(12) STANDARD PATENT (11) Application No. **AU 2016233495 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Anti-PDL1 antibodies, activatable anti-PDL1 antibodies, and methods of use thereof

(51) International Patent Classification(s)
C07K 16/28 (2006.01) ***G01N 33/53*** (2006.01)
A61K 49/00 (2006.01)

(21) Application No: **2016233495** (22) Date of Filing: **2016.03.14**

(87) WIPO No: **WO16/149201**

(30) Priority Data

(31) Number	(32) Date	(33) Country
62/139,596	**2015.03.27**	**US**
62/218,883	**2015.09.15**	**US**
62/133,231	**2015.03.13**	**US**

(43) Publication Date: **2016.09.22**
(44) Accepted Journal Date: **2022.02.24**

(71) Applicant(s)
Cytomx Therapeutics, Inc

(72) Inventor(s)
West, James William;Mei, Li;Moore, Stephen James;Nguyen, Margaret;Hostetter, Daniel;Vasiljeva, Olga;Sagert, Jason;Terrett, Jonathan

(74) Agent / Attorney
Spruson & Ferguson, GPO Box 3898, Sydney, NSW, 2001, AU

(56) Related Art
WO 2011/066389 A1
WO 2015/013671 A1

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 September 2016 (22.09.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/149201 A3

(51) International Patent Classification:
C07K 16/28 (2006.01) *G01N 33/53* (2006.01)
A61K 49/00 (2006.01)

(21) International Application Number:
PCT/US2016/022345

(22) International Filing Date:
14 March 2016 (14.03.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/133,231 13 March 2015 (13.03.2015) US
62/139,596 27 March 2015 (27.03.2015) US
62/218,883 15 September 2015 (15.09.2015) US

(71) Applicant: **CYTOMX THERAPEUTICS, INC.** [US/US]; 343 Oyster Point Blvd., Suite 100, South San Francisco, California 94080-1913 (US).

(72) Inventors: **WEST, James William**; 724 Laurel Ave. Apt 404, San Mateo, California 94401 (US). **MEI, Li**; 534 Balboa Street, San Francisco, California 94118 (US). **MOORE, Stephen James**; 218 Country Meadows Lane, Danville, California 94506 (US). **NGUYEN, Margaret**; 1176 Pusateri Way, San Jose, California 95121 (US). **HOSTETTER, Daniel**; 3909 Park Blvd, Palo Alto, California 94306 (US). **VASILJEVA, Olga**; 20080 Rodrigues Ave. #D, Cupertino, California 95104 (US). **SAGERT, Jason**; 231 Laurie Meadows Rd Apt 153, San Mateo, California 94403 (US). **TERRETT, Jonathan**; 10678 Maplewood Road, Cupertino, California 95014 (US).

(74) Agents: **ELRIFI, Ivor R.** et al.; COOLEY LLP, 1299 Pennsylvania Avenue, NW, Suite 700, Washington, District of Columbia 20004-2400 (US).

(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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, 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).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

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

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
24 November 2016

WO 2016/149201 A3

(54) Title: ANTI-PDL1 ANTIBODIES, ACTIVATABLE ANTI-PDL1 ANTIBODIES, AND METHODS OF USE THEREOF

(57) Abstract: The invention relates generally to antibodies that bind programmed death ligand 1 (PDL1), activatable antibodies that specifically bind to PDL1 and methods of making and using these anti-PDL1 antibodies and anti-PDL1 activatable antibodies in a variety of therapeutic, diagnostic and prophylactic indications.

2016233495 02 Feb 2022

ANTI-PDL1 ANTIBODIES, ACTIVATABLE ANTI-PDL1 ANTIBODIES, AND METHODS OF USE THEREOF

Related Applications

[0001] This application claims the benefit of U.S. Provisional Application No. 62/133,231, filed March 13, 2015; U.S. Provisional Application No. 62/139,596, filed March 27, 2015; and U.S. Provisional Application No. 62/218,883, filed September 15, 2015; the contents of each of which are incorporated herein by reference in their entirety.

Field of the Invention

[0002] The invention relates generally to antibodies that bind programmed death ligand 1 (PDLl), activatable antibodies that specifically bind to PDLl and methods of making and using these anti-PDLl antibodies and anti-PDLl activatable antibodies in a variety of therapeutic, diagnostic and prophylactic indications.

Background of the Invention

[0003] Antibody-based therapies have proven effective treatments for several diseases but in some cases, toxicities due to broad target expression have limited their therapeutic effectiveness. In addition, antibody-based therapeutics have exhibited other limitations such as rapid clearance from the circulation following administration.

[0004] In the realm of small molecule therapeutics, strategies have been developed to provide prodrugs of an active chemical entity. Such prodrugs are administered in a relatively inactive (or significantly less active) form. Once administered, the prodrug is metabolized in vivo into the active compound. Such prodrug strategies can provide for increased selectivity of the drug for its intended target and for a reduction of adverse effects.

[0005] Accordingly, there is a continued need in the field of antibody-based therapeutics for antibodies that mimic the desirable characteristics of the small molecule prodrug.

Summary of the Invention

[0006] According to a first aspect, the present invention provides an activatable antibody comprising the following structure:

(1) an antibody or an antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1, wherein the AB comprises:

(a) a variable heavy chain region (VH) comprising:

i. a variable heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence of SEQ ID NO: 212;

2016233495 02 Feb 2022

ii. a variable heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence of SEQ ID NO: 246; and

iii. a variable heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence of SEQ ID NO:235; and

(b) a variable light chain region (VL) comprising:

i. a variable light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence of SEQ ID NO: 209;

ii. a variable light chain complementarity determining region 2 (VL CDR2) comprising an amino acid sequence of SEQ ID NOs: 215 or 227; and

iii. a variable light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence of SEQ ID NO: 228;

(2) a masking moiety (MM) comprising the amino acid sequence of SEQ ID NO: 63 or 71; and

(3) a cleavable moiety (CM) comprising the amino acid sequence of SEQ ID NO: 377.

[0006a] According to a second aspect, the present invention provides a conjugated activatable antibody comprising the activatable antibody of the first aspect conjugated to an agent.

[0006b] According to a third aspect, the present invention provides a pharmaceutical composition comprising:

a) the activatable antibody of the first aspect and

b) a carrier.

[0006c] According to a fourth aspect, the present invention provides a method of treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or disease comprising administering an effective amount the conjugated activatable antibody of the second aspect, or the activatable antibody of the first aspect to a subject in need thereof.

[0006d] According to a fifth aspect, the present invention provides use of an effective amount of the conjugated activatable antibody of the second aspect, or the activatable antibody of the first aspect in the preparation of a medicament for reducing PDLl activity in a subject.

2016233495 02 Feb 2022

[0006e] According to a sixth aspect, the present invention provides use of an effective amount of the conjugated activatable antibody of the second aspect, or the activatable antibody of the first aspect in the preparation of a medicament for blocking binding of a natural ligand to PDLl in a subject.

[0006f] According to a seventh aspect, the present invention provides use of an effective amount of the conjugated activatable antibody of the second aspect, or the activatable antibody of the first aspect in the preparation of a medicament for treating, alleviating a symptom of, or delaying the progression of a PDLl-mediated disorder or disease in a subject.

[0006g] The disclosure provides antibodies or antigen-binding fragments thereof that specifically bind programmed death ligand 1 (PDLl), also known as PD-L1, CD274, B7 homolog 1 and/or B7-H1. The use of the term "PDLl" is intended to cover any variation

thereof, such as, by way of non-limiting example, PD-L1 and/or PDL-1, all variations are used herein interchangeably.

[0007] In some embodiments, the antibody includes an antibody or antigen-binding fragment thereof that specifically binds PDL1. In some embodiments, the antibody or antigen binding fragment thereof that binds PDL1 is a monoclonal antibody, domain antibody, single chain, Fab fragment, a $F(ab')_2$ fragment, a scFv, a scAb, a dAb, a single domain heavy chain antibody, or a single domain light chain antibody. In some embodiments, such an antibody or antigen binding fragment thereof that binds PDL1 is a mouse, other rodent, chimeric, humanized or fully human monoclonal antibody.

[0008] In some embodiments, the antibody is an isolated antibody or antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1, wherein the AB has one or more of the following characteristics: (a) the AB specifically binds to human PDL1 and murine PDL1; (b) the AB specifically binds to human PDL1 and cynomolgus monkey PDL1; (c) the AB specifically binds to human PDL1, murine PDL1, and cynomolgus monkey PDL1; (d) the AB inhibits binding of human B7-1 and human PD1 to human PDL1 with an EC_{50} value less than 10 nM; (e) the AB inhibits binding of murine B7-1 and murine PD1 to murine PDL1 with an EC_{50} value less than 10 nM; and (f) the AB inhibits binding of cynomolgus monkey B7-1 and cynomolgus monkey PD1 to cynomolgus monkey PDL1 with an EC_{50} value less than 10 nM.

[0009] In some embodiments, the antibody or antigen binding fragment thereof specifically binds to the mammalian PDL1 with a dissociation constant is less than or equal to 0.01 nM, less than or equal to 0.05 nM, less than or equal to 0.1 nM, less than or equal to 0.2 nM, less than or equal to 0.3 nM, less than or equal to 0.4 nM, less than or equal to 0.5 nM, less than or equal to 0.75 nM, and less than or equal to 1 nM.

[00010] In some embodiments, the antibody or antigen binding fragment thereof specifically binds to the mammalian PDL1 with a dissociation constant in the range of 0.01 nM to 1 nM, 0.05 nM to 1 nM, 0.1 nM to 1 nM, 0.2 nM to 1 nM, 0.3 nM to 1 nM, 0.4 nM to 1 nM, 0.5 nM to 1 nM, 0.75 nM to 1 nM, 0.01 nM to 0.75 nM, 0.05 nM to 0.75 nM, 0.1 nM to 0.75 nM, 0.2 nM to 0.75 nM, 0.3 nM to 0.75 nM, 0.4 nM to 0.75 nM, 0.5 nM to 0.75 nM, 0.01 nM to 0.5 nM, 0.05 nM to 0.5 nM, 0.1 nM to 0.5 nM, 0.2 nM to 0.5 nM, 0.3 nM to 0.5 nM, 0.4 nM to 0.5 nM, 0.01 nM to 0.4 nM, 0.05 nM to 0.4 nM, 0.1 nM to 0.4 nM, 0.2 nM to 0.4 nM, 0.3 nM to 0.4 nM, 0.01 nM to 0.3 nM, 0.05 nM to

0.3 nM, 0.1 nM to 0.3 nM, 0.2 nM to 0.3 nM, 0.01 nM to 0.2 nM, 0.05 nM to 0.2 nM, 0.1 nM to 0.2 nM, 0.01 nM to 0.1 nM, 0.05 nM to 0.1 nM, or 0.01 nM to 0.05 nM.

[00011] In some embodiments, the mammalian PDL1 is selected from the group consisting of a human PDL1, a murine PDL1, a rat PDL1, and a cynomolgus monkey PDL1.

[00012] In some embodiments, the antibody or antigen binding fragment thereof specifically binds to human PDL1, murine PDL1 or cynomolgus monkey PDL1 with a dissociation constant of less than 1 nM.

[00013] In some embodiments, the mammalian PDL1 is a human PDL1.

[00014] In some embodiments, the antibody or antigen binding fragment thereof has one or more of the following characteristics: (a) the AB specifically binds human PDL1, murine PDL1, and cynomolgus monkey PDL1; (b) the AB inhibits binding of human B7-1 and human PD1 to human PDL1; (c) the AB inhibits binding of murine B7-1 and murine PD1 to murine PDL1; and (d) the AB inhibits binding of cynomolgus monkey B7-1 and cynomolgus monkey PD1 to cynomolgus monkey PDL1.

[00015] In some embodiments, the antibody or antigen binding fragment thereof blocks the ability of a natural ligand to bind to the mammalian PDL1 with an EC_{50} less than or equal to 0.5 nM, less than or equal to 1 nM, less than or equal to 2 nM, less than or equal to 3 nM, less than or equal to 4 nM, less than or equal to 5 nM, less than or equal to 6 nM, less than or equal to 7 nM, less than or equal to 8 nM, less than or equal to 9nM, and/or less than or equal to 10 nM.

[00016] In some embodiments, the antibody or antigen binding fragment thereof blocks the ability of a natural ligand to bind to the mammalian PDL1 with an EC_{50} in the range of 0.5 nM to 10 nM, 0.5 nM to 5 nM, 0.5 nM to 3 nM, 0.5 nM to 2 nM, 0.5 nM to 1 nM, 1 nM to 10 nM, 1 nM to 5 nM, 1 nM to 3 nM, 1 nM to 2 nM,2 nM to 10 nM, 2 nM to 5 nM, 2 nM to 3 nM, 3 nM to 10 nM, 3 nM to 5 nM, or 5 nM to 10 nM. In some embodiments, the natural ligand is a mammalian PD1. In some embodiments, the natural ligand is selected from the group consisting of: a human PD1, a murine PD1, and a cynomolgus monkey PD1.

[00017] In some embodiments, the natural ligand is a mammalian B7-1. In some embodiments, the natural ligand is selected from the group consisting of: a human B7-1, a murine B7-1, and a cynomolgus monkey B7-1.

[00018] In some embodiments, the antibody comprises a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 12 or SEQ ID NO: 58. In some embodiments, the antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 58.

[00019] In some embodiments, the antibody comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 58.

[00020] In some embodiments, the antibody comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 12.

[00021] In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[00022] In some embodiments, the antibody comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 12.

[00023] In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid of SEQ ID NO: 46. In some embodiments, the antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[00024] In some embodiments, the antibody comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 16; a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence shown in Table 16.

[00025] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR1 sequence shown in Table 16; a VH CD2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR3 sequence shown in Table 16.

[00026] In some embodiments, the antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein the combination is a combination of the three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[00027] In some embodiments, the antibody comprises a light chain that comprise a combination of a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the three light chain CDR sequences (VL CDR1, VL CDR2, VL CDR3) shown in a single row in Table 16.

[00028] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[00029] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%,

99% or more identical to the corresponding CDR sequence in a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[00030] In some embodiments, the antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[00031] In some embodiments, the antibody comprises a light chain that comprise a combination of a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of the three light chain CDR sequences (VL CDR1, VL CDR2, VL CDR3) shown in a single row in Table 16.

[00032] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[00033] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246). In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235). In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence,

wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246), and the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235).

[00034] In some embodiments, the antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[00035] In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12 or SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58 In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the antibody is encoded by a nucleic

acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12.

[00036] In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence

selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[00037] In some embodiments, the antibody is encoded by a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55. In some embodiments, the antibody is encoded by a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55. In some embodiments, the antibody is encoded by the light chain nucleic acid sequence of SEQ ID NO: 57. In some embodiments, the antibody is encoded by the light chain nucleic acid sequence of SEQ ID NO: 11. In some embodiments, the antibody is encoded by heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the antibody is encoded by heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 11. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ

ID NO: 57. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 11.

[00038] In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55. In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55. In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence of SEQ ID NO: 57. In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence of SEQ ID NO: 11. In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence comprising SEQ ID NO: 11. In some embodiments, the antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the antibody is

encoded by a nucleic acid sequence that comprises a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to light chain nucleic acid sequence comprising SEQ ID NO: 11.

[00039] In some embodiments, the antibody or antigen-binding fragment thereof is incorporated in a multispecific antibody or antigen-binding fragment thereof, where at least one arm of the multispecific antibody specifically binds PDL1. In some embodiments, the antibody or antigen-binding fragment thereof is incorporated in a bispecific antibody or antigen-binding fragment thereof, where at least one arm of the bispecific antibody specifically binds PDL1.

[00040] In some embodiments, at least one arm of the multispecific antibody, *e.g.*, a bispecific antibody, comprises a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, at least one arm of the multispecific antibody, *e.g.*, a bispecific antibody, comprises a light chain amino acid sequence comprising SEQ ID NO: 12 or SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, *e.g.*, a bispecific antibody, comprises a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, at least one arm of the multispecific antibody, *e.g.*, a bispecific antibody, comprises a light chain amino acid sequence comprising SEQ ID NO: 58.

[00041] In some embodiments, at least one arm of the multispecific antibody, *e.g.*, a bispecific antibody, a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 58.

[00042] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 12.

[00043] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38,

40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[00044] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 12.

[00045] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid of SEQ ID NO: 46. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID

NO: 12. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[00046] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 16; a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence shown in Table 16.

[00047] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR1 sequence shown in Table 16; a VH CD2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR2 sequence shown in

Table 16; a VH CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR3 sequence shown in Table 16.

[00048] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[00049] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein the combination is a combination of the three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[00050] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[00051] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a

combination of three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[00052] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[00053] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246). In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235). In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246), and the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235).

[00054] In some embodiments, at least one arm of the multispecific antibody, e.g., a bispecific antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[00055] The disclosure also provides activatable antibodies that include an antibody or antigen-binding fragment thereof that specifically binds PDL1 coupled to a masking moiety (MM), such that coupling of the MM reduces the ability of the antibody or antigen-binding fragment thereof to bind PDL1. In some embodiments, the MM is coupled via a sequence that includes a substrate for a protease, for example, a protease that is active in diseased tissue and/or a protease that is co-localized with PDL1 at a treatment site in a subject. The activatable anti-PDL1 antibodies provided herein, also referred to herein as anti-PDL1 activatable antibodies or PDL1 activatable antibodies, are stable in circulation, activated at intended sites of therapy and/or diagnosis but not in normal, *e.g.*, healthy tissue or other tissue not targeted for treatment and/or diagnosis, and, when activated, exhibit binding to PDL1 that is at least comparable to the corresponding, unmodified antibody.

[00056] In some embodiments, the activatable antibody that, in an activated state, specifically binds to mammalian PDL1, includes an antibody or an antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1; a masking moiety (MM) that inhibits the binding of the AB to mammalian PDL1 when the activatable antibody is in an uncleaved state; and a cleavable moiety (CM) coupled to the AB, wherein the CM is a polypeptide that functions as a substrate for a protease.

[00057] In some embodiments, the activatable antibody that, in an activated state, has one or more of the following characteristics: (a) specifically binds to mammalian PDL1; and(b) specifically blocks a natural ligand of PDL1 from binding to the mammalian PDL1, wherein the activatable antibody comprises: an antibody or an antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1; a masking moiety (MM) that inhibits the binding of the AB to mammalian PDL1 when the activatable antibody is in an uncleaved state; and a cleavable moiety (CM) coupled to the AB, wherein the CM is a polypeptide that functions as a substrate for a protease.

[00058] In some embodiments, the activatable antibody in an uncleaved state specifically binds to the mammalian PDL1 with a dissociation constant less than or equal to 1 nM, less than or equal to 2 nM, less than or equal to 3 nM, less than or equal to 4 nM, less than or equal to 5 nM, less than or equal to 10 nM, less than or equal to 15 nM, less than or equal to 20 nM, and/or less than or equal to 25 nM.

[00059] In some embodiments, the activatable antibody in an uncleaved state specifically binds to the mammalian PDL1 with a dissociation constant greater than or equal to 1 nM, greater than or equal to 2 nM, greater than or equal to 3 nM, greater than or equal

to 4 nM, greater than or equal to 5 nM, greater than or equal to 10 nM, greater than or equal to 15 nM, greater than or equal to 20 nM, and/or greater than or equal to 25 nM.

[00060] In some embodiments, the activatable antibody in an uncleaved state specifically binds to the mammalian PDL1 with a dissociation constant in the range of 1 to 2 nM, 1 to 5 nM, 1 to 10 nM, 1 to 15 nM, 1 to 20 nM, 1 to 25 nM, 2 nM to 5 nM, 2 nM to 10 nM, 2 nM to 15 nM, 2 to 20 nM, 2 to 25 nM, 5 nM to 10 nM, 5 nM to 15 nM, 5 to 20 nM, 5 to 25 nM, 10 nM to 15 nM, 10 to 20 nM, 10 to 25 nM, 15 to 20 nM, 15 to 25 nM, or 20 to 25 nM.

[00061] In some embodiments, the activatable antibody in an activated state specifically binds to the mammalian PDL1 with a dissociation constant is less than or equal to 0.01 nM, less than or equal to 0.05 nM, less than or equal to 0.1 nM, less than or equal to 0.2 nM, less than or equal to 0.3 nM, less than or equal to 0.4 nM, less than or equal to 0.5 nM, less than or equal to 0.75 nM, and less than or equal to 1 nM.

[00062] In some embodiments, the activatable antibody in an activated state specifically binds to the mammalian PDL1 with a dissociation constant in the range of 0.01 nM to 1 nM, 0.05 nM to 1 nM, 0.1 nM to 1 nM, 0.2 nM to 1 nM, 0.3 nM to 1 nM, 0.4 nM to 1 nM, 0.5 nM to 1 nM, 0.75 nM to 1 nM, 0.01 nM to 0.75 nM, 0.05 nM to 0.75 nM, 0.1 nM to 0.75 nM, 0.2 nM to 0.75 nM, 0.3 nM to 0.75 nM, 0.4 nM to 0.75 nM, 0.5 nM to 0.75 nM, 0.01 nM to 0.5 nM, 0.05 nM to 0.5 nM, 0.1 nM to 0.5 nM, 0.2 nM to 0.5 nM, 0.3 nM to 0.5 nM, 0.4 nM to 0.5 nM, 0.01 nM to 0.4 nM, 0.05 nM to 0.4 nM, 0.1 nM to 0.4 nM, 0.2 nM to 0.4 nM, 0.3 nM to 0.4 nM, 0.01 nM to 0.3 nM, 0.05 nM to 0.3 nM, 0.1 nM to 0.3 nM, 0.2 nM to 0.3 nM, 0.01 nM to 0.2 nM, 0.05 nM to 0.2 nM, 0.1 nM to 0.2 nM, 0.01 nM to 0.1 nM, 0.05 nM to 0.1 nM, or 0.01 nM to 0.05 nM.

[00063] In some embodiments, the AB specifically binds to the mammalian PDL1 with a dissociation constant is less than or equal to 0.01 nM, less than or equal to 0.05 nM, less than or equal to 0.1 nM, less than or equal to 0.2 nM, less than or equal to 0.3 nM, less than or equal to 0.4 nM, less than or equal to 0.5 nM, less than or equal to 0.75 nM, and less than or equal to 1 nM.

[00064] In some embodiments, the AB specifically binds to the mammalian PDL1 with a dissociation constant in the range of 0.01 nM to 1 nM, 0.05 nM to 1 nM, 0.1 nM to 1 nM, 0.2 nM to 1 nM, 0.3 nM to 1 nM, 0.4 nM to 1 nM, 0.5 nM to 1 nM, 0.75 nM to 1 nM, 0.01 nM to 0.75 nM, 0.05 nM to 0.75 nM, 0.1 nM to 0.75 nM, 0.2 nM to 0.75 nM, 0.3 nM to 0.75 nM, 0.4 nM to 0.75 nM, 0.5 nM to 0.75 nM, 0.01 nM to 0.5 nM, 0.05 nM to 0.5 nM,

0.1 nM to 0.5 nM, 0.2 nM to 0.5 nM, 0.3 nM to 0.5 nM, 0.4 nM to 0.5 nM, 0.01 nM to 0.4 nM, 0.05 nM to 0.4 nM, 0.1 nM to 0.4 nM, 0.2 nM to 0.4 nM, 0.3 nM to 0.4 nM, 0.01 nM to 0.3 nM, 0.05 nM to 0.3 nM, 0.1 nM to 0.3 nM, 0.2 nM to 0.3 nM, 0.01 nM to 0.2 nM, 0.05 nM to 0.2 nM, 0.1 nM to 0.2 nM, 0.01 nM to 0.1 nM, 0.05 nM to 0.1 nM, or 0.01 nM to 0.05 nM.

[00065] In some embodiments, the mammalian PDL1 is selected from the group consisting of a human PDL1, a murine PDL1, a rat PDL1, and a cynomolgus monkey PDL1. In some embodiments, the AB specifically binds to human PDL1, murine PDL1 or cynomolgus monkey PDL1 with a dissociation constant of less than 1 nM. In some embodiments, the mammalian PDL1 is a human PDL1.

[00066] In some embodiments, the AB has one or more of the following characteristics: (a) the AB specifically binds to human PDL1 and murine PDL1; (b) the AB specifically binds to human PDL1 and cynomolgus monkey PDL1; and (c) the AB specifically binds to human PDL1, murine PDL1, and cynomolgus monkey PDL1.

[00067] In some embodiments, the AB has one or more of the following characteristics: (a) the AB specifically binds human PDL1, murine PDL1, and cynomolgus monkey PDL1; (b) the AB inhibits binding of human B7-1 and human PD1 to human PDL1; (c) the AB inhibits binding of murine B7-1 and murine PD1 to murine PDL1; and (d) the AB inhibits binding of cynomolgus monkey B7-1 and cynomolgus monkey PD1 to cynomolgus monkey PDL1.

[00068] In some embodiments, the AB blocks the ability of a natural ligand to bind to the mammalian PDL1 with an EC_{50} less than or equal to 0.5 nM, less than or equal to 1 nM, less than or equal to 2 nM, less than or equal to 3 nM, less than or equal to 4 nM, less than or equal to 5 nM, less than or equal to 6 nM, less than or equal to 7 nM, less than or equal to 8 nM, less than or equal to 9nM, and/or less than or equal to 10 nM.

