgt cagctat 3407

<210> 113
<211> 2630
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-640 Transgene cassette

<400> 113
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc 240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac 300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt 360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag 420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga 480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac 540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg 600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat 660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga 720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc 780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca 840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc 900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc 960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa 1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat 1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga 1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg 1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc 1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc 1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat 1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg 1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg 1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg 1560

gggaagcgga gctactaact tcagcctgct gaagcaggct ggagacgtgg aggagaaccc 1620

tggacctaat caaactgcca ttctgatttg ctgccttatc tttctgactc taagtggcat 1680

tcaaggagta cctctctcta gaactgtacg ctgtacctgc atcagcatta gtaatcaacc 1740

tgttaatcca aggtctttag aaaaacttga aattattcct gcaagccaat tttgtccacg 1800

tgttgagatc attgctacaa tgaaaaagaa gggtgagaag agatgtctga atccagaatc 1860

gaaggccatc aagaatttac tgaaagcagt tagcaaggaa aggtctaaaa gatctcctgg 1920

aagcggagag ggcagaggaa gtctgctaac atgcggtgac gtcgaggaga atcctggacc 1980

taagaaaagt ggtgttcttt tcctcttggg catcatcttg ctggttctga ttggagtgca 2040

aggaacccca gtagtgagaa agggtcgctg ttcctgcatc agcaccaacc aagggactat 2100

ccacctacaa tccttgaaag accttaaaca atttgcccca agcccttcct gcgagaaaat 2160

tgaaatcatt gctacactga agaatggagt tcaaacatgt ctaaacccag attcagcaga 2220

tgtgaaggaa ctgattaaaa agtgggagaa acaggtcagc caaaagaaaa agcaaaagaa 2280

tgggaaaaaa catcaaaaaa agaaagttct gaaagttcga aaatctcaac gttctcgtca 2340

aaagaagact acataagcta gcttgactga ctgagataca gcgtaccttc agctcacaga 2400

catgataaga tacattgatg agtttggaca aaccacaact agaatgcagt gaaaaaaatg 2460

ctttatttgt gaaatttgtg atgctattgc tttatttgta accattataa gctgcaataa 2520

acaagttaac aacaacaatt gcattcattt tatgtttcag gttcaggggg aggtgtggga 2580

ggtttttaa agcaagtaaa acctctacaa atgtggtagt cgtcagctat 2630

<210> 114
<211> 3260
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-641 Transgene cassette

<400> 114
caggcccacc atgggctgga gctgcatcat cttgttcctg gtcgcaactg ctaccggagt 60

ccattcggac atcgtcatga cccaaagccc tgactcgctc gctgtgtcac tgggagagcg 120

ggcgactatc aactgcaaat catcccagag cctgctgtat tcacgcaatc agaaaaacta 180

cctggcctgg tatcagcaga agccgggcca gcctcccaag ctgctgatct tctgggcctc 240

cacccgcgaa agcggcgtgc cggaccgctt cagcggaagc ggattcggaa ctgactttac 300

tctgaccatt agctccttgc aggcggagga cgtggccgtc tactactgcc agcagtattt 360

ctcctatccg ctcacctttg ggcaaggcac caaggtggag attaagggag ggggcggcag 420

cgggggaggc ggcagcggcg gcgggggatc gcaggtccag ctcgtccaat ccggagccga 480

agtcaagaag ccgggagcgt cggtcaaggt cagctgcaaa acttcgcgct acaccttcac 540

tgagtacacg atccactggg tccgccaggc gcccggccag cggctggagt ggatcggcgg 600

gatcaaccca aacaacggaa tcccaaatta caatcagaaa tttaaagggc gggtgactat 660

caccgtggat acctcggcct ccacggcgta catggagctc tcatcactca gatcggagga 720

caccgcggtc tattactgcg cccgccgccg gatcgcttat ggatacgatg aaggacatgc 780

gatggattac tggggccagg gcaccctcgt cacggtgtcg tcaggaggcg gcggttcaca 840

ggtgcagctg cagcagtctg gggctgaact ggcaagacct ggggcctcag tgaagatgtc 900

ctgcaaggct tctggctaca cctttactag gtacacgatg cactgggtaa aacagaggcc 960

tggacagggt ctggaatgga ttggatacat taatcctagc cgtggttata ctaattacaa 1020

tcagaagttc aaggacaagg ccacattgac tacagacaaa tcctccagca cagcctacat 1080

gcaactgagc agcctgacat ctgaggactc tgcagtctat tactgtgcaa gatattatga 1140

tgatcattac tgccttgact actggggcca aggcaccact ctcacagtct cctcaggtgg 1200

cggtggctcg ggcggtggtg gatctggtgg cggcggatct gatatcgtgc tcactcagtc 1260

tccagcaatc atgtctgcat ctccagggga gaaggtcacc atgacctgca gtgccagctc 1320

aagtgtaagt tacatgaact ggtaccagca gaagtcaggc acctccccca aaagatggat 1380

ttatgacaca tccaaactgg cttctggagt ccctgctcac ttcaggggca gtgggtctgg 1440

gacctcttac tctctcacaa tcagcggcat ggaggctgaa gatgctgcca cttattactg 1500

ccagcagtgg agtagtaacc cattcacgtt cggctcgggg acaaagttgg aaataaaccg 1560

gggaagcgga gctactaact tcagcctgct gaagcaggct ggagacgtgg aggagaaccc 1620

tggacctaat caaactgcca ttctgatttg ctgccttatc tttctgactc taagtggcat 1680

tcaaggagta cctctctcta gaactgtacg ctgtacctgc atcagcatta gtaatcaacc 1740

tgttaatcca aggtctttag aaaaacttga aattattcct gcaagccaat tttgtccacg 1800

tgttgagatc attgctacaa tgaaaaagaa gggtgagaag agatgtctga atccagaatc 1860

gaaggccatc aagaatttac tgaaagcagt tagcaaggaa aggtctaaaa gatctcctgg 1920

aagcggagag ggcagaggaa gtctgctaac atgcggtgac gtcgaggaga atcctggacc 1980

taagaaaagt ggtgttcttt tcctcttggg catcatcttg ctggttctga ttggagtgca 2040

aggaacccca gtagtgagaa agggtcgctg ttcctgcatc agcaccaacc aagggactat 2100

ccacctacaa tccttgaaag accttaaaca atttgcccca agcccttcct gcgagaaaat 2160

tgaaatcatt gctacactga agaatggagt tcaaacatgt ctaaacccag attcagcaga 2220

tgtgaaggaa ctgattaaaa agtgggagaa acaggtcagc caaaagaaaa agcaaaagaa 2280

tgggaaaaaa catcaaaaaa agaaagttct gaaagttcga aaatctcaac gttctcgtca 2340

aaagaagact acaggaagcg gacagtgtac taattatgct ctcttgaaat tggctggaga 2400

tgttgagagc aaccctggac ctgccttgac ctttgcttta ctggtggccc tcctggtgct 2460

cagctgcaag tcaagctgct ctgtgggctg tgatctgcct caaacccaca gcctgggtag 2520

caggaggacc ttgatgctcc tggcacagat gaggagaatc tctcttttct cctgcttgaa 2580

ggacagacat gactttggat ttccccagga ggagtttggc aaccagttcc aaaaggctga 2640

aaccatccct gtcctccatg agatgatcca gcagatcttc aatctcttca gcacaaagga 2700

ctcatctgct gcttgggatg agaccctcct agacaaattc tacactgaac tctaccagca 2760

gctgaatgac ctggaagcct gtgtgataca gggggtgggg gtgacagaga ctcccctgat 2820

gaaggaggac tccattctgg ctgtgaggaa atacttccaa agaatcactc tctatctgaa 2880

agagaagaaa tacagccctt gtgcctggga ggttgtcaga gcagaaatca tgagatcttt 2940

ttctttgtca acaaacttgc aagaaagttt aagaagtaag gaataagcta gcttgactga 3000

ctgagataca gcgtaccttc agctcacaga catgataaga tacattgatg agtttggaca 3060

aaccacaact agaatgcagt gaaaaaaatg ctttatttgt gaaatttgtg atgctattgc 3120

tttatttgta accattataa gctgcaataa acaagttaac aacaacaatt gcattcattt 3180

tatgtttcag gttcaggggg aggtgtggga ggtttttttaa agcaagtaaa acctctacaa 3240

atgtggtagt cgtcagctat 3260

<210> 115
<211> 154
<212> PRT
<213> Artificial Sequence

<220>
<223> FLT3L amino acid sequence

<400> 115

Met Thr Gln Asp Cys Ser Phe Gln His Ser Pro Ile Ser Ser Asp Phe
1 5 10 15

Ala Val Lys Ile Arg Glu Leu Ser Asp Tyr Leu Leu Gln Asp Tyr Pro
20 25 30

Val Thr Val Ala Ser Asn Leu Gln Asp Glu Glu Leu Cys Gly Gly Leu
35 40 45

Trp Arg Leu Val Leu Ala Gln Arg Trp Met Glu Arg Leu Lys Thr Val
50 55 60

Ala Gly Ser Lys Met Gln Gly Leu Leu Glu Arg Val Asn Thr Glu Ile
65 70 75 80

His Phe Val Thr Lys Cys Ala Phe Gln Pro Pro Pro Ser Cys Leu Arg
85 90 95

Phe Val Gln Thr Asn Ile Ser Arg Leu Leu Gln Glu Thr Ser Glu Gln
100 105 110

Leu Val Ala Leu Lys Pro Trp Ile Thr Arg Gln Asn Phe Ser Arg Cys
115 120 125

```
Leu Glu Leu Gln Cys Gln Pro Asp Ser Ser Thr Leu Pro Pro Pro Trp
    130                 135                 140


Ser Pro Arg Pro Leu Glu Ala Thr Ala Pro
145                 150


<210>  116
<211>  93
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  MIP1 alpha amino acid sequence

<400>  116

Met Gln Val Ser Thr Ala Ala Leu Ala Val Leu Leu Cys Thr Met Ala
1               5                   10                  15


Leu Cys Asn Gln Val Leu Ser Ala Pro Leu Ala Ala Asp Thr Pro Thr
            20                  25                  30


Ala Cys Cys Phe Ser Tyr Thr Ser Arg Gln Ile Pro Gln Asn Phe Ile
        35                  40                  45


Ala Asp Tyr Phe Glu Thr Ser Ser Gln Cys Ser Lys Pro Ser Val Ile
    50                  55                  60


Phe Leu Thr Lys Arg Gly Arg Gln Val Cys Ala Asp Pro Ser Glu Glu
65                  70                  75                  80


Trp Val Gln Lys Tyr Val Ser Asp Leu Glu Leu Ser Ala
                85                  90


<210>  117
<211>  188
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  IFN alpha amino acid sequence

<400>  117
```

```
Met Ala Leu Thr Phe Ala Leu Leu Val Ala Leu Leu Val Leu Ser Cys
1               5                  10                  15

Lys Ser Ser Cys Ser Val Gly Cys Asp Leu Pro Gln Thr His Ser Leu
            20                  25                  30

Gly Ser Arg Arg Thr Leu Met Leu Leu Ala Gln Met Arg Arg Ile Ser
        35                  40                  45

Leu Phe Ser Cys Leu Lys Asp Arg His Asp Phe Gly Phe Pro Gln Glu
    50                  55                  60

Glu Phe Gly Asn Gln Phe Gln Lys Ala Glu Thr Ile Pro Val Leu His
65                  70                  75                  80

Glu Met Ile Gln Gln Ile Phe Asn Leu Phe Ser Thr Lys Asp Ser Ser
                85                  90                  95

Ala Ala Trp Asp Glu Thr Leu Leu Asp Lys Phe Tyr Thr Glu Leu Tyr
            100                 105                 110

Gln Gln Leu Asn Asp Leu Glu Ala Cys Val Ile Gln Gly Val Gly Val
        115                 120                 125

Thr Glu Thr Pro Leu Met Lys Glu Asp Ser Ile Leu Ala Val Arg Lys
    130                 135                 140

Tyr Phe Gln Arg Ile Thr Leu Tyr Leu Lys Glu Lys Lys Tyr Ser Pro
145                 150                 155                 160

Cys Ala Trp Glu Val Val Arg Ala Glu Ile Met Arg Ser Phe Ser Leu
                165                 170                 175

Ser Thr Asn Leu Gln Glu Ser Leu Arg Ser Lys Glu
            180                 185
```

<210> 118
<211> 125
<212> PRT

<213> Artificial Sequence

<220>
<223> CXCL9 amino acid sequence

<400> 118

```
Met Lys Lys Ser Gly Val Leu Phe Leu Leu Gly Ile Ile Leu Leu Val
1               5                   10                  15


Leu Ile Gly Val Gln Gly Thr Pro Val Val Arg Lys Gly Arg Cys Ser
            20                  25                  30


Cys Ile Ser Thr Asn Gln Gly Thr Ile His Leu Gln Ser Leu Lys Asp
        35                  40                  45


Leu Lys Gln Phe Ala Pro Ser Pro Ser Cys Glu Lys Ile Glu Ile Ile
    50                  55                  60


Ala Thr Leu Lys Asn Gly Val Gln Thr Cys Leu Asn Pro Asp Ser Ala
65                  70                  75                  80


Asp Val Lys Glu Leu Ile Lys Lys Trp Glu Lys Gln Val Ser Gln Lys
                85                  90                  95


Lys Lys Gln Lys Asn Gly Lys Lys His Gln Lys Lys Lys Val Leu Lys
            100                 105                 110


Val Arg Lys Ser Gln Arg Ser Arg Gln Lys Lys Thr Thr
        115                 120                 125
```

<210> 119
<211> 98
<212> PRT
<213> Artificial Sequence

<220>
<223> CXCL10 amino acid sequence

<400> 119

```
Met Asn Gln Thr Ala Ile Leu Ile Cys Cys Leu Ile Phe Leu Thr Leu
1               5                   10                  15
```

Ser Gly Ile Gln Gly Val Pro Leu Ser Arg Thr Val Arg Cys Thr Cys
20 25 30

Ile Ser Ile Ser Asn Gln Pro Val Asn Pro Arg Ser Leu Glu Lys Leu
35 40 45

Glu Ile Ile Pro Ala Ser Gln Phe Cys Pro Arg Val Glu Ile Ile Ala
50 55 60

Thr Met Lys Lys Lys Gly Glu Lys Arg Cys Leu Asn Pro Glu Ser Lys
65 70 75 80

Ala Ile Lys Asn Leu Leu Lys Ala Val Ser Lys Glu Arg Ser Lys Arg
85 90 95

Ser Pro

<210> 120
<211> 35788
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-618 Genome