[00069] In some embodiments, the AB blocks the ability of a natural ligand to bind to the mammalian PDL1 with an EC_{50} of 0.5 nM to 10 nM, 0.5 nM to 5 nM, 0.5 nM to 3 nM, 0.5 nM to 2 nM, 0.5 nM to 1 nM, 1 nM to 10 nM, 1 nM to 5 nM, 1 nM to 3 nM, 1 nM to 2 nM, 2 nM to 10 nM, 2 nM to 5 nM, 2 nM to 3 nM, 3 nM to 10 nM, 3 nM to 5 nM, or 5 nM to 10 nM.

[00070] In some embodiments, natural ligand is a mammalian PD1. In some embodiments, the natural ligand is selected from the group consisting of: a human PD1, a murine PD1, and a cynomolgus monkey PD1.

[00071] In some embodiments, the natural ligand is a mammalian B7-1. In some embodiments, the natural ligand is selected from the group consisting of: a human B7-1, a murine B7-1, and a cynomolgus monkey B7-1.

[00072] In some embodiments, the activatable antibody has one or more of the following characteristics (a) the AB induces type 1 diabetes in a non-obese diabetic (NOD) mouse; and (b) the activatable antibody in an uncleaved state inhibits the induction of type 1 diabetes in a NOD mouse.

[00073] In some embodiments, the activatable antibody inhibits the induction of type 1 diabetes in the NOD mouse after administration of the activatable antibody at a single dose of 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, or 0.1 mg/kg to 0.5 mg/kg.

[00074] In some embodiments, the activatable antibody induces type 1 diabetes in a subject after administration of the activatable antibody at a single dose of 1 mg/kg. In some embodiments, the subject is a NOD mouse.

[00075] In some embodiments, the activatable antibody induces type 1 diabetes in a subject after administration of the activatable antibody at single dose less than or equal to 3 mg/kg, less than or equal to 2 mg/kg, less than or equal to 1 mg/kg, less than or equal to 0.5 mg/kg, and/or less than or equal to 0.1 mg/kg.

[00076] In some embodiments, the activatable antibody induces type 1 diabetes in a subject after administration of the activatable antibody at single dose in the range selected from the group consisting of 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, and 0.1 mg/kg to 0.5 mg/kg. In some embodiments, the subject is a NOD mouse.

[00077] In some embodiments, the activatable antibody has one or more of the following characteristics (a) the activatable antibody in an uncleaved state does not induce type 1 diabetes in greater than 50% of a population of non-obese diabetic (NOD) mice, and the AB induces type 1 diabetes in greater than 50% of a population of NOD mice.

[00078] In some embodiments, the activatable antibody does not induce type 1 diabetes in greater than 50% of the population of NOD mice after administration to each mouse in the population a single dose less than or equal to 3 mg/kg, less than or equal to

2 mg/kg, less than or equal to 1 mg/kg, less than or equal to 0.5 mg/kg, and/or less than or equal to 0.1 mg/kg.

[00079] In some embodiments, the activatable antibody does not induce type 1 diabetes in greater than 50% of the population of NOD mice after administration to each mouse in the population a single dose of the activatable antibody at a dosage of: 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, or 0.1 mg/kg to 0.5 mg/kg.

[00080] In some embodiments, the activatable antibody has one or more of the following characteristics (a) the activatable antibody in an uncleaved state does not induce type 1 diabetes in greater than 50% of a population of non-obese diabetic (NOD) mice when administered at a single dose of 1 mg/kg; and (b) the AB induces type 1 diabetes in greater than 50% of a population of NOD mice, when administered at a single dose of 1 mg/kg.

[00081] In some embodiments, the AB induces type 1 diabetes in greater than 50% of the population of the NOD mice after administration to each mouse in the population a single dose of the AB at a dosage less than or equal to 3 mg/kg, less than or equal to 2 mg/kg, less than or equal to 1 mg/kg, less than or equal to 0.5 mg/kg, and/or less than or equal to 0.1 mg/kg.

[00082] In some embodiments, the AB induces type 1 diabetes in greater than 50% of the population of the NOD mice after administration to each mouse in the population a single dose of the AB at a dosage of: 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, or 0.1 mg/kg to 0.5 mg/kg.

[00083] In some embodiments, he NOD mouse is a female NOD/ShiLtJ mouse substrain.

[00084] In some embodiments, the activatable antibody inhibits the induction of type 1 diabetes in a NOD mouse by at least 3-fold compared to the AB.

[00085] In some embodiments, the activatable antibody exhibits a safety margin that is at least a three-fold safety margin relative to the AB.

[00086] In some embodiments, the activatable antibody in an uncleaved state binds to a smaller percentage of a population of peripheral blood CD4+ CD8+ T lymphocytes than does the AB.

[00087] In some embodiments, the activatable antibody does not bind to greater than 50% of the population of peripheral blood CD4+ CD8+ T lymphocytes after administration of a single dose of the activatable antibody at a dosage less than or equal to 5 mg/kg, less than or equal to 4 mg/kg, less than or equal to 3 mg/kg, less than or equal to 2 mg/kg, less than or equal to 1 mg/kg, less than or equal to 0.5 mg/kg, and/or less than or equal to 0.1 mg/kg.

[00088] In some embodiments, the activatable antibody does not bind to greater than 50% of the population of peripheral blood CD4+ CD8+ T lymphocytes after administration of a single dose of the activatable antibody at a dosage of: 0.1 mg/kg to 5 mg/kg, 0.5 mg/kg to 5 mg/kg, 1 mg/kg to 5 mg/kg, 2 mg/kg to 5 mg/kg, 3 mg/kg to 5 mg/kg, 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, or 0.1 mg/kg to 0.5 mg/kg.

[00089] In some embodiments, the AB binds to greater than 50% of the population of peripheral blood CD4+ CD8+ T lymphocytes after administration of a single dose of the AB at a dosage of: 0.1 mg/kg to 5 mg/kg, 0.5 mg/kg to 5 mg/kg, 1 mg/kg to 5 mg/kg, 2 mg/kg to 5 mg/kg, 3 mg/kg to 5 mg/kg, 0.1 mg/kg to 3 mg/kg, 0.5 mg/kg to 3 mg/kg, 1 mg/kg to 3 mg/kg, 2 mg/kg to 3 mg/kg, 0.1 mg/kg to 2 mg/kg, 0.5 mg/kg to 2 mg/kg, 1 mg/kg to 2 mg/kg, 0.1 mg/kg to 1 mg/kg, 0.5 mg/kg to 1 mg/kg, or 0.1 mg/kg to 0.5 mg/kg.

[00090] In some embodiments, the peripheral blood CD4+ CD8+ T lymphocytes are murine. In some embodiments, the murine peripheral blood CD4+ CD8+ T lymphocytes are derived from a tumor-bearing mouse.

[00091] In some embodiments, the percentage of the population of peripheral blood CD4+CD8+ T lymphocytes to which the AB binds is less than 60% when the activatable antibody is administered at a dose between 1 mg/kg and 5 mg/kg. In some embodiments, the percentage of the population of peripheral blood CD4+CD8+ T lymphocytes to which the AB binds is less than 50% when the activatable antibody is administered at a dose between 1 mg/kg and 5 mg/kg. In some embodiments, the percentage of the population of peripheral blood CD4+CD8+ T lymphocytes to which the AB binds is between 30 and 60% when the activatable antibody is administered at a dose between 1 mg/kg and 5 mg/kg. In some embodiments, the percentage of the population of peripheral blood CD4+CD8+ T lymphocytes to which the AB binds is between 30 and 50% when the activatable antibody is administered at a dose between 1 mg/kg and 5 mg/kg.

[00092] The invention also provides methods of treating, preventing and/or delaying the onset or progression of, or alleviating a symptom associated with aberrant expression and/or activity of PDL1 in a subject using activatable antibodies that bind PDL1, particularly activatable antibodies that bind and neutralize or otherwise inhibit at least one biological activity of PDL1 and/or PDL1-mediated signaling.

[00093] The activatable antibodies in an activated state bind PDL1 and include (i) an antibody or an antigen binding fragment thereof (AB) that specifically binds to PDL1; (ii) a masking moiety (MM) that, when the activatable antibody is in an uncleaved state, inhibits the binding of the AB to PDL1; and (c) a cleavable moiety (CM) coupled to the AB, wherein the CM is a polypeptide that functions as a substrate for a protease.

[00094] In some embodiments, the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM.

[00095] In some embodiments, the activatable antibody comprises a linking peptide between the MM and the CM.

[00096] In some embodiments, the activatable antibody comprises a linking peptide between the CM and the AB.

[00097] In some embodiments, the activatable antibody comprises a first linking peptide (LP1) and a second linking peptide (LP2), and wherein the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-LP1-CM-LP2-AB or AB-LP2-CM-LP1-MM. In some embodiments, the two linking peptides need not be identical to each other.

[00098] In some embodiments, at least one of LP1 or LP2 comprises an amino acid sequence selected from the group consisting of $(GS)_n$, $(GGS)_n$, $(GSGGS)_n$ (SEQ ID NO: 191) and $(GGGS)_n$ (SEQ ID NO: 192), where n is an integer of at least one.

[00099] In some embodiments, at least one of LP1 or LP2 comprises an amino acid sequence selected from the group consisting of GGSG (SEQ ID NO: 193), GGSGG (SEQ ID NO: 194), GSGSG (SEQ ID NO: 195), GSGGG (SEQ ID NO: 196), GGGSG (SEQ ID NO: 197), and GSSSG (SEQ ID NO: 198).

[000100] In some embodiments, LP1 comprises the amino acid sequence GSSGGSGGSGGSG (SEQ ID NO: 199), GSSGGSGGSGG (SEQ ID NO: 200), GSSGGSGGSGGS (SEQ ID NO: 201), GSSGGSGGSGGSGGGS (SEQ ID NO: 202), GSSGGSGGSG (SEQ ID NO: 203), or GSSGGSGGSGS (SEQ ID NO: 204).

[000101] In some embodiments, LP2 comprises the amino acid sequence GSS, GGS, GGGS (SEQ ID NO: 205), GSSGT (SEQ ID NO: 206) or GSSG (SEQ ID NO: 207).

[000102] In some embodiments, the AB has a dissociation constant of about 100 nM or less for binding to PDL1.

[000103] In some embodiments, the activatable antibody includes an antibody or antigen-binding fragment thereof (AB) that specifically binds PDL1. In some embodiments, the antibody or antigen binding fragment thereof that binds PDL1 is a monoclonal antibody, domain antibody, single chain, Fab fragment, a $F(ab')_2$ fragment, a scFv, a scAb, a dAb, a single domain heavy chain antibody, or a single domain light chain antibody. In some embodiments, such an antibody or antigen binding fragment thereof that binds PDL1 is a mouse, other rodent, chimeric, humanized or fully human monoclonal antibody.

[000104] In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 12 or SEQ ID NO: 58. In some embodiments, the activatable antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the activatable antibody comprises a light chain amino acid sequence comprising SEQ ID NO: 58.

[000105] In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 58.

[000106] In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 12.

[000107] In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid

sequence of SEQ ID NO: 58. In some embodiments, the activatable antibody comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the activatable antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[000108] In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a heavy chain amino acid sequence selected from the group consisting of the heavy chain sequences shown in Table 15. In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a light chain amino acid sequence selected from the group consisting of the light chain sequences shown in Table 15. In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a heavy chain amino acid sequence selected from the group consisting of the heavy chain sequences shown in Table 15 and a light chain amino acid sequence selected from the group consisting of the light chain sequences shown in Table 15.

[000109] In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of the heavy chain sequences shown in Table 15. In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a light chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of the light chain sequences shown in Table 15. In some embodiments, the AB of the activatable anti-PDL1 antibody comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of the heavy chain sequences shown in Table 15 and a light chain amino acid sequence that is at

least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of the light chain sequences shown in Table 15.

[000110] In some embodiments, the activatable antibody comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 16; a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence shown in Table 16.

[000111] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR1 sequence shown in Table 16; a VH CD2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR3 sequence shown in Table 16.

[000112] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence,

a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[000113] In some embodiments, the activatable antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein the combination is a combination of the three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[000114] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[000115] In some embodiments, the activatable antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[000116] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000117] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246). In some embodiments, the

activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235). In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246), and the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235).

[000118] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000119] In some embodiments, the activatable antibody comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 17; a VH CDR2 sequence shown in Table 17; a VH CDR3 sequence shown in Table 17; a VL CDR1 sequence shown in Table 17; a VL CDR2 sequence shown in Table 17; and a VL CDR3 sequence shown in Table 17.

[000120] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence that includes a sequence that is

at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR1 sequence shown in Table 17; a VH CD2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR2 sequence shown in Table 17; a VH CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR3 sequence shown in Table 17; a VL CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR1 sequence shown in Table 17; a VL CDR2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR2 sequence shown in Table 17; and a VL CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR3 sequence shown in Table 17.

[000121] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination shown in Table 17.

[000122] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination shown in Table 17.

[000123] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141,

143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000124] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000125] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, and 1201. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 100, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, and 1201, and an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000126] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino

acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000127] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99%

identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000128] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, 1200, and 1201. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56.

[000129] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and the heavy chain amino acid sequence of SEQ ID NO: 46.

[000130] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and the heavy chain amino acid sequence of SEQ ID NO: 46.

[000131] In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, and 1201, and the heavy chain amino acid sequence of SEQ ID NO: 46.

[000132] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the heavy chain amino acid sequence of SEQ ID NO: 46.

[000133] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the heavy chain amino acid sequence of SEQ ID NO: 46.

[000134] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1145, 1147, 1149, 1151, 1153, 1155, 1157, 1159, 1161, 1163, 1165, 1167, 1169, 1171, 1173, 1175, 1177, 1179, 1181, 1183, 1185, 1187, 1189, 1191, and 1201, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the heavy chain amino acid sequence of SEQ ID NO: 46.

[000135] In some embodiments, the activatable antibody comprises the amino acid sequence of SEQ ID NO: 428. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202. In some embodiments, the activatable antibody comprises the amino acid sequence of SEQ ID NO: 428, and an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, and 434.

[000136] In some embodiments, the activatable antibody comprises the amino acid sequence of SEQ ID NO: 1008. In some embodiments, the activatable antibody comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202. In some embodiments, the activatable antibody comprises the amino acid sequence of SEQ ID NO: 1008, and an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202.

[000137] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 428. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 428, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202.

[000138] In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 1008. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202. In some embodiments, the activatable antibody includes an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 1008, and an amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 430, 432, 434, and 1202.

[000139] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 59-81, 208, and 426; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 352, 359, 364, 372, 377, 379, 383, 394, 437, 883-893, 901-920, and 921; and a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000140] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 60, 62, 63, 66-68, 71, 75, and 76; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 364, 377, 394, 437, 883-893, 901-911, and 920; and a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000141] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 59-81, 208, and 426; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 352, 359, 364, 372, 377, 379, 383, 394, 437, 883-893, 901-920, and 921; and of a variable light chain comprising the amino acid sequence of SEQ ID NO: 58 and a variable heavy chain comprising the amino acid sequence of SEQ ID NO: 46.

[000142] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID

NOs: 60, 62, 63, 66-68, 71, 75, and 76; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 364, 377, 394, 437, 883-893, 901-911, and 920; and of a variable light chain comprising the amino acid sequence of SEQ ID NO: 58 and a variable heavy chain comprising the amino acid sequence of SEQ ID NO: 46.

[000143] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 59-81, 208, and 426; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 352, 359, 364, 372, 377, 379, 383, 394, 437, 883-893, 901-920, and 921; and of a variable light chain comprising the amino acid sequence of SEQ ID NO: 12 and a variable heavy chain comprising the amino acid sequence of SEQ ID NO: 46.

[000144] In some embodiments, the activatable antibody comprises a masking moiety (MM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 60, 62, 63, 66-68, 71, 75, and 76; a cleavable moiety (CM) comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 341, 364, 377, 394, 437, 883-893, 901-11, and 920; and of a variable light chain comprising the amino acid sequence of SEQ ID NO: 12 and a variable heavy chain comprising the amino acid sequence of SEQ ID NO: 46.

[000145] In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42,

44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid sequence comprising SEQ ID NO: 12.

[000146] In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain

amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence encoding a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a nucleic acid sequence that comprises a nucleic acid sequence encoding a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[000147] In some embodiments, the activatable antibody is encoded by a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55. In some embodiments, the activatable antibody is encoded by a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55. In some embodiments, the activatable antibody is encoded by the light chain nucleic acid sequence of SEQ ID NO: 57.

In some embodiments, the activatable antibody is encoded by the light chain nucleic acid sequence of SEQ ID NO: 11. In some embodiments, the activatable antibody is encoded by heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the activatable antibody is encoded by heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 11. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a light chain nucleic acid sequence comprising SEQ ID NO: 11.

[000148] In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence of SEQ ID NO: 57. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence of SEQ ID NO: 11. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence comprising SEQ ID NO: 57.

In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to a heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 13, 15, 17, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the light chain nucleic acid sequence comprising SEQ ID NO: 11. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to light chain nucleic acid sequence comprising SEQ ID NO: 57. In some embodiments, the activatable antibody is encoded by a nucleic acid sequence that comprises a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to heavy chain nucleic acid sequence selected from the group consisting of SEQ ID NO: 45, 47, 49, 51, 53, and 55, and a nucleic acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to light chain nucleic acid sequence comprising SEQ ID NO: 11.

[000149] In some embodiments, the MM has a dissociation constant for binding to the AB that is greater than the dissociation constant of the AB to PDL1.

[000150] In some embodiments, the MM has a dissociation constant for binding to the AB that is no more than the dissociation constant of the AB to PDL1.

[000151] In some embodiments, the MM has a dissociation constant for binding to the AB that is less than the dissociation constant of the AB to PDL1.

[000152] In some embodiments, the MM has a dissociation constant for binding to the AB that is approximately equal to the dissociation constant of the AB to PDL1.

[000153] In some embodiments, the MM does not interfere or compete with the AB for binding to PDL1 when the activatable antibody is in a cleaved state.

[000154] In some embodiments, the MM is a polypeptide of about 2 to 40 amino acids in length. In some embodiments, the MM is a polypeptide of up to about 40 amino acids in length.

[000155] In some embodiments, the MM polypeptide sequence is different from that of PDL1. In some embodiments, the MM polypeptide sequence is no more than 50% identical to any natural binding partner of the AB. In some embodiments, the MM

polypeptide sequence is different from that of PDL1 and is no more than 40%, 30%, 25%, 20%, 15%, or 10% identical to any natural binding partner of the AB.

[000156] In some embodiments, the MM comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 59-81, 208, and 426. In some embodiments, the MM comprises an amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NOs: 59-81, 208, and 426.

[000157] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least two times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000158] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least five times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000159] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least 10 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000160] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least 20 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000161] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least 40 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000162] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least 100 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000163] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to

the MM towards PDL1 is at least 1000 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000164] In some embodiments, the coupling of the MM to the AB reduces the ability of the AB to bind PDL1 such that the dissociation constant (K_d) of the AB when coupled to the MM towards PDL1 is at least 10,000 times greater than the K_d of the AB when not coupled to the MM towards PDL1.

[000165] In some embodiments, in the presence of PDL1, the MM reduces the ability of the AB to bind PDL1 by at least 90% when the CM is uncleaved, as compared to when the CM is cleaved when assayed *in vitro* using a target displacement assay such as, for example, the assay described in PCT Publication No. WO 2010/081173, the contents of which are hereby incorporated by reference in their entirety.

[000166] In some embodiments, the protease that cleaves the CM is active, e.g., up-regulated, in diseased tissue, and the protease cleaves the CM in the activatable antibody when the activatable antibody is exposed to the protease.

[000167] In some embodiments, the protease is co-localized with PDL1 in a tissue, and the protease cleaves the CM in the activatable antibody when the activatable antibody is exposed to the protease.

[000168] In some embodiments, the protease is present at relatively higher levels in or in close proximity to target-containing tissue of a treatment site or diagnostic site than in tissue of non-treatment sites (for example in healthy tissue), and the protease cleaves the CM in the activatable antibody when the activatable antibody is exposed to the protease.

[000169] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least twofold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state (i.e., when the activatable antibody is in the cleaved state), the AB binds PDL1.

[000170] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least fivefold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state (i.e., when the activatable antibody is in the cleaved state), the AB binds PDL1.

[000171] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 10-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state (i.e., when the activatable antibody is in the cleaved state), the AB binds PDL1.

[000172] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 20-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state (i.e., when the activatable antibody is in the cleaved state), the AB binds PDL1.

[000173] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 40-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state, the AB binds PDL1.

[000174] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 50-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state, the AB binds PDL1.

[000175] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 100-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state, the AB binds PDL1.

[000176] In some embodiments, the CM is positioned in the activatable antibody such that when the activatable antibody is in the uncleaved state, binding of the activatable antibody to PDL1 is reduced to occur with a dissociation constant that is at least 200-fold greater than the dissociation constant of an unmodified AB binding to PDL1, whereas in the cleaved state, the AB binds PDL1.

[000177] In some embodiments, the CM is a polypeptide of up to 15 amino acids in length.

[000178] In some embodiments, the CM is a polypeptide that includes a first cleavable moiety (CM1) that is a substrate for at least one matrix metalloprotease (MMP) and a second cleavable moiety (CM2) that is a substrate for at least one serine protease (SP). In some embodiments, each of the CM1 substrate sequence and the CM2 substrate sequence of the CM1-CM2 substrate is independently a polypeptide of up to 15 amino acids in length.

[000179] In some embodiments, the CM is a substrate for at least one protease that is or is believed to be up-regulated in cancer. In some embodiments, the CM is a substrate for at least one protease that is or is believed to be up-regulated in inflammation. In some embodiments, the CM is a substrate for at least one protease that is or is believed to be up-regulated in autoimmunity.

[000180] In some embodiments, the CM is a substrate for at least one protease selected from the group consisting of a matrix metalloprotease (MMP), a thrombin, a neutrophil elastase, a cysteine protease, a legumain, and a serine protease, such as a matriptase (MT-SP1), and a urokinase (uPA). Without being bound by theory, it is believed that these proteases are up-regulated in at least one of cancer, inflammation, and/or autoimmunity.

[000181] Exemplary substrates include but are not limited to substrates cleavable by one or more of the following enzymes or proteases listed in Table 12.

[000182] In some embodiments, the CM is selected for use with a specific protease, for example a protease that is known to be co-localized with the target of the activatable antibody.

[000183] In some embodiments, the CM is selected for use with a specific protease, for example a protease that is known to be in close proximity to the target of the activatable antibody.

[000184] In some embodiments, the CM is a substrate for at least one MMP. Examples of MMPs include the MMPs listed in the Table 12. In some embodiments, the CM is a substrate for a protease selected from the group consisting of MMP 9, MMP14, MMP1, MMP3, MMP13, MMP17, MMP11, and MMP19. In some embodiments the CM is a substrate for MMP9. In some embodiments, the CM is a substrate for MMP14.

[000185] In some embodiments, the CM is a substrate that includes the sequence TGRGPSWV (SEQ ID NO: 338); SARGPSRW (SEQ ID NO: 339); TARGPSFK (SEQ ID NO: 340); LSGRSDNH (SEQ ID NO: 341); GGWHTGRN (SEQ ID NO: 342);

HTGRSGAL (SEQ ID NO: 343); PLTGRSGG (SEQ ID NO: 344); AARGPAIH (SEQ ID NO: 345); RGPAFNPM (SEQ ID NO: 346); SSRGPAYL (SEQ ID NO: 347); RGPATPIM (SEQ ID NO: 348); RGPA (SEQ ID NO: 349); GGQPSGMWGW (SEQ ID NO: 350); FPRPLGITGL (SEQ ID NO: 351); VHMPLGFLGP (SEQ ID NO: 352); SPLTGRSG (SEQ ID NO: 353); SAGFSLPA (SEQ ID NO: 354); LAPLGLQRR (SEQ ID NO: 355); SGGPLGVR (SEQ ID NO: 356); PLGL (SEQ ID NO: 357); LSGRSGNH (SEQ ID NO: 883); SGRSANPRG (SEQ ID NO: 884); LSGRSDDH (SEQ ID NO: 885); LSGRSDIH (SEQ ID NO: 886); LSGRSDQH (SEQ ID NO: 887); LSGRSDTH (SEQ ID NO: 888); LSGRSDYH (SEQ ID NO: 889); LSGRSDNP (SEQ ID NO: 890); LSGRSANP (SEQ ID NO: 891); LSGRSANI (SEQ ID NO: 892); and/or LSGRSDNI (SEQ ID NO: 893).

[000186] In some embodiments, the CM comprises the amino acid sequence LSGRSDNH (SEQ ID NO: 341). In some embodiments, the CM comprises the amino acid sequence TGRGPSWV (SEQ ID NO: 338). In some embodiments, the CM comprises the amino acid sequence PLTGRSGG (SEQ ID NO: 344). In some embodiments, the CM comprises the amino acid sequence GGQPSGMWGW (SEQ ID NO: 350). In some embodiments, the CM comprises the amino acid sequence FPRPLGITGL (SEQ ID NO: 351). In some embodiments, the CM comprises the amino acid sequence VHMPLGFLGP (SEQ ID NO: 352). In some embodiments, the CM comprises the amino acid sequence PLGL (SEQ ID NO: 357). In some embodiments, the CM comprises the amino acid sequence SARGPSRW (SEQ ID NO: 339). In some embodiments, the CM comprises the amino acid sequence TARGPSFK (SEQ ID NO: 340). In some embodiments, the CM comprises the amino acid sequence GGWHTGRN (SEQ ID NO: 342). In some embodiments, the CM comprises the amino acid sequence HTGRSGAL (SEQ ID NO: 343). In some embodiments, the CM comprises the amino acid sequence AARGPAIH (SEQ ID NO: 345). In some embodiments, the CM comprises the amino acid sequence RGPAFNPM (SEQ ID NO: 346). In some embodiments, the CM comprises the amino acid sequence SSRGPAYL (SEQ ID NO: 347). In some embodiments, the CM comprises the amino acid sequence RGPATPIM (SEQ ID NO: 348). In some embodiments, the CM comprises the amino acid sequence RGPA (SEQ ID NO: 349). In some embodiments, the CM comprises the amino acid sequence LSGRSGNH (SEQ ID NO: 883). In some embodiments, the CM comprises the amino acid sequence SGRSANPRG (SEQ ID NO: 884). In some embodiments, the CM comprises the amino acid sequence LSGRSDDH (SEQ ID NO: 885).

In some embodiments, the CM comprises the amino acid sequence LSGRSDIH (SEQ ID NO: 886). In some embodiments, the CM comprises the amino acid sequence LSGRSDQH (SEQ ID NO: 887). In some embodiments, the CM comprises the amino acid sequence LSGRSDTH (SEQ ID NO: 888). In some embodiments, the CM comprises the amino acid sequence LSGRSDYH (SEQ ID NO: 889). In some embodiments, the CM comprises the amino acid sequence LSGRSDNP (SEQ ID NO: 890). In some embodiments, the CM comprises the amino acid sequence LSGRSANP (SEQ ID NO: 891). In some embodiments, the CM comprises the amino acid sequence LSGRSANI (SEQ ID NO: 892). In some embodiments, the CM comprises the amino acid sequence LSGRSDNI (SEQ ID NO: 893)

[000187] In some embodiments, the CM is a substrate for an MMP and includes the sequence ISSGLSS (SEQ ID NO: 358); QNQALRMA (SEQ ID NO: 359); AQNLLGMV (SEQ ID NO: 360); STFPFGMF (SEQ ID NO: 361); PVGYTSSL (SEQ ID NO: 362); DWLYWPGI (SEQ ID NO: 363), ISSGLLSS (SEQ ID NO: 364), LKAAPRWA (SEQ ID NO: 365); GPSHLVLT (SEQ ID NO: 366); LPGGLSPW (SEQ ID NO: 367); MGLFSEAG (SEQ ID NO: 368); SPLPLRVP (SEQ ID NO: 369); RMHLRSLG (SEQ ID NO: 370); LAAPLGLL (SEQ ID NO: 371); AVGLLAPP (SEQ ID NO: 372); LLAPSHRA (SEQ ID NO: 373); PAGLWLDP (SEQ ID NO: 374); MIAPVAYR (SEQ ID NO: 894); RPSPMWAY (SEQ ID NO: 895); WATPRPMR (SEQ ID NO: 896); FRLLDWQW (SEQ ID NO: 897); ISSGL (SEQ ID NO: 898); ISSGLLS (SEQ ID NO: 899); and/or ISSGLL (SEQ ID NO: 900).

[000188] In some embodiments, the CM comprises the amino acid sequence ISSGLSS (SEQ ID NO: 358). In some embodiments, the CM comprises the amino acid sequence QNQALRMA (SEQ ID NO: 359). In some embodiments, the CM comprises the amino acid sequence AQNLLGMV (SEQ ID NO: 360). In some embodiments, the CM comprises the amino acid sequence STFPFGMF (SEQ ID NO: 361). In some embodiments, the CM comprises the amino acid sequence PVGYTSSL (SEQ ID NO: 362). In some embodiments, the CM comprises the amino acid sequence DWLYWPGI (SEQ ID NO: 363). In some embodiments, the CM comprises the amino acid sequence ISSGLLSS (SEQ ID NO: 364). In some embodiments, the CM comprises the amino acid sequence LKAAPRWA (SEQ ID NO: 365). In some embodiments, the CM comprises the amino acid sequence GPSHLVLT (SEQ ID NO: 366). In some embodiments, the CM comprises the amino acid sequence LPGGLSPW (SEQ ID NO: 367). In some embodiments, the CM comprises the amino acid sequence MGLFSEAG (SEQ ID NO: 368). In some embodiments, the CM comprises the

amino acid sequence SPLPLRVP (SEQ ID NO: 369). In some embodiments, the CM comprises the amino acid sequence RMHLRSLG (SEQ ID NO: 370). In some embodiments, the CM comprises the amino acid sequence LAAPLGLL (SEQ ID NO: 371). In some embodiments, the CM comprises the amino acid sequence AVGLLAPP (SEQ ID NO: 372). In some embodiments, the CM comprises the amino acid sequence LLAPSHRA (SEQ ID NO: 373). In some embodiments, the CM comprises the amino acid sequence PAGLWLDP (SEQ ID NO: 374). In some embodiments, the CM comprises the amino acid sequence MIAPVAYR (SEQ ID NO: 894). In some embodiments, the CM comprises the amino acid sequence RPSPMWAY (SEQ ID NO: 895). In some embodiments, the CM comprises the amino acid sequence WATPRPMR (SEQ ID NO: 896). In some embodiments, the CM comprises the amino acid sequence FRLLDWQW (SEQ ID NO: 897). In some embodiments, the CM comprises the amino acid sequence ISSGL (SEQ ID NO: 898). In some embodiments, the CM comprises the amino acid sequence ISSGLLS (SEQ ID NO: 899). In some embodiments, the CM comprises the amino acid sequence ISSGLL (SEQ ID NO: 900).

[000189] In some embodiments, the CM is a substrate for thrombin. In some embodiments, the CM is a substrate for thrombin and includes the sequence GPRSFGL (SEQ ID NO: 375) or GPRSFG (SEQ ID NO: 376). In some embodiments, the CM comprises the amino acid sequence GPRSFGL (SEQ ID NO: 375). In some embodiments, the CM comprises the amino acid sequence GPRSFG (SEQ ID NO: 376).

[000190] In some embodiments, the CM comprises an amino acid sequence selected from the group consisting of NTLSGRSENHSG (SEQ ID NO: 435); NTLSGRSGNHGS (SEQ ID NO: 436); TSTSGRSANPRG (SEQ ID NO: 437); TSGRSANP (SEQ ID NO: 438); VAGRSMRP (SEQ ID NO: 439); VVPEGRRS (SEQ ID NO: 440); ILPRSPAF (SEQ ID NO: 441); MVLGRSLL (SEQ ID NO: 442); QGRAITFI (SEQ ID NO: 443); SPRSIMLA (SEQ ID NO: 444); and SMLRSMPL (SEQ ID NO: 445).

[000191] In some embodiments, the CM comprises the amino acid sequence NTLSGRSENHSG (SEQ ID NO: 435). In some embodiments, the CM comprises the amino acid sequence NTLSGRSGNHGS (SEQ ID NO: 436). In some embodiments, the CM comprises the amino acid sequence TSTSGRSANPRG (SEQ ID NO: 437). In some embodiments, the CM comprises the amino acid sequence TSGRSANP (SEQ ID NO: 438). In some embodiments, the CM comprises the amino acid sequence VAGRSMRP (SEQ ID NO: 439). In some embodiments, the CM comprises the amino acid sequence VVPEGRRS

(SEQ ID NO: 440). In some embodiments, the CM comprises the amino acid sequence ILPRSPAF (SEQ ID NO: 441). In some embodiments, the CM comprises the amino acid sequence MVLGRSLL (SEQ ID NO: 442). In some embodiments, the CM comprises the amino acid sequence QGRAITFI (SEQ ID NO: 443). In some embodiments, the CM comprises the amino acid sequence SPRSIMLA (SEQ ID NO: 444). In some embodiments, the CM comprises the amino acid sequence SMLRSMPL (SEQ ID NO: 445).

[000192] In some embodiments, the CM is a substrate for a neutrophil elastase. In some embodiments, the CM is a substrate for a serine protease. In some embodiments, the CM is a substrate for uPA. In some embodiments, the CM is a substrate for legumain. In some embodiments, the CM is a substrate for matriptase. In some embodiments, the CM is a substrate for a cysteine protease. In some embodiments, the CM is a substrate for a cysteine protease, such as a cathepsin.

[000193] In some embodiments, the CM is a CM1-CM2 substrate and includes the sequence ISSGLLSGRSDNH (SEQ ID NO: 377); ISSGLLSSGGSGGSLSGRSDNH (SEQ ID NO: 378); AVGLLAPPGGTSTSGRSANPRG (SEQ ID NO: 379); TSTSGRSANPRGGGAVGLLAPP (SEQ ID NO: 380); VHMPLGFLGPGGTSTSGRSANPRG (SEQ ID NO: 381); TSTSGRSANPRGGGVHMPLGFLGP (SEQ ID NO: 382); AVGLLAPPGGLSGRSDNH (SEQ ID NO: 383); LSGRSDNHGGAVGLLAPP (SEQ ID NO: 384); VHMPLGFLGPGGLSGRSDNH (SEQ ID NO: 385); LSGRSDNHGGVHMPLGFLGP (SEQ ID NO: 386); LSGRSDNHGGSGGSISSGLLSS (SEQ ID NO: 387); LSGRSGNHGGSGGSISSGLLSS (SEQ ID NO: 388); ISSGLLSSGGSGGSLSGRSGNH (SEQ ID NO: 389); LSGRSDNHGGSGGSQNQALRMA (SEQ ID NO: 390); QNQALRMAGGSGGSLSGRSDNH (SEQ ID NO: 391); LSGRSGNHGGSGGSQNQALRMA (SEQ ID NO: 392); QNQALRMAGGSGGSLSGRSGNH (SEQ ID NO: 393); ISSGLLSGRSGNH (SEQ ID NO: 394); ISSGLLSGRSANPRG (SEQ ID NO: 901); AVGLLAPPTSGRSANPRG (SEQ ID NO: 902); AVGLLAPPSGRSANPRG (SEQ ID NO: 903); ISSGLLSGRSDDH (SEQ ID NO: 904); ISSGLLSGRSDIH (SEQ ID NO: 905); ISSGLLSGRSDQH (SEQ ID NO: 906); ISSGLLSGRSDTH (SEQ ID NO: 907); ISSGLLSGRSDYH (SEQ ID NO: 908); ISSGLLSGRSDNP (SEQ ID NO: 909); ISSGLLSGRSANP (SEQ ID NO: 910); ISSGLLSGRSANI (SEQ ID NO: 911); AVGLLAPPGGLSGRSDDH (SEQ ID NO: 912); AVGLLAPPGGLSGRSDIH (SEQ ID NO: 913); AVGLLAPPGGLSGRSDQH (SEQ ID

NO: 914); AVGLLAPPGGLSGRSDTH (SEQ ID NO: 915); AVGLLAPPGGLSGRSDYH (SEQ ID NO: 916); AVGLLAPPGGLSGRSDNP (SEQ ID NO: 917); AVGLLAPPGGLSGRSANP (SEQ ID NO: 918); AVGLLAPPGGLSGRSANI (SEQ ID NO: 919); ISSGLLSGRSDNI (SEQ ID NO: 920); AVGLLAPPGGLSGRSDNI (SEQ ID NO: 921); GLSGRSDNHGGAVGLLAPP (SEQ ID NO: 1009); and/or GLSGRSDNHGGVHMPLGFLGP (SEQ ID NO: 1010).

[000194] In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDNH (SEQ ID NO: 377), which is also referred to herein as substrate 2001. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSSGGSGGSLSGRSDNH (SEQ ID NO: 378), which is also referred to herein as substrate 1001/LP′/0001, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGTSTSGRSANPRG (SEQ ID NO: 379), which is also referred to herein as substrate 2015 and/or substrate 1004/LP′/0003, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence TSTSGRSANPRGGGAVGLLAPP (SEQ ID NO: 380), which is also referred to herein as substrate 0003/LP′/1004, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence VHMPLGFLGPGGTSTSGRSANPRG (SEQ ID NO: 381), which is also referred to herein as substrate 1003/LP′/0003, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence TSTSGRSANPRGGGVHMPLGFLGP (SEQ ID NO: 382), which is also referred to herein as substrate 0003/LP′/1003, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDNH (SEQ ID NO: 383), which is also referred to herein as substrate 3001 and/or substrate 1004/LP′/0001, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence LSGRSDNHGGAVGLLAPP (SEQ ID NO: 384), which is also referred to herein as substrate 0001/LP′/1004, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence VHMPLGFLGPGGLSGRSDNH (SEQ ID NO: 385), which is also referred to herein as substrate 1003/LP′/0001, wherein LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2

substrate includes the sequence LSGRSDNHGGVHMPLGFLGP (SEQ ID NO: 386), which is also referred to herein as substrate 0001/LP′/1003, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence LSGRSDNHGGSGGSISSGLLSS (SEQ ID NO: 387), which is also referred to herein as substrate 0001/LP′/1001, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence LSGRSGNHGGSGGSISSGLLSS (SEQ ID NO: 388), which is also referred to herein as substrate 0002/LP′/1001, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSSGGSGGSLSGRSGNH (SEQ ID NO: 389), which is also referred to herein as substrate 1001/LP′/0002, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence LSGRSDNHGGSGGSQNQALRMA (SEQ ID NO: 390), which is also referred to herein as substrate 0001/LP′/1002, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence QNQALRMAGGSGGSLSGRSDNH (SEQ ID NO: 391), which is also referred to herein as substrate 1002/LP′/0001, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence LSGRSGNHGGSGGSQNQALRMA (SEQ ID NO: 392), which is also referred to herein as substrate 0002/LP′/1002, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence QNQALRMAGGSGGSLSGRSGNH (SEQ ID NO: 393), which is also referred to herein as substrate 1002/LP′/0002, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GGSGGS (SEQ ID NO: 922). In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSGNH (SEQ ID NO: 394), which is also referred to herein as substrate 2002. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSANPRG (SEQ ID NO: 901), which is also referred to herein as substrate 2003. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPTSGRSANPRG (SEQ ID NO: 902), which is also referred to herein as substrate 2004. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPSGRSANPRG (SEQ ID NO: 903), which is also

referred to herein as substrate 2005. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDDH (SEQ ID NO: 904), which is also referred to herein as substrate 2006. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDIH (SEQ ID NO: 905), which is also referred to herein as substrate 2007. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDQH (SEQ ID NO: 906), which is also referred to herein as substrate 2008. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDTH (SEQ ID NO: 907), which is also referred to herein as substrate 2009. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDYH (SEQ ID NO: 908), which is also referred to herein as substrate 2010. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDNP (SEQ ID NO: 909), which is also referred to herein as substrate 2011. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSANP (SEQ ID NO: 910), which is also referred to herein as substrate 2012. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSANI (SEQ ID NO: 911), which is also referred to herein as substrate 2013. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDDH (SEQ ID NO: 912), which is also referred to herein as substrate 3006. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDIH (SEQ ID NO: 913), which is also referred to herein as substrate 3007. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDQH (SEQ ID NO: 914), which is also referred to herein as substrate 3008. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDTH (SEQ ID NO: 915), which is also referred to herein as substrate 3009. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDYH (SEQ ID NO: 916), which is also referred to herein as substrate 3010. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDNP (SEQ ID NO: 917), which is also referred to herein as substrate 3011. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSANP (SEQ ID NO: 918), which is also referred to herein as substrate 3012. In some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSANI (SEQ ID NO: 919), which is also referred to herein as substrate 3013. In some embodiments, the CM1-CM2 substrate includes the sequence ISSGLLSGRSDNI (SEQ ID NO: 920), which is also referred to herein as substrate 2014. In

some embodiments, the CM1-CM2 substrate includes the sequence AVGLLAPPGGLSGRSDNI (SEQ ID NO: 921), which is also referred to herein as substrate 3014. In some embodiments, the CM1-CM2 substrate includes the sequence GLSGRSDNHGGAVGLLAPP (SEQ ID NO: 1009), which is also referred to herein as substrate 0001/LP′/1004, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG. In some embodiments, the CM1-CM2 substrate includes the sequence GLSGRSDNHGGVHMPLGFLGP (SEQ ID NO: 1010), which is also referred to herein as substrate 0001/LP′/1003, where LP′ as used in this CM1-CM2 substrate is the amino acid sequence GG.

[000195] In some embodiments, the CM is a substrate for at least two proteases. In some embodiments, each protease is selected from the group consisting of those shown in Table 12. In some embodiments, the CM is a substrate for at least two proteases, wherein one of the proteases is selected from the group consisting of a MMP, a thrombin, a neutrophil elastase, a cysteine protease, a uPA, a legumain and a matriptase and other serine proteases and the other protease is selected from the group consisting of those shown in Table 12. In some embodiments, the CM is a substrate for at least two proteases selected from the group consisting of a MMP, a thrombin, a neutrophil elastase, a cysteine protease, a uPA, a legumain and a matriptase and other serine proteases.

[000196] In some embodiments, the activatable antibody includes at least a first CM and a second CM. In some embodiments, the first CM and the second CM are each polypeptides of no more than 15 amino acids long. In some embodiments, the first CM and the second CM in the activatable antibody in the uncleaved state have the structural arrangement from N-terminus to C-terminus as follows: MM-CM1-CM2-AB or AB-CM2-CM1-MM. In some embodiments, at least one of the first CM and the second CM is a polypeptide that functions as a substrate for a protease selected from the group consisting of a MMP, a thrombin, a neutrophil elastase, a cysteine protease, a uPA, a legumain, and a matriptase and other serine proteases. In some embodiments, the first CM is cleaved by a first cleaving agent selected from the group consisting of a MMP, a thrombin, a neutrophil elastase, a cysteine protease, a uPA, a legumain, and a matriptase and other serine proteases in a target tissue and the second CM is cleaved by a second cleaving agent in a target tissue. In some embodiments, the other protease is selected from the group consisting of those shown in Table 12. In some embodiments, the first cleaving agent and the second cleaving agent are the same protease selected from the group consisting of a MMP, a thrombin, a

neutrophil elastase, a cysteine protease, a uPA, a legumain, and a matriptase and other serine proteases, and the first CM and the second CM are different substrates for the enzyme. In some embodiments, the first cleaving agent and the second cleaving agent are the same protease selected from the group consisting of those shown in Table 12. In some embodiments, the first cleaving agent and the second cleaving agent are different proteases. In some embodiments, the first cleaving agent and the second cleaving agent are co-localized in the target tissue. In some embodiments, the first CM and the second CM are cleaved by at least one cleaving agent in the target tissue.

[000197] In some embodiments, the activatable antibody is exposed to and cleaved by a protease such that, in the activated or cleaved state, the activated antibody includes a light chain amino acid sequence that includes at least a portion of LP2 and/or CM sequence after the protease has cleaved the CM.

[000198] In some embodiments, the activatable antibody also includes an agent conjugated to the AB. In some embodiments, the agent conjugated to the AB or the AB of an activatable antibody is a therapeutic agent. In some embodiments, the agent is an antineoplastic agent. In some embodiments, the agent is a toxin or fragment thereof. As used herein, a fragment of a toxin is a fragment that retains toxic activity. In some embodiments, the agent is conjugated to the AB via a cleavable linker. In some embodiments, the agent is conjugated to the AB via a linker that includes at least one CM1-CM2 substrate sequence. In some embodiments, the agent is conjugated to the AB via a noncleavable linker. In some embodiments, the agent is conjugated to the AB via a linker that is cleavable in an intracellular or lysosomal environment. In some embodiments, the agent is a microtubule inhibitor. In some embodiments, the agent is a nucleic acid damaging agent, such as a DNA alkylator, a DNA cleaving agent, a DNA cross-linker, or DNA intercalator, or other DNA damaging agent. In some embodiments, the agent is an agent selected from the group listed in Table 11. In some embodiments, the agent is a dolastatin. In some embodiments, the agent is an auristatin or derivative thereof. In some embodiments, the agent is auristatin E or a derivative thereof. In some embodiments, the agent is monomethyl auristatin E (MMAE). In some embodiments, the agent is monomethyl auristatin D (MMAD). In some embodiments, the agent is a maytansinoid or maytansinoid derivative. In some embodiments, the agent is DM1 or DM4. In some embodiments, the agent is a duocarmycin or derivative thereof. In some embodiments, the agent is a

calicheamicin or derivative thereof. In some embodiments, the agent is a pyrrolobenzodiazepine. In some embodiments, the agent is a pyrrolobenzodiazepine dimer.

[000199] In some embodiments, the activatable antibody is conjugated to one or more equivalents of an agent. In some embodiments, the activatable antibody is conjugated to one equivalent of the agent. In some embodiments, the activatable antibody is conjugated to two, three, four, five, six, seven, eight, nine, ten, or greater than ten equivalents of the agent. In some embodiments, the activatable antibody is part of a mixture of activatable antibodies having a homogeneous number of equivalents of conjugated agents. In some embodiments, the activatable antibody is part of a mixture of activatable antibodies having a heterogeneous number of equivalents of conjugated agents. In some embodiments, the mixture of activatable antibodies is such that the average number of agents conjugated to each activatable antibody is between zero to one, between one to two, between two and three, between three and four, between four and five, between five and six, between six and seven, between seven and eight, between eight and nine, between nine and ten, and ten and greater. In some embodiments, the mixture of activatable antibodies is such that the average number of agents conjugated to each activatable antibody is one, two, three, four, five, six, seven, eight, nine, ten, or greater.

[000200] In some embodiments, the activatable antibody comprises one or more site-specific amino acid sequence modifications such that the number of lysine and/or cysteine residues is increased or decreased with respect to the original amino acid sequence of the activatable antibody, thus in some embodiments correspondingly increasing or decreasing the number of agents that can be conjugated to the activatable antibody, or in some embodiments limiting the conjugation of the agents to the activatable antibody in a site-specific manner. In some embodiments, the modified activatable antibody is modified with one or more non-natural amino acids in a site-specific manner, thus in some embodiments limiting the conjugation of the agents to only the sites of the non-natural amino acids.

[000201] In some embodiments, the agent is an anti-inflammatory agent.

[000202] In some embodiments, the activatable antibody also includes a detectable moiety. In some embodiments, the detectable moiety is a diagnostic agent.

[000203] In some embodiments, the activatable antibody also includes a signal peptide. In some embodiments, the signal peptide is conjugated to the activatable antibody via a spacer. In some embodiments, the spacer is conjugated to the activatable antibody in the absence of a signal peptide. In some embodiments, the spacer is joined directly to the

2016233495 14 Aug 2018

MM of the activatable antibody. In some embodiments, the spacer is joined directly to the MM of the activatable antibody in the structural arrangement from N-terminus to C-terminus of spacer-MM-CM-AB. An example of a spacer joined directly to the N-terminus of MM of the activatable antibody is selected from the group consisting of QGQSGS (SEQ ID NO: 923); GQSGS (SEQ ID NO: 1192); QSGS (SEQ ID NO: 1193); SGS (SEQ ID NO: 1194); GS (SEQ ID NO: 1195); S; QGQSGQG (SEQ ID NO: 924); GQSGQG (SEQ ID NO: 395); QSGQG (SEQ ID NO: 925); SGQG (SEQ ID NO: 926); GQG (SEQ ID NO: 927); QG (SEQ ID NO: 928); G; QGQSGQ (SEQ ID NO: 1196); GQSGQ (SEQ ID NO: 1197); QSGQ (SEQ ID NO: 1198); SGQ (SEQ ID NO: 616); GQ (SEQ ID NO: 1199); and Q. In some embodiments, the spacer includes at least the amino acid sequence QGQSGS (SEQ ID NO: 923). In some embodiments, the spacer includes at least the amino acid sequence GQSGS (SEQ ID NO: 1192). In some embodiments, the spacer includes at least the amino acid sequence QSGS (SEQ ID NO: 1193). In some embodiments, the spacer includes at least the amino acid sequence SGS (SEQ ID NO: 1194). In some embodiments, the spacer includes at least the amino acid sequence GS (SEQ ID NO: 1195). In some embodiments, the spacer includes at least the amino acid sequence S. In some embodiments, the spacer includes at least the amino acid sequence QGQSGQG (SEQ ID NO: 924). In some embodiments, the spacer includes at least the amino acid sequence GQSGQG (SEQ ID NO: 395). In some embodiments, the spacer includes at least the amino acid sequence QSGQG (SEQ ID NO: 925). In some embodiments, the spacer includes at least the amino acid sequence SGQG (SEQ ID NO: 926). In some embodiments, the spacer includes at least the amino acid sequence GQG (SEQ ID NO: 927). In some embodiments, the spacer includes at least the amino acid sequence QG (SEQ ID NO: 928). In some embodiments, the spacer includes at least the amino acid sequence G. In some embodiments, the spacer includes at least the amino acid sequence QGQSGQ (SEQ ID NO: 1196). In some embodiments, the spacer includes at least the amino acid sequence GQSGQ (SEQ ID NO: 1197). In some embodiments, the spacer includes at least the amino acid sequence QSGQ (SEQ ID NO: 1198). In some embodiments, the spacer includes at least the amino acid sequence SGQ (SEQ ID NO: 616). In some embodiments, the spacer includes at least the amino acid sequence GQ (SEQ ID NO: 1199). In some embodiments, the spacer includes at least the amino acid sequence Q. In some embodiments, the activatable antibody does not include a spacer sequence.

[000204] In some embodiments, the AB of the activatable antibody naturally contains one or more disulfide bonds. In some embodiments, the AB can be engineered to include one or more disulfide bonds.