<400> 120
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

cattttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agttttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggtttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgccaggcc caccatgggt tggagctgta ttattctctt 29400

cctcgtcgcc accgcgaccg gagtgcattc cgagctcgtg atgacccagt caccatcatc 29460

cttgaccgtg actgcgggcg agaaggtcac gatgtcatgc aagtcgtcac aaagcctgct 29520

gaactccggc aatcagaaga attacctgac ctggtaccag cagaaaccgg gtcagccgcc 29580

aaaactgctg atctactggg catccacccg ggaaagcggg gtccctgacc ggttcactgg 29640

atcaggatca ggaaccgact ttaccctcac gatctcaagc gtccaagccg aggacttggc 29700

tgtgtactac tgccaaaatg actactcgta ccccctgact ttcggagctg ggaccaagct 29760

ggagatcaaa ggcggcggag ggtccggagg agggggggtcg ggaggggggg gaagcgaggt 29820

gcagctgctg gaacagagcg gagccgagct ggtgagacca ggcaccagcg tgaaaatctc 29880

gtgcaaggcc tcggggtacg ctttcacgaa ctactggttg ggttgggtga agcagcggcc 29940

gggtcatgga ctggagtgga tcggagacat ctttcccgga agcggaaata tccattacaa 30000

cgaaaagttt aaaggcaagg ccacccttac tgcggataag tcaagctcca ccgcttacat 30060

gcaactgtcc tcactgactt ttgaagacag cgctgtgtat ttctgcgctc gcctgcgcaa 30120

ttgggatgaa cctatggact actggggcca aggaaccacc gtgactgtgt cgtcgggagg 30180

gggaggctca caagtgcagc tgcagcagtc aggtgcagaa ttggccaggc cgggagccag 30240

cgtgaagatg tcgtgcaaag cctccggcta caccttcact cgctacacta tgcattgggt 30300

gaaacagcgg ccgggacaag ggctggagtg gatcggatac atcaatccat caagaggtta 30360

caccaactac aatcagaagt tcaaggacaa ggctaccctg acgactgata agagctcgtc 30420

aactgcatac atgcagctgt cgagcctgac cagcgaggat tccgccgtgt actactgcgc 30480

gagatactat gatgaccact actgcttgga ttactggggc caagggacca ctctgaccgt 30540

gtcctccggc ggaggggggct cgggcggcgg gggctcgggg ggcggcggca gcgacatcgt 30600

gctgacgcag agccccgcaa tcatgtcagc ctcccctggc gaaaaagtga cgatgacctg 30660

ctccgcttcc tcatcagtct cctacatgaa ctggtatcaa cagaagagcg gaacctcgcc 30720

gaagcgctgg atctacgata cctccaaact ggccagcgga gtgccggcgc attttcgggg 30780

atcgggcagc ggtacctcct actcgctcac catctcagga atggaagccg aagacgccgc 30840

cacctactac tgccagcagt ggtcctcaaa cccattcacc ttcggatccg gcactaagct 30900

ggaaatcaac cgcgggagcg gagcgactaa cttcagcttg ctcaagcaag ccggagatgt 30960

cgaggagaac ccgggacctg gttggtcgtg catcatccta ttccttgtcg cgaccgcaac 31020

tggcgtccat tccgacatcg tcatgaccca atccccagat tcgctggcgg tgtcgcttgg 31080

ggaacgggca accatcaact gcaagagctc gcagtcactg ctatacagcc ggaatcagaa 31140

aaactacctg gcgtggtacc agcaaaagcc gggtcagcct ccgaagctgc tgattttctg 31200

ggcctcaacc cgggaatccg gagtccctga cagattcagc gggtccggat tcgggaccga 31260

cttcactctg actatttcga gcctgcaagc agaagatgtg gcagtgtact attgccaaca 31320

gtatttttca tacccgctga ccttcggcca gggtacgaag gtggagatca agggtggagg 31380

gggtagcggc gggggaggca gcggcggggg gggaagccag gtgcagctgg tccaatcagg 31440

cgccgaggtc aagaaacctg gagcgtcggt caaggtctcc tgcaagacta gccgctacac 31500

ttttaccgaa tacaccatcc actgggtcag acaggcgccc ggtcagcgcc tggagtggat 31560

cggcgggatc aacccgaata atggaatccc gaactacaat caaaaattca aaggccgcgt 31620

gactatcacc gtggatactt cagcctcaac tgcttacatg gaactgtcat cgctgagatc 31680

agaggacact gcggtctact actgtgcgcg cagaagaatc gcttacggat acgacgaggg 31740

gcacgcaatg gactactggg gacagggaac cctggtgacc gtgtcgtcag gcggaggagg 31800

atcggatgtg cagttggtgc agtcgggcgc cgaagtgaaa aaaccggggg cctcagtgaa 31860

agtgtcctgc aaggcctccg gatacacctt cacccgctac actatgcact gggtcaggca 31920

ggcgcccggg cagggcctgg agtggatcgg gtatatcaac ccgtcaaggg gatacactaa 31980

ctacgccgac tccgtgaagg gaagattcac tatcaccact gacaaatcaa cttcgacggc 32040

gtatatggaa ctgtcatcct tgagatcgga agataccgcg acctactact gtgcgcgcta 32100

ctacgatgac cattactgcc tcgattactg gggacagggc accacggtga ccgtctcatc 32160

aggagaagga acttcaactg gttccggagg ctccggcggc tcaggcggcg ctgacgacat 32220

tgtgctgacc cagagcccgg cgaccctgtc actctcgccg ggggaaaggg ctactctgtc 32280

atgcagagcg tcacaatcgg tctcatacat gaactggtac cagcagaaac cgggcaaggc 32340

tccaaagcgg tggatctacg atacttcgaa ggtggcttca ggagtgccgg ctcgcttcag 32400

cggatccggc tcgggaaccg attacagctt gaccattaac tcgctggagg cggaggatgc 32460

agcgacctac tactgtcaac aatggtcctc gaacccactc acttttgggg gcgggaccaa 32520

ggtggagatt aagtaggcta gcttgactga ctgagataca gcgtaccttc agctcacaga 32580

catgataaga tacattgatg agtttggaca aaccacaact agaatgcagt gaaaaaaatg 32640

ctttatttgt gaaatttgtg atgctattgc tttatttgta accattataa gctgcaataa 32700

acaagttaac aacaacaatt gcattcattt tatgtttcag gttcaggggg aggtgtggga 32760

ggttttttaa agcaagtaaa acctctacaa atgtggtagt cgtcagctat cctgcaggaa 32820

cttgtttatt tgaaaatcaa ttcacaaaat ccgagtagtt attttgcctc ccccttccca 32880

tttaacagaa tacaccaatc tctccccacg cacagcttta aacatttgga taccattaga 32940

tatagacatg gttttagatt ccacattcca aacagtttca gagcgagcca atctggggtc 33000

agtgatagat aaaaatccat cgggatagtc ttttaaagcg ctttcacagt ccaactgctg 33060

cggatgcgac tccggagtct ggatcacggt catctggaag aagaacgatg ggaatcataa 33120

tccgaaaacg gtatcggacg attgtgtctc atcaaaccca caagcagccg ctgtctgcgt 33180

cgctccgtgc gactgctgtt tatgggatca gggtccacag tgtcctgaag catgatttta 33240

atagccctta acatcaactt tctggtgcga tgcgcgcagc aacgcattct gatttcactc 33300

aaatctttgc agtaggtaca acacattatt acaatattgt ttaataaacc ataattaaaa 33360

gcgctccagc caaaactcat atctgatata atcgcccctg catgaccatc ataccaaagt 33420

ttaatataaa ttaaatgacg ttccctcaaa aacacactac ccacatacat gatctctttt 33480

ggcatgtgca tattaacaat ctgtctgtac catggacaac gttggttaat catgcaaccc 33540

aatataacct tccggaacca cactgccaac accgctcccc cagccatgca ttgaagtgaa 33600

ccctgctgat tacaatgaca atgaagaacc caattctctc gaccgtgaat cacttgagaa 33660

tgaaaaatat ctatagtggc acaacataga cataaatgca tgcatcttct cataattttt 33720

aactcctcag gatttagaaa catatcccag ggaataggaa gctcttgcag aacagtaaag 33780

ctggcagaac aaggaagacc acgaacacaa cttacactat gcatagtcat agtatcacaa 33840

tctggcaaca gcgggtggtc ttcagtcata gaagctcggg tttcattttc ctcacaacgt 33900

ggtaactggg ctctggtgta agggtgatgt ctggcgcatg atgtcgagcg tgcgcgcaac 33960

cttgtcataa tggagttgct tcctgacatt ctcgtatttt gtatagcaaa acgcggccct 34020

ggcagaacac actcttcttc gccttctatc ctgccgctta gcgtgttccg tgtgatagtt 34080

caagtacaac cacactctta agttggtcaa aagaatgctg gcttcagttg taatcaaaac 34140

tccatcgcat ctaatcgttc tgaggaaatc atccaagcaa tgcaactgga ttgtgtttca 34200

agcaggagag gagagggaag agacggaaga accatgttaa tttttattcc aaacgatctc 34260

gcagtacttc aaattgtaga tcgcgcagat ggcatctctc gcccccactg tgttggtgaa 34320

aaagcacagc tagatcaaaa gaaatgcgat tttcaaggtg ctcaacggtg gcttccagca 34380

aagcctccac gcgcacatcc aagaacaaaa gaataccaaa agaaggagca ttttctaact 34440

cctcaatcat catattacat tcctgcacca ttcccagata attttcagct ttccagcctt 34500

gaattattcg tgtcagttct tgtggtaaat ccaatccaca cattacaaac aggtcccgga 34560

gggcgccctc caccaccatt cttaaacaca ccctcataat gacaaaatat cttgctcctg 34620

tgtcacctgt agcgaattga gaatggcaac atcaattgac atgcccttgg ctctaagttc 34680

ttctttaagt tctagttgta aaaactctct catattatca ccaaactgct tagccagaag 34740

ccccccggga acaagagcag gggacgctac agtgcagtac aagcgcagac ctccccaatt 34800

ggctccagca aaaacaagat tggaataagc atattgggaa ccgccagtaa tatcatcgaa 34860

gttgctggaa atataatcag gcagagtttc ttgtaaaaat tgaataaaag aaaaatttgc 34920

caaaaaaaca ttcaaaacct ctgggatgca aatgcaatag gttaccgcgc tgcgctccaa 34980

cattgttagt tttgaattag tctgcaaaaa taaaaaaaaa aacaagcgtc atatcatagt 35040

agcctgacga acagatggat aaatcagtct ttccatcaca agacaagcca cagggtctcc 35100

agctcgaccc tcgtaaaacc tgtcatcatg attaaacaac agcaccgaaa gttcctcgcg 35160

gtgaccagca tgaataattc ttgatgaagc atacaatcca gacatgttag catcagttaa 35220

cgagaaaaaa cagccaacat agcctttggg tataattatg cttaatcgta agtatagcaa 35280

agccacccct cgcggataca aagtaaaagg cacaggagaa taaaaaatat aattatttct 35340

ctgctgctgt tcaggcaacg tcgcccccgg tccctctaaa tacacataca aagcctcatc 35400

agccatggct taccagacaa agtacagcgg gcacacaaag cacaagctct aaagtgactc 35460

tccaacctct ccacaatata tatatacaca agccctaaac tgacgtaatg ggagtaaagt 35520

gtaaaaaatc ccgccaaacc caacacacac cccgaaactg cgtcaccagg gaaaagtaca 35580

gtttcacttc cgcaatccca acaggcgtaa cttcctcttt ctcacggtac gtgatatccc 35640

actaacttgc aacgtcattt tcccacggtc gcaccgcccc ttttagccgt taaccccaca 35700

gccaatcacc acacgatcca cacttttaa aatcacctca tttacatatt ggcaccattc 35760

catctataag gtatattata tagataga 35788

<210> 121
<211> 1540
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-618 EpCam BiTE nucleic acid sequence

<400> 121
atgggttgga gctgtattat tctcttcctc gtcgccaccg cgaccggagt gcattccgag 60

ctcgtgatga cccagtcacc atcatccttg accgtgactg cgggcgagaa ggtcacgatg 120

tcatgcaagt cgtcacaaag cctgctgaac tccggcaatc agaagaatta cctgacctgg 180

taccagcaga aaccgggtca gccgccaaaa ctgctgatct actgggcatc cacccgggaa 240

agcggggtcc ctgaccggtt cactggatca ggatcaggaa ccgactttac cctcacgatc 300

tcaagcgtcc aagccgagga cttggctgtg tactactgcc aaaatgacta ctcgtacccc 360

ctgactttcg gagctgggac caagctggag atcaaaggcg gcggagggtc cggaggaggg 420

gggtcgggag gggggggaag cgaggtgcag ctgctggaac agagcggagc cgagctggtg 480

agaccaggca ccagcgtgaa aatctcgtgc aaggcctcgg ggtacgcttt cacgaactac 540

tggttgggtt gggtgaagca gcggccgggt catggactgg agtggatcgg agacatcttt 600

cccggaagcg gaaatatcca ttacaacgaa aagtttaaag gcaaggccac ccttactgcg 660

gataagtcaa gctccaccgc ttacatgcaa ctgtcctcac tgacttttga agacagcgct 720

gtgtatttct gcgctcgcct gcgcaattgg gatgaaccta tggactactg gggccaagga 780

accaccgtga ctgtgtcgtc gggaggggga ggctcacaag tgcagctgca gcagtcaggt 840

gcagaattgg ccaggccggg agccagcgtg aagatgtcgt gcaaagcctc cggctacacc 900

ttcactcgct acactatgca ttgggtgaaa cagcggccgg gacaagggct ggagtggatc 960

ggatacatca atccatcaag aggttacacc aactacaatc agaagttcaa ggacaaggct 1020

accctgacga ctgataagag ctcgtcaact gcatacatgc agctgtcgag cctgaccagc 1080

gaggattccg ccgtgtacta ctgcgcgaga tactatgatg accactactg cttggattac 1140

tggggccaag ggaccactct gaccgtgtcc tccggcggag ggggctcggg cggcgggggc 1200

tcgggggggcg gcggcagcga catcgtgctg acgcagagcc ccgcaatcat gtcagcctcc 1260

cctggcgaaa aagtgacgat gacctgctcc gcttcctcat cagtctccta catgaactgg 1320

tatcaacaga agagcggaac ctcgccgaag cgctggatct acgatacctc caaactggcc 1380

agcggagtgc cggcgcattt tcggggatcg ggcagcggta cctcctactc gctcaccatc 1440

tcaggaatgg aagccgaaga cgccgccacc tactactgcc agcagtggtc ctcaaaccca 1500

ttcaccttcg gatccggcac taagctggaa atcaaccgcg 1540

<210> 122
<211> 1557
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-618 FAP BiTE nucleic acid sequence