[000205] In some embodiments, the serum half-life of the activatable antibody is longer than that of the corresponding antibody; e.g., the pK of the activatable antibody is longer than that of the corresponding antibody. In some embodiments, the serum half-life of the activatable antibody is similar to that of the corresponding antibody. In some embodiments, the serum half-life of the activatable antibody is at least 15 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 12 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 11 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 10 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 9 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 8 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 7 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 6 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 5 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 4 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 3 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 2 days when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 24 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 20 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 18 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 16 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 14 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 12 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least

10 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 8 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 6 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 4 hours when administered to an organism. In some embodiments, the serum half-life of the activatable antibody is at least 3 hours when administered to an organism.

[000206] In some embodiments, the activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is monospecific. In some embodiments, the activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is multispecific, *e.g.*, by way of non-limiting example, bispecific or trifunctional. In some embodiments, the activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is formulated as part of a pro-Bispecific T Cell Engager (BITE) molecule, i.e., the BITE includes a masking moiety and a cleavable moiety. In some embodiments, the activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is formulated as part of a pro-Chimeric Antigen Receptor (CAR) -modified T cell, -modified NK cell, or other -modified immune effector cell. In some embodiments, an activatable anti-PDL1 antibody is formulated as part of another engineered receptor on an immune effector cell; i.e., the pro-CAR or other pro-engineered receptor includes a masking moiety and a cleavable moiety.

[000207] In some embodiments, the activatable antibody or antigen-binding fragment thereof is incorporated in a multispecific activatable antibody or antigen-binding fragment thereof, where at least one arm of the multispecific activatable antibody specifically binds PDL1. In some embodiments, the activatable antibody or antigen-binding fragment thereof is incorporated in a bispecific antibody or antigen-binding fragment thereof, where at least one arm of the bispecific activatable antibody specifically binds PDL1.

[000208] In some embodiments, at least one arm of the multispecific activatable antibody, *e.g.*, a bispecific activatable antibody, comprises a heavy chain amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, at least one arm of the multispecific activatable antibody, *e.g.*, a bispecific activatable antibody, comprises a light chain amino acid sequence comprising SEQ ID NO: 12 or SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, *e.g.*, a bispecific activatable antibody, comprises a light chain amino acid sequence

comprising SEQ ID NO: 12. In some embodiments, at least one arm of the multispecific activatable antibody, *e.g.*, a bispecific activatable antibody, comprises a light chain amino acid sequence comprising SEQ ID NO: 58.

[000209] In some embodiments, at least one arm of the multispecific activatable antibody, *e.g.*, a bispecific activatable antibody, a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 58.

[000210] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid sequence comprising SEQ ID NO: 12.

[000211] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to an amino acid sequence selected from the group consisting of SEQ ID NO: 46, 48, 50, 52, 54, and 56,

and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[000212] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises the heavy chain amino acid sequence of SEQ ID NO: 46 and the light chain amino acid sequence of SEQ ID NO: 12.

[000213] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid of SEQ ID NO: 46. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 58. In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a heavy chain amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence selected of SEQ ID NO: 46, and a light chain amino acid that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence of SEQ ID NO: 12.

[000214] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH

CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 16; a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence shown in Table 16.

[000215] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR1 sequence shown in Table 16; a VH CD2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR2 sequence shown in Table 16; a VH CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VH CDR3 sequence shown in Table 16; a VL CDR1 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR1 sequence shown in Table 16; a VL CDR2 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR2 sequence shown in Table 16; and a VL CDR3 sequence that includes a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to a VL CDR3 sequence shown in Table 16.

[000216] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[000217] In some embodiments, the antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein the combination is a combination of the three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[000218] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 16.

[000219] In some embodiments, the antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein each CDR sequence in the combination comprises a sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the corresponding CDR sequence in a combination of three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 16.

[000220] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein at least one CDR sequence is selected from the group consisting of a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000221] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246). In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a

combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235). In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the VH CDR2 sequence comprises SSIWRNGIVTVYADS (SEQ ID NO: 246), and the VH CDR3 sequence comprises WSAAFDY (SEQ ID NO: 235).

[000222] In some embodiments, at least one arm of the multispecific activatable antibody, e.g., a bispecific activatable antibody, comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination comprises a VL CDR1 sequence comprising RASQSISSYLN (SEQ ID NO: 209); a VL CDR2 sequence comprising AASSLQS (SEQ ID NO: 215); a VL CDR3 sequence comprising DNGYPST (SEQ ID NO: 228); a VH CDR1 sequence comprising SYAMS (SEQ ID NO: 212); a VH CDR2 sequence comprising SSIWRNGIVTVYADS (SEQ ID NO: 246); and a VH CDR3 sequence comprising WSAAFDY (SEQ ID NO: 235).

[000223] In some embodiments, the anti-PDL1 antibodies, conjugated anti-PDL1 antibodies, activatable anti-PDL1 antibodies and/or conjugated activatable anti-PDL1 antibodies described herein are used as sole active agents. In some embodiments, the anti-PDL1 antibodies, conjugated anti-PDL1 antibodies, activatable anti-PDL1 antibodies and/or conjugated activatable anti-PDL1 antibodies described herein are used in conjunction with one or more additional agents or a combination of additional agents. Suitable additional agents include current pharmaceutical and/or surgical therapies for an intended application, such as, for example, cancer. For example, the anti-PDL1 antibodies, conjugated anti-PDL1 antibodies, activatable anti-PDL1 antibodies and/or conjugated activatable anti-PDL1 antibodies can be used in conjunction with an additional chemotherapeutic or anti-neoplastic agent.

[000224] In some embodiments, the additional agent(s) is a chemotherapeutic agent, such as a chemotherapeutic agent selected from the group consisting of docetaxel, paclitaxel, abraxane (i.e., albumin-conjugated paclitaxel), doxorubicin, oxaliplatin, carboplatin, cisplatin, irinotecan, and gemcitabine.

[000225] In some embodiments, the additional agent(s) is a checkpoint inhibitor, a kinase inhibitor, an agent targeting inhibitors in the tumor microenvironment, and/or a T cell or NK agonist. In some embodiments, the additional agent(s) is radiation therapy, alone or in combination with another additional agent(s) such as a chemotherapeutic or anti-neoplastic agent. In some embodiments, the additional agent(s) is a vaccine, an oncovirus, and/or a DC-activating agent such as, by way of non-limiting example, a toll-like receptor (TLR) agonist and/or α-CD40. In some embodiments, the additional agent(s) is a tumor-targeted antibody designed to kill the tumor via ADCC or via direct conjugation to a toxin (e.g., an antibody drug conjugate (ADC).

[000226] In some embodiments, the checkpoint inhibitor is an inhibitor of a target selected from the group consisting of CTLA-4, LAG-3, PD1 (also referred to as PD-1), PDL1, TIGIT, TIM-3, B7H4, and Vista. In some embodiments, the kinase inhibitor is selected from the group consisting of B-RAFi, MEKi, and Btk inhibitors, such as ibrutinib. In some embodiments, the kinase inhibitor is crizotinib. In some embodiments, the tumor microenvironment inhibitor is selected from the group consisting of an IDO inhibitor, an α-CSF1R inhibitor, an α-CCR4 inhibitor, a TGF-beta, a myeloid-derived suppressor cell, or a T-regulatory cell. In some embodiments, the agonist is selected from the group consisting of Ox40, GITR, CD137, ICOS, CD27, and HVEM.

[000227] In some embodiments, the inhibitor is a CTLA-4 inhibitor. In some embodiments, the inhibitor is a LAG-3 inhibitor. In some embodiments, the inhibitor is a PD1 inhibitor. In some embodiments, the inhibitor is a PDL1 inhibitor. In some embodiments, the inhibitor is a TIGIT inhibitor. In some embodiments, the inhibitor is a TIM-3 inhibitor. In some embodiments, the inhibitor is a B7H4 inhibitor. In some embodiments, the inhibitor is a Vista inhibitor. In some embodiments, the inhibitor is a B-RAFi inhibitor. In some embodiments, the B-RAFi inhibitor is vemurafenib. In some embodiments, the inhibitor is a MEKi inhibitor. In some embodiments, the inhibitor is a Btk inhibitor. In some embodiments, the inhibitor is ibrutinib. In some embodiments, the inhibitor is crizotinib. In some embodiments, the inhibitor is an IDO inhibitor. In some embodiments, the inhibitor is an α-CSF1R inhibitor. In some embodiments, the inhibitor is an α-CCR4 inhibitor. In some embodiments, the inhibitor is a TGF-beta. In some embodiments, the inhibitor is a myeloid-derived suppressor cell. In some embodiments, the inhibitor is a T-regulatory cell.

[000228] In some embodiments, the agonist is Ox40. In some embodiments, the agonist is GITR. In some embodiments, the agonist is CD137. In some embodiments, the agonist is ICOS. In some embodiments, the agonist is CD27. In some embodiments, the agonist is HVEM.

[000229] In some embodiments, the anti-PDL1 antibody, conjugated antibody, activatable antibody and/or conjugated activatable antibody is administered before and/or during and/or after treatment in combination with one or more additional agents such as, for example, a chemotherapeutic agent, an anti-inflammatory agent, and/or an immunosuppressive agent. In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent are formulated into a single therapeutic composition, and the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and additional agent are administered simultaneously. Alternatively, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and additional agent are separate from each other, *e.g.*, each is formulated into a separate therapeutic composition, and the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent are administered simultaneously, or the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent are administered at different times during a treatment regimen. For example, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is administered prior to the administration of the additional agent, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is administered subsequent to the administration of the additional agent, or the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent are administered in an alternating fashion. As described herein, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and additional agent are administered in single doses or in multiple doses.

[000230] In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) are administered simultaneously. For example, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) can be formulated in a single composition or administered as two or more separate compositions. In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) are administered sequentially, or the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent are administered at different times during a treatment regimen.

[000231] In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is administered before and/or during and/or after treatment in combination with one or more additional agents such as, by way of non-limiting example, a chemotherapeutic agent, an anti-inflammatory agent, and/or an immunosuppressive agent, such as an alkylating agent, an anti-metabolite, an anti-microtubule agent, a topoisomerase inhibitor, a cytotoxic antibiotic, and/or any other nucleic acid damaging agent. In some embodiments, the additional agent is a taxane, such as paclitaxel (e.g., Abraxane®). In some embodiments, the additional agent is an anti-metabolite, such as gemcitabine. In some embodiments, the additional agent is an alkylating agent, such as platinum-based chemotherapy, such as carboplatin or cisplatin. In some embodiments, the additional agent is a targeted agent, such as a kinase inhibitor, e.g., sorafenib or erlotinib. In some embodiments, the additional agent is a targeted agent, such as another antibody, e.g., a monoclonal antibody (e.g., bevacizumab), a bispecific antibody, or a multispecific antibody. In some embodiments, the additional agent is a proteosome inhibitor, such as bortezomib or carfilzomib. In some embodiments, the additional agent is an immune modulating agent, such as lenolidominde or IL-2. In some embodiments, the additional agent is radiation. In some embodiments, the additional agent is an agent considered standard of care by those skilled in the art. In some embodiments, the additional agent is a chemotherapeutic agent well known to those skilled in the art.

[000232] In some embodiments, the additional agent is another antibody or antigen-binding fragment thereof, another conjugated antibody or antigen-binding fragment thereof,

another activatable antibody or antigen-binding fragment thereof and/or another conjugated activatable antibody or antigen-binding fragment thereof. In some embodiments the additional agent is another antibody or antigen-binding fragment thereof, another conjugated antibody or antigen-binding fragment thereof, another activatable antibody or antigen-binding fragment thereof and/or another conjugated activatable antibody or antigen-binding fragment thereof against the same target as the first antibody or antigen-binding fragment thereof, the first conjugated antibody or antigen-binding fragment thereof, activatable antibody or antigen-binding fragment thereof and/or a conjugated activatable antibody or antigen-binding fragment thereof, e.g., against PDL1. In some embodiments the additional agent is another antibody or antigen-binding fragment thereof, another conjugated antibody or antigen-binding fragment thereof, another activatable antibody or antigen-binding fragment thereof and/or another conjugated activatable antibody or antigen-binding fragment thereof against a target different than the target of the first antibody or antigen-binding fragment thereof, the first conjugated antibody or antigen-binding fragment thereof, activatable antibody or antigen-binding fragment thereof and/or a conjugated activatable antibody or antigen-binding fragment thereof (i.e., target other than PDL1). In some embodiments, the additional agent is a chimeric antigen receptor-modified T cell, -modified NK cell or other -modified immune effector cell or is another engineered receptor-modified immune effector cell. In some embodiments, the additional agent is a pro-chimeric antigen receptor-modified T cell, -modified NK cell, or other -modified immune effector cell or is another pro-engineered receptor-modified immune effector cell.

[000233] As a non-limiting example, the antibody or antigen-binding fragment and/or the AB of an activatable antibody is a binding partner for any target listed in Table 22. In some embodiments that additional agent is ipilimumab, a CTLA4-binding fragment of ipilimumab, and/or an ipilimumab activatable antibody.

Table 22: Exemplary Targets

1-92-LFA-3	CD52	DL44	HVEM	LIF-R	STEAP1
Alpha-4 integrin	CD56	DLK1	Hyaluronidase	Lewis X	STEAP2
Alpha-V integrin	CD64	DLL4	ICOS	LIGHT	TAG-72
alpha4beta1 integrin	CD70	DPP-4	IFNalpha	LRP4	TAPA1
alpha4beta7 integrin	CD71	DSG1	IFNbeta	LRRC26	TGFbeta

AGR2	CD74	EGFR	IFNgamma	MCSP	TIGIT
Anti-Lewis-Y		EGFRviii	IgE	Mesothelin	TIM-3
Apelin J receptor	CD80	Endothelin B receptor (ETBR)	IgE Receptor (FceRI)	MRP4	TLR2
APRIL	CD81	ENPP3	IGF	MUC1	TLR4
B7-H4	CD86	EpCAM	IGF1R	Mucin-16 (MUC16, CA-125)	TLR6
BAFF	CD95	EPHA2	IL1B	Na/K ATPase	TLR7
BTLA	CD117	EPHB2	IL1R	Neutrophil elastase	TLR8
C5 complement	CD125	ERBB3	IL2	NGF	TLR9
C-242	CD132 (IL-2RG)	F protein of RSV	IL11	Nicastrin	TMEM31
CA9	CD133	FAP	IL12	Notch Receptors	TNFalpha
CA19-9 (Lewis a)	CD137	FGF-2	IL12p40	Notch 1	TNFR
Carbonic anhydrase 9	CD138	FGF8	IL-12R, IL-12Rbeta1	Notch 2	TNFRS12 A
CD2	CD166	FGFR1	IL13	Notch 3	TRAIL-R1
CD3	CD172A	FGFR2	IL13R	Notch 4	TRAIL-R2
CD6	CD248	FGFR3	IL15	NOV	Transferrin
CD9	CDH6	FGFR4	IL17	OSM-R	Transferrin receptor
CD11a	CEACAM5 (CEA)	Folate receptor	IL18	OX-40	TRK-A
CD19	CEACAM6 (NCA-90)	GAL3ST1	IL21	PAR2	TRK-B
CD20	CLAUDIN-3	G-CSF	IL23	PDGF-AA	uPAR
CD22	CLAUDIN-4	G-CSFR	IL23R	PDGF-BB	VAP1
CD24	cMet	GD2	IL27/IL27R (wsx1)	PDGFRalpha	VCAM-1
CD25	Collagen	GITR	IL29	PDGFRbeta	VEGF
CD27	Cripto	GLUT1	IL-31R	PD-1	VEGF-A
CD28	CSFR	GLUT4	IL31/IL31R	PD-L1	VEGF-B
CD30	CSFR-1	GM-CSF	IL2R	PD-L2	VEGF-C
CD33	CTLA-4	GM-CSFR	IL4	Phosphatidyl-serine	VEGF-D
CD38	CTGF	GP IIb/IIIa receptors	IL4R	P1GF	VEGFR1
CD40	CXCL10	Gp130	IL6, IL6R	PSCA	VEGFR2
CD40L	CXCL13	GPIIB/IIIA	Insulin Receptor	PSMA	VEGFR3
CD41	CXCR1	GPNMB	Jagged Ligands	RAAG12	VISTA

CD44	CXCR2	GRP78	Jagged 1	RAGE	WISP-1
CD44v6		HER2/neu	Jagged 2	SLC44A4	WISP-2
CD47	CXCR4	HGF	LAG-3	Sphingosine 1 Phosphate	WISP-3
CD51	CYR61	hGH			

[000234] As a non-limiting example, the antibody or antigen-binding fragment and/or the AB of an activatable antibody is or is derived from an antibody listed in Table 23.

Table 23: Exemplary sources for Abs

Antibody Trade Name (antibody name)	Target
Avastin™ (bevacizumab)	VEGF
Lucentis™ (ranibizumab)	VEGF
Erbitux™ (cetuximab)	EGFR
Vectibix™ (panitumumab)	EGFR
Remicade™ (infliximab)	TNFα
Humira™ (adalimumab)	TNFα
Tysabri™ (natalizumab)	Integrinα4
Simulect™ (basiliximab)	IL2R
Soliris™ (eculizumab)	Complement C5
Raptiva™ (efalizumab)	CD11a
Bexxar™ (tositumomab)	CD20
Zevalin™ (ibritumomab tiuxetan)	CD20
Rituxan™ (rituximab)	CD20
(Ocrelizumab)	CD20
Arzerra™ (ofatumumab)	CD20
Gazyva™ (Obinutuzumab)	CD20
Zenapax™ (daclizumab)	CD25
Adcetris™ (brentuximab vedotin)	CD30
Myelotarg™ (gemtuzumab)	CD33
Mylotarg™ (gemtuzumab ozogamicin)	CD33
Campath™ (alemtuzumab)	CD52
ReoPro™ (abiciximab)	Glycoprotein receptor IIb/IIIa
Xolair™ (omalizumab)	IgE
Herceptin™ (trastuzumab)	Her2
Kadcyla™ (trastuzumab emtansine)	Her2
Synagis™ (palivizumab)	F protein of RSV
(ipilimumab)	CTLA-4
(tremelimumab)	CTLA-4
Hu5c8	CD40L
(pertuzumab)	Her2-neu
(ertumaxomab)	CD3/Her2-neu
Orencia™ (abatacept)	CTLA-4
(tanezumab)	NGF
(bavituximab)	Phosphatidylserine
(zalutumumab)	EGFR
(mapatumumab)	EGFR

(matuzumab)	EGFR
(nimotuzumab)	EGFR
ICR62	EGFR
mAb 528	EGFR
CH806	EGFR
MDX-447	EGFR/CD64
(edrecolomab)	EpCAM
RAV12	RAAG12
huJ591	PSMA
Enbrel™ (etanercept)	TNF-R
Amevive™ (alefacept)	1-92-LFA-3
Antril™, Kineret™ (ankinra)	IL-1Ra
GC1008	TGFbeta
	Notch, e.g., Notch 1
	Jagged 1 or Jagged 2
(adecatumumab)	EpCAM
(figitumumab)	IGF1R
(tocilizumab)	IL-6 receptor
Stelara™ (ustekinumab)	IL-12/IL-23
Prolia™ (denosumab)	RANKL

[000235] In some embodiments, the additional antibody or antigen binding fragment thereof, conjugated antibody or antigen binding fragment thereof, activatable antibody or antigen binding fragment thereof, and/or conjugated activatable antibody or antigen binding fragment thereof is a monoclonal antibody, domain antibody, single chain, Fab fragment, a $F(ab')_2$ fragment, a scFv, a scAb, a dAb, a single domain heavy chain antibody, or a single domain light chain antibody. In some embodiments, the additional antibody or antigen binding fragment thereof, conjugated antibody or antigen binding fragment thereof, activatable antibody or antigen binding fragment thereof, and/or conjugated activatable antibody or antigen binding fragment thereof is a mouse, other rodent, chimeric, humanized or fully human monoclonal antibody.

[000236] The disclosure also provides methods of producing an anti-PDL1 antibody and/or activatable anti-PDL1 antibody polypeptide by culturing a cell under conditions that lead to expression of the polypeptide, wherein the cell comprises an isolated nucleic acid molecule encoding an antibody and/or an activatable antibody described herein, and/or vectors that include these isolated nucleic acid sequences. The disclosure provides methods of producing an antibody and/or activatable antibody by culturing a cell under conditions that lead to expression of the antibody and/or activatable antibody, wherein the cell comprises an isolated nucleic acid molecule encoding an antibody and/or an activatable antibody described herein, and/or vectors that include these isolated nucleic acid sequences.

[000237] The invention also provides a method of manufacturing activatable antibodies that in an activated state binds PDL1 by (a) culturing a cell comprising a nucleic acid construct that encodes the activatable antibody under conditions that lead to expression of the activatable antibody, wherein the activatable antibody comprises a masking moiety (MM), a cleavable moiety (CM), and an antibody or an antigen binding fragment thereof (AB) that specifically binds PDL1, (i) wherein the CM is a polypeptide that functions as a substrate for a protease; and (ii) wherein the CM is positioned in the activatable antibody such that, when the activatable antibody is in an uncleaved state, the MM interferes with specific binding of the AB to PDL1 and in a cleaved state the MM does not interfere or compete with specific binding of the AB to PDL1; and (b) recovering the activatable antibody. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

[000238] In some embodiments, the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM. In some embodiments, the activatable antibody comprises a linking peptide between the MM and the CM. In some embodiments, the activatable antibody comprises a linking peptide between the CM and the AB. In some embodiments, the activatable antibody comprises a first linking peptide (LP1) and a second linking peptide (LP2), and wherein the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-LP1-CM-LP2-AB or AB-LP2-CM-LP1-MM. In some embodiments, the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: spacer-MM-LP1-CM-LP2-AB or AB-LP2-CM-LP1-MM-spacer. In some embodiments, the two linking peptides need not be identical to each other.

[000239] In some embodiments, at least one of LP1 or LP2 comprises an amino acid sequence selected from the group consisting of $(GS)_n$, $(GGS)_n$, $(GSGGS)_n$ (SEQ ID NO: 191) and $(GGGS)_n$ (SEQ ID NO: 192), where n is an integer of at least one.

[000240] In some embodiments, at least one of LP1 or LP2 comprises an amino acid sequence selected from the group consisting of GGSG (SEQ ID NO: 193), GGSGG (SEQ ID NO: 194), GSGSG (SEQ ID NO: 195), GSGGG (SEQ ID NO: 196), GGGSG (SEQ ID NO: 197), and GSSSG (SEQ ID NO: 198).

[000241] In some embodiments, LP1 comprises the amino acid sequence GSSGGSGGSGGSG (SEQ ID NO: 199), GSSGGSGGSGG (SEQ ID NO: 200),

GSSGGSGGSGGS (SEQ ID NO: 201), GSSGGSGGSGGSGGGS (SEQ ID NO: 202), GSSGGSGGSG (SEQ ID NO: 203), or GSSGGSGGSGS (SEQ ID NO: 204).

[000242] In some embodiments, LP2 comprises the amino acid sequence GSS, GGS, GGGS (SEQ ID NO: 205), GSSGT (SEQ ID NO: 206) or GSSG (SEQ ID NO: 207).

[000243] The invention provides methods of preventing, delaying the progression of, treating, alleviating a symptom of, or otherwise ameliorating an PDL1 mediated disease in a subject by administering a therapeutically effective amount of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody described herein to a subject in need thereof.

[000244] The invention also provides methods of preventing, delaying the progression of, treating, alleviating a symptom of, or otherwise ameliorating cancer in a subject by administering a therapeutically effective amount of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody described herein to a subject in need thereof. PDL1 is known to be expressed in a variety of cancers, such as, by way of non-limiting example, melanoma, non-small cell lung cancer, nasopharyngeal cancer, glioblastoma/mixed glioma, colon adenocarcinoma, hepatocellular carcinoma, urothelial cancer, multiple myeloma, ovarian cancer, gastric carcinoma, esophageal cancer, pancreatic cancer, renal cell carcinoma (RCC), breast cancer, lymphomas, and leukemias. (See e.g., Chen et al., "Molecular Pathways: Next-Generation Immunotherapy – Inhibiting Programmed Death-Ligand 1 and Programmed Death-1," Clin. Can. Res., vol. 18: 6580-6587 (2012), the contents of which are hereby incorporated by reference in their entirety).

[000245] In some embodiments, the cancer is a bladder cancer, a bone cancer, a breast cancer, a carcinoid, a cervical cancer, a colon cancer, an endometrial cancer, a glioma, a head and neck cancer, a liver cancer, a lung cancer, a lymphoma, a melanoma, an ovarian cancer, a pancreatic cancer, a prostate cancer, a renal cancer, a sarcoma, a skin cancer, a stomach cancer, a testis cancer, a thyroid cancer, a urogenital cancer, and/or a urothelial cancer.

[000246] In some embodiments, the cancer is selected from the group consisting of melanoma (MEL), renal cell carcinoma (RCC), squamous non-small cell lung cancer (NSCLC), non-squamous NSCLC, colorectal cancer (CRC), castration-resistant prostate cancer (CRPC), hepatocellular carcinoma (HCC), squamous cell carcinoma of the head and neck, carcinomas of the esophagus, ovary, gastrointestinal tract and breast, or a hematologic

malignancy such as multiple myeloma, B-cell lymphoma, T-cell lymphoma, Hodgkin's lymphoma/primary mediastinal B-cell lymphoma, and chronic myelogenous leukemia. In some embodiments, the cancer is due to a PDL1-expressing tumor.

[000247] The invention also provides methods of treating cancer patients with an autoimmune or inflammatory disease by administering a therapeutically effective amount of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody described herein to a subject in need thereof. In some embodiments, the autoimmune disease is colitis, RA, pancreatitis, diabetes, or pneumonitis.

[000248] An anti-PDL1 antibody, a conjugated anti-PDL1 antibody, an activatable anti-PDL1 antibody and/or a conjugated activatable anti-PDL1 antibody used in any of the embodiments of these methods and uses can be administered at any stage of the disease. For example, such an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody can be administered to a patient suffering cancer of any stage, from early to metastatic. The terms subject and patient are used interchangeably herein.

[000249] In some embodiments, the subject is a mammal, such as a human, non-human primate, companion animal (*e.g.*, cat, dog, horse), farm animal, work animal, or zoo animal. In some embodiments, the subject is a human. In some embodiments, the subject is a companion animal. In some embodiments, the subject is an animal in the care of a veterinarian.

[000250] The anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and therapeutic formulations thereof are administered to a subject suffering from or susceptible to a disease or disorder associated with aberrant PDL1 expression and/or activity. A subject suffering from or susceptible to a disease or disorder associated with aberrant PDL1 expression and/or activity is identified using any of a variety of methods known in the art. For example, subjects suffering from cancer or other neoplastic condition are identified using any of a variety of clinical and/or laboratory tests such as, physical examination and blood, urine and/or stool analysis to evaluate health status. For example, subjects suffering from inflammation and/or an inflammatory disorder are identified using any of a variety of clinical and/or laboratory tests such as physical examination and/or bodily fluid analysis, e.g., blood, urine and/or stool analysis, to evaluate health status.

[000251] Administration of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody to a patient suffering from a disease or disorder associated with aberrant PDL1 expression and/or activity is considered successful if any of a variety of laboratory or clinical objectives is achieved. For example, administration of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody to a patient suffering from a disease or disorder associated with aberrant PDL1 expression and/or activity is considered successful if one or more of the symptoms associated with the disease or disorder is alleviated, reduced, inhibited or does not progress to a further, *i.e.*, worse, state. Administration of an anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody to a patient suffering from a disease or disorder associated with aberrant PDL1 expression and/or activity is considered successful if the disease or disorder enters remission or does not progress to a further, *i.e.*, worse, state.

[000252] In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody is administered before and/or during and/or after treatment in combination with one or more additional agents such as, for example, a chemotherapeutic agent, an anti-inflammatory agent, and/or an immunosuppressive agent. In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) are administered simultaneously. For example, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) can be formulated in a single composition or administered as two or more separate compositions. In some embodiments, the anti-PDL1 antibody, conjugated anti-PDL1 antibody, activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody and the additional agent(s) are administered sequentially.

[000253] The invention also provides methods and kits for using the activatable anti-PDL1 antibodies and/or conjugated activatable anti-PDL1 antibodies in a variety of diagnostic and/or prophylactic indications. For example, the invention provides methods and kits for detecting the presence or absence of a cleaving agent and a target of interest in a subject or a sample by (i) contacting a subject or sample with an anti-PDL1 activatable antibody, wherein the anti-PDL1 activatable antibody comprises a masking moiety (MM), a

cleavable moiety (CM) that is cleaved by the cleaving agent, and an antigen binding domain or fragment thereof (AB) that specifically binds the target of interest, wherein the anti-PDL1 activatable antibody in an uncleaved, non-activated state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to PDL1, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB and is not a modified form of a natural binding partner of the AB; and (b) wherein, when the AB is in an uncleaved, non-activated state, the MM interferes with specific binding of the AB to PDL1, and when the AB is in a cleaved, activated state the MM does not interfere or compete with specific binding of the AB to PDL1; and (ii) measuring a level of activated anti-PDL1 activatable antibody in the subject or sample, wherein a detectable level of activated anti-PDL1 activatable antibody in the subject or sample indicates that the cleaving agent and PDL1 are present in the subject or sample and wherein no detectable level of activated anti-PDL1 activatable antibody in the subject or sample indicates that the cleaving agent, PDL1 or both the cleaving agent and PDL1 are absent in the subject or sample.

[000254] In some embodiments, the activatable anti-PDL1 antibody is an activatable anti-PDL1 antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable anti-PDL1 antibody is not conjugated to an agent. In some embodiments, the activatable anti-PDL1 antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable anti-PDL1 antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000255] In some embodiments of these methods and kits, the activatable anti-PDL1 antibody includes a detectable label. In some embodiments of these methods and kits, the detectable label includes an imaging agent, a contrasting agent, an enzyme, a fluorescent label, a chromophore, a dye, one or more metal ions, or a ligand-based label. In some embodiments of these methods and kits, the imaging agent comprises a radioisotope. In some embodiments of these methods and kits, the radioisotope is indium or technetium. In some embodiments of these methods and kits, the contrasting agent comprises iodine, gadolinium or iron oxide. In some embodiments of these methods and kits, the enzyme comprises horseradish peroxidase, alkaline phosphatase, or β-galactosidase. In some

embodiments of these methods and kits, the fluorescent label comprises yellow fluorescent protein (YFP), cyan fluorescent protein (CFP), green fluorescent protein (GFP), modified red fluorescent protein (mRFP), red fluorescent protein tdimer2 (RFP tdimer2), HCRED, or a europium derivative. In some embodiments of these methods and kits, the luminescent label comprises an N- methylacrydium derivative. In some embodiments of these methods, the label comprises an Alexa Fluor® label, such as Alex Fluor® 680 or Alexa Fluor® 750. In some embodiments of these methods and kits, the ligand-based label comprises biotin, avidin, streptavidin or one or more haptens.

[000256] In some embodiments of these methods and kits, the subject is a mammal. In some embodiments of these methods, the subject is a human. In some embodiments, the subject is a non-human mammal, such as a non-human primate, companion animal (e.g., cat, dog, horse), farm animal, work animal, or zoo animal. In some embodiments, the subject is a rodent.

[000257] In some embodiments of these methods and kits, the method is an *in vivo* method. In some embodiments of these methods, the method is an *in situ* method. In some embodiments of these methods, the method is an *ex vivo* method. In some embodiments of these methods, the method is an *in vitro* method.

[000258] In some embodiments of the methods and kits, the method is used to identify or otherwise refine a patient population suitable for treatment with an anti-PDL1 activatable antibody of the disclosure, followed by treatment by administering that activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody to a subject in need thereof. For example, patients that test positive for both the target (e.g., PDL1) and a protease that cleaves the substrate in the cleavable moiety (CM) of the anti-PDL1 activatable antibody being tested in these methods are identified as suitable candidates for treatment with such an anti-PDL1 activatable antibody comprising such a CM, and the patient is then administered a therapeutically effective amount of the activatable anti-PDL1 antibody and/or conjugated activatable anti-PDL1 antibody that was tested. Likewise, patients that test negative for either or both of the target (*e.g.*, PDL1) and the protease that cleaves the substrate in the CM in the activatable antibody being tested using these methods might be identified as suitable candidates for another form of therapy. In some embodiments, such patients can be tested with other anti-PDL1 activatable antibodies until a suitable anti-PDL1 activatable antibody for treatment is identified (e.g., an anti-PDL1 activatable antibody comprising a CM that is cleaved by the patient at the site of disease). In

some embodiments, the patient is then administered a therapeutically effective amount of the activatable anti-PDL1 antibody and/or conjugated for which the patient tested positive. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

[000259] Pharmaceutical compositions according to the invention can include an antibody of the invention and a carrier. These pharmaceutical compositions can be included in kits, such as, for example, diagnostic kits.

Brief Description of the Drawings

[000260] Figure 1 is graph depicting by ELISA-based binding that PDL1 c60 ScFv-phage binds specifically to human and mouse PDL1.

[000261] Figure 2 is a graph depicting that hPD1 inhibits the binding of clones 12, 18 and 60 to hPDL1 in an ELISA format, and, furthermore mPD1 inhibits the binding of clone 60 to mPDL1.

[000262] Figure 3 is a graph depicting saturation binding data and demonstrates that anti-PDL1 clone 60:IgG binds to human PDL1 with a binding affinity ~ 1 nM, and to mouse PDL1 at 30 nM.

[000263] Figures 4A and 4B are a series of graphs depicting H2 specificity and cross reactivity (Figure 4A) and H3W specificity and cross reactivity (Figure 4B).

[000264] Figures 5A and 5B are a series of graphs depicting that combining the matured heavy variable CDR3 domains with the heavy variable CDR2 domains results in antibodies with enhanced affinity towards human PDL1.

[000265] Figures 6A, 6B, 6C, and 6D are a series of graphs depicting that anti-PDL1 antibody C5H9 binds to human and mouse PDL1 with near equal affinity and that anti-PDL1 antibodies C5B10 and C5E10 only bind human PDL1.

[000266] Figure 7 is a graph depicting the ability of anti-PDL1 antibody C5H9 to bind with high and equal affinity to human, mouse and cyno PDL1.

[000267] Figures 8A and 8B are a series of graphs depicting that anti-PDL1 antibody C5H9v2 has lower immunogenicity potential and enhanced manufacturability. These graphs demonstrate decreased predicted immunogenicity, increased expression levels (3X), and increased monomer percentage in human IgG1 format.

[000268] Figures 9A, 9B, and 9C are a series of graphs depicting ability of anti-PDL1 antibody C5H9v2 to bind with high affinity to (A) mouse, (B) cyno, and (C) human PDL1. Figures 9A-9C show that both anti-PDL1 antibodies C5H9 and C5H9v2 bind human, mouse and cyno PDL1 with near equal affinities.

[000269] Figure 10 is a graph depicting C5H9v2 specificity for a panel of human and mouse proteins. Figure 10 demonstrates that anti-PDL1 antibody C5H9v2 binds only to human and mouse PDL1 demonstrating specificity toward PDL1.

[000270] Figure 11 is a series of graphs depicting B7-1 and PD1 blockade. Figure 11 demonstrates that both anti-PDL1 antibody C5H9 and anti-PDL1 antibody C5H9v2 are potent blockers of either B7-1 or PD1 binding to PDL1, and that blockade includes all three species human, cyno and mouse with single digit nM EC_{50}'s.

[000271] Figure 12 is a graph depicting that anti-PDL1 antibody C5H9 accelerates the onset of diabetes in NOD mice similar to the positive control anti-PDL1 antibody 10F9G2.

[000272] Figure 13 is a graph depicting that anti-PDL1 antibody C5H9v2 accelerates the onset of diabetes in NOD mice in a dose dependent matter.

[000273] Figure 14 is a graph depicting that an anti-PDL1 antibody C5H9v2 inhibits the growth of MC38 syngeneic tumors similar to positive control anti-PDL1 antibody 10F9G2.

[000274] Figure 15 is a graph depicting binding isotherms for anti-PDL1 activatable antibodies that include the anti-PDL1 antibody C5H9v2.

[000275] Figure 16 is a graph depicting binding isotherms for anti-PDL1 activatable antibodies that include the anti-PDL1 antibody C5H9v2.

[000276] Figure 17 is a graph depicting binding isotherms for anti-PDL1 activatable antibodies that include the anti-PDL1 antibody C5H9v2.

[000277] Figures 18A and 18B are a series of graphs depicting that anti-PDL1 activatable antibody PL15-0003-C5H9v2, when administered at a dose of 1 mg/kg, has an absence of diabetes induction and anti-PDL1 activatable antibody PL18-0003-C5H9v2, when administered at a dose of 1 mg/kg, has a delay in diabetes induction compared to the anti-PDL1 antibody C5H9v2 administered at a dose of 1 mg/kg in NOD mice (Figure 18A); in addition, anti-PDL1 activatable antibody PL15-0003-C5H9v2, when administered at a dose of 3 mg/kg induced diabetes in 2 of 8 NOD mice (75% non-diabetic), compared to 1 mg/kg anti-PDL1 antibody C5H9v2 which led to 38% non-diabetic NOD mice (Figure 18B).

[000278] Figure 19 is a graph depicting that anti-PDL1 activatable antibodies PL15-0003-C5H9v2 and PL18-0003-C5H9v2 inhibit the growth of MC38 syngeneic tumors similar to anti-PDL1 antibody C5H9v2.

[000279] Figures 20A, 20B, 20C, and 20D are a series of graphs depicting the percent of anti-PDL1 antibody C5H9v2 and anti-PDL1 activatable antibody PL15-0003-C5H9v2 bound to CD4+ and CD8+ T cells from peripheral blood (Figures 20A, 20B) or spleen (Figures 20C, 20D). In all graphs, the circle represents isotype, the square represents anti-PDL1 antibody C5H9v2, and the triangle represents anti-PDL1 activatable antibody PL15-0003-C5H9v2.

[000280] Figures 21A and 21B are a series of graphs depicting that the presence of tumor-derived proteases capable of cleaving anti-PDL1 activatable antibody PL15-0003-C5H9v2 (depicted by squares) did not lead to high levels of activated activatable antibody in the blood compared to anti-PDL1 antibody C5H9v2 (depicted by circles) or an isotype antibody (depicted by triangles) (Figure 21A) despite the plasma concentrations of the activatable antibody being higher than those of the antibody (Figure 21B).

[000281] Figure 22 is a graph depicting the ability of anti-PDL1 activatable antibody PL07-2001-C5H9v2 to increase CMV-stimulated IFN-gamma secretion as compared to control hIgG4, but with decreased potency relative to anti-PDL1 parental antibody C5H9v2.

[000282] Figures 23A, 23B, 23C, and 23D are a series of images showing the ability of anti-PDL1 activatable antibody PL15-0003-C5H9v2 to be activated and to bind frozen MC38 mouse cancer tissues using an *in situ* imaging method.

[000283] Figure 24 depicts that anti-PDL1 activatable antibody PL15-0003-C5H9v2 exhibited a higher EC_{50} for PDL1 binding and PD1 blocking than did the anti-PDL1 antibody as measured by ELISA. The figure further demonstrates that activation of anti-PDL1 activatable antibody PL15-0003-C5H9v2 by matriptase fully restored PDL1 binding and PD1 blocking activities to levels comparable to those of anti-PDL1 antibody C5H9v2.

[000284] Figures 25A and 25B are a series of graphs depicting the ability of anti-PDL1 activatable antibodies referred to herein as PL07-2001-C5H9v2 and PF07-3001-C5H9v2 and of the anti-PDL1 antibody referred to herein as C5H9 to bind to human or murine PDL1.

[000285] Figures 26A, 26B, and 26C are a series of graphs depicting the abilities of anti-PDL1 activatable antibody PL07-2001-C5H9v2, uPA-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, MMP14-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, and anti-PDL1 antibody C5H9v2 to block human PD1 (PD-1) to human PDL1 (Figure 26A), cynomolgus PD1 (PD-1) binding to cynomolgus PDL1 (Figure 26B), or rat PD1 (PD-1) binding to rat PDL1 (Figure 26C).

[000286] Figures 27A and 27B are a series of graphs depicting the ability of anti-PDL1 activatable antibody PL07-2001-C5H9v2, uPA-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, MMP14-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, or anti-PDL1 antibody C5H9v2 to human B7-1 binding to human PDL1 (Figure 27A) or cynomolgus B7-1 binding to cynomolgus PDL1 (Figure 27B).

[000287] Figure 28 is a graph depicting the ability of the anti-PDL1 activatable antibodies PL15-0003-C5H9v2, PL15-2001-C5H9v2, and PL15-3001-C5H9v2 to inhibit the growth of MC38 syngeneic tumors similar to positive control anti-PDL1 antibody C5H9v2.

[000288] Figures 29A, 29B, and 29C are a series of graphs depicting that the presence of tumor-derived proteases capable of cleaving the activatable antibodies anti-PDL1 antibody C5H9v2 or anti-PDL1 activatable antibody PL15-0003-C5H9v2, PL15-2001-C5H9v2, or PL15-3001-C5H9v2 did not lead to high levels of activated activatable antibodies in the blood.

[000289] Figure 30 is an illustration depicting the ability of proteases in a tumor implanted into a mouse to activate the anti-PDL1 activatable antibody PL07-2001-C5H9v2.

Detailed Description of the Invention

[000290] The present invention provides monoclonal antibodies (mAbs) and activatable monoclonal antibodies that specifically bind human programmed death ligand 1 (PDL1). PDL1 is a 40kDa type I transmembrane protein that forms a complex with its receptor programmed cell death protein 1 (PD1), also known as CD279. Engagement of PDL1 with its receptor PD1 on T cells delivers a signal that inhibits TCR-mediated activation of IL-2 production and T cell proliferation. Aberrant expression and/or activity of PDL1 and PDL1-related signaling has been implicated in the pathogenesis of many diseases and disorders, such as cancer, inflammation, and autoimmunity.

[000291] The activatable anti-PDL1 antibodies are used in methods of treating, preventing, delaying the progression of, ameliorating and/or alleviating a symptom of a disease or disorder associated with aberrant PDL1 expression and/or activity. For example, the activatable anti-PDL1 antibodies are used in methods of treating, preventing, delaying the progression of, ameliorating and/or alleviating a symptom of a cancer or other neoplastic condition.

[000292] The activatable anti-PDL1 antibodies include an antibody or antigen-binding fragment thereof that specifically binds PDL1 coupled to a masking moiety (MM), such that

coupling of the MM reduces the ability of the antibody or antigen-binding fragment thereof to bind PDL1. In some embodiments, the MM is coupled via a sequence that includes a substrate for a protease, for example, a protease that is co-localized with PDL1 at a treatment site in a subject.

[000293] Exemplary activatable anti-PDL1 antibodies of the invention include, for example, activatable antibodies that include a heavy chain and a light chain that are, or are derived from, antibodies described in the Examples, for example in Example 3 and Example 4.

[000294] In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain that comprises or is derived from an amino acid sequence selected from the group consisting of SEQ ID NO: 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, and 56, and a light chain that comprises or is derived from the amino acid sequence of SEQ ID NO: 12 or SEQ ID NO: 58.

[000295] In some embodiments, the activatable anti-PDL1 antibody comprises a combination of a variable heavy chain complementarity determining region 1 (VH CDR1, also referred to herein as CDRH1) sequence, a variable heavy chain complementarity determining region 2 (VH CDR2, also referred to herein as CDRH2) sequence, a variable heavy chain complementarity determining region 3 (VH CDR3, also referred to herein as CDRH3) sequence, a variable light chain complementarity determining region 1 (VL CDR1, also referred to herein as CDRL1) sequence, a variable light chain complementarity determining region 2 (VL CDR2, also referred to herein as CDRL2) sequence, and a variable light chain complementarity determining region 3 (VL CDR3, also referred to herein as CDRL3) sequence, wherein at least one CDR sequence is selected from the group consisting of a VH CDR1 sequence shown in Table 15; a VH CDR2 sequence shown in Table 15; a VH CDR3 sequence shown in Table 15; a VL CDR1 sequence shown in Table 15; a VL CDR2 sequence shown in Table 15; and a VL CDR3 sequence shown in Table 15.

[000296] In some embodiments, the activatable antibody comprises a combination of a VH CDR1 sequence, a VH CDR2 sequence, a VH CDR3 sequence, a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the six CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3) shown in a single row in Table 15.

[000297] In some embodiments, the antibody comprises a heavy chain that comprise a combination of a VH CDR1 sequence, a VH CDR2 sequence, and a VH CDR3 sequence, wherein the combination is a combination of the three heavy chain CDR sequences (VH CDR1, VH CDR2, VH CDR3) shown in a single row in Table 15.

[000298] In some embodiments, the antibody comprises a light chain that comprise a combination of a VL CDR1 sequence, a VL CDR2 sequence, and a VL CDR3 sequence, wherein the combination is a combination of the three light chain CDR sequences (VL CDR1, VL CDR2, VL CDR3) shown in a single row in Table 15.

[000299] In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain that comprises or is derived from a heavy chain amino acid sequence shown in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes a light chain that comprises or is derived from a light chain amino acid sequence shown in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain that comprises or is derived from a heavy chain amino acid sequence shown in Table 15, and a light chain that comprises or is derived from a light chain amino acid sequence shown in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain variable region and light chain variable region sequences from the combinations shown in Group A in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group B in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group C in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group D in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group E in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group F in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group G in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group H in Table 15. In some embodiments, the activatable anti-PDL1

antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group I in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain and light chain sequences shown in Group J in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group K in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain and light chain sequences shown in Group K in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group L in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group M in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group N in Table 15. In some embodiments, the activatable anti-PDL1 antibody includes the combination of heavy chain variable region and light chain variable region sequences shown in Group O in Table 15.

Table 15. Variable Heavy Chain Region (VH) and Variable Light Chain Region (VL) Sequences for Activatable Antibodies that Bind PDL1 (CDR sequences are underlined; CDR sequences disclosed herein were identified in accordance with the definitions of Kabat, Sequences of Proteins of Immunological Interest (National Institutes of Health, Bethesda, Md. (1987 and 1991)))

Group A	
VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFTDYGFSWVRQAPGQGLEWMGWITAYNGNTNYAQKLQGRVTM TTDTSTSTVYMELRSLRSDDTAVYYCARDYFYGMDVWGQGTTVTVSS (SEQ ID NO: 248)
VH	QVQLVQSGAEVKKPGSSVKVSCKTSGDTFSTYAISWVRQAPGQGLEWMGGIIPIFGKAHYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYFCARKFHFVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 249)
VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYDVHWVRQAPGQRLEWMGWLHADTGITKFSQKFQGRVTI TRDTSASTAYMELSSLRSEDTAVYYCARERIQLWFDYWGQGT (SEQ ID NO: 250)
VH	QVQLVQSGAEVKKPGSSVKVSCKVSGGIFSTYAINWVRQAPGQGLEWMGGIIPIFGTANHAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARDQGIAAALFDYWGQGTLVTVSS (SEQ ID NO: 251)
VH	EVQLVESGGGLVQPGRSLRLSCAVSGFTFDDYVVHWVRQAPGKGLEWVSGNSGNIGYADSVKGRFTISRD NAKNSLYLQMNSLRAEDTALYYCAVPFDYWGQGTLVTVSS (SEQ ID NO: 252)

VH	QVQLVQSGAEVKKPGSSVKVSCKTSGDTFSSYAISWVRQAPGQGLEWMGGIIPIFGRAHYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYFCARKFHFVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 253)
VH	QVQLVQSGAEVKKPGSSVKVSCKTSGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGKAHYAQKFQGRVTI TADESTTTAYMELSSLRSEDTAVYYCARKYDYVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 254)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAINWVRQAPGQGLEWMGGIIPIFGSANYAQKFQDRVTI TADESTSAAYMELSSLRSEDTAVYYCARDSSGWSRYYMDVWGQGTTVTVSS (SEQ ID NO: 255)
VH	QVQLVQSGAEVKEPGSSVKVSCKASGGTFNSYAISWVRQAPGQGLEWMGGIIPLFGIAHYAQKFQGRVTI TADESTNTAYMDLSSLRSEDTAVYYCARKYSYVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 256)
VH	EVQLVESGGGLVQPGRSLRLSCAASGITFDDYGMHWVRQAPGKGLEWVSGISWNRGRIEYADSVKGRFTI SRDNAKNSLYLQMNSLRAEDTALYYCAKGRFRYFDWFLDYWGQGTLVTVSS (SEQ ID NO: 257)
VH	QMQLVQSGGGLVQPGGSLRLSCAASGFTFSSYWMSWVRQAPGKGLEWVANIKQDGSEKYYVDSVKGRFTI SRDNAKNSLYLQMNSLRAEDTAVYYCARDYFWSGFSAFDIWGKGTLVTVS (SEQ ID NO: 449)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLVWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPRTFGQGTKVEIK (SEQ ID NO: 258)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPTFGQGTKVEIK (SEQ ID NO: 259)
VL	DIQMTQSPSSLSASVGDRVTITCRASQGISSWLAWYQQKPEKAPKSLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYNSYPYTFGQGTKLEIK (SEQ ID NO: 260)
VL	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGT DFTLTISRLEPEDFAVYYCQQYGSSPWTFGQGTKVEIK (SEQ ID NO: 261)
VL	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGT DFTLTISRLEPEDFAVYYCQQYGSSPFGGGTKVEIK (SEQ ID NO: 262)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPTFGQGTRLEIK (SEQ ID NO: 263)
VL	AIQLTQSPSSLSASVGDRVTITCRASQGISSALAWYQQKPGKAPKLLIYDASSLESGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQFNSYPFTFGPGTKVDIK (SEQ ID NO: 264)
	DIVMTQSPSTLSASVGDRVTITCRASQGISSWLAWYQQKPGRAPKVLIYKASTLESGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYSTPWTFGQGTKLEIK (SEQ ID NO: 450)
Group B	
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSRYWMSWVRQAPGKGLEWVANIKQDGSEKYYVDSVKGRFTI SRDNAKNSLYLQMNSLRAEDTAVYYCAREGGWFGELAFDYWGQGTLVTVSS (SEQ ID NO: 265)
VL	EIVLTQSPGTLSLSPGERATLSCRASQRVSSSYLAWYQQKPGQAPRLLIYDASSRATGIPDRFSGSGSGT DFTLTISRLEPEDFAVYYCQQYGSLPWTFGQGTKVEIK (SEQ ID NO: 266)
Group C	
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSDSWIHWVRQAPGKGLEWVAWISPYGGSTYYADSVKGRFTI SADTSKNTAYLQMNSLRAEDTAVYYCARRHWPGGFDYWGQGTLVTVSA (SEQ ID NO: 267)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSGSWIHWVRQAPGKGLEWVAWILPYGGSSYYADSVKGRFTI SADTSKNTAYLQMNSLRAEDTAVYYCARRHWPGGFDYWGQGTLVTVSA (SEQ ID NO: 451)

VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYLYHPATFGQGTKVEIKR (SEQ ID NO: 268)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYYNVPWTFGQGTKVEIKR (SEQ ID NO: 452)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYYAPPWTFGQGTKVEIKR (SEQ ID NO: 453)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYYTVPWTFGQGTKVEIKR (SEQ ID NO: 454)
VL	DIQMTQSPSSLSASVGDRVTITCRASQVINTFLAWYQQKPGKAPKLLIYSASTLASGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYYTVPRTFGQGTKVEIKR (SEQ ID NO: 455)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQGYGVPRTFGQGTKVEIKR (SEQ ID NO: 456)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYLFTPPTFGQGTKVEIKR (SEQ ID NO: 457)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYFITPTTFGQGTKVEIKR (SEQ ID NO: 458)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYYYTPPTFGQGTKVEIKR (SEQ ID NO: 459)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQFFYTPPTFGQGTKVEIKR (SEQ ID NO: 460)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSLFTPPTFGQGTKVEIKR (SEQ ID NO: 461)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSLYTPPTFGQGTKVEIKR (SEQ ID NO: 462)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSWYHPPTFGQGTKVEIKR (SEQ ID NO: 463)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYFYIPPTFGQGTKVEIKR (SEQ ID NO: 464)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYWYTPTTFGQGTKVEIKR (SEQ ID NO: 465)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYFIPPTFGQGTKVEIKR (SEQ ID NO: 466)
Group D	
VH	METGLRWLLLVAVLKGVQCLSVEESGGRLVTPGTPLTLTCTASGFTITNYHMFWVRQAPGKGLEWIGVIT SSGIGSSSTTYYATWAKGRFTISKTSTTVNLRITSPTTEDTATYFCARDYFTNTYYALDIWGPGTLVTVS S (SEQ ID NO: 467)
VH	QVQLVQSGAEVKKPGSSVKVSCKTSGDTFSTYAISWVRQAPGQGLEWMGGIIPIFGKAHYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYFCARKFHFVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 249)

VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYDVHWVRQAPGQRLEWMGWLHADTGITKFSQKFQGRVTI TRDTSASTAYMELSSLRSEDTAVYYCARERIQLWFDYWGQGTLVTVSS (SEQ ID NO: 468)
VH	QVQLVQSGAEVKKPGSSVKVSCKVSGGIFSTYAINWVRQAPGQGLEWMGGIIPIFGTANHAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARDQGIAAALFDYWGQGTLVTVSS (SEQ ID NO: 251)
VH	EVQLVESGGGLVQPGRSLRLSCAVSGFTFDDYVVHWVRQAPGKGLEWVSGISGNSGNIGYADSVKGRFTI SRDNAKNSLYLQMNSLRAEDTALYYCAVPFDYWGQGTLVTVSS (SEQ ID NO: 469)
VH	QVQLVQSGAEVKKPGSSVKVSCKTSGDTFSSYAISWVRQAPGQGLEWMGGIIPIFGRAHYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYFCARKFHFVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 253)
VH	QVQLVQSGAEVKKPGSSVKVSCKTSGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGKAHYAQKFQGRVTI TADESTTTAYMELSSLRSEDTAVYYCARKYDYVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 254)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAINWVRQAPGQGLEWMGGIIPIFGSANYAQKFQDRVTI TADESTSAAYMELSSLRSEDTAVYYCARDSSGWSRYYMDVWGQGTTVTVSS (SEQ ID NO: 255)
VH	QVQLVQSGAEVKEPGSSVKVSCKASGGTFNSYAISWVRQAPGQGLEWMGGIIPLFGIAHYAQKFQGRVTI TADESTNTAYMDLSSLRSEDTAVYYCARKYSYVSGSPFGMDVWGQGTTVTVSS (SEQ ID NO: 256)
VH	EVQLVESGGGLVQPGRSLRLSCAASGITFDDYGMHWVRQAPGKGLEWVSGISWNRGRIEYADSVKGRFTI SRDNAKNSLYLQMNSLRAEDTALYYCAKGRFRYFDWFLDYWGQGTLVTVSS (SEQ ID NO: 257)
VL	MDTRAPTQLLGLLLLWLPGARCALVMTQTPSSTSTAVGGTVTIKCQASQSISVYLAWYQQKPGQPPKLLI YSASTLASGVPSRFKGSRSGTEYTLTISGVQREDAATYYCLGSAGS (SEQ ID NO: 470)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLVWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPRTFGQGTKVEIK (SEQ ID NO: 258)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPTFGQGTKVEIK (SEQ ID NO: 259)
VL	DIQMTQSPSSLSASVGDRVTITCRASQGISSWLAWYQQKPEKAPKSLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYNSYPYTFGQGTKLEIK (SEQ ID NO: 260)
VL	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGT DFTLTISRLEPEDFAVYYCQQYGSSPWTFGQGTKVEIK (SEQ ID NO: 261)
VL	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGT DFTLTISRLEPEDFAVYYCQQYGSSPFGGGTKVEIK (SEQ ID NO: 262)
VL	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQRSNWPTFGQGTRLEIK (SEQ ID NO: 263)
VL	AIQLTQSPSSLSASVGDRVTITCRASQGISSALAWYQQKPGKAPKLLIYDASSLESGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQFNSYPFTFGPGTKVDIK (SEQ ID NO: 264)
Group E	
VH	EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYIMMWVRQAPGKGLEWVSSIYPSGGITFYADTVKGRFTI SRDNSKNTLYLQMNSLRAEDTAVYYCARIKLGTVTTVDYWGQGTLVTVSS (SEQ ID NO: 471)
VL	QSALTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSSTRVFGTGTKVTVL (SEQ ID NO: 472)

Group F	
VH	EVKLQESGPSLVKPSQTLSLTCSVTGYSITSDYWNWIRKFPGNKLEYVGYISYTGSTYYNPSLKSRISIT RDTSKNQYYLQLNSVTSEDTATYYCARYGGWLSPFDYWGQGTTLTVSS (SEQ ID NO: 473)
VH	EVQLQESGPGLVAPSQSLSITCTVSGFSLTTYSINWIRQPPGKGLEWLGVMWAGGGTNSNSVLKSRLIIS KDNSKSQVFLKMNSLQTDDTARYYCARYYGNSPYYAIDYWGQGTSVTVSS (SEQ ID NO: 474)
VH	EVKLQESGPSLVKPSQTLSLTCSVTGYSIISDYWNWIRKFPGNKLEYLGYISYTGSTYYNPSLKSRISIT RDTSKNQYYLQLNSVTTEDTATYYCARRGGWLLPFDYWGQGTTLTVSS (SEQ ID NO: 475)
VH	EVKLQESGPSLVKPGASVKLSCKASGYTFTSYDINWVKQRPGQGLEWIGWIFPRDNNTKYNENFKGKATL TVDTSSTTAYMELHSLTSEDSAVYFCTKENWVGDFDYWGQGTTLTLSS (SEQ ID NO: 476)
VH	EVQLQQSGPDLVTPGASVRISCQASGYTFPDYYMNWVKQSHGKSLEWIGDIDPNYGGTTYNQKFKGKAIL TVDRSSSTAYMELRSLTSEDSAVYYCARGALTDWGQGTSLTVSS (SEQ ID NO: 477)
VH	EIVLTQSPATLSLSPGERATLSCRASSSVSYIYWFQQKPGQSPRPLIYAAFNRATGIPARFSGSGSGTDY TLTISSLEPEDFAVYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 478)
VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFPDYYMNWVRQAPGQGLEWMGDIDPNYGGTNYAQKFQGRVTM TRDTSISTAYMELSRLRSDDTAVYYCARGALTDWGQGTMVTVSS (SEQ ID NO: 479)
VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFPDYYMNWVRQAPGQSLEWMGDIDPNYGGTNYNQKFQGRVTM TRDTSISTAYMELSRLRSDDTAVYYCARGALTDWGQGTMVTVSS (SEQ ID NO: 480)
VH	EVQLVQSGAEVKKPGASVKVSCKASGYTFPDYYMNWVRQAPGQSLEWMGDIDPNYGGTNYNQKFQGRVTM TVDRSSSTAYMELSRLRSDDTAVYYCARGALTDWGQGTMVTVSS (SEQ ID NO: 481)
VH	EVQLVESGGGLVQPGRSLRLSCTASGYTFPDYYMNWVRQAPGKGLEWVGDIDPNYGGTTYAASVKGRFTI SVDRSKSIAYLQMSSLKTEDTAVYYCTRGALTDWGQGTMVTVSS (SEQ ID NO: 482)
VH	EVQLVESGGGLVQPGRSLRLSCTASGYTFPDYYMNWVRQAPGKGLEWVGDIDPNYGGTTYNASVKGRFTI SVDRSKSIAYLQMSSLKTEDTAVYYCARGALTDWGQGTMVTVSS (SEQ ID NO: 483)
VL	DIVMTQSHKLMSTSVGDRVSITCKASQDVGTAVAWYQQKPGQSPKLLIYWASTRHTGVPDRFTGSGSGTD FTLTISNVQSEDLADYFCQQDSSYPLTFGAGTKVELK (SEQ ID NO: 484)
VL	DIVTTQSHKLMSTSVGDRVSITCKASQDVGTAVAWYQQKPGQSPKLLIYWASTRHTGVPDRFTGSGSGTD FTLTISNVQSEDLADYFCQQDSSYPLTFGAGTKVELK (SEQ ID NO: 485)
VL	DIVMTQSPSSLAVSVGEKVSMGCKSSQSLLYSSNQKNSLAWYQQKPGQSPKLLIDWASTRESGVPDRFTG SGSGTDFTLTISSVKAEDLAVYYCQQYYGYPLTFGAGTKLELK (SEQ ID NO: 486)
VL	DIVMTQSPAIMSASPGEKVTMTCSASSSIRYMHWYQQKPGTSPKRWISDTSKLTSGVPARFSGSGSGTSY ALTISSMEAEDAATYYCHQRSSYPWTFGGGTKLEIK (SEQ ID NO: 487)
VL	QIVLSQSPAILSASPGEKVTMTCRASSSVSYIYWFQQKPGSSPKPWIYATFNLASGVPARFSGSGSGTSY SLTISRVETEDAATYYCQQWSNNPLTFGAGTKLELK (SEQ ID NO: 488)
VL	EIVLTQSPATLSLSPGERATLSCRASSSVSYIYWFQQKPGQAPRLLIYAAFNRATGIPARFSGSGSGTDY TLTISSLEPEDFAVYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 489)
VL	QIVLTQSPATLSLSPGERATLSCRASSSVSYIYWFQQKPGQSPRPLIYATFNLASGIPARFSGSGSGTSY TLTISRLEPEDFAVYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 490)
VL	DIQLTQSPSSLSASVGDRVTITCRASSGVSYIYWFQQKPGKAPKLLIYAAFNLASGVPSRFSGSGSGTEY TLTISSLQPEDFATYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 491)

VL	DIQLTQSPSSLSASVGDRVTITCRASSGVSYIYWFQQKPGKAPKPLIYAAFNLASGVPSRFSGSGSGTEY TLTISSLQPEDFATYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 492)
VL	DIQLTQSPSILSASVGDRVTITCRASSSVSYIYWFQQKPGKAPKPLIYATFNLASGVPSRFSGSGSGTSY TLTISSLQPEDFATYYCQQWSNNPLTFGQGTKVEIK (SEQ ID NO: 493)

Group G	
VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYGISWVRQAPGQGLEWMGWISAYNGNTNYAQKLQGRVTM TTDTSTSTAYMELRSLRSDDTAVYYCARALPSGTILVGGWFDPWGQGTLVTVSS (SEQ ID NO: 494)
VH	EVQLVQSGGGVVQPGRSLRLSCAASGFTFSSYALSWVRQAPGKGLEWVSAISGGGGSTYYADSVKGRFTI SRDNSKNTLYLQMNSLRAEDTAVYYCAKDVFPETFSMNYGMDVWGQGTLVTVSS (SEQ ID NO: 495)
VH	QVQLVQSGGGVVQPGGSLRLSCAASGFTFDDYAMHWVRQAPGKGLEWVSLISGDGGSTYYADSVKGRFTI SRDNSKNSLYLQMNSLRTEDTALYYCAKVLLPCSSTSCYGSVGAFDIWGQGTTVTVSS (SEQ ID NO: 496)
VH	QVQLVQSGGSVVRPGESLRLSCVASGFIFDNYDMSWVRQVPGKGLEWVSRVNWNGGSTTYADAVKGRFTI SRDNTKNSLYLQMNNLRAEDTAVYYCVREFVGAYDLWGQGTTVTVSS (SEQ ID NO: 497)
VH	QVQLVQSGAEVKKPGATVKVSCKVFGDTFRGLYIHWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TTDESTSTAYMELSSLRSEDTAVYYCASGLRWGIWGWFDPWGQGTLVTVSS (SEQ ID NO: 498)
VH	EVQLVQSGAELKKPGSSVKVSCKAFGGTFSDNAISWVRQAPGQGPEWMGGIIPIFGKPNYAQKFQGRVTI TADESTSTAYMVLSSLRSEDTAVYYCARTMVRGFLGVMDVWGQGTTVTVSS (SEQ ID NO: 499)
VH	QVQLVQSGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSAISGSGGSTYYADSVKGRFTI SRDNSKNTLYLQMNSLRAEDTAVYYCAKDQFVTIFGVPRYGMDVWGQGTTVTVSS (SEQ ID NO: 500)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADKSTSTAYMELSSLRSEDTAVYYCARGRQMFGAGIDFWGPGTLVTVSS (SEQ ID NO: 501)
VH	EVQLVESGAEVKKPGSSVKVSCKVSGGTFGTYALNWVRQAPGQGLEWMGRIVPLIGLVNYAHNFEGRISI TADKSTGTAYMELSNLRSDDTAVYYCAREVYGGNSDYWGQGTLVTVSS (SEQ ID NO: 502)
VH	QVQLVQSGGEVKKPGASVKVSCKASGYTLSSHGITWVRQAPGQGLEWMGWISAHNGHASNAQKVEDRVTM TTDTSTNTAYMELRSLTADDTAVYYCARVHAALYYGMDVWGQGTLVTVSS (SEQ ID NO: 503)
VH	QVQLQESGGGVVQPGRSLRLSCSASGFTFSRHGMHWVRQAPGKGLEWVAVISHDGSVKYYADSMKGRFSI SRDNSNNTLYLQMDSLRADDTAVYYCARGLSYQVSGWFDPWGQGTLVTVSS (SEQ ID NO: 504)
VH	NFMLTQPHSVSESPGKTVTISCTRSSGSIASNYVQWYQQRPGSSPTTVIYEDNQRPSGVPDRFSGSIDTS SNSASLTISGLKTKDEADYYCQSYDGITVIFGGGTKLTVL (SEQ ID NO: 505)
VH	NFMLTQPHSVSGSPGKTVTLPCTRSSGSIASHYVQWYQQRPGSAPTTVIYEDNKRPSGVPDRFSGSIDSS SNSASLSISGLKTEDEADYYCQSYDSSNRWVFGGGTKLTVL (SEQ ID NO: 506)
VH	LPVLTQPASLSASPGASASLTCTLRSGLNVGSYRIYWYQQKPGSRPQYLLNYKSDSNKQQASGVPSRFSG SKDASANAGILLISGLQSEDEADYYCMIWYSSAVVFGGGTKLTVL (SEQ ID NO: 507)
VL	NFMLTQPHSVSESPGKTVTISCTRSSGNIASNYVQWYQQRPGSAPTTVIYEDNQRPSGVPDRFSGSIDSS SNSASLTISGLKTEDEADYYCQSYDSSNLWVFGGGTKLTVL (SEQ ID NO: 508)

VL	SSELTQDPAVSVALGQTVRITCQGDSLRSYYASWYQQKPGQAPVLVIYGKNNRPSGIPDRFSGSSSGNTA SLTITGAQAEDEADYYCNSRDSSGNHYVFGTGTKVTVL (SEQ ID NO: 509)
VL	LPVLTQAPSVSVAPGKTARITCGGSDIGRKSVHWYQQKPGQAPALVIYSDRDRPSGISERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDNNSDHYVFGAGTELIVL (SEQ ID NO: 510)
VL	QSALTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSTLPFGGGTKLTVL (SEQ ID NO: 511)
VL	EIVLTQSPATLSLSPGERATLSCRASQSIGNSLAWYQQKPGQAPRLLMYGASSRATGIPDRFSGSGAGTD FTLTISSLEPEDFATYYCQQHTIPTFSFGPGTKVEVK (SEQ ID NO: 512)
VL	DIVMTQTPSFLSASIGDRVTITCRASQGIGSYLAWYQQRPGEAPKLLIYAASTLQSGVPSRFSGSGSGTD FTLTISNLQPEDFATYYCQQLNNYPITFGQGTRLEIK (SEQ ID NO: 513)
VL	QSALTQPPSVSVSPGQTANIPCSGDKLGNKYAYWYQQKPGQSPVLLIYQDIKRPSRIPERFSGSNSADTA TLTISGTQAMDEADYYCQTWDNSVVFGGGTKLTVL (SEQ ID NO: 514)
VL	NFMLTQPHSVSESPGKTVTISCTRSSGSIDSNYVQWYQQRPGSAPTTVIYEDNQRPSGVPDRFSGSIDSS SNSASLTISGLKTEDEADYYCQSYDSNNRHVIFGGGTKLTVL (SEQ ID NO: 515)
VL	NFMLTQPHSVSESPGKTVTISCTRSSGNIGTNYVQWYQQRPGSAPVALIYEDYRRPSGVPDRFSGSIDSS SNSASLIISGLKPEDEADYYCQSYHSSGWEFGGGTKLTVL (SEQ ID NO: 516)
VL	QSVLTQPPSVSVAPGQTARITCGGNNIGSKGVHWYQQKPGQAPVLVVYDDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHWVFGGGTKLTVL (SEQ ID NO: 517)
VL	NFMLTQPHSVSESPGKTVTISCTRSSGSIASNYVQWYQQRPGSAPTTVIYEDNQRPSGVPDRFSGSIDSS SNSASLTISGLKTEDEADYYCQSYDSTTPSVFGGGTKLTVL (SEQ ID NO: 518)
VL	QVQLVQSGAEVKKPGASVKVSCKASGYTFTSYGISWVRQAPGQGLEWMGWTSPHNGLTAFAQILEGRVTM TTDTSTNTAYMELRNLTFDDTAVYFCAKVHPVFSYALDVWGQGTLVTVSS (SEQ ID NO: 519)
VL	EVQLVESGAEVMNPGSSVRVSCRGSGGDFSTYAFSWVRQAPGQGLEWMGRIIPILGIANYAQKFQGRVTI TADKSTSTAYMELSSLRSDDTAVYYCARDGYGSDPVLWGQGTLVTVSS (SEQ ID NO: 520)
VL	EVQLVQSGAEVKKPGASVKVSCKASGYTFTNYGISWVRQAPGQGLEWMGWISAYNGNTNYAQKVQGRVTM TTDTSTSTGYMELRSLRSDDTAVYYCARGDFRKPFDYWGQGTLVTVSS (SEQ ID NO: 521)
Group H	
VH	EVQLVQSGPELKKPGASVKMSCKASGYTFTSYVMHWVKQAPGQRLEWIGYVNPFNDGTKYNEMFKGRATL TSDKSTSTAYMELSSLRSEDSAVYYCARQAWGYPWGQGTLVTVSS (SEQ ID NO: 522)
VH	EVQLVQSGAEVKKPGASVKMSCKASGYTFTSYVMHWVKQAPGQRLEWIGYVNPFNDGTKYNEMFKGRATL TSDKSTSTAYMELSSLRSEDTAVYYCARQAWGYPWGQGTLVTVSS (SEQ ID NO: 523)
VH	EVQLVQSGAEVKKPGASVKMSCKASGYTFTSYVMHWVRQAPGQRLEWIGYVNPFNDGTKYNEMFKGRATL TSDKSTSTAYMELSSLRSEDTAVYYCARQAWGYPWGQGTLVTVSS (SEQ ID NO: 524)
VH	EVQLVQSGAEVKKPGASVKVSCKASGYTFTSYVMHWVRQAPGQRLEWIGYVNPFNDGTKYNEMFKGRATL TSDKSTSTAYMELSSLRSEDTAVYYCARQAWGYPWGQGTLVTVSS (SEQ ID NO: 525)
VH	EVQLVQSGAEVKKPGASVKVSCKASGYTFTSYVMHWVRQAPGQRLEWIGYVNPFNDGTKYNEMFKGRATI TSDKSTSTAYMELSSLRSEDTAVYYCARQAWGYPWGQGTLVTVSS (SEQ ID NO: 526)
VL	DIVLTQSPASLALSPGERATLSCRATESVEYYGTSLVQWYQQKPGQPPKLLIYAASSVDSGVPSRFSGSG SGTDFTLTINSLEEEDAAMYFCQQSRRVPYTFGQGTKLEIK (SEQ ID NO: 527)

VL	DIVLTQSPATLSLSPGERATLSCRATESVEYYGTSLVQWYQQKPGQPPKLLIYAASSVDSGVPSRFSGSG SGTDFTLTINSLEAEDAAMYFCQQSRRVPYTFGQGTKLEIK (SEQ ID NO: 528)
VL	EIVLTQSPATLSLSPGERATLSCRATESVEYYGTSLVQWYQQKPGQPPKLLIYAASSVDSGVPSRFSGSG SGTDFTLTINSLEAEDAAMYFCQQSRRVPYTFGQGTKLEIK (SEQ ID NO: 529)
VL	DIVLTQSPATLSLSPGERATLSCRATESVEYYGTSLVQWYQQKPGQPPKLLIYAASSVDSGVPSRFSGSG SGTDFTLTINSLEAEDAATYFCQQSRRVPYTFGQGTKLEIK (SEQ ID NO: 530)
Group I	
VH	EVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADKSTSTAYMELSSLRSEDTAVYYCAREGTIYDSSGYSFDYWGQGTLVTVSS (SEQ ID NO: 531)
VH	EVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGIINPSGGSTSYAQKFQGRVSM TRDTSTSTVYMELSSLTSEDTAVYYCARDLFPHIYGNYYGMDIWGQGTTVTVSS (SEQ ID NO: 532)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADKSTSTAYMELSSLRSEDTAVYYCARLAVPGAFDIWGQGTMVTVSS (SEQ ID NO: 533)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLAVISYDGSNKYYADSVKGRFTISRD NSKNTLYLQMNSLRAEDTAVYYCARGQWLVTELDYWGQGTLVTVSS (SEQ ID NO: 534)
VH	EVQLVESGSEVEKPGSSVKVSCKASGGTFSDSGISWVRQAPGQGLEWMGGIIPMFATPYYAQKFQDRVTI TADESTSTVYMELSGLRSDDTAVFYCARDRGRGHLPWYFDLWGRGTLVTVSS (SEQ ID NO: 535)
VH	EVQLVESGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARAPYYYYYMDVWGQGTTVTVSS (SEQ ID NO: 536)
VH	EVQLLESGAEVKKPGSSVKVSCKASGGTLSRYALSWVRQAPGQGPEWVGAIIPIFGTPHYSKKFQDRVII TVDTSTNTAFMELSSLRFEDTALYFCARGHDEYDISGYHRLDYWGQGTLVTVSS (SEQ ID NO: 537)
VH	QVQLVQSGSELKKPGSSVKVSCKASGYSFSGYYIHWVRQAPGQGLEWMGWIDPNSGVTNYVRRFQGRVTM TRDTSLSTAYMELSGLTADDTAVYYCARDENLWQFGYLDYWGQGTLVTVSS (SEQ ID NO: 538)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSRYGVHWVRQAPGQGLEWMGRLIPIVSMTNYAQKFQDRVSI TTDKSTGTAYMELRSLTSEDTALYYCASVGQQLPWVFFAWGQGTLVTVSS (SEQ ID NO: 539)
VH	QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 540)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 541)
VH	EVQLVQSGGGLVQPGGSLRLSCAASGFTFSDYGMHWVRQPPGKGLEWLAVISYDGSYKIHADSVQGRFTI SRDNAKNSVFLQMNSLKTEDTAVYYCTTDRKWLAWHGMDVWGQGTTVTVSS (SEQ ID NO: 542)
VH	EVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARDGIVADFQHWGQGTLVTVSS (SEQ ID NO: 543)
VH	EVQLVESGAEVKKPGASVKVSCKASGDTFSRYGITWVRQAPGRGLEWMGNIVPFFGATNYAQKFQGRLTI TADKSSYTSYMDLSSLRSDDTAVYYCARDHFYGSGGYFDYWGQGTLVTVSS (SEQ ID NO: 544)
VH	EVQLLESGAEVKKPGASVKVSCKASGYTFNSYDINWVRQAPGQGLEWMGGIIPVFGTANYAESFQGRVTM TADHSTSTAYMELNNLRSEDTAVYYCARDRWHYESRPMDVWGQGTTVTVSS (SEQ ID NO: 545)