<400> 122

```
atgggttggt cgtgcatcat cctattcctt gtcgcgaccg caactggcgt ccattccgac       60

atcgtcatga cccaatcccc agattcgctg gcggtgtcgc ttggggaacg ggcaaccatc      120

aactgcaaga gctcgcagtc actgctatac agccggaatc agaaaaacta cctggcgtgg      180

taccagcaaa agccgggtca gcctccgaag ctgctgattt tctgggcctc aacccgggaa      240

tccggagtcc ctgacagatt cagcgggtcc ggattcggga ccgacttcac tctgactatt      300

tcgagcctgc aagcagaaga tgtggcagtg tactattgcc aacagtattt ttcatacccg      360

ctgaccttcg gccagggtac gaaggtggag atcaagggtg gaggggggtag cggcggggga      420

ggcagcggcg gggggggaag ccaggtgcag ctggtccaat caggcgccga ggtcaagaaa      480

cctggagcgt cggtcaaggt ctcctgcaag actagccgct acacttttac cgaatacacc      540

atccactggg tcagacaggc gcccggtcag cgcctggagt ggatcggcgg gatcaacccg      600

aataatggaa tcccgaacta caatcaaaaa ttcaaaggcc gcgtgactat caccgtggat      660

acttcagcct caactgctta catggaactg tcatcgctga gatcagagga cactgcggtc      720

tactactgtg cgcgcagaag aatcgcttac ggatacgacg aggggcacgc aatggactac      780

tggggacagg gaaccctggt gaccgtgtcg tcaggcggag gaggatcgga tgtgcagttg      840

gtgcagtcgg gcgccgaagt gaaaaaaccg ggggcctcag tgaaagtgtc ctgcaaggcc      900

tccggataca ccttcacccg ctacactatg cactgggtca ggcaggcgcc cgggcagggc      960

ctggagtgga tcgggtatat caacccgtca aggggataca ctaactacgc cgactccgtg     1020

aagggaagat tcactatcac cactgacaaa tcaacttcga cggcgtatat ggaactgtca     1080

tccttgagat cggaagatac cgcgacctac tactgtgcgc gctactacga tgaccattac     1140

tgcctcgatt actggggaca gggcaccacg gtgaccgtct catcaggaga aggaacttca     1200

actggttccg gaggctccgg cggctcaggc ggcgctgacg acattgtgct gacccagagc     1260

ccggcgaccc tgtcactctc gccgggggaa agggctactc tgtcatgcag agcgtcacaa     1320

tcggtctcat acatgaactg gtaccagcag aaaccgggca aggctccaaa gcggtggatc     1380

tacgatactt cgaaggtggc ttcaggagtg ccggctcgct tcagcggatc cggctcggga     1440

accgattaca gcttgaccat taactcgctg gaggcggagg atgcagcgac ctactactgt     1500

caacaatggt cctcgaaccc actcactttt gggggcggga ccaaggtgga gattaag        1557
```

<210> 123
<211> 3169
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-618 Transgene cassette

<400> 123
caggcccacc atgggttgga gctgtattat tctcttcctc gtcgccaccg cgaccggagt 60

gcattccgag ctcgtgatga cccagtcacc atcatccttg accgtgactg cgggcgagaa 120

ggtcacgatg tcatgcaagt cgtcacaaag cctgctgaac tccggcaatc agaagaatta 180

cctgacctgg taccagcaga aaccgggtca gccgccaaaa ctgctgatct actgggcatc 240

cacccgggaa agcggggtcc ctgaccggtt cactggatca ggatcaggaa ccgactttac 300

cctcacgatc tcaagcgtcc aagccgagga cttggctgtg tactactgcc aaaatgacta 360

ctcgtacccc ctgactttcg gagctgggac caagctggag atcaaaggcg gcggagggtc 420

cggaggaggg gggtcgggag gggggggaag cgaggtgcag ctgctggaac agagcggagc 480

cgagctggtg agaccaggca ccagcgtgaa aatctcgtgc aaggcctcgg ggtacgcttt 540

cacgaactac tggttgggtt gggtgaagca gcggccgggt catggactgg agtggatcgg 600

agacatcttt cccggaagcg gaaatatcca ttacaacgaa aagtttaaag gcaaggccac 660

ccttactgcg gataagtcaa gctccaccgc ttacatgcaa ctgtcctcac tgacttttga 720

agacagcgct gtgtatttct gcgctcgcct gcgcaattgg gatgaaccta tggactactg 780

gggccaagga accaccgtga ctgtgtcgtc gggaggggga ggctcacaag tgcagctgca 840

gcagtcaggt gcagaattgg ccaggccggg agccagcgtg aagatgtcgt gcaaagcctc 900

cggctacacc ttcactcgct acactatgca ttgggtgaaa cagcggccgg gacaagggct 960

ggagtggatc ggatacatca atccatcaag aggttacacc aactacaatc agaagttcaa 1020

ggacaaggct accctgacga ctgataagag ctcgtcaact gcatacatgc agctgtcgag 1080

cctgaccagc gaggattccg ccgtgtacta ctgcgcgaga tactatgatg accactactg 1140

cttggattac tggggccaag ggaccactct gaccgtgtcc tccggcggag ggggctcggg 1200

cggcgggggc tcgggggcg gcggcagcga catcgtgctg acgcagagcc ccgcaatcat 1260

gtcagcctcc cctggcgaaa aagtgacgat gacctgctcc gcttcctcat cagtctccta 1320

catgaactgg tatcaacaga agagcggaac ctcgccgaag cgctggatct acgatacctc 1380

caaactggcc agcggagtgc cggcgcattt tcggggatcg ggcagcggta cctcctactc 1440

gctcaccatc tcaggaatgg aagccgaaga cgccgccacc tactactgcc agcagtggtc 1500

ctcaaaccca ttcaccttcg gatccggcac taagctggaa atcaaccgcg ggagcggagc 1560

gactaacttc agcttgctca agcaagccgg agatgtcgag gagaacccgg gacctggttg 1620

gtcgtgcatc atcctattcc ttgtcgcgac cgcaactggc gtccattccg acatcgtcat 1680

gacccaatcc ccagattcgc tggcggtgtc gcttggggaa cgggcaacca tcaactgcaa 1740

gagctcgcag tcactgctat acagccggaa tcagaaaaac tacctggcgt ggtaccagca 1800

aaagccgggt cagcctccga agctgctgat tttctgggcc tcaacccggg aatccggagt 1860

ccctgacaga ttcagcgggt ccggattcgg gaccgacttc actctgacta tttcgagcct 1920

gcaagcagaa gatgtggcag tgtactattg ccaacagtat ttttcatacc cgctgacctt 1980

cggccagggt acgaaggtgg agatcaaggg tggagggggt agcggcgggg gaggcagcgg 2040

cgggggggga agccaggtgc agctggtcca atcaggcgcc gaggtcaaga aacctggagc 2100

gtcggtcaag gtctcctgca agactagccg ctacactttt accgaataca ccatccactg 2160

ggtcagacag gcgcccggtc agcgcctgga gtggatcggc gggatcaacc cgaataatgg 2220

aatcccgaac tacaatcaaa aattcaaagg ccgcgtgact atcaccgtgg atacttcagc 2280

ctcaactgct tacatggaac tgtcatcgct gagatcagag gacactgcgg tctactactg 2340

tgcgcgcaga agaatcgctt acggatacga cgaggggcac gcaatggact actggggaca 2400

gggaaccctg gtgaccgtgt cgtcaggcgg aggaggatcg gatgtgcagt tggtgcagtc 2460

gggcgccgaa gtgaaaaaac cgggggcctc agtgaaagtg tcctgcaagg cctccggata 2520

caccttcacc cgctacacta tgcactgggt caggcaggcg cccgggcagg gcctggagtg 2580

gatcgggtat atcaacccgt caaggggata cactaactac gccgactccg tgaagggaag 2640

attcactatc accactgaca aatcaacttc gacggcgtat atggaactgt catccttgag 2700

atcggaagat accgcgacct actactgtgc gcgctactac gatgaccatt actgcctcga 2760

ttactgggga cagggcacca cggtgaccgt ctcatcagga gaaggaactt caactggttc 2820

cggaggctcc ggcggctcag gcggcgctga cgacattgtg ctgacccaga gcccggcgac 2880

cctgtcactc tcgccggggg aaagggctac tctgtcatgc agagcgtcac aatcggtctc 2940

atacatgaac tggtaccagc agaaaccggg caaggctcca aagcggtgga tctacgatac 3000

ttcgaaggtg gcttcaggag tgccggctcg cttcagcgga tccggctcgg gaaccgatta 3060

cagcttgacc attaactcgc tggaggcgga ggatgcagcg acctactact gtcaacaatg 3120

gtcctcgaac ccactcactt ttgggggcgg gaccaaggtg gagattaag 3169

<210> 124
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 124

Ser Gly Gly Gly Gly Ser Glu
1 5

<210> 125
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 125

Asp Lys Thr His Thr Ser
1 5

<210> 126
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature

<222> (1)..(1)
<223> Ser is optional

<400> 126

Ser Gly Gly Gly Gly Ser
1 5

<210> 127
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (1)..(1)
<223> Ser is optional

<400> 127

Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10

<210> 128
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (1)..(1)
<223> Ser is optional

<400> 128

Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10 15

<210> 129
<211> 21
<212> PRT

<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (1)..(1)
<223> Ser is optional

<400> 129

Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1   5   10   15

Gly Gly Gly Gly Ser
            20

<210> 130
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (1)..(1)
<223> Ser is optional

<400> 130

Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1   5   10   15

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
            20   25

<210> 131
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 131

Ala Ala Ala Gly Ser Gly Gly Ala Ser Ala Ser
1 5 10

<210> 132
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<400> 132

Ala Ala Ala Gly Ser Gly Xaa Gly Gly Gly Ser Gly Ala Ser Ala Ser
1 5 10 15

<210> 133
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (12)..(12)
<223> Xaa can be any naturally occurring amino acid

<400> 133

Ala Ala Ala Gly Ser Gly Xaa Gly Gly Gly Ser Xaa Gly Gly Gly Ser
1 5 10 15

Gly Ala Ser Ala Ser
            20

<210> 134
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (12)..(12)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (17)..(17)
<223> Xaa can be any naturally occurring amino acid

<400> 134

Ala Ala Ala Gly Ser Gly Xaa Gly Gly Gly Ser Xaa Gly Gly Gly Ser
1   5   10   15

Xaa Gly Gly Gly Ser Gly Ala Ser Ala Ser
            20   25

<210> 135
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (12)..(12)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (17)..(17)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (22)..(22)
<223> Xaa can be any naturally occurring amino acid

<400> 135

Ala Ala Ala Gly Ser Gly Xaa Gly Gly Gly Ser Xaa Gly Gly Gly Ser
1 5 10 15

Xaa Gly Gly Gly Ser Xaa Gly Gly Gly Ser Gly Ala Ser Ala Ser
20 25 30

<210> 136
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<400> 136

Ala Ala Ala Gly Ser Gly Xaa Ser Gly Ala Ser Ala Ser
1 5 10

<210> 137
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 137

Pro Gly Gly Asn Arg Gly Thr Thr Thr Thr Arg Arg Pro Ala Thr Thr
1 5 10 15

Thr Gly Ser Ser Pro Gly Pro Thr Gln Ser His Tyr
20 25

<210> 138
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 138

Ala Thr Thr Thr Gly Ser Ser Pro Gly Pro Thr
1 5 10

<210> 139
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 139

Ala Thr Thr Thr Gly Ser
1 5

<210> 140
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 140

Met Pro Ser Leu Ser Gly Val Leu Gln Val Arg Tyr Leu Ser Pro Pro
1 5 10 15

Asp Leu

<210> 141
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 141

Glu Pro Ser Gly Pro Ile Ser Thr Ile Asn Ser Pro Pro Ser Lys Glu
1 5 10 15

Ser His Lys Ser Pro
20

<210> 142
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 142

Gly Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
1 5 10 15

<210> 143
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 143

Gly Gly Gly Gly Ile Ala Pro Ser Met Val Gly Gly Gly Gly Ser
1 5 10 15

<210> 144

<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 144

Gly Gly Gly Gly Lys Val Glu Gly Ala Gly Gly Gly Gly Gly Ser
1 5 10 15

<210> 145
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 145

Gly Gly Gly Gly Ser Met Lys Ser His Asp Gly Gly Gly Gly Ser
1 5 10 15

<210> 146
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 146

Gly Gly Gly Gly Asn Leu Ile Thr Ile Val Gly Gly Gly Gly Ser
1 5 10 15

<210> 147
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 147

Gly Gly Gly Gly Val Val Pro Ser Leu Pro Gly Gly Gly Gly Ser

1 5 10 15

<210> 148
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 148

Gly Gly Glu Lys Ser Ile Pro Gly Gly Gly Gly Ser
1 5 10

<210> 149
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 149

Arg Pro Leu Ser Tyr Arg Pro Pro Phe Pro Phe Gly Phe Pro Ser Val
1 5 10 15

Arg Pro

<210> 150
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 150

Tyr Pro Arg Ser Ile Tyr Ile Arg Arg Arg His Pro Ser Pro Ser Leu
1 5 10 15

Thr Thr

<210> 151
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 151

Thr Pro Ser His Leu Ser His Ile Leu Pro Ser Phe Gly Leu Pro Thr
1   5   10   15

Phe Asn

<210> 152
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 152

Arg Pro Val Ser Pro Phe Thr Phe Pro Arg Leu Ser Asn Ser Trp Leu
1   5   10   15

Pro Ala

<210> 153
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 153

Ser Pro Ala Ala His Phe Pro Arg Ser Ile Pro Arg Pro Gly Pro Ile
1   5   10   15

Arg Thr

<210> 154
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 154

Ala Pro Gly Pro Ser Ala Pro Ser His Arg Ser Leu Pro Ser Arg Ala
1   5   10   15

Phe Gly

<210> 155
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 155

Pro Arg Asn Ser Ile His Phe Leu His Pro Leu Leu Val Ala Pro Leu
1   5   10   15

Gly Ala

<210> 156
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 156

Asn Pro Ser Leu Asn Pro Pro Ser Tyr Leu His Arg Ala Pro Ser Arg
1   5   10   15

Ile Ser

<210> 157
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 157

Leu Pro Trp Arg Thr Ser Leu Leu Pro Ser Leu Pro Leu Arg Arg Arg
1 5 10 15

Pro

<210> 158
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 158

Pro Pro Leu Phe Ala Lys Gly Pro Val Gly Leu Leu Ser Arg Ser Phe
1 5 10 15

Pro Pro

<210> 159
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 159

Val Pro Pro Ala Pro Val Val Ser Leu Arg Ser Ala His Ala Arg Pro

1 5 10 15

Pro Tyr

<210> 160
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 160

Leu Arg Pro Thr Pro Pro Arg Val Arg Ser Tyr Thr Cys Cys Pro Thr
1 5 10 15

Pro

<210> 161
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 161

Pro Asn Val Ala His Val Leu Pro Leu Leu Thr Val Pro Trp Asp Asn
1 5 10 15

Leu Arg

<210> 162
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Flexible linker sequence

<400> 162

Cys Asn Pro Leu Leu Pro Leu Cys Ala Arg Ser Pro Ala Val Arg Thr
1   5   10   15

Phe Pro

<210> 163
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> rigid linker

<400> 163

Gly Ala Pro Ala Pro Ala Ala Pro Ala Pro Ala
1   5   10

<210> 164
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> rigid linker

<400> 164

Pro Pro Pro Pro
1

<210> 165

<400> 165
000

<210> 166
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<220>

<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (8)..(8)
<223> Xaa can be any naturally occurring amino acid

<400> 166

Asp Lys Thr His Thr Cys Xaa Xaa
1 5

<210> 167
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 167

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala
1 5 10

<210> 168
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 168

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala

<210> 169
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 169

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 170
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequences

<400> 170

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Gly Lys Pro Thr Leu
1   5   10   15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Cys Tyr
            20   25   30

<210> 171
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 171

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Cys Tyr
            20   25   30

<210> 172
<211> 15
<212> PRT

<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 172

Asp Lys Thr His Thr Cys Cys Val Glu Cys Pro Pro Cys Pro Ala
1   5   10   15

<210> 173
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 173

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Cys Pro Ala
            20   25

<210> 174
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 174

Asp Lys Thr His Thr Cys Pro Ser Cys Pro Ala
1   5   10

<210> 175
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (8)..(8)
<223> Xaa can be any naturally occurring amino acid

<400> 175

Asp Lys Thr His Thr Ser Xaa Xaa
1   5

<210> 176
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 176

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala
1   5   10

<210> 177
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 177

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala
1   5   10

<210> 178
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 178

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala
1   5   10

<210> 179
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 179

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala

<210> 180
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 180

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala

<210> 181
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 181

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala

<210> 182
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 182

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala

<210> 183
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 183

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala

<210> 184
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 184

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala

<210> 185
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 185

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala

<210> 186
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 186

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala

<210> 187
<211> 18
<212> PRT
<213> Artificial Sequence

<220>

<223> Linker sequence

<400> 187

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala

<210> 188
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 188

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala

<210> 189
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 189

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala

<210> 190
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 190

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala

<210> 191
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 191

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala

<210> 192
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 192

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala

<210> 193
<211> 18

<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 193

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala

<210> 194
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 194

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 195
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 195

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
            20   25

<210> 196
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 196

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 197
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 197

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 198
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 198

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 199
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 199

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 200
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 200

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 201
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 201

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
20 25

<210> 202
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 202

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
20 25

<210> 203
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 203

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
20 25

<210> 204
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 204

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 205
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 205

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
            20   25

<210> 206
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 206

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
            20   25

<210> 207
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 207

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 208
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 208

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 209
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 209

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 210
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 210

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 211
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 211

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 212
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 212

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 213
<211> 25
<212> PRT
<213> Artificial Sequence

<220>

<223> Linker sequence

<400> 213

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 214
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 214

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 215
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 215

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 216
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 216

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 217
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 217

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 218
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 218

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 219
<211> 25

<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 219

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 220
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 220

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 221
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 221

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 222
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 222

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 223
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 223

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 224
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 224

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 225
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 225

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
            20   25

<210> 226
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 226

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
            20   25

<210> 227
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 227

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
20 25

<210> 228
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 228

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 229
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 229

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 230
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 230

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1 5 10 15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 231
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 231

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 232
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 232

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 233
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 233

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Cys Pro Pro Cys Pro Ala
20 25

<210> 234
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 234

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 235
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 235

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1 5 10 15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
20 25

<210> 236
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 236

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 237
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 237

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
20 25

<210> 238
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 238

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1 5 10 15

Pro Ala Thr Ser Pro Pro Cys Pro Ala
20 25

<210> 239
<211> 25
<212> PRT
<213> Artificial Sequence

<220>

<223> Linker sequence

<400> 239

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 240
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 240

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Cys Pro Pro Ser
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 241
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 241

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Cys
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 242
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 242

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala Thr Cys Pro Pro Ser Pro Ala
            20   25

<210> 243
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 243

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Thr Ser Pro Pro Ser
1   5   10   15

Pro Ala Thr Ser Pro Pro Ser Pro Ala
            20   25

<210> 244
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 244

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Gly Lys Pro Thr Leu
1   5   10   15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Ser Tyr
            20   25   30

<210> 245
<211> 30

<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 245

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Gly Lys Pro Thr Leu
1   5   10   15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Cys Tyr
            20   25   30

<210> 246
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 246

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Gly Lys Pro Thr Leu
1   5   10   15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Cys Tyr
            20   25   30

<210> 247
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 247

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Gly Lys Pro Thr Leu
1   5   10   15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Ser Tyr
            20   25   30

<210> 248
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 248

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Gly Lys Pro Thr Leu
1 5 10 15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Cys Tyr
20 25 30

<210> 249
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 249

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Gly Lys Pro Thr Leu
1 5 10 15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Ser Tyr
20 25 30

<210> 250
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 250

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Gly Lys Pro Thr Leu
1 5 10 15

Tyr Asn Ser Leu Val Met Ser Asp Thr Ala Gly Thr Ser Tyr
20 25 30

<210> 251
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 251

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Ser Tyr
            20   25   30

<210> 252
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 252

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Cys Tyr
            20   25   30

<210> 253
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 253

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Cys Tyr
            20   25   30

<210> 254
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 254

Asp Lys Thr His Thr Cys Pro Pro Ser Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Ser Tyr
            20   25   30

<210> 255
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 255

Asp Lys Thr His Thr Ser Pro Pro Cys Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Ser Tyr
            20   25   30

<210> 256
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 256

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Cys Tyr
            20   25   30

<210> 257
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 257

Asp Lys Thr His Thr Ser Pro Pro Ser Pro Ala Gly Lys Pro Thr His
1   5   10   15

Val Asn Val Ser Val Val Met Ala Glu Val Asp Gly Thr Ser Tyr
            20   25   30

<210> 258
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 258

Asp Lys Thr His Thr Cys Cys Val Glu Cys Pro Pro Ser Pro Ala
1   5   10   15

<210> 259
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 259

Asp Lys Thr His Thr Cys Cys Val Glu Ser Pro Pro Cys Pro Ala
1   5   10   15

<210> 260
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 260

Asp Lys Thr His Thr Cys Ser Val Glu Cys Pro Pro Cys Pro Ala
1 5 10 15

<210> 261
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 261

Asp Lys Thr His Thr Ser Cys Val Glu Cys Pro Pro Cys Pro Ala
1 5 10 15

<210> 262
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 262

Asp Lys Thr His Thr Cys Cys Val Glu Ser Pro Pro Ser Pro Ala
1 5 10 15

<210> 263
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 263

Asp Lys Thr His Thr Cys Ser Val Glu Cys Pro Pro Ser Pro Ala
1   5   10   15

<210> 264
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 264

Asp Lys Thr His Thr Ser Cys Val Glu Cys Pro Pro Ser Pro Ala
1   5   10   15

<210> 265
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 265

Asp Lys Thr His Thr Cys Ser Val Glu Ser Pro Pro Cys Pro Ala
1   5   10   15

<210> 266
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 266

Asp Lys Thr His Thr Ser Ser Val Glu Cys Pro Pro Cys Pro Ala
1   5   10   15

<210> 267
<211> 15
<212> PRT
<213> Artificial Sequence

<220>

<223> Linker sequence

<400> 267

Asp Lys Thr His Thr Cys Ser Val Glu Ser Pro Pro Ser Pro Ala
1   5   10   15

<210> 268
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 268

Asp Lys Thr His Thr Ser Ser Val Glu Cys Pro Pro Ser Pro Ala
1   5   10   15

<210> 269
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 269

Asp Lys Thr His Thr Ser Ser Val Glu Ser Pro Pro Cys Pro Ala
1   5   10   15

<210> 270
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 270

Asp Lys Thr His Thr Ser Ser Val Glu Ser Pro Pro Ser Pro Ala
1   5   10   15

<210> 271
<211> 26

<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 271

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 272
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 272

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Ser Pro Arg Cys Pro Ala
            20   25

<210> 273
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 273

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Cys Pro Ala
            20   25

<210> 274
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 274

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Cys Pro Arg Cys Pro Ala
20 25

<210> 275
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 275

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Cys Pro Arg Cys Pro Ala
20 25

<210> 276
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 276

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
20 25

<210> 277
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 277

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 278
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 278

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 279
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 279

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
20 25

<210> 280
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 280

Asp Lys Thr His Thr Cys Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
20 25

<210> 281
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 281

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
20 25

<210> 282
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 282

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
            20   25

<210> 283
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 283

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 284
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 284

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 285
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 285

Asp Lys Thr His Thr Ser Pro Arg Ser Pro Glu Pro Lys Ser Cys Asp
1 5 10 15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
20 25

<210> 286
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 286

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Cys Pro Ala
20 25

<210> 287
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 287

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1 5 10 15

Thr Pro Pro Pro Ser Pro Arg Cys Pro Ala
20 25

<210> 288
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 288

Asp Lys Thr His Thr Ser Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Cys Pro Ala
            20   25

<210> 289
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 289

Asp Lys Thr His Thr Cys Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
            20   25

<210> 290
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 290

Asp Lys Thr His Thr Ser Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Cys Pro Arg Ser Pro Ala
            20   25

<210> 291
<211> 26
<212> PRT
<213> Artificial Sequence

<220>

<223> Linker sequence

<400> 291

Asp Lys Thr His Thr Ser Pro Arg Ser Pro Glu Pro Lys Ser Cys Asp
1   5   10   15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
            20   25

<210> 292
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 292

Asp Lys Thr His Thr Ser Pro Arg Cys Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
            20   25

<210> 293
<211> 26
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 293

Asp Lys Thr His Thr Ser Pro Arg Ser Pro Glu Pro Lys Ser Ser Asp
1   5   10   15

Thr Pro Pro Pro Ser Pro Arg Ser Pro Ala
            20   25

<210> 294
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 294

Asp Lys Thr His Thr Cys Pro Ser Ser Pro Ala
1   5   10

<210> 295
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 295

Asp Lys Thr His Thr Ser Pro Ser Cys Pro Ala
1   5   10

<210> 296
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 296

Asp Lys Thr His Thr Ser Pro Ser Ser Pro Ala
1   5   10

<210> 297
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> Linker sequence

<400> 297

Gly Gly Gly Ser
1

<210> 298
<211> 35759
<212> DNA
<213> Artificial Sequence

<220>
<223> NG-616 genome sequence

<400> 298
tctatctata taatatacct tatagatgga atggtgccaa tatgtaaatg aggtgatttt 60

aaaaagtgtg gatcgtgtgg tgattggctg tggggttaac ggctaaaagg ggcggtgcga 120

ccgtgggaaa atgacgtttt gtgggggtgg agtttttttg caagttgtcg cgggaaatgt 180

gacgcataaa aaggcttttt tctcacggaa ctacttagtt ttcccacggt atttaacagg 240

aaatgaggta gttttgaccg gatgcaagtg aaaattgttg attttcgcgc gaaaactgaa 300

tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg 360

ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt 420

ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt 480

tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc 540

tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat 600

aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga 660

cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt 720

agaggtagag ggatcggagg attctaatga ggaagctgta aatggctttt ttaccgattc 780

tatgctttta gctgctaatg aagggttaga attagatccg cctttggaca cttttgatac 840

tccaggggta attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt 900

ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga 960

aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt 1020

tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa 1080

aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagaacgc actgccactt 1140

tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat 1200

attgagtgtg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgaatcacc 1260

atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg 1320

caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga 1380

cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacgtc caagacaata 1440

agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaca gtgcaatgta 1500

ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata 1560

taagtagaag cagacctgtg tggttagctc ataggagctg gctttcatcc atggaggttt 1620

gggccatttt ggaagacctt aggaagacta ggcaactgtt agagaacgct tcggacggag 1680

tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa 1740

aacaggacta taaacaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag 1800

ctcttaattt gggccatcag gttcacttta aagaaaaagt tttatcagtt ttagactttt 1860

caaccccagg tagaactgct gctgctgtgg cttttcttac ttttatatta gataaatgga 1920

tcccgcagac tcatttcagc aggggatacg ttttggattt catagccaca gcattgtgga 1980

gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg 2040

gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc 2100

aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt 2160

gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt 2220

taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat 2280

gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtt cagaaagagg gaagggatga 2340

agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc 2400

tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa 2460

acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg 2520

ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat 2580

gtggcctggg gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga 2640

tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt 2700

ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag 2760

tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa 2820

atgcatattt caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca 2880

ctgcgcttct acagatactg gatgttttat tttgattaag ggaaatgcca gcgtaaagca 2940

taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgctggtgg 3000

gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt 3060

ttttgatcac aatgtgatga cgaagtgtac catgcatgca ggtgggcgta gaggaatgtt 3120

tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc 3180

cagaatgagc ctaacaggaa tttttgacat gaacatgcaa atctggaaga tcctgaggta 3240

tgatgatacg agatcgaggg tacgcgcatg cgaatgcgga ggcaagcatg ccaggttcca 3300

gccggtgtgt gtagatgtga ctgaagatct cagaccggat catttggtta ttgcccgcac 3360

tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt 3420

tggggtggga ttttcagatg gacagattga gtaaaaattt gtttttctg tcttgcagct 3480

gtcatgagtg gaaacgcttc ttttaagggg ggagtcttca gcccttatct gacagggcgt 3540

ctcccatcct gggcaggagt tcgtcagaat gttatgggat ctactgtgga tggaagaccc 3600

gtccaacccg ccaattcttc aacgctgacc tatgctactt taagttcttc acctttggac 3660

gcagctgcag ctgccgccgc cgcttctgtt gccgctaaca ctgtgcttgg aatgggttac 3720

tatggaagca tcatggctaa ttccacttcc tctaataacc cttctaccct gactcaggac 3780

aagttacttg tccttttggc ccagctggag gctttgaccc aacgtctggg tgaactttct 3840

cagcaggtgg tcgagttgcg agtacaaact gagtctgctg tcggcacggc aaagtctaaa 3900

taaaaaaatc ccagaatcaa tgaataaata aacaagcttg ttgttgattt aaaatcaagt 3960

gtttttattt catttttcgc gcacggtatg ccctagacca ccgatctcta tcattgagaa 4020

ctcggtggat tttttccagg atcctataga ggtgggattg aatgtttaga tacatgggca 4080

ttaggccgtc tttggggtgg agatagctcc attgaaggga ttcatgctcc ggggtagtgt 4140

tgtaaatcac ccagtcataa caaggtcgca gtgcatggtg ttgcacaata tcttttagaa 4200

gtaggctgat tgccacagat aagcccttgg tgtaggtgtt tacaaaccgg ttgagctggg 4260

atgggtgcat tcggggtgaa attatgtgca ttttggattg gatttttaag ttggcaatat 4320

tgccgccaag atcccgtctt gggttcatgt tatgaaggac caccaagacg gtgtatccgg 4380

tacatttagg aaatttatcg tgcagcttgg atggaaaagc gtggaaaaat ttggagacac 4440

ccttgtgtcc tccaagattt tccatgcact catccatgat aatagcaatg gggccgtggg 4500

cagcggcgcg ggcaaacacg ttccgtgggt ctgacacatc atagttatgt tcctgagtta 4560

aatcatcata agccatttta atgaatttgg ggcggagagt accagattgg ggtatgaatg 4620

ttccttcggg ccccggagca tagttcccct cacagatttg catttcccaa gctttcagtt 4680

ccgagggtgg aatcatgtcc acctgggggg ctatgaaaaa caccgtttct ggggcggggg 4740

tgattaattg tgatgatagc aaatttctga gcaattgaga tttgccacat ccggtggggc 4800

cataaatgat tccgattacg ggttgcaggt ggtagtttag ggaacggcaa ctgccgtctt 4860

ctcgaagcaa gggggccacc tcgttcatca tttcccttac atgcatattt tcccgcacca 4920

aatccattag gaggcgctct cctcctagtg atagaagttc ttgtagtgag gaaaagtttt 4980

tcagcggttt cagaccgtca gccatgggca ttttggagag agtttgctgc aaaagttcta 5040

gtctgttcca cagttcagtg atgtgttcta tggcatctcg atccagcaga cctcctcgtt 5100

tcgcgggttt ggacggctcc tggaataggg tatgagacga tgggcgtcca gcgctgccag 5160

ggttcggtcc ttccagggtc tcagtgttcg agtcagggtt gtttccgtca cagtgaaggg 5220

gtgtgcgcct gcttgggcgc ttgccagggt gcgcttcaga ctcatcctgc tggtcgaaaa 5280

cttctgtcgc ttggcgccct gtatgtcggc caagtagcag tttaccatga gttcgtagtt 5340

gagcgcctcg gctgcgtggc ctttggcgcg gagcttacct ttggaagttt tcttgcatac 5400

cgggcagtat aggcatttca gcgcatacaa cttgggcgca aggaaaacgg attctgggga 5460

gtatgcatct gcgccgcagg aggcgcaaac agtttcacat tccaccagcc aggttaaatc 5520

cggttcattg gggtcaaaaa caagttttcc gccatatttt ttgatgcgtt tcttaccttt 5580

ggtctccatg agttcgtgtc ctcgttgagt gacaaacagg ctgtccgtgt ccccgtagac 5640

tgattttaca ggcctcttct ccagtggagt gcctcggtct tcttcgtaca ggaactctga 5700

ccactctgat acaaaggcgc gcgtccaggc cagcacaaag gaggctatgt gggaggggta 5760

gcgatcgttg tcaaccaggg ggtccacctt ttccaaagta tgcaaacaca tgtcaccctc 5820

ttcaacatcc aggaatgtga ttggcttgta ggtgtatttc acgtgacctg gggtccccgc 5880

tgggggggta taaaaggggg cggttctttg ctcttcctca ctgtcttccg gatcgctgtc 5940

caggaacgtc agctgttggg gtaggtattc cctctcgaag gcgggcatga cctctgcact 6000

caggttgtca gtttctaaga acgaggagga tttgatattg acagtgccgg ttgagatgcc 6060

tttcatgagg ttttcgtcca tctggtcaga aaacacaatt tttttattgt caagtttggt 6120

ggcaaatgat ccatacaggg cgttggataa aagtttggca atggatcgca tggtttggtt 6180

cttttccttg tccgcgcgct ctttggcggc gatgttgagt tggacatact cgcgtgccag 6240

gcacttccat tcggggaaga tagttgttaa ttcatctggc acgattctca cttgccaccc 6300

tcgattatgc aaggtaatta aatccacact ggtggccacc tcgcctcgaa ggggttcatt 6360

ggtccaacag agcctacctc ctttcctaga acagaaaggg ggaagtgggt ctagcataag 6420

ttcatcggga gggtctgcat ccatggtaaa gattcccgga agtaaatcct tatcaaaata 6480

gctgatggga gtggggtcat ctaaggccat ttgccattct cgagctgcca gtgcgcgctc 6540

atatgggtta aggggactgc cccatggcat gggatgggtg agtgcagagg catacatgcc 6600

acagatgtca tagacgtaga tgggatcctc aaagatgcct atgtaggttg gatagcatcg 6660

ccccccctctg atacttgctc gcacatagtc atatagttca tgtgatggcg ctagcagccc 6720

cggacccaag ttggtgcgat tgggtttttc tgttctgtag acgatctggc gaaagatggc 6780

gtgagaattg gaagagatgg tgggtctttg aaaaatgttg aaatgggcat gaggtagacc 6840

tacagagtct ctgacaaagt gggcataaga ttcttgaagc ttggttacca gttcggcggt 6900

gacaagtacg tctagggcgc agtagtcaag tgtttcttga atgatgtcat aacctggttg 6960

gtttttcttt tcccacagtt cgcggttgag aaggtattct tcgcgatcct tccagtactc 7020

ttctagcgga aacccgtctt tgtctgcacg gtaagatcct agcatgtaga actgattaac 7080

tgccttgtaa gggcagcagc ccttctctac gggtagagag tatgcttgag cagcttttcg 7140

tagcgaagcg tgagtaaggg caaaggtgtc tctgaccatg actttgagga attggtattt 7200

gaagtcgatg tcgtcacagg ctccctgttc ccagagttgg aagtctaccc gtttcttgta 7260

ggcggggttg ggcaaagcga aagtaacatc attgaagaga atcttgccgg ccctgggcat 7320

gaaattgcga gtgatgcgaa aaggctgtgg tacttccgct cggttattga taacctgggc 7380

agctaggacg atctcgtcga aaccgttgat gttgtgtcct acgatgtata attctatgaa 7440

acgcggcgtg cctctgacgt gaggtagctt actgagctca tcaaaggtta ggtctgtggg 7500

gtcagataag gcgtagtgtt cgagagccca ttcgtgcagg tgaggattcg ctttaaggaa 7560

ggaggaccag aggtccactg ccagtgctgt ttgtaactgg tcccggtact gacgaaaatg 7620

ccgtccgact gccatttttt ctggggtgac gcaatagaag gtttgggggt cctgccgcca 7680

gcgatcccac ttgagtttta tggcgaggtc ataggcgatg ttgacgagcc gctggtctcc 7740

agagagtttc atgaccagca tgaaggggat tagctgcttg ccaaaggacc ccatccaggt 7800

gtaggtttcc acatcgtagg tgagaaagag cctttctgtg cgaggatgag agccaatcgg 7860

gaagaactgg atctcctgcc accagttgga ggaatggctg ttgatgtgat ggaagtagaa 7920

ctccctgcga cgcgccgagc attcatgctt gtgcttgtac agacggccgc agtagtcgca 7980

gcgttgcacg ggttgtatct cgtgaatgag ttgtacctgg cttcccttga cgagaaattt 8040

cagtgggaag ccgaggcctg gcgattgtat ctcgtgcttt actatgttgt ctgcatcggc 8100

ctgttcatct tctgtctcga tggtggtcat gctgacgagc cctcgcggga ggcaagtcca 8160

gacctcggcg cggcaggggc ggagctcgag gacgagagcg cgcaggctgg agctgtccag 8220

ggtcctgaga cgctgcggac tcaggttagt aggcagtgtc aggagattaa cttgcatgat 8280

cttttggagg gcgtgcggga ggttcagata gtacttgatc tcaacgggtc cgttggtgga 8340

gatgtcgatg gcttgcaggg ttccgtgtcc cttgggcgct accaccgtgc ccttgttttt 8400

catttggac ggcggtggct ctgttgcttc ttgcatgttt agaagcggtg tcgagggcgc 8460

gcaccgggcg gcaggggcgg ctcgggaccc ggcggcatgg ctggcagtgg tacgtcggcg 8520

ccgcgcgcgg gtaggttctg gtactgcgcc ctgagaagac tcgcatgcgc gacgacgcgg 8580

cggttgacat cctggatctg acgcctctgg gtgaaagcta ccggccccgt gagcttgaac 8640

ctgaaagaga gttcaacaga atcaatctcg gtatcgttga cggcggcttg cctaaggatt 8700

tcttgcacgt caccagagtt gtcctggtag gcgatctccg ccatgaactg ctcgatctct 8760

tcctcttgaa gatctccgcg gcccgctctc tcgacggtgg ccgcgaggtc gttggagatg 8820

cgcccaatga gttgagagaa tgcattcatg cccgcctcgt tccagacgcg gctgtagacc 8880

acggccccca cgggatctct cgcgcgcatg accacctggg cgaggttgag ctccacgtgg 8940

cgggtgaaga ccgcatagtt gcataggcgc tggaaaaggt agttgagtgt ggtggcgatg 9000

tgctcggtga cgaagaaata catgatccat cgtctcagcg gcatctcgct gacatcgccc 9060

agagcttcca agcgctccat ggcctcgtag aagtccacgg caaaattaaa aaactgggag 9120

tttcgcgcgg acacggtcaa ctcctcttcc agaagacgga taagttcggc gatggtggtg 9180

cgcacctcgc gctcgaaagc ccctgggatt tcttcctcaa tctcttcttc ttccactaac 9240

atctcttcct cttcaggtgg ggctgcagga ggagggggaa cgcggcgacg ccggcggcgc 9300

acgggcagac ggtcgatgaa tctttcaatg acctctccgc ggcggcggcg catggtttca 9360

gtgacggcgc ggccgttctc gcgcggtcgc agagtaaaaa caccgccgcg catctcctta 9420

aagtggtgac tgggaggttc tccgtttggg agggagaggg cgctgattat acattttatt 9480

aattggcccg tagggactgc acgcagagat ctgatcgtgt caagatccac gggatctgaa 9540

aacctttcga cgaaagcgtc taaccagtca cagtcacaag gtaggctgag tacggcttct 9600

tgtgggcggg ggtggttatg tgttcggtct gggtcttctg tttcttcttc atctcgggaa 9660

ggtgagacga tgctgctggt gatgaaatta aagtaggcag ttctaagacg gcggatggtg 9720

gcgaggagca ccaggtcttt gggtccggct tgctggatac gcaggcgatt ggccattccc 9780

caagcattat cctgacatct agcaagatct ttgtagtagt cttgcatgag ccgttctacg 9840

ggcacttctt cctcacccgt tctgccatgc atacgtgtga gtccaaatcc gcgcattggt 9900

tgtaccagtg ccaagtcagc tacgactctt tcggcgagga tggcttgctg tacttgggta 9960

agggtggctt gaaagtcatc aaaatccaca aagcggtggt aagctcctgt attaatggtg 10020

taagcacagt tggccatgac tgaccagtta actgtctggt gaccagggcg cacgagctcg 10080

gtgtatttaa ggcgcgaata ggcgcgggtg tcaaagatgt aatcgttgca ggtgcgcacc 10140

agatactggt accctataag aaaatgcggc ggtggttggc ggtagagagg ccatcgttct 10200

gtagctggag cgccaggggc gaggtcttcc aacataaggc ggtgatagcc gtagatgtac 10260

ctggacatcc aggtgattcc tgcggcggta gtagaagccc gaggaaactc gcgtacgcgg 10320

ttccaaatgt tgcgtagcgg catgaagtag ttcattgtag gcacggtttg accagtgagg 10380

cgcgcgcagt cattgatgct ctatagacac ggagaaaatg aaagcgttca gcgactcgac 10440

tccgtagcct ggaggaacgt gaacgggttg ggtcgcggtg taccccggtt cgagacttgt 10500

actcgagccg gccggagccg cggctaacgt ggtattggca ctcccgtctc gacccagcct 10560

acaaaaatcc aggatacgga atcgagtcgt tttgctggtt tccgaatggc agggaagtga 10620

gtcctatttt tttttttgc cgctcagatg catcccgtgc tgcgacagat gcgcccccaa 10680

caacagcccc cctcgcagca gcagcagcag caatcacaaa aggctgtccc tgcaactact 10740

gcaactgccg ccgtgagcgg tgcgggacag cccgcctatg atctggactt ggaagagggc 10800