VH	EVQLVESGGGLVRPGGSLRLACAASGFSFSDYYMTWIRQAPGRGLEWIAYISDSGQTVHYADSVKGRFTI SRDNTKNSLFLQVNTLRAEDTAVYYCAREDLLGYYLQSWGQGTLVTVSS (SEQ ID NO: 546)
VH	QVQLQQSGPGLVKPSQTLSLTCAISGDSVSSNSAAWNWIRQSPSRGLEWLGRTYYRSKWYNDYAVSVKSR ITINPDTSKNQFSLQLNSVTPEDTAVYYCARDEPRAVAGSQAYYYYGMDVWGQGTTVTVSS (SEQ ID NO: 547)
VH	EVQLVQSGAEVKKPGASVKVSCKASGYTFTSYYMHWVRQAPGQGLEWMGIINPSDGSTSYAQKFQGRVTM TRDTSTSTVHMELSSLRSEDTAVYYCARDLFPHIYGNYYGMDIWGQGTTVTVSS (SEQ ID NO: 548)
VH	QMQLVQSGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 549)
VH	QVQLVQSGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 550)
VL	QSVLTQPPSVSAAPGQKVTISCSGNNSNIANNYVSWYQQLPGTAPKLLIYDNNYRPSGIPDRFSGSKSGT SATLDITGLQTGDEADYYCGVWDGSLTTGVFGGGTKLTVL (SEQ ID NO: 551)
VL	AIQMTQSPSSLSASVGDRVTITCRASQGISNYLAWYQQKPGKVPKLLIYAASTLESGVPSRFSGSGSGTD FTLTISSLQPEDLATYYCQQLHTFPLTFGGGTKVEIK (SEQ ID NO: 552)
VL	QPVLTQPPSASGSPGQSVTISCTGTSSDVGAYNFVSWYRQHPGKAPKLMIYEVNKRPSGVPDRFSGSKSG NTASLTVSGLQAEDEADYYCSSYAGTNSLGIFGTGTKLTVL (SEQ ID NO: 553)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSDIGNHYVSWYQQLPGTAPKLLIYDNNQRPSGIPDRFSGSKSGT SATLAITGLQTGDEADYYCGTWDNSLSPHLLFGGGTKLTVL (SEQ ID NO: 554)
VL	QSVLTQPPSVSAAPGQKVTISCSGSSSNMGNNYVSWYKQVPGTAPKLLIYENDKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDNSLSGFVFASGTKVTVL (SEQ ID NO: 555)
VL	QSALTQPASVSGSLGQSVTISCTGSSSDVGSYNLVSWYQQHPGKAPNLMIYDVSKRSGVSNRFSGSKSGN TASLTISGLQAEDEADYYCSSYTGISTVVFGGGTKLTVL (SEQ ID NO: 556)
VL	QSVLTQPASVSGSPGQSITISCTGTSSDVGSYNLVSWYQQHPGKAPKLMIYEVSKRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYGGFNNLLFGGGTKLTVL (SEQ ID NO: 557)
VL	DIVMTQSPSSLSASIGDRVTITCRASQRISAYVNWYQQKPGKAPKVLIYAASSLRSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQTYSSPWTFGQGTKVEIK (SEQ ID NO: 558)
VL	QSVLTQPPSASGSPGQSVTISCTGTSSDIGGYDSVSWYQQHPGKAPKLMIYDVSKRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSSIFFYVFGTGTKVTVL (SEQ ID NO: 559)
VL	LPVLTQPASVSGSPGQSITISCTGTTSDIGGYDYVSWYQQHPGKAPKLMIYDVSKRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSSTHVFGTGTKLTVL (SEQ ID NO: 560)
VL	QSALTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYRSSTLGPVFGGGTKLTVL (SEQ ID NO: 561)
VL	QAGLTQPPSVSEAPRQRVTISCSGSSSNIGNNAVNWYQQLPGKAPKLLIYYDDLLPSGVSDRFSGSKSGT SASLAISGLQSEDEADYYCAAWDDSLNGYVFGTGTKLTVL (SEQ ID NO: 562)
VL	QSALTQPRSVSGSPGQSVTISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSKRPSGVPDRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSTTHVFGTGTKVTVL (SEQ ID NO: 563)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSVWVFGGGTQLTVL (SEQ ID NO: 564)

VL	QSVLTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGRAPRLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEGDYYCSSYTSGGTLGPVFGGGTKLTVL (SEQ ID NO: 565)
VL	QAGLTQPPSASGTPGQRVTISCSGSSSNIGSNTVNWYQQLPGTAPKLLIYSNNQRPSGVPDRFSGSKSGT SASLAISGLQSEDEADYYCAAWDDSLNGWVFGGGTKLTVL (SEQ ID NO: 566)
VL	AIRMTQSPSSLSASVGDRVTITCRASQSISNYLNWYQQRPGKAPNLLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQTYSTPYTFGQGTKLEIK (SEQ ID NO: 567)
VL	QSVLTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYRQHPGKAPKLMIYDVSYRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTDSSTRYVFGTGTKLTVL (SEQ ID NO: 568)
VL	QPVLTQPPSASGTPGQRVAISCSGSRSNIEINSVNWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGSWDSSLSADVFGTGTKLTVL (SEQ ID NO: 569)
VL	QSVLTQPPSVSAAPGKKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYRNNQRPSGVPDRFSGSKSGT SASLAISGLQSEDEADYYCATWDDSLNGWVFGGGTKLTVL (SEQ ID NO: 570)
VL	QSVVTQPPSVSGAPGQRVTISCTGSSSNIGAGYDVHWYQQLPGTAPKLLIYGNNNRHSGVPDRFSGSKSG TSASLAITGLQAEDEAEFFCGTWDSRLTTYVFGSGTKLTVL (SEQ ID NO: 571)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSAVVFGGGTKLTVL (SEQ ID NO: 572)
VL	VIWMTQSPSSLSASVGDRVTITCAASSLQSWYQQKPGKAPKLLIYEASTLESGVPSRFSGSGSGTEFTLT ISSLQPEDFATYYCQQSYSTPYTFGQGTKLEIK (SEQ ID NO: 573)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQVPGTAPKLLIYDNNKRPSGIPDRFSGSNSDT SATLGITGLQTGDEADYYCGTWDSSLSAWVFGGGTKLTVL (SEQ ID NO: 574)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSAGSVVFGGGTKLTVL (SEQ ID NO: 575)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCLVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 576)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 577)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 578)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 579)
Group J*	
HC	QVQLVQSGVEVKKPGASVKVSCKASGYTFTNYYMYWVRQAPGQGLEWMGGINPSNGGTNFNEKFKNRVTL TTDSSTTTAYMELKSLQFDDTAVYYCARRDYRFDMGFDYWGQGTTVTVSSASTKGPSVFPLAPCSRSTSE STAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPS NTKVDKRVESKYGPPCPPCPAPEFLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVD GVEVHNAKTKPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYT LPPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEG NVFSCSVMHEALHNHYTQKSLSLSLGK (SEQ ID NO: 580)

HC	QVQLVESGGGVVQPGRSLRLDCKASGITFSNSGMHWVRQAPGKGLEWVAVIWYDGSKRYYADSVKGRFTI SRDNSKNTLFLQMNSLRAEDTAVYYCATNDDYWGQGTLVTVSSASTKGPSVFPLAPCSRSTSESTAALGC LVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKR VESKYGPPCPPCPAPEFLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNA KTKPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEE MTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSV MHEALHNHYTQKSLSLSLGK (SEQ ID NO: 581)
LC	EIVLTQSPATLSLSPGERATLSCRASKGVSTSGYSYLHWYQQKPGQAPRLLIYLASYLESGVPARFSGSG SGTDFTLTISSLEPEDFAVYYCQHSRDLPLTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLL NNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVT KSFNRGEC (SEQ ID NO: 582)
LC	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRLLIYDASNRATGIPARFSGSGSGTD FTLTISSLEPEDFAVYYCQQSSNWPRTFGQGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFY PREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFN RGEC (SEQ ID NO: 583)
Group K	
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSDSWIHWVRQAPGKGLEWVAWISPYGGSTYYADSVKGRFTI SADTSKNTAYLQMNSLRAEDTAVYYCARRHWPGGFDYWGQGTLVTVSSASTK (SEQ ID NO: 735)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSDSWIHWVRQAPGKGLEWVAWISPYGGSTYYADSVKGRFTI SADTSKNTAYLQMNSLRAEDTAVYYCARRHWPGGFDYWGQGTLVTVSS (SEQ ID NO: 736)
HC	EVQLVESGGGLVQPGGSLRLSCAASGFTFSDSWIHWVRQAPGKGLEWVAWISPYGGSTYYADSVKGRFTI SADTSKNTAYLQMNSLRAEDTAVYYCARRHWPGGFDYWGQGTLVTVSSASTKGPSVFPLAPSSKSTSGGT AALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNT KVDKKVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV DGVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVY TLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQ GNVFSCSVMHEALHNHYTQKSLSLSPG (SEQ ID NO: 737)
VL	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYLYHPATFGQGTKVEIKR (SEQ ID NO: 268)
LC	DIQMTQSPSSLSASVGDRVTITCRASQDVSTAVAWYQQKPGKAPKLLIYSASFLYSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQYLYHPATFGQGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFY PREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFN RGEC (SEQ ID NO: 738)
Group L	
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSRFWMSWVRQAPGKGLEWVANINQDGTEKYYVDSVKGRFTI SRDNAKNSLYLQMNSLRAGDTAVYYCANTYYDFWSGHFDYWGQGTLVTVSS (SEQ ID NO: 739)
VH	QEHLVESGGGVVQPGRSLRLSCEASGFTFSNFGMHWVRQAPGKGLEWVAALWSDGSNKYYADSVKGRVTI SRDNSKNTLYLQMNSLRAEDTAVYYCARGRGAPGIPIFGYWGQGTLVTVSS (SEQ ID NO: 740)

VH	EVQLVESGGGLVKPGGSLRLSCAASGFTFSNAWMSWVRQAPGKGLEWVGRIKRKTDGGTTDYAAPVKGRF TISRDDSKNTLHLQMNSLKTEDTAVYYCTTDDIVVVPAVMREYYFGMDVWGQGTTVTVSS (SEQ ID NO: 741)
VH	QVQLVQSGAEVKKPGASVQVSCKASGYSFTGYYIHWVRQAPGQGLEWMGWINPNSGTKKYAHKFQGRVTM TRDTSIDTAYMILSSLISDDTAVYYCARDEDWNFGSWFDSWGQGTLVTVSS (SEQ ID NO: 742)
VH	QVHLVQSGAEVKKPGASVKVSCKASGYTFTGYYIHWVRQAPGHGLEWMGWLNPNTGTTKYIQNFQGRVTM TRDTSSSTAYMELTRLRSDDTAVYYCARDEDWNYGSWFDTWGQGTLVTVSS (SEQ ID NO: 743)
VH	EVQLVESGGGVVRPGGSLRLSCAASGFTFDDYGMTWVRQAPGRGLEWVSGIHWHGKRTGYADSVKGRFTI SRDNAKKSLYLQMNSLKGEDTALYHCVRGGMSTGDWFDPWGQGTLVIVSS (SEQ ID NO: 744)
VH	EVQLVESGGGVVRPGGSLRLSCAASGFTFDDYGMTWVRQVPGKGLEWVSGIHWSGRSTGYADSVKGRFTI SRDNAKNSLYLQMNSLRAEDTALYYCARGGMSTGDWFDPWGQGTLVTVSS (SEQ ID NO: 745)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTVGSNYMNWVRQAPGKGLEWVSVIYSGGSTYYADSVKGRFTIS RLTSKNTLYLQMSSLRPEDTAVYYCARGIRGLDVWGQGTTVTVSS (SEQ ID NO: 746)
VH	EERLVESGGDLVQPGGSLRLSCAASGITVGTNYMNWVRQAPGKGLEWVSVISSGGNTHYADSVKGRFIMS RQTSKNTLYLQMNSLETEDTAVYYCARGIRGLDVWGQGTMVTVSS (SEQ ID NO: 747)
VH	QVQLVQSGAEVKMPGSSVRVSCKASGGIFSSSTISWVRQAPGQGLEWMGEIIPVFGTVNYAQKFQDRVIF TADESTTTAYMELSSLKSGDTAVYFCARNWGLGSFYIWGQGTMVTVSS (SEQ ID NO: 748)
VH	EVQLVESGGDLVHPGRSLRLSCAASGFPFDEYAMHWVRQVPGKGLEWVSGISWSNNNIGYADSVKGRFTI SRDNAKNSLYLQMNSLRPEDTAFYYCAKSGIFDSWGQGTLVTVSS (SEQ ID NO: 749)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVTLISYEGRNKYYADSVKGRFTI SRDNSKNTLYLQMNSLRAEDTAVYYCAKDRTLYGMDVWGQGTTVTVSS (SEQ ID NO: 750)
VH	QVTLRESGPALVKTTQTLTLTCTFSGFSLSTNRMCVTWIRQPPGKALEWLARIDWDGVKYYNTSLKTRLT ISKDTSKNQVVLTMTNMDPVDTATFYCARSTSLTFYYFDYWGQGTLVTVSS (SEQ ID NO: 751)
VH	EVQLVESGGGLVQPGGSLRLSCAASEFTVGTNHMNWVRQAPGKGLEWVSVIYSGGNTFYADSVKGRFTIS RHTSKNTLYLQMNSLTAEDTAVYYCARGLGGMDVWGQGTTVTVSS (SEQ ID NO: 752)
VH	EVQLVESGGGLVQRGESLRLYCAASGFTFSKYWMNWVRQAPGKGLEWVANIKGDGSEKYYVDSVKGRFTI SRDNAKNSLYLQMNSLRAEDTAVYYCARDYWGSGYYFDFWGQGTLVTVSS (SEQ ID NO: 753)
VH	EVQLVESGGGLVQSGGSLRLSCAASGFTFSSYWMSWVRQAPGKGLEWVANIKQDGSEKYYVDSVKGRFTI SRDNAKNSLYLQMNSLRADDTAVYYCARDDIVVVPAPMGYYYYYFGMDVWGQGTTVTVSS (SEQ ID NO: 754)
VH	EVQLVESGGGLVQPGRSLRLSCAASGFTFDDFAMHWVRQAPGKGLEWVSGISWTGGNMDYANSVKGRFTI SREDAKNSLYLQMNSLRAADTALYYCVKDIRGIVATGGAFDIWGRGTMVTVSS (SEQ ID NO: 755)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTVGTNYMNWVRQAPGKGLEWISVIYSGGSTFYADSVKGRFTIS RQTSQNTLYLQMNSLRPEDTAVYYCARGIRGFDIWGQGTMVTVSS (SEQ ID NO: 756)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTISTNYMNWVRQAPGKGLEWVAVIYSSGSTYYIDSVKGRFTIS RLTSKNTVYLQMSSLNSEDTAVYYCARGIRGFDIWGQGTMVTVSS (SEQ ID NO: 757)
VH	EVQLVESGGGLVQPGRSLRLSCAASGFTIDDSAMHWVRQTPGKGLEWVSGISWKSGSIGYADSVRGRFTI SRDNAKNSLYLQMNSLRVEDTALYYCVKDIRGNWNYGGNWFDPWGQGTLVTVSS (SEQ ID NO: 758)

VH	EVQLVESGGGLVQPGGSLRLSCEASGFTVGVNHMNWVRQAPGKGLEWVSVIFSSGRTFYGDYVKGRLTIF RQTSQNTVYLQMNSLRSEDTAIYYCARGIGGLDIWGRGTMVTVSS (SEQ ID NO: 759)
VH	EVQLVESGGGLVQPGRSLRLSCAASGFTFDDYALHWVRQAPGKGLEWVSGISWTGGTIDYADSVKGRFTI SRDNAKNSLYLQMSSLRTEDTAIYYCTRDIRGNWKYGGWFDPWGQGTLVTVSS (SEQ ID NO: 760)
VH	QVQLVQSGTEVKKPGASVKVSCKASGYTFTAYYMHWVRQAPGQGLDWMGWISPNSGFTNYAQKFQGRVTM TRDTSINTFYMELSGLRSDDTAVYYCAREGSTHHNSFDPWGQGTLVTVSS (SEQ ID NO: 761)
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTVGTNFMNWVRQAPGKGLEWVSAIYSGGTANYADSVKGRFTIS RDTSRNTLYLQMNSLRTEDTAVYYCARGGGMDVWGQGTTVTVSS (SEQ ID NO: 762)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFNTYVLSWVRQAPGQGLEWMGEIIPILGAANYAQNFQGRVTF TTDESTNTAYMDLSSLRSEDTAVYYCARDRTSGGFDPWGQGTLVTVSS (SEQ ID NO: 763)
VH	QVQLVQSGAEVEKPGASVKVSCKASGYIFTHYGISWVRQAPGQGLEWVGWISPYNGYTDYAQKLQGRVTL TTDTSTTTAYMELRNLRSDDTAMYYCSRGRGPYWSFDLWGRGTLVTVSS (SEQ ID NO: 764)
VL	DIQMTQSPSTLSASVGDRVTITCRASQSISNWLAWYQQKPGKAPKLLIYKASSLESGVPSRFSGSGSGTE FTLTISSLQPDDFATYYCQQYHSYSYTFGQGTKEIK (SEQ ID NO: 765)
VL	DIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWYQQKPGKAPKRLIYTASSLQSGVPSRFSGSGSGTE FTLTISSLQPEDFATYYCLQHNSYPLTFGGGTKVAIK (SEQ ID NO: 766)
VL	DIQMTQSPSSLSASVGDRVTITCRTSQGIRNDLGWYQQKPGKAPKRLIYAASSLQSGVPSRFSGSGSGTE FTLTISSLQPEDFATYYCLQHNNYPYTFGQGTKLEIK (SEQ ID NO: 767)
VL	DIVMTQTPLSSPVTLGQPASISCRSSQTLVHGDGNTYLSWIQQRPGQPPRLLIYKVSNQFSGVPDRFSGS GAGTDFTLKISRVEAEDVGLYFCMQATHFPITFGQGTRLEIK (SEQ ID NO: 768)
VL	DIVMTQTPLSSPVTLGQPASISCRSSPSLVHSDGNTYLSWLQQRPGQPPRLLIYKISNRFSGVPDRFSGS GAGTDFTLKISRVEAEDVGVYYCMQATHFPITFGQGTRLEIR (SEQ ID NO: 769)
VL	DIQMTQSPSSLSASLGDRVTITCRASQSINSYLNWYQQKPGKAPKLLIYVASSLQSGVPSRFSGSGSGTE FTLTISNLQPEDFATYYCQQSYSTPPITFGQGTRLEIK (SEQ ID NO: 770)
VL	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYVASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYSTPPITFGQGTRLEIK (SEQ ID NO: 771)
VL	DIQMTQSPSSLSASVGDRVTITCRASQTINIYLNWYQQKPGRAPRLLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCHQSYSTPPITFGQGTRLEIK (SEQ ID NO: 772)
VL	DIQMTQSPSSLSASVGDRVTITCRASQSMSSYLNWYQQKPGRAPKLLIFAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYSTPPITFGQGTRLEIK (SEQ ID NO: 773)
VL	EIVLTQSPGTLSLSPGERATLSCRASQSFNFNYLAWYQQKPGQAPRLLIYGASSRATGIPDRFSGSGSGT DFTLTINRLEPEDFGVFYCQQYESAPWTFGQGTKVEIK (SEQ ID NO: 774)
VL	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKLLIYAASSLQSGVPSRFSGGGSGTDFTL TISSLRPEDFATYYCQQSYCTPPITFGQGTRLEIK (SEQ ID NO: 775)
VL	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYSTPPITFGQGTRLEIK (SEQ ID NO: 776)
VL	DRVTITCRASQVISNYLAWYQQKPGKVPRLLIYAASTLQSGVPSRFSGSGSGTDFTLTISSLQPEDVATY YCQKYNSAPRTFGQGTKVEIK (SEQ ID NO: 777)
VL	DIQMTQSPSSLSASVGDRVTITCRASQNINNYLNWYQQKPGKAPKLLIYAASSFQNAVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYNTPLTFGGGTKVEIK (SEQ ID NO: 778)

VL	DIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWYQQKPGKAPKRLIYAASSLQSGVPSRFSGSGSGTE FTLTISSLQPEDFATYYCLQHNSYPYTFGQGTKLEIK (SEQ ID NO: 779)
VL	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTD FTLTISSLQPEDFATYYCQQSYSTPPITFGQGTRLEIK (SEQ ID NO: 780)
Group M	
VH	QSLEESGGRLVKPDETLTITCTVSGIDLSSNGLTWVRQAPGEGLEWIGTINKDASAYYASWAKGRLTISK PSSTKVDLKITSPTTEDTATYFCGRIAFKTGTSIWGPGTLVTVSS (SEQ ID NO: 1108)
VL	AIVMTQTPSPVSAAVGGTVTINCQASESVYSNNYLSWFQQKPGQPPKLLIYLASTLASGVPSRFKGSGSG TQFTLTISGVQCDDAATYYCIGGKSSSTDGNAFGGGTEVVVR (SEQ ID NO: 1109)
Group N	
VH	QMQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARGNIVATITPLDYWGQGTLVTVSS (SEQ ID NO: 1110)
VH	QPVLTQPPSVSAAPGQKVTISCSGSSSNIANNYVSWYQQLPGTAPKLLIFANNKRPSGIPDRFSGSKSGT SAALDITGLQTGDEADYYCGTWDSDLRAGVFGGGTKLTVL (SEQ ID NO: 1111)
VH	EVQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADKSTSTAYMELSSLRSEDTAVYYCAREGTIYDSSGYSFDYWGQGTLVTVSS (SEQ ID NO: 1112)
VH	QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1113)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1114)
VH	QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1115)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1116)
VH	EVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1117)
VH	QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1118)
VH	QVQLVQSGAEVKKPGSSVKVSCKASGGTFSRYGVHWVRQAPGQGLEWMGRLIPIVSMTNYAQKFQDRVSI TTDKSTGTAYMELRSLTSEDTALYYCASVGQQLPWVFFAWGQGTLVTVSS (SEQ ID NO: 1119)
VH	QMQLVQSGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1120)
VH	QVQLVQSGGGVVQPGRSLRLSCAASGFTFSSYAMHWVRQAPGKGLEWVAVISFDGSNKYYADSVRGRFTI SRDNSKNTLYLQMNSLRTEDTAVYYCARGWLDRDIDYWGQGTLVTVSS (SEQ ID NO: 1121)
VH	QMQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAYSWVRQAPGQGLEWMGGIIPSFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARGPIVATITPLDYWGQGTLVTVSS (SEQ ID NO: 1122)
VH	QMQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAYSWVRQAPGQGLEWMGGIIPIFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARGPIVATITPLDYWGQGTLVTVSS (SEQ ID NO: 1123)

VH	QMQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAYSWVRQAPGQGLEWMGGIIPSFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARGPIVATITPLDYWGQGTLVTVSS (SEQ ID NO: 1124)
VH	QMQLVQSGAEVKKPGSSVKVSCKASGGTFSSYAISWVRQAPGQGLEWMGGIIPAFGTANYAQKFQGRVTI TADESTSTAYMELSSLRSEDTAVYYCARGPIVATITPLDYWGQGTLVTVSS (SEQ ID NO: 1125)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 1126)
VL	AIRMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYTTSSLKSGVPSRFSGSGSGTD FTLTISRLQPEDFATYYCQQSYSSTWTFGRGTKVEIK (SEQ ID NO: 1127)
VL	QSVLTQPPSVSAAPGQKVTISCSGNNSNIANNYVSWYQQLPGTAPKLLIYDNNYRPSGIPDRFSGSKSGT SATLDITGLQTGDEADYYCGVWDGSLTTGVFGGGTKLTVL (SEQ ID NO: 1128)
VL	LPVLTQPASVSGSPGQSITISCTGTTSDIGGYDYVSWYQQHPGKAPKLMIYDVSKRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSSTHVFGTGTKLTVL (SEQ ID NO: 1129)
VL	QSALTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYRSSTLGPVFGGGTKLTVL (SEQ ID NO: 1130)
VL	QAGLTQPPSVSEAPRQRVTISCSGSSSNIGNNAVNWYQQLPGKAPKLLIYYDDLLPSGVSDRFSGSKSGT SASLAISGLQSEDEADYYCAAWDDSLNGYVFGTGTKLTVL (SEQ ID NO: 1131)
VL	QSALTQPRSVSGSPGQSVTISCTGTSSDVGGYNYVSWYQQHPGKAPKLMIYDVSKRPSGVPDRFSGSKSG NTASLTISGLQAEDEADYYCSSYTSSTTHVFGTGTKVTVL (SEQ ID NO: 1132)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSVWVFGGGTQLTVL (SEQ ID NO: 1133)
VL	QSVLTQPASVSGSPGQSITISCTGTSSDVGGYNYVSWYQQHPGRAPRLMIYDVSNRPSGVSNRFSGSKSG NTASLTISGLQAEDEGDYYCSSYTSGGTLGPVFGGGTKLTVL (SEQ ID NO: 1134)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSAVVFGGGTKLTVL (SEQ ID NO: 1135)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQVPGTAPKLLIYDNNKRPSGIPDRFSGSNSDT SATLGITGLQTGDEADYYCGTWDSSLSAWVFGGGTKLTVL (SEQ ID NO: 1136)
VL	QSVVTQPPSVSAAPGQKVTISCSGSSSNIGNNYVSWYQQLPGTAPKLLIYDNNKRPSGIPDRFSGSKSGT SATLGITGLQTGDEADYYCGTWDSSLSAGSVVFGGGTKLTVL (SEQ ID NO: 1137)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCLVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 1138)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 1139)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 1140)
VL	SYELMQPPSVSVAPGKTATIACGGENIGRKTVHWYQQKPGQAPVLVIYYDSDRPSGIPERFSGSNSGNTA TLTISRVEAGDEADYYCQVWDSSSDHRIFGGGTKLTVL (SEQ ID NO: 1141)
Group O	
VH	QVQLVQSGSEVKKSGSSVKVSCKTSGGTFSITNYAINWVRQAPGQGLEWMGGILPIFGAAKYAQKFQDRV TITADESTNTAYLELSSLTSEDTAMYYCARGKRWLQSDLQYWGQGTLVTVSS (SEQ ID NO: 1142)

VL	QPVLTQPASVSGSPGQSITISCTGSSSDVGSYDLVSWYQQSPGKVPKLLIYEGVKRPSGVSNRFSGSKSG NTASLTISGLQAEDEADYYCSSYAGTRNFVFGGGTQLTVL (SEQ ID NO: 1143)

Note that the sequences provided for Group J are heavy chain and light chain amino acid sequences; the sequences provided for Group K include variable heavy chain, variable light chain, heavy chain, and light chain amino acid sequences; all other sequences presented in Table 15 are variable heavy chain and variable light chain sequences

[000300] In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain that comprises or is derived from a heavy chain amino acid sequence shown in US Patent Nos. 7,943,743; 8,779,108; 8,217,149; 8,460,927; 7,794,710; 8,741,295; and 8,981,063; in US Patent Application Publication Nos. 2014356353; 20130323249; 2014341917; 20130309250; 20110280877; and 20090317368 (now issued as US Patent No. 8,981,063 listed above); and in PCT Publication Nos. WO2014/100483; WO2012/145493; WO2014/100439; WO2014/195852; WO2014/100079; WO2013/173223; and WO2014/55897, the contents of each of which are hereby incorporated by reference in their entirety. In some embodiments, the activatable anti-PDL1 antibody includes a light chain that comprises or is derived from a light chain amino acid sequence shown in US Patent Nos. 7,943,743; 8,779,108; 8,217,149; 8,460,927; 7,794,710; 8,741,295; and 8,981,063; in US Patent Application Publication Nos. 2014356353; 20130323249; 2014341917; 20130309250; 20110280877; and 20090317368 (now issued as US Patent No. 8,981,063); and in PCT Publication Nos. WO2014/100483; WO2012/145493; WO2014/100439; WO2014/195852; WO2014/100079; WO2013/173223; and WO2014/55897, the contents of each of which are hereby incorporated by reference in their entirety. In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain and a light chain that comprise or are derived from a heavy chain amino acid sequence and a light chain amino acid sequence shown in US Patent Nos. 7,943,743; 8,779,108; 8,217,149; 8,460,927; 7,794,710; 8,741,295; and 8,981,063; in US Patent Application Publication Nos. 2014356353; 20130323249; 2014341917; 20130309250; 20110280877; and 20090317368 (now issued as US Patent No. 8,981,063); and in PCT Publication Nos. WO2014/100483; WO2012/145493; WO2014/100439; WO2014/195852; WO2014/100079; WO2013/173223; and WO2014/55897, the contents of each of which are hereby incorporated by reference in their entirety.