gaaggactgg cacgtctagg tgcgccttca cccgagcggc atccgcgagt tcaactgaaa 10860

aaagattctc gcgaggcgta tgtgccccaa cagaacctat ttagagacag aagcggcgag 10920

gagccggagg agatgcgagc ttcccgcttt aacgcgggtc gtgagctgcg tcacggtttg 10980

gaccgaagac gagtgttgcg ggacgaggat ttcgaagttg atgaaatgac agggatcagt 11040

cctgccaggg cacacgtggc tgcagccaac cttgtatcgg cttacgagca gacagtaaag 11100

gaagagcgta acttccaaaa gtcttttaat aatcatgtgc gaaccctgat tgcccgcgaa 11160

gaagttaccc ttggtttgat gcatttgtgg gatttgatgg aagctatcat tcagaaccct 11220

actagcaaac ctctgaccgc ccagctgttt ctggtggtgc aacacagcag agacaatgag 11280

gctttcagag aggcgctgct gaacatcacc gaacccgagg ggagatggtt gtatgatctt 11340

atcaacattc tacagagtat catagtgcag gagcggagcc tgggcctggc cgagaaggtg 11400

gctgccatca attactcggt tttgagcttg ggaaaatatt acgctcgcaa aatctacaag 11460

actccatacg ttcccataga caaggaggtg aagatagatg ggttctacat gcgcatgacg 11520

ctcaaggtct tgaccctgag cgatgatctt ggggtgtatc gcaatgacag aatgcatcgc 11580

gcggttagcg ccagcaggag gcgcgagtta agcgacaggg aactgatgca cagtttgcaa 11640

agagctctga ctggagctgg aaccgagggt gagaattact tcgacatggg agctgacttg 11700

cagtggcagc ctagtcgcag ggctctgagc gccgcgacgg caggatgtga gcttccttac 11760

atagaagagg cggatgaagg cgaggaggaa gagggcgagt acttggaaga ctgatggcac 11820

aacccgtgtt ttttgctaga tggaacagca agcaccggat cccgcaatgc gggcggcgct 11880

gcagagccag ccgtccggca ttaactcctc ggacgattgg acccaggcca tgcaacgtat 11940

catggcgttg acgactcgca accccgaagc ctttagacag caaccccagg ccaaccgtct 12000

atcggccatc atggaagctg tagtgccttc ccgctctaat cccactcatg agaaggtcct 12060

ggccatcgtg aacgcgttgg tggagaacaa agctattcgt ccagatgagg ccggactggt 12120

atacaacgct ctcttagaac gcgtggctcg ctacaacagt agcaatgtgc aaaccaattt 12180

ggaccgtatg ataacagatg tacgcgaagc cgtgtctcag cgcgaaaggt tccagcgtga 12240

tgccaacctg ggttcgctgg tggcgttaaa tgctttcttg agtactcagc ctgctaatgt 12300

gccgcgtggt caacaggatt atactaactt tttaagtgct ttgagactga tggtatcaga 12360

agtacctcag agcgaagtgt atcagtccgg tcctgattac ttctttcaga ctagcagaca 12420

gggcttgcag acggtaaatc tgagccaagc ttttaaaaac cttaaaggtt tgtggggagt 12480

gcatgccccg gtaggagaaa gagcaaccgt gtctagcttg ttaactccga actcccgcct 12540

attattactg ttggtagctc ctttcaccga cagcggtagc atcgaccgta attcctattt 12600

gggttaccta ctaaacctgt atcgcgaagc catagggcaa agtcaggtgg acgagcagac 12660

ctatcaagaa attacccaag tcagtcgcgc tttgggacag gaagacactg gcagtttgga 12720

agccactctg aacttcttgc ttaccaatcg gtctcaaaag atccctcctc aatatgctct 12780

tactgcggag gaggagagga tccttagata tgtgcagcag agcgtgggat tgtttctgat 12840

gcaagagggg gcaactccga ctgcagcact ggacatgaca gcgcgaaata tggagcccag 12900

catgtatgcc agtaaccgac ctttcattaa caaactgctg gactacttgc acagagctgc 12960

cgctatgaac tctgattatt tcaccaatgc catcttaaac ccgcactggc tgcccccacc 13020

tggtttctac acgggcgaat atgacatgcc cgaccctaat gacggatttc tgtgggacga 13080

cgtggacagc gatgtttttt cacctctttc tgatcatcgc acgtggaaaa aggaaggcgg 13140

cgatagaatg cattcttctg catcgctgtc cggggtcatg ggtgctaccg cggctgagcc 13200

cgagtctgca agtccttttc ctagtctacc cttttctcta cacagtgtac gtagcagcga 13260

agtgggtaga ataagtcgcc cgagtttaat gggcgaagag gagtatctaa acgattcctt 13320

gctcagaccg gcaagagaaa aaaatttccc aaacaatgga atagaaagtt tggtggataa 13380

aatgagtaga tggaagactt atgctcagga tcacagagac gagcctggga tcatggggat 13440

tacaagtaga gcgagccgta gacgccagcg ccatgacaga cagaggggtc ttgtgtggga 13500

cgatgaggat tcggccgatg atagcagcgt gctggacttg ggtgggagag gaaggggcaa 13560

cccgtttgct catttgcgcc ctcgcttggg tggtatgttg taaaaaaaaa taaaaaaaaa 13620

actcaccaag gccatggcga cgagcgtacg ttcgttcttc tttattatct gtgtctagta 13680

taatgaggcg agtcgtgcta ggcggagcgg tggtgtatcc ggagggtcct cctccttcgt 13740

acgagagcgt gatgcagcag cagcaggcga cggcggtgat gcaatcccca ctggaggctc 13800

cctttgtgcc tccgcgatac ctggcaccta cggagggcag aaacagcatt cgttattcgg 13860

aactggcacc tcagtacgat accaccaggt tgtatctggt ggacaacaag tcggcggaca 13920

ttgcttctct gaactatcag aatgaccaca gcaacttctt gaccacggtg gtgcaaaaca 13980

atgactttac ccctacggaa gccagcaccc agaccattaa ctttgatgaa cgatcgcggt 14040

ggggcggtca gctaaagacc atcatgcata ctaacatgcc aaacgtgaac gagtatatgt 14100

ttagtaacaa gttcaaagcg cgtgtgatgg tgtccagaaa acctcccgac ggtgctgcag 14160

ttggggatac ttatgatcac aagcaggata ttttgaaata tgagtggttc gagtttactt 14220

tgccagaagg caacttttca gttactatga ctattgattt gatgaacaat gccatcatag 14280

ataattactt gaaagtgggt agacagaatg gagtgcttga aagtgacatt ggtgttaagt 14340

tcgacaccag gaacttcaag ctgggatggg atcccgaaac caagttgatc atgcctggag 14400

tgtatacgta tgaagccttc catcctgaca ttgtcttact gcctggctgc ggagtggatt 14460

ttaccgagag tcgtttgagc aaccttcttg gtatcagaaa aaaacagcca tttcaagagg 14520

gttttaagat tttgtatgaa gatttagaag gtggtaatat tccggccctc ttggatgtag 14580

atgcctatga gaacagtaag aaagaacaaa aagccaaaat agaagctgct acagctgctg 14640

cagaagctaa ggcaaacata gttgccagcg actctacaag ggttgctaac gctggagagg 14700

tcagaggaga caattttgcg ccaacacctg ttccgactgc agaatcatta ttggccgatg 14760

tgtctgaagg aacggacgtg aaactcacta ttcaacctgt agaaaaagat agtaagaata 14820

gaagctataa tgtgttggaa gacaaaatca acacagccta tcgcagttgg tatctttcgt 14880

acaattatgg cgatcccgaa aaaggagtgc gttcctggac attgctcacc acctcagatg 14940

tcacctgcgg agcagagcag gtctactggt cgcttccaga catgatgaag gatcctgtca 15000

ctttccgctc cactagacaa gtcagtaact accctgtggt gggtgcagag cttatgcccg 15060

tcttctcaaa gagcttctac aacgaacaag ctgtgtactc ccagcagctc cgccagtcca 15120

cctcgcttac gcacgtcttc aaccgctttc ctgagaacca gattttaatc cgtccgccgg 15180

cgcccaccat taccaccgtc agtgaaaacg ttcctgctct cacagatcac gggaccctgc 15240

cgttgcgcag cagtatccgg ggagtccaac gtgtgaccgt tactgacgcc agacgccgca 15300

cctgtcccta cgtgtacaag gcactgggca tagtcgcacc gcgcgtcctt tcaagccgca 15360

ctttctaaaa aaaaaaaaaa tgtccattct tatctcgccc agtaataaca ccggttgggg 15420

tctgcgcgct ccaagcaaga tgtacggagg cgcacgcaaa cgttctaccc aacatcctgt 15480

ccgtgttcgc ggacattttc gcgctccatg gggcgccctc aagggccgca ctcgcgttcg 15540

aaccaccgtc gatgatgtaa tcgatcaggt ggttgccgac gcccgtaatt atactcctac 15600

tgcgcctaca tctactgtgg atgcagttat tgacagtgta gtggctgacg ctcgcaacta 15660

tgctcgacgt aagagccggc gaaggcgcat tgccagacgc caccgagcta ccactgccat 15720

gcgagccgca agagctctgc tacgaagagc tagacgcgtg gggcgaagag ccatgcttag 15780

ggcggccaga cgtgcagctt cgggcgccag cgccggcagg tcccgcaggc aagcagccgc 15840

tgtcgcagcg gcgactattg ccgacatggc ccaatcgcga agaggcaatg tatactgggt 15900

gcgtgacgct gccaccggtc aacgtgtacc cgtgcgcacc cgtccccctc gcacttagaa 15960

gatactgagc agtctccgat gttgtgtccc agcggcgagg atgtccaagc gcaaatacaa 16020

ggaagaaatg ctgcaggtta tcgcacctga agtctacggc caaccgttga aggatgaaaa 16080

aaaaccccgc aaaatcaagc gggttaaaaa ggacaaaaaa gaagaggaag atggcgatga 16140

tgggctggcg gagtttgtgc gcgagtttgc cccacggcga cgcgtgcaat ggcgtgggcg 16200

caaagttcga catgtgttga gacctggaac ttcggtggtc tttacacccg gcgagcgttc 16260

aagcgctact tttaagcgtt cctatgatga ggtgtacggg gatgatgata ttcttgagca 16320

ggcggctgac cgattaggcg agtttgctta tggcaagcgt agtagaataa cttccaagga 16380

tgagacagtg tcgataccct tggatcatgg aaatcccacc cctagtctta aaccggtcac 16440

tttgcagcaa gtgttacccg taactccgcg aacaggtgtt aaacgcgaag gtgaagattt 16500

gtatcccact atgcaactga tggtacccaa acgccagaag ttggaggacg ttttggagaa 16560

agtaaaagtg gatccagata ttcaacctga ggttaaagtg agacccatta agcaggtagc 16620

gcctggtctg ggggtacaaa ctgtagacat taagattccc actgaaagta tggaagtgca 16680

aactgaaccc gcaaagccta ctgccacctc cactgaagtg caaacggatc catggatgcc 16740

catgcctatt acaactgacg ccgccggtcc cactcgaaga tcccgacgaa agtacggtcc 16800

agcaagtctg ttgatgccca attatgttgt acacccatct attattccta ctcctggtta 16860

ccgaggcact cgctactatc gcagccgaaa cagtacctcc cgccgtcgcc gcaagacacc 16920

tgcaaatcgc agtcgtcgcc gtagacgcac aagcaaaccg actcccggcg ccctggtgcg 16980

gcaagtgtac cgcaatggta gtgcggaacc tttgacactg ccgcgtgcgc gttaccatcc 17040

gagtatcatc acttaatcaa tgttgccgct gcctccttgc agatatggcc ctcacttgtc 17100

gccttcgcgt tcccatcact ggttaccgag gaagaaactc gcgccgtaga agagggatgt 17160

tgggacgcgg aatgcgacgc tacaggcgac ggcgtgctat ccgcaagcaa ttgcggggtg 17220

gtttttacc agccttaatt ccaattatcg ctgctgcaat tggcgcgata ccaggcatag 17280

cttccgtggc ggttcaggcc tcgcaacgac attgacattg gaaaaaaacg tataaataaa 17340

aaaaaaaaaa tacaatggac tctgacactc ctggtcctgt gactatgttt tcttagagat 17400

ggaagacatc aatttttcat ccttggctcc gcgacacggc acgaagccgt acatgggcac 17460

ctggagcgac atcggcacga gccaactgaa cgggggcgcc ttcaattgga gcagtatctg 17520

gagcgggctt aaaaattttg gctcaaccat aaaaacatac gggaacaaag cttggaacag 17580

cagtacagga caggcgctta gaaataaact taaagaccag aacttccaac aaaaagtagt 17640

cgatgggata gcttccggca tcaatggagt ggtagatttg gctaaccagg ctgtgcagaa 17700

aaagataaac agtcgtttgg acccgccgcc agcaacccca ggtgaaatgc aagtggagga 17760

agaaattcct ccgccagaaa aacgaggcga caagcgtccg cgtcccgatt tggaagagac 17820

gctggtgacg cgcgtagatg aaccgccttc ttatgaggaa gcaacgaagc ttggaatgcc 17880

caccactaga ccgatagccc caatggccac cggggtgatg aaaccttctc agttgcatcg 17940

acccgtcacc ttggatttgc cccctccccc tgctgctact gctgtacccg cttctaagcc 18000

tgtcgctgcc ccgaaaccag tcgccgtagc caggtcacgt cccgggggcg ctcctcgtcc 18060

aaatgcgcac tggcaaaata ctctgaacag catcgtgggt ctaggcgtgc aaagtgtaaa 18120

acgccgtcgc tgcttttaat taaatatgga gtagcgctta acttgcctat ctgtgtatat 18180

gtgtcattac acgccgtcac agcagcagag gaaaaaagga agaggtcgtg cgtcgacgct 18240

gagttacttt caagatggcc accccatcga tgctgcccca atgggcatac atgcacatcg 18300

ccggacagga tgcttcggag tacctgagtc cgggtctggt gcagttcgcc cgcgccacag 18360

acacctactt caatctggga aataagttta gaaatcccac cgtagcgccg acccacgatg 18420

tgaccaccga ccgtagccag cggctcatgt tgcgcttcgt gcccgttgac cgggaggaca 18480

atacatactc ttacaaagtg cggtacaccc tggccgtggg cgacaacaga gtgctggata 18540

tggccagcac gttctttgac attaggggtg tgttggacag aggtcccagt ttcaaaccct 18600

attctggtac ggcttacaac tccctggctc ctaaaggcgc tccaaataca tctcagtgga 18660

ttgcagaagg tgtaaaaaat acaactggtg aggaacacgt aacagaagag gaaaccaata 18720

ctactactta cacttttggc aatgctcctg taaaagctga agctgaaatt acaaaagaag 18780

gactcccagt aggtttggaa gtttcagatg aagaaagtaa accgatttat gctgataaaa 18840

catatcagcc agaacctcag ctgggagatg aaacttggac tgaccttgat ggaaaaaccg 18900

aaaagtatgg aggcagggct ctcaaacccg atactaagat gaaaccatgc tacgggtcct 18960

ttgccaaacc tactaatgtg aaaggcggtc aggcaaaaca aaaaacaacg gagcagccaa 19020

atcagaaagt cgaatatgat atcgacatgg agtttttga tgcggcatcg cagaaaacaa 19080

acttaagtcc taaaattgtc atgtatgcag aaaatgtaaa tttggaaact ccagacactc 19140

atgtagtgta caaacctgga acagaagaca caagttccga agctaatttg ggacaacaat 19200

ctatgcccaa cagacccaac tacattggct tcagagataa ctttattgga cttatgtact 19260

ataacagtac tggtaacatg ggggtgctgg ctggtcaagc gtctcagtta aatgcagtgg 19320

ttgacttgca ggacagaaac acagaacttt cttaccaact cttgcttgac tctctgggcg 19380

acagaaccag atactttagc atgtggaatc aggctgtgga cagttatgat cctgatgtac 19440

gtgttattga aaatcatggt gtggaagatg aacttcccaa ctactgtttt ccactggacg 19500

gcataggtgt tccaacaacc agttacaaat caatagttcc aaatggagac aatgcgccta 19560

attggaagga acctgaagta aatggaacaa gtgagatcgg acagggtaat ttgtttgcca 19620

tggaaattaa ccttcaagcc aatctatggc gaagtttcct ttattccaat gtggctctat 19680

atctcccaga ctcgtacaaa tacaccccgt ccaatgtcac tcttccagaa aacaaaaaca 19740

cctacgacta catgaacggg cgggtggtgc cgccatctct agtagacacc tatgtgaaca 19800

ttggtgccag gtggtctctg gatgccatgg acaatgtcaa cccattcaac caccaccgta 19860

acgctggctt gcgttaccga tccatgcttc tgggtaacgg acgttatgtg cctttccaca 19920

tacaagtgcc tcaaaaattc ttcgctgtta aaaacctgct gcttctccca ggctcctaca 19980

cttatgagtg gaactttagg aaggatgtga acatggttct acagagttcc ctcggtaacg 20040

acctgcgggt agatggcgcc agcatcagtt tcacgagcat caacctctat gctacttttt 20100

tccccatggc tcacaacacc gcttccaccc ttgaagccat gctgcggaat gacaccaatg 20160

atcagtcatt caacgactac ctatctgcag ctaacatgct ctaccccatt cctgccaatg 20220

caaccaatat tcccatttcc attccttctc gcaactgggc ggctttcaga ggctggtcat 20280

ttaccagact gaaaaccaaa gaaactccct ctttggggtc tggatttgac ccctactttg 20340

tctattctgg ttctattccc tacctggatg gtaccttcta cctgaaccac acttttaaga 20400

aggtttccat catgtttgac tcttcagtga gctggcctgg aaatgacagg ttactatctc 20460

ctaacgaatt tgaaataaag cgcactgtgg atggcgaagg ctacaacgta gcccaatgca 20520

acatgaccaa agactggttc ttggtacaga tgctcgccaa ctacaacatc ggctatcagg 20580

gcttctacat tccagaagga tacaaagatc gcatgtattc atttttcaga aacttccagc 20640

ccatgagcag gcaggtggtt gatgaggtca attacaaaga cttcaaggcc gtcgccatac 20700

cctaccaaca caacaactct ggctttgtgg gttacatggc tccgaccatg cgccaaggtc 20760

aaccctatcc cgctaactat ccctatccac tcattggaac aactgccgta aatagtgtta 20820

cgcagaaaaa gttcttgtgt gacagaacca tgtggcgcat accgttctcg agcaacttca 20880

tgtctatggg ggcccttaca gacttgggac agaatatgct ctatgccaac tcagctcatg 20940

ctctggacat gacctttgag gtggatccca tggatgagcc caccctgctt tatcttctct 21000

tcgaagtttt cgacgtggtc agagtgcatc agccacaccg cggcatcatc gaggcagtct 21060

acctgcgtac accgttctcg gccggtaacg ctaccacgta agaagcttct tgcttcttgc 21120

aaatagcagc tgcaaccatg gcctgcggat cccaaaacgg ctccagcgag caagagctca 21180

gagccattgt ccaagacctg ggttgcggac cctatttttt gggaacctac gataagcgct 21240

tcccggggtt catggccccc gataagctcg cctgtgccat tgtaaatacg gccggacgtg 21300

agacgggggg agagcactgg ttggctttcg gttggaaccc acgttctaac acctgctacc 21360

tttttgatcc ttttggattc tcggatgatc gtctcaaaca gatttaccag tttgaatatg 21420

agggtctcct gcgccgcagc gctcttgcta ccaaggaccg ctgtattacg ctggaaaaat 21480

ctacccagac cgtgcagggt ccccgttctg ccgcctgcgg acttttctgc tgcatgttcc 21540

ttcacgcctt tgtgcactgg cctgaccgtc ccatggacgg aaaccccacc atgaaattgc 21600

taactggagt gccaaacaac atgcttcatt ctcctaaagt ccagcccacc ctgtgtgaca 21660

atcaaaaagc actctaccat tttcttaata cccattcgcc ttattttcgc tcccatcgta 21720

cacacatcga aagggccact gcgttcgacc gtatggatgt tcaataatga ctcatgtaaa 21780

caacgtgttc aataaacatc actttatttt tttacatgta tcaaggctct gcattactta 21840

tttatttaca agtcgaatgg gttctgacga gaatcagaat gacccgcagg cagtgatacg 21900

ttgcggaact gatacttggg ttgccacttg aattcgggaa tcaccaactt gggaaccggt 21960

atatcgggca ggatgtcact ccacagcttt ctggtcagct gcaaagctcc aagcaggtca 22020

ggagccgaaa tcttgaaatc acaattagga ccagtgcttt gagcgcgaga gttgcggtac 22080

accggattgc agcactgaaa caccatcagc gacggatgtc tcacgcttgc cagcacggtg 22140

ggatctgcaa tcatgcccac atccagatct tcagcattgg caatgctgaa cggggtcatc 22200

ttgcaggtct gcctacccat ggcgggcacc caattaggct tgtggttgca atcgcagtgc 22260

agggggatca gtatcatctt ggcctgatcc tgtctgattc ctggatacac ggctctcatg 22320

aaagcatcat attgcttgaa agcctgctgg gctttactac cctcggtata aaacatcccg 22380

caggacctgc tcgaaaactg gttagctgca cagccggcat cattcacaca gcagcgggcg 22440

tcattgttag ctatttgcac cacacttctg ccccagcggt tttgggtgat tttggttcgc 22500

tcgggattct cctttaaggc tcgttgtccg ttctcgctgg ccacatccat ctcgataatc 22560

tgctccttct gaatcataat attgccatgc aggcacttca gcttgccctc ataatcattg 22620

cagccatgag gccacaacgc acagcctgta cattcccaat tatggtgggc gatctgagaa 22680

aaagaatgta tcattccctg cagaaatctt cccatcatcg tgctcagtgt cttgtgacta 22740

gtgaaagtta actggatgcc tcggtgctcc tcgtttacgt actggtgaca gatgcgcttg 22800

tattgttcgt gttgctcagg cattagttta aaagaggttc taagttcgtt atccagcctg 22860

tacttctcca tcagcagaca catcacttcc atgcctttct cccaagcaga caccaggggc 22920

aagctaatcg gattcttaac agtgcaggca gcagctcctt tagccagagg gtcatcttta 22980

gcgatcttct caatgcttct tttgccatcc ttctcaacga tgcgcacggg cgggtagctg 23040

aaacccactg ctacaagttg cgcctcttct ctttcttctt cgctgtcttg actgatgtct 23100

tgcatgggga tatgtttggt cttccttggc ttctttttgg ggggtatcgg aggaggagga 23160

ctgtcgctcc gttccggaga cagggaggat tgtgacgttt cgctcaccat taccaactga 23220

ctgtcggtag aagaacctga ccccacacgg cgacaggtgt ttctcttcgg gggcagaggt 23280

ggaggcgatt gcgaagggct gcggtccgac ctggaaggcg gatgactggc agaacccctt 23340

ccgcgttcgg gggtgtgctc cctgtggcgg tcgcttaact gatttccttc gcggctggcc 23400

attgtgttct cctaggcaga gaaacaacag acatggaaac tcagccattg ctgtcaacat 23460

cgccacgagt gccatcacat ctcgtcctca gcgacgagga aaaggagcag agcttaagca 23520

ttccaccgcc cagtcctgcc accacctcta ccctagaaga taaggaggtc gacgcatctc 23580

atgacatgca gaataaaaaa gcgaaagagt ctgagacaga catcgagcaa gacccgggct 23640

atgtgacacc ggtggaacac gaggaagagt tgaaacgctt tctagagaga gaggatgaaa 23700

actgcccaaa acaacgagca gataactatc accaagatgc tggaaatagg gatcagaaca 23760

ccgactacct catagggctt gacggggaag acgcgctcct taaacatcta gcaagacagt 23820

cgctcatagt caaggatgca ttattggaca gaactgaagt gcccatcagt gtggaagagc 23880

tcagccgcgc ctacgagctt aacctctttt cacctcgtac tccccccaaa cgtcagccaa 23940

acggcacctg cgagccaaat cctcgcttaa acttttatcc agcttttgct gtgccagaag 24000

tactggctac ctatcacatc ttttttaaaa atcaaaaaat tccagtctcc tgccgcgcta 24060

atcgcacccg cgccgatgcc ctactcaatc tgggacctgg ttcacgctta cctgatatag 24120

cttccttgga agaggttcca aagatcttcg agggtctggg caataatgag actcgggccg 24180

caaatgctct gcaaaaggga gaaaatggca tggatgagca tcacagcgtt ctggtggaat 24240

tggaaggcga taatgccaga ctcgcagtac tcaagcgaag catcgaggtc acacacttcg 24300

catatcccgc tgtcaacctg ccccctaaag tcatgacggc ggtcatggac cagttactca 24360

ttaagcgcgc aagtcccctt tcagaagaca tgcatgaccc agatgcctgt gatgagggta 24420

aaccagtggt cagtgatgag cagctaaccc gatggctggg caccgactct cccagggatt 24480

tggaagagcg tcgcaagctt atgatggccg tggtgctggt taccgtagaa ctagagtgtc 24540

tccgacgttt ctttaccgat tcagaaacct tgcgcaaact cgaagagaat ctgcactaca 24600

cttttagaca cggctttgtg cggcaggcat gcaagatatc taacgtggaa ctcaccaacc 24660

tggtttccta catgggtatt ctgcatgaga atcgcctagg acaaagcgtg ctgcacagca 24720

ccctgaaggg ggaagcccgc cgtgattaca tccgcgattg tgtctatctg tacctgtgcc 24780

acacgtggca aaccggcatg ggtgtatggc agcaatgttt agaagaacag aacttgaaag 24840

agcttgacaa gctcttacag aaatctctta aggttctgtg gacagggttc gacgagcgca 24900

ccgtcgcttc cgacctggca gacctcatct tcccagagcg tctcagggtt actttgcgaa 24960

acggattgcc tgactttatg agccagagca tgcttaacaa ttttcgctct ttcatcctgg 25020

aacgctccgg tatcctgccc gccacctgct gcgcactgcc ctccgacttt gtgcctctca 25080

cctaccgcga gtgccccccg ccgctatgga gtcactgcta cctgttccgt ctggccaact 25140

atctctccta ccactcggat gtgatcgagg atgtgagcgg agacggcttg ctggagtgtc 25200

actgccgctg caatctgtgc acgccccacc ggtccctagc ttgcaacccc cagttgatga 25260

gcgaaaccca gataataggc acctttgaat tgcaaggccc cagcagccaa ggcgatgggt 25320

cttctcctgg gcaaagttta aaactgaccc cgggactgtg gacctccgcc tacttgcgca 25380

agtttgctcc ggaagattac cacccctatg aaatcaagtt ctatgaggac caatcacagc 25440

ctccaaaggc cgaactttcg gcctgcgtca tcacccaggg ggcaattctg gcccaattgc 25500

aagccatcca aaaatcccgc caagaatttc tactgaaaaa gggtaagggg gtctaccttg 25560

acccccagac cggcgaggaa ctcaacacaa ggttccctca ggatgtccca acgacgagaa 25620

aacaagaagt tgaaggtgca gccgccgccc ccagaagata tggaggaaga ttgggacagt 25680

caggcagagg aggcggagga ggacagtctg gaggacagtc tggaggaaga cagtttggag 25740

gaggaaaacg aggaggcaga ggaggtggaa gaagtaaccg ccgacaaaca gttatcctcg 25800

gctgcggaga caagcaacag cgctaccatc tccgctccga gtcgaggaac ccggcggcgt 25860

cccagcagta gatgggacga gaccggacgc ttcccgaacc caaccagcgc ttccaagacc 25920

ggtaagaagg atcggcaggg atacaagtcc tggcgggggc ataagaatgc catcatctcc 25980

tgcttgcatg agtgcggggg caacatatcc ttcacgcggc gctacttgct attccaccat 26040

ggggtgaact ttccgcgcaa tgttttgcat tactaccgtc acctccacag cccctactat 26100

agccagcaaa tcccggcagt ctcgacagat aaagacagcg gcggcgacct ccaacagaaa 26160

accagcagcg gcagttagaa aatacacaac aagtgcagca acaggaggat taaagattac 26220

agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc 26280

catcttccag cagagtcggg gtcaagagca ggaactgaaa ataaaaaacc gatctctgcg 26340

ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga 26400

ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac 26460

cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca 26520

cgccttacat gtggagttat caaccccaaa tgggattggc ggcaggcgcc tcccaggact 26580

actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata 26640

tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc 26700

aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca 26760

ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc 26820

agttagctgg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga 26880

tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac 26940

gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg 27000

ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc 27060

aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc 27120

attacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg 27180

attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg 27240

ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca 27300

ccctcaaggt ccggcccacg gagtgcggat ttctatcgaa ggcaaaatag actctcgcct 27360

gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt 27420

ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg 27480

tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg 27540

gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct 27600

ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta 27660

ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg 27720

tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct 27780

acctatacac accttgcttc actttcttag tggtgttgtg gtattggttt aaaaaatggg 27840

gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga 27900

tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg 27960

catctgtgga gttcatcgcc tctcttacga acttggcccc caacgacaaa aatttacctg 28020

catggtggga atcaacccca tagttatcac ccagcaaagt ggagatacta agggttgcat 28080

tcactgctcc tgcgattcca tcgagtgcac ctacaccctg ctgaagaccc tatgcggcct 28140

aagagacctg ctaccaatga attaaaaaat gattaataaa aaatcactta cttgaaatca 28200

gcaataaggt ctctgttgaa attttctccc agcagcacct cacttccctc ttcccaactc 28260

tggtattcta aaccccgttc agcggcatac tttctccata ctttaaaggg gatgtcaaat 28320

tttagctcct ctcctgtacc cacaatcttc atgtctttct tcccagatga ccaagagagt 28380

ccggctcagt gactccttca accctgtcta cccctatgaa gatgaaagca cctcccaaca 28440

ccccttttata aacccagggt ttatttcccc aaatggcttc acacaaagcc caaacggagt 28500

tcttacttta aaatgtttaa ccccactaac aaccacaggc ggatctctac agctaaaagt 28560

gggaggggga cttacagtgg atgacaccaa cggttttttg aaagaaaaca taagtgccac 28620

cacaccactc gttaagactg gtcactctat aggtttacca ctaggagccg gattgggaac 28680

gaatgaaaat aaactttgta tcaaattagg acaaggactt acattcaatt caaacaacat 28740

ttgcattgat gacaatatta acaccttatg gacaggagtc aaccccaccg aagccaactg 28800

tcaaatcatg aactccagtg aatctaatga ttgcaaatta attctaacac tagttaaaac 28860

tggagcacta gtcactgcat ttgtttatgt tataggagta tctaacaatt ttaatatgct 28920

aactacacac agaaatataa attttactgc agagctgttt ttcgattcta ctggtaattt 28980

actaactaga ctctcatccc tcaaaactcc acttaatcat aaatcaggac aaaacatggc 29040

tactggtgcc attactaatg ctaaaggttt catgcccagc acgactgcct atcctttcaa 29100

tgataattct agagaaaaag aaaactacat ttacggaact tgttactaca cagctagtga 29160

tcgcactgct tttcccattg acatatctgt catgcttaac cgaagagcaa taaatgacga 29220

gacatcatat tgtattcgta taacttggtc ctggaacaca ggagatgccc cagaggtgca 29280

aacctctgct acaaccctag tcacctcccc atttaccttt tactacatca gagaagacga 29340

ctgacaaata aagtttgcga tcgctttctc tcttcaggcc caccatgggc tggagctgca 29400

tcatcttgtt cctggtcgca actgctaccg gagtccattc ggacatcgtc atgacccaaa 29460

gccctgactc gctcgctgtg tcactgggag agcgggcgac tatcaactgc aaatcatccc 29520

agagcctgct gtattcacgc aatcagaaaa actacctggc ctggtatcag cagaagccgg 29580

gccagcctcc caagctgctg atcttctggg cctccacccg cgaaagcggc gtgccggacc 29640

gcttcagcgg aagcggattc ggaactgact ttactctgac cattagctcc ttgcaggcgg 29700

aggacgtggc cgtctactac tgccagcagt atttctccta tccgctcacc tttgggcaag 29760

gcaccaaggt ggagattaag ggagggggcg gcagcggggg aggcggcagc ggcggcgggg 29820

gatcgcaggt ccagctcgtc caatccggag ccgaagtcaa gaagccggga gcgtcggtca 29880

aggtcagctg caaaacttcg cgctacacct tcactgagta cacgatccac tgggtccgcc 29940

aggcgcccgg ccagcggctg gagtggatcg gcgggatcaa cccaaacaac ggaatcccaa 30000

attacaatca gaaatttaaa gggcgggtga ctatcaccgt ggatacctcg gcctccacgg 30060

cgtacatgga gctctcatca ctcagatcgg aggacaccgc ggtctattac tgcgcccgcc 30120

gccggatcgc ttatggatac gatgaaggac atgcgatgga ttactggggc cagggcaccc 30180

tcgtcacggt gtcgtcagga ggcggcggtt cacaggtgca gctgcagcag tctggggctg 30240

aactggcaag acctggggcc tcagtgaaga tgtcctgcaa ggcttctggc tacaccttta 30300

ctaggtacac gatgcactgg gtaaaacaga ggcctggaca gggtctggaa tggattggat 30360

acattaatcc tagccgtggt tatactaatt acaatcagaa gttcaaggac aaggccacat 30420

tgactacaga caaatcctcc agcacagcct acatgcaact gagcagcctg acatctgagg 30480

actctgcagt ctattactgt gcaagatatt atgatgatca ttactgcctt gactactggg 30540

gccaaggcac cactctcaca gtctcctcag gtggcggtgg ctcgggcggt ggtggatctg 30600

gtggcggcgg atctgatatc gtgctcactc agtctccagc aatcatgtct gcatctccag 30660

gggagaaggt caccatgacc tgcagtgcca gctcaagtgt aagttacatg aactggtacc 30720

agcagaagtc aggcacctcc cccaaaagat ggatttatga cacatccaaa ctggcttctg 30780

gagtccctgc tcacttcagg ggcagtgggt ctgggacctc ttactctctc acaatcagcg 30840

gcatggaggc tgaagatgct gccacttatt actgccagca gtggagtagt aacccattca 30900

cgttcggctc ggggacaaag ttggaaataa accggggaag cggacagtgt actaattatg 30960

ctctcttgaa attggctgga gatgttgaga gcaaccctgg acctacagtg ctggcgccag 31020

cctggagccc aacaacctat ctcctcctgc tgctgctgct gagctcggga ctcagtggga 31080

cccaggactg ctccttccaa cacagcccca tctcctccga cttcgctgtc aaaatccgtg 31140

agctgtctga ctacctgctt caagattacc cagtcaccgt ggcctccaac ctccaggacg 31200

aggagctctg cgggggcctc tggcggctgg tcctggcaca gcgctggatg gagcggctca 31260

agactgtcgc tgggtccaag atgcaaggct tgctggagcg cgtgaacacg gagatacact 31320

ttgtcaccaa atgtgccttt cagcccccc ccagctgtct tcgcttcgtc cagaccaaca 31380

tctcccgcct cctacaggag acctccgagc agctggtggc gctgaagccc tggatcactc 31440

gccagaactt ctcccggtgc ctggagctgc agtgtcagcc cgactcctca accctgccac 31500

ccccatggag tccccggccc ctggaggcca cagccccggg aagcggagct actaacttca 31560

gcctgctgaa gcaggctgga gacgtggagg agaaccctgg acctcaggtc tccactgctg 31620

cccttgccgt cctcctctgc accatggctc tctgcaacca ggtcctctct gcaccacttg 31680

ctgctgacac gccgaccgcc tgctgcttca gctacacctc ccgacagatt ccacagaatt 31740

tcatagctga ctactttgag acgagcagcc agtgctccaa gcccagtgtc atcttcctaa 31800

ccaagagagg ccggcaggtc tgtgctgacc ccagtgagga gtgggtccag aaatacgtca 31860

gtgacctgga gctgagtgcc ggaagcggag agggcagagg aagtctgcta acatgcggtg 31920

acgtcgagga gaatcctgga cctgccttga cctttgcttt actggtggcc ctcctggtgc 31980

tcagctgcaa gtcaagctgc tctgtgggct gtgatctgcc tcaaacccac agcctgggta 32040

gcaggaggac cttgatgctc ctggcacaga tgaggagaat ctctcttttc tcctgcttga 32100

aggacagaca tgactttgga tttccccagg aggagtttgg caaccagttc caaaaggctg 32160

aaaccatccc tgtcctccat gagatgatcc agcagatctt caatctcttc agcacaaagg 32220

actcatctgc tgcttgggat gagaccctcc tagacaaatt ctacactgaa ctctaccagc 32280

agctgaatga cctggaagcc tgtgtgatac agggggtggg ggtgacagag actcccctga 32340

tgaaggagga ctccattctg gctgtgagga aatacttcca aagaatcact ctctatctga 32400

aagagaagaa atacagccct tgtgcctggg aggttgtcag agcagaaatc atgagatctt 32460

tttctttgtc aacaaacttg caagaaagtt taagaagtaa ggaataagct agcttgactg 32520

actgagatac agcgtacctt cagctcacag acatgataag atacattgat gagtttggac 32580

aaaccacaac tagaatgcag tgaaaaaaat gctttatttg tgaaatttgt gatgctattg 32640

ctttatttgt aaccattata agctgcaata aacaagttaa caacaacaat tgcattcatt 32700

ttatgtttca ggttcagggg gaggtgtggg aggtttttta aagcaagtaa aacctctaca 32760

aatgtggtag tcgtcagcta tcctgcagga acttgtttat ttgaaaatca attcacaaaa 32820

tccgagtagt tattttgcct ccccccttccc atttaacaga atacaccaat ctctccccac 32880

gcacagcttt aaacatttgg ataccattag atatagacat ggttttagat tccacattcc 32940

aaacagtttc agagcgagcc aatctggggt cagtgataga taaaaatcca tcgggatagt 33000

cttttaaagc gctttcacag tccaactgct gcggatgcga ctccggagtc tggatcacgg 33060

tcatctggaa gaagaacgat gggaatcata atccgaaaac ggtatcggac gattgtgtct 33120

catcaaaccc acaagcagcc gctgtctgcg tcgctccgtg cgactgctgt ttatgggatc 33180

agggtccaca gtgtcctgaa gcatgatttt aatagccctt aacatcaact ttctggtgcg 33240

atgcgcgcag caacgcattc tgatttcact caaatctttg cagtaggtac aacacattat 33300

tacaatattg tttaataaac cataattaaa agcgctccag ccaaaactca tatctgatat 33360

aatcgcccct gcatgaccat cataccaaag tttaatataa attaaatgac gttccctcaa 33420

aaacacacta cccacataca tgatctcttt tggcatgtgc atattaacaa tctgtctgta 33480

ccatggacaa cgttggttaa tcatgcaacc caatataacc ttccggaacc acactgccaa 33540

caccgctccc ccagccatgc attgaagtga accctgctga ttacaatgac aatgaagaac 33600

ccaattctct cgaccgtgaa tcacttgaga atgaaaaata tctatagtgg cacaacatag 33660

acataaatgc atgcatcttc tcataatttt taactcctca ggatttagaa acatatccca 33720

gggaatagga agctcttgca gaacagtaaa gctggcagaa caaggaagac cacgaacaca 33780

acttacacta tgcatagtca tagtatcaca atctggcaac agcgggtggt cttcagtcat 33840

agaagctcgg gtttcatttt cctcacaacg tggtaactgg gctctggtgt aagggtgatg 33900

tctggcgcat gatgtcgagc gtgcgcgcaa ccttgtcata atggagttgc ttcctgacat 33960

tctcgtattt tgtatagcaa aacgcggccc tggcagaaca cactcttctt cgccttctat 34020

cctgccgctt agcgtgttcc gtgtgatagt tcaagtacaa ccacactctt aagttggtca 34080

aaagaatgct ggcttcagtt gtaatcaaaa ctccatcgca tctaatcgtt ctgaggaaat 34140

catccaagca atgcaactgg attgtgtttc aagcaggaga ggagagggaa gagacggaag 34200

aaccatgtta atttttattc caaacgatct cgcagtactt caaattgtag atcgcgcaga 34260

tggcatctct cgcccccact gtgttggtga aaaagcacag ctagatcaaa agaaatgcga 34320

ttttcaaggt gctcaacggt ggcttccagc aaagcctcca cgcgcacatc caagaacaaa 34380

agaataccaa aagaaggagc attttctaac tcctcaatca tcatattaca ttcctgcacc 34440

attcccagat aattttcagc tttccagcct tgaattattc gtgtcagttc ttgtggtaaa 34500

tccaatccac acattacaaa caggtcccgg agggcgccct ccaccaccat tcttaaacac 34560

accctcataa tgacaaaata tcttgctcct gtgtcacctg tagcgaattg agaatggcaa 34620

catcaattga catgcccttg gctctaagtt cttctttaag ttctagttgt aaaaactctc 34680

tcatattatc accaaactgc ttagccagaa gccccccggg aacaagagca ggggacgcta 34740

cagtgcagta caagcgcaga cctccccaat tggctccagc aaaaacaaga ttggaataag 34800

catattggga accgccagta atatcatcga agttgctgga aatataatca ggcagagttt 34860

cttgtaaaaa ttgaataaaa gaaaaatttg ccaaaaaaac attcaaaacc tctgggatgc 34920

aaatgcaata ggttaccgcg ctgcgctcca acattgttag ttttgaatta gtctgcaaaa 34980

ataaaaaaaa aaacaagcgt catatcatag tagcctgacg aacagatgga taaatcagtc 35040

tttccatcac aagacaagcc acagggtctc cagctcgacc ctcgtaaaac ctgtcatcat 35100

gattaaacaa cagcaccgaa agttcctcgc ggtgaccagc atgaataatt cttgatgaag 35160

catacaatcc agacatgtta gcatcagtta acgagaaaaa acagccaaca tagcctttgg 35220

gtataattat gcttaatcgt aagtatagca aagccacccc tcgcggatac aaagtaaaag 35280

gcacaggaga ataaaaaata taattatttc tctgctgctg ttcaggcaac gtcgcccccg 35340

gtccctctaa atacacatac aaagcctcat cagccatggc ttaccagaca aagtacagcg 35400

ggcacacaaa gcacaagctc taaagtgact ctccaacctc tccacaatat atatatacac 35460

aagccctaaa ctgacgtaat gggagtaaag tgtaaaaaat cccgccaaac ccaacacaca 35520

ccccgaaact gcgtcaccag ggaaaagtac agtttcactt ccgcaatccc aacaggcgta 35580

acttcctctt tctcacggta cgtgatatcc cactaacttg caacgtcatt ttcccacggt 35640

cgcaccgccc cttttagccg ttaaccccac agccaatcac cacacgatcc acacttttta 35700

aaatcacctc atttacatat tggcaccatt ccatctataa ggtatattat atagataga 35759