[000301] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that includes at least one CDR sequence selected from the CDR sequences (VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, VL CDR3) from the CDR sequences recited in US Patent No. 7,943,743. In some embodiments, the activatable antibody includes an anti-PDL1 antibody that includes at least one CDR, at least two, at least three, at least four, at least five, and/or six CDR sequences selected from the following sequences in US Patent No. 7,943,743: SEQ ID NO: 21, SEQ ID NO: 31, SEQ ID NO: 41, SEQ ID NO: 51, SEQ ID NO: 61, and SEQ ID NO: 71. In some embodiments, the activatable antibody includes an anti-PDL1 antibody that includes at least one CDR, at least two, at least three, at least four, at least five, and/or six CDR sequences selected from SEQ ID NO: 22, SEQ ID NO: 32, SEQ ID NO: 42, SEQ ID NO: 52, SEQ ID NO: 62, and SEQ ID NO: 72. In some embodiments, the activatable antibody includes an anti-PDL1 antibody that includes at least one CDR, at least two, at least three, at least four, at least five, and/or six CDR sequences selected from SEQ ID NO: 23, SEQ ID NO: 33, SEQ ID NO: 43, SEQ ID NO: 53, SEQ ID NO: 63, and SEQ ID NO: 73.

[000302] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that includes at least one CDR, at least two, at least three, at least four, at least five, and/or six CDR sequences selected from the following sequences in US Patent No. 7,943,743: a VH CDR1 sequence comprising SEQ ID NO: 21, SEQ ID NO: 22, or SEQ ID NO: 23; a VH CDR2 sequence comprising SEQ ID NO: 31, SEQ ID NO: 32, or SEQ ID NO: 33; a VH CDR3 sequence comprising SEQ ID NO: 41, SEQ ID NO: 42, or SEQ ID NO: 43; a VL CDR1 sequence comprising SEQ ID NO: 51, SEQ ID NO: 52, or SEQ ID NO: 53; a VL CDR2 sequence comprising SEQ ID NO: 61, SEQ ID NO: 62, or SEQ ID NO: 63; and a VL CDR3 sequence comprising SEQ ID NO: 71, SEQ ID NO: 72, or SEQ ID NO: 73.

[000303] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a polypeptide that comprises or is derived from SEQ ID NO: 1 or SEQ ID NO: 3 of US Patent No. 8,460,927.

[000304] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a human PDL1 polypeptide that comprises or is derived from SEQ ID NO: 1 of US Patent No. 8,460,927:

MRIFAVFIFMTYWHLLNAFTVTVPKDLYVVEYGSNMTIECKFPVEKQLDLAALIVYWEMEDKNIIQFVHGEEDL
KVQHSSYRQRARLLKDQLSLGNAALQITDVKLQDAGVYRCMISYGGADYKRITVKVNAPYNKINQRILVVDPVT

SEHELTCQAEGYPKAEVIWTSSDHQVLSGKTTTTNSKREEKLFNVTSTLRINTTTNEIFYCTFRRLDPEENHTA
ELVIPELPLAHPPNERTHLVILGAILLCLGVALTFIFRLRKGRMMDVKKCGIQDTNSKKQSDTHLEET (SEQ
ID NO: 585)

[000305] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a murine PDL1 polypeptide that comprises or is derived from SEQ ID NO: 3 of US Patent No. 8,460,927:

MRIFAGIIFTACCHLLRAFTITAPKDLYVVEYGSNVTMECRFPVERELDLLALVVYWEKEDEQVIQFVAGEEDL
KPQHSNFRGRASLPKDQLLKGNAALQITDVKLQDAGVYCCIISYGGADYKRITLKVNAPYRKINQRISVDPATS
EHELICQAEGYPEAEVIWTNSDHQPVSGKRSVTTSRTEGMLLNVTSSLRVNATANDVFYCTFWRSQPGQNHTAE
LIIPELPATHPPQNRTHWVLLGSILLFLIVVSTVLLFLRKQVRMLDVEKCGVEDTSSKNRNDTQFEET (SEQ
ID NO: 586)

[000306] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a polypeptide that comprises or is derived from SEQ ID NO: 36 or SEQ ID NO: 38 of PCT Publication No. WO 2014/10079.

[000307] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a human PDL1 polypeptide that comprises or is derived from SEQ ID NO: 36 of PCT Publication No. WO 2014/10079.

MRIFAVFIFMTYWHLLNAFTVTVPKDLYVVEYGSNMTIECKFPVEKQLDLAALIVYWEMEDKNIIQFVHGEEDL
KVQHSSYRQRARLLKDQLSLGNAALQITDVKLQDAGVYRCMISYGGADYKRITVKVNAPYNKINQRILVVDPVT
SEHELTCQAEGYPKAEVIWTSSDHQVLSGKTTTTNSKREEKLFNVTSTLRINTTTNEIFYCTFRRLDPEENHTA
ELVIPELPLAHPPNERTHLVILGAILLCLGVALTFIFRLRKGRMMDVKCGIQDTNSKQSDTHLEET (SEQ ID
NO: 587)

[000308] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that binds a human PDL1 extracellular domain polypeptide that comprises or is derived from SEQ ID NO: 38 of PCT Publication No. WO 2014/10079.

FTVTVPKDLYVVEYGSNMTIECKFPVEKQLDLAALIVYWEMEDKNIIQFVHGEEDLKVQHSSYRQRARLLKDQL
SLGNAALQITDVKLQDAGVYRCMISYGGADYKRITVKVNAPYNKINQRILVVDPVTSEHELTCQAEGYPKAEVI
WTSSDHQVLSGKTTTTNSKREEKLFNVTSTLRINTTTNEIFYCTFRRLDPEENHTAELVIPELPLAHPPNERT
(SEQ ID NO: 588)

[000309] In some embodiments, the activatable antibody includes an anti-PDL1 antibody that is or is derived from BMS-936559 (MDX-1 105). In some embodiments, the activatable antibody includes an anti-PDL1 antibody that is or is derived from MPDL3280A

(RG7446). In some embodiments, the activatable antibody includes an anti-PDL1 antibody that is or is derived from MEDI4736. In some embodiments, the activatable antibody includes an anti-PDL1 antibody that is or is derived from AMP224. In some embodiments, the activatable antibody includes an anti-PDL1 antibody that is or is derived from MSB0010718C.

[000310] In some embodiments, the activatable anti-PDL1 antibody comprises or is derived from an antibody that is manufactured, secreted or otherwise produced by a hybridoma, such as, for example, the hybridoma(s) disclosed in US Patent No. 8,779,108 and deposited at the National Collections of Industrial and Marine Bacteria (NCIMB) under deposit number 41598, as well as the hybridoma(s) disclosed in US Patent No. 8,741,295 and deposited at the Collection Nationale De Cultures De Microorganismes (CNCM) under deposit number I-4080, I-4081, and/or I-4122.

[000311] In some embodiments, the activatable anti-PDL1 antibody includes a CDR sequence shown in Table 16, a combination of VL CDR sequences (VL CDR1, VL CDR2, VL CDR3) selected from the group consisting of those combinations shown in a single row Table 16, a combination of VH CDR sequences (VH CDR1, VH CDR2, VH CDR3) selected from the group consisting of those combinations shown in Table 16, or a combination of VL CDR and VH CDR sequences (VL CDR1, VL CDR2, VL CDR3, VH CDR1, VH CDR2, VH CDR3) selected the group consisting of those combinations shown in Table 16.

Table 16. CDR Sequences for Antibodies and Activatable Antibodies that Bind PDL1

	VL			VH		
AB Name	CDR1 (SEQ ID NO)	CDR2 (SEQ ID NO)	CDR3 (SEQ ID NO)	CDR1 (SEQ ID NO)	CDR2 (SEQ ID NO)	CDR3 (SEQ ID NO)
C8	RASQSISSYLN (209)	KASRLQS (210)	RALKPVT (211)	SYAMS (212)	DITASGQRTTYADS (213)	SKAIFDY (214)
C12	RASQSISSYLN (209)	AASSLQS (215)	SYSTPNT (216)	SYAMS (212)	SINKDGHYTSYADS (217)	NLDEFDY (218)
C16	RASQSISSYLN (209)	SASQLQS (219)	ANSRPST (220)	SYAMS (212)	SIMATGAGTLYADS (221)	DGAGFDY (222)
C20	RASQSISSYLN (209)	NASSLQS (223)	YPYGPG (224)	SYAMS (212)	TITSSGAATYYADS (225)	NYTGFDY (226)

C60	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SIYSTGGATAYADS (229)	SSAGFDY (230)
C1	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	SSAGQSRP GFDY (232)
D1	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	SSAGQSWP GFDY (233)
G7	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	SSAGQSFP GFDY (234)
H9	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	WSAAFDY (235)
B10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	WSAGYDY (236)
E10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIYSTGGATAYADS (231)	WSKGFDY (237)
A05	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWKQGIVTVYDS (238)	SSAGFDY (230)
C05	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRNGIVTVYDS (239)	SSAGFDY (230)
C10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SDIWKQGMVTVYDS (240)	SSAGFDY (230)
D08	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRQGLATAYDS (241)	SSAGFDY (230)
G09	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SEIVATGILTSYDS (242)	SSAGFDY (230)
G10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIGRQGLITVYDS (243)	SSAGFDY (230)
G12	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWYQGLVTVYDS (244)	SSAGFDY (230)
E11	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SDIWKQGFATADS (245)	SSAGFDY (230)
D01	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWKQGIVTVYDS (238)	SSAGFDY (230)
H06	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRQGLATAYDS (241)	SSAGFDY (230)
C5H9	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRNGIVTVYADS (246)	WSAAFDY (235)

C5B10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRNGIVTVYADS (246)	WSAGYDY (236)
C5E10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWRNGIVTVYADS (246)	WSKGFDY (237)
G12H9	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWYQGLVTVYADS (247)	WSAAFDY (235)
G12B10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWYQGLVTVYADS (247)	WSAGYDY (236)
G12E10	RASQSISSYLN (209)	YASTLQS (227)	DNGYPST (228)	SYAMS (212)	SSIWYQGLVTVYADS (247)	WSKGFDY (237)
C5H9 v2	RASQSISSYLN (209)	AASSLQS (215)	DNGYPST (228)	SYAMS (212)	SSIWRNGIVTVYADS (246)	WSAAFDY (235)

[000312] In some embodiments, the activatable anti-PDL1 antibody includes a CDR sequence shown in Table 17, a combination of VL CDR sequences selected from the group consisting of those combinations shown in Table 17, and/or a combination of VH CDR sequences selected from the group consisting of those combinations shown in Table 17.

[000313] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group A in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group A in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group A in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group A in Table 17.

[000314] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group B in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group B in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group B in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group B in Table 17.

[000315] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group C in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group C in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group C in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group C in Table 17.

[000316] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group D in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group D in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group D in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group D in Table 17.

[000317] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group E in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group E in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group E in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group E in Table 17.

[000318] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group F in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group F in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences

selected from the group consisting of the combinations shown in Group F in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group F in Table 17.

[000319] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group G in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group G in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group G in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group G in Table 17.

[000320] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group H in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group H in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group H in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group H in Table 17.

[000321] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group I in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group I in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group I in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group I in Table 17.

[000322] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group J in Table 17. In some embodiments, the activatable anti-

PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group J in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group J in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group J in Table 17.

[000323] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group K in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group K in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group K in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group K in Table 17.

[000324] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group L in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group L in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group L in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group L in Table 17.

[000325] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group M in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group M in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group M in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group M in Table 17.

[000326] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group N in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group N in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group N in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group N in Table 17.

[000327] In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group O in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group O in Table 17. In some embodiments, the activatable anti-PDL1 antibody includes a combination of heavy chain CDR sequences selected from the group consisting of the combinations shown in Group O in Table 17, and a combination of light chain CDR sequences selected from the group consisting of the combinations shown in Group O in Table 17.

[000328] In some embodiments, the activatable anti-PDL1 antibody includes a heavy chain CDR1 sequence selected from the group consisting of the sequences shown in Group P in Table 17.

Table 17. Additional CDR Sequences for Antibodies and Activatable Antibodies that Bind PDL1

Group A					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
RASQSVSSYLV (304)	DASNRAT (293)	QQRSNWPRT (278)	DYGFS (296)	WITAYNGNTNYAQKLQG (284)	DYFYGMDV (269)
RASQSVSSYLA (305)	AASSLQS (215)	QQRSNWPT (279)	TYAIS (297)	GIIPIFGKAHYAQKFQG (285)	KFHFVSGSPFG MDV (270)

RASQGISSWLA (306)	GASSRAT (294)	QQYNSYPYT (280)	SYDVH (298)	WLHADTGITKFSQKFQG (286)	ERIQLWFDY (271)
RASQSVSSSYLA (307)	DASSLES (295)	QQYGSSPWT (281)	TYAIN (299)	GIIPIFGTANHAQKFQG (287)	DQGIAAALFDY (272)
RASQGISSALA (308)	KASTLES (447)	QQYGSSP (282)	DYVVH (300)	GISGNSGNIGYADSVKG (288)	PFDY (273)
		QQFNSYPFT (283)	SYAIS (301)	GIIPIFGRAHYAQKFQG (289)	KYDYVSGSPFG MDV (274)
		QQSYSTPWT (448)	SYAIN (302)	GIIPIFGSANYAQKFQD (290)	DSSGWSRYYMD V (275)
			DYGMH (303)	GIIPLFGIAHYAQKFQG (291)	KYSYVSGSPFG MDV (276)
				GISWNRGRIEYADSVKG (292)	GRFRYFDWFLD Y (277)
					DYFWSGFSAFD I (446)

Group B					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
SGDALPQKYVF (312)	EDSKRPS (313)	YSTDRSGNHRV (314)	TYSMN (309)	SISSSGDYIYYADSVK (310)	DLVTSMVAFDY (311)
RASQRVSSSYLA (318)	DASSRAT (319)	QQYGSLPWT (320)	RYWMS (315)	NIKQDGSEKYYVDSVKG (316)	EGGWFGELAFD Y (317)
RASQSVSSNYLA (324)	GTSSRAT (325)	QQYGSSIFT (326)	SYWMS (321)	NIKQDGGEQYYVDSVK (322)	DWNYGYYDMDV (323)

Group C					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)

RASQ(D/V)(V/I)(S/N)T(A/F)(V/L)A (327)	SAS(F/T)L(Y/A)S (328)	QQ(Y/G/F/S)(L/Y/F/W)(Y/N/A/T/G/F/I)(H/V/P/T/I)P(A/W/R/P/T)T (329)	GFTFS(D/G)SWIH (330)	AWI(S/L)PYGGS(T/S)YYADSVKG (331)	RHWPGGFDY (332)
RASQDVSTAVA (333)	SASFLYS (334)	QQYLYHPAT (335)	GFTFSDSWIH (336)	AWISPYGGSTYYADSVKG (337)	

Group D					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
KSSQSLL(H/N)(S/T)(R/S)TRKNYLA (584)	WASTRES (589)	(Q/K)QSYDVVT (590)	SYW(I/M)H (591)	YINPSS(D/G)Y(H/N)EY(S/N)(E/Q)KF(I/M)D (592)	SGWL(I/V)HGDYYFD(F/Y) (593)
KSSQSLLNSRTRKNYLA (594)		QQSYDVVT (595)	SYWMH (596)	YINPSSDYNEYSEKFMD (597)	SGWLVHGDYYFDY (598)
KSSQSLLHTSTRKNYLA (599)		KQSYDVVT (600)	GYIFTSYWMH (601)	YINPSSGYHEYNQKFID (602)	SGWLIHGDYYFDF (603)
			SYWIH (604)		
			GTTFTSYWIH (605)		

Group E					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)

TGT(N/S)(T/R/S)DVG(A/G)YNYVS (606)	(E/D)V(I/N/D)(D/H/N)RPS (607)	SS(F/Y)T(N/S)(R/T/S)(G/S)(I/T)RV (608)	(K/R/T/Q/G/A/W/M/I/S)Y(V/R/K/L/M/I)M(H/T/N/Q/A/V/Y/W/F/M) (609)	SIYPSGG(F/I)TFYAD(S/T)VKG (610)	IKLGTVTTV(E/D)Y (611)
TGTSSDVGGYNYVS (612)	DVSNRPS (613)	SSYTSSSTRV (614)	SYIMM (615)	SIYPSGGITFYADTVKG (617)	IKLGTVTTVDY (618)

Group F					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
			MYMMM (619)	SIYPSGGITFYADSVKG (620)	TGTSSDVGAYNYVS (621)

Group G					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
(R/S/K)(A/S)S(R/N/D/Q/E/H/K/M/S)(SLLYSS or Absent)(N/D or Absent)(A/Q/E/L/K/M/P/S/T/Y/V)X(R/N/S/T)(A/R/N/C/Q/E/H/I/L/K/M/F/S/T/Y/V)(I/L/M/V)(A/R/N	X(A/C/G/S/T/V)(A/C/H/I/L/M/F/S/T/Y/V)(R/N/D/Q/E/K/S/T)(A/R/N/D/Q/E/G/H/K/M/F/P/S/T/Y)(A/N/S/T) (623)	(R/N/Q/E/H)QX(A/R/N/C/Q/E/H/I/L/K/M/F/S/T/Y/V)(N/G/S)(A/R/N/D/C/Q/E/G/H/I/L/K/M/F/R/S/T/W/Y/V)P(A/R/N/D/Q/E/G/H/K/M/P/S/T/Y) T (624)	G(Y/F)(T/S)(I/L/M/F)(A/R/N/D/C/Q/E/H/I/L/K/M/P/S/T/W/Y/V)(N/D/Q/E/K/P/S/T)(A/R/N/D/C/Q/E/G/H/I/L/K/M/F/P/S/T/Y/V)(A/R/N/D/C/Q/E/G/H/I/L/K/M/	X(I/L/M/F/V)X(P or Absent)(A/R/N/Q/E/H/K/M/S/T/Y/V)(A/R/N/D/C/Q/E/G/H/K/M/F/P/S/T/Y/V)(N/G/S)(N/G/S)T(A/R/N/Q/E/H/K/M/S/T/Y)(A/R/N/C/Q/E/H/I/L/K/M/F/S/T/W/Y/V)N(A/D/Q/E/K/P/S/T)(A/R/N/D/C/Q/E/G/H/I/L/K/M/F/P/S/T/Y/V)(I/L/M/F)K(A/G/S (626)	(A/R/N/Q/E/H/K/M/S/T/Y)(A/R/N/D/C/Q/E/G/H/K/M/F/P/S/T/Y/V)(Q/G/H/T/W)XXXX(F/Y)(AI or Absent) (627)

/Q/E/H/I/K/M/F/S/T/Y) (622)			F/P/S/T/Y/V)(A/R/C/Q/E/H/I/L/K/M/F/S/T/W/Y/V)N (625)		
RASSSVSYIY (628)	ATFNLAS (629)	HQRSSYPWT (630)	GYTFPDYYMN (631)	DIDPNYGGTTYNQKFKG (632)	GAL (633)
SASSSIRYMH (634)	DTSKLTS (635)	QQDSSYPLT (636)	GYTFTSYDIN (637)	WIFPRDNNTKYNENFKG (638)	ENWVGDF (639)
KASQDVGTAVA (640)	WASTRHT (641)	QQYYGYPLT (642)	GYSITSDYWN (643)	YISYTGSTYYNPSLKS (644)	YGGWLSPF (645)
KSSQSLLYSSNQKNSL (646)	WASTRES (589)		GYSIISDYWN (647)		RGGWLLPF (648)
			GFSLTTYSIN (649)	VMWAGGGTNSNSVLKS (650)	YYGNSPYYAI (651)

Group H					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
TRSSGSIGSNYVQ (652)	EDNQRPS (653)	QSYDSSTWV (654)	SYAIS (301)	WISPIGGSTNYAQKVQG (655)	GLXXXXXXXXXXXXXXXDV (656)
TRSSGNIASNYVQ (657)	GKNNRPS (658)	QSYDSSNLWV (659)	SYGIS (660)	WISAYNGNTNYAQKLED (661)	ALPSGTILVGGWFDP (662)
QGDSLRSYYAS (663)	SDRDRPS (664)	NSRDSSGNHYV (665)	SYALS (666)	AISGGGGSTYYADSVKD (667)	DVFPETFSMNYGMDV (668)
GGSDIGRKSVH (669)	DVSNRPS (613)	QVWDNNSDHYV (670)	DYAMH (671)	LISGDGGSTYYADSVKD (672)	VLLPCSSTSCYGSVGAFDI (673)
TGTSSDVGGYNYVS (612)	GASSRAT (294)	SSYTSSTLP (674)	NYDMS (675)	RVNWNGGSTTYADAVKD (676)	EFVGAYDL (677)
RASQSIGNSLA (678)	AASTLQS (679)	QQHTIPTFS (680)	GLYIH (681)	WIIPIFGTANYAQKFED (682)	GLRWGIWGWFDP (683)
RASQGIGSYLA (684)	QDIKRPS (685)	QQLNNYPIT (686)	DNAIS (687)	WIIPIFGKPNYAQKFED (688)	TMVRGFLGVMDV (689)

SGDKLGNKYAY (690)	EDYRRPS (691)	QTWDNSVV (692)	SYAMS (212)	AISGSGGSTYYADS VKD (693)	DQFVTIFGVPR YGMDV (694)
TRSSGSIDSNY VQ (695)	DDSDRPS (696)	QSYDSNNRHVI (697)	TYALN (698)	RIVPLIGLVNYAHN FED (699)	GRQMFGAGIDF (700)
TRSSGNIGTNY VQ (701)	EDNKRPS (702)	QSYHSSGWE (703)	SHGIT (704)	WISAHNGHASNAQK VED (705)	EVYGGNSDY (706)
GGNNIGSKGVH (707)	YKSDSNKQ QAS (708)	QVWDSSSDHWV (709)	RHGMH (710)	VISHDGSVKYYADS MKD (711)	VHAALYYGMDV (712)
TRSSGSIASNY VQ (713)		QSYDSTTPSV (714)		WTSPHNGLTAFAQI LED (715)	GLSYQVSGWFD P (716)
TRSSGSIASHY VQ (717)		QSYDGITVI (718)		RIIPILGIANYAQK FED (719)	VHPVFSYALDV (720)
TLRSGLNVGSY RIY (721)		QSYDSSNRWV (722)	TYAFS (723)	WISAYNGNTNYAQK VED (724)	DGYGSDPVL (725)
		MIWYSSAVV (726)	NYGIS (727)		GDFRKPFDY (728)

Group I					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
RATESVEYYGT SLVQ (729)	AASSVDS (730)	QQSRRVPYT (731)	SYVMH (732)	YVNPFNDGTKYNEMFKG (733)	QAWGYP (734)

Group J					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
RASQDVSTAVA (333)	SASFLYS (334)	QQYLYHPAT (335)	GFTFSDSWIH (336)	AWISPYGGSTYYADSVKG (337)	RHWPGGF DY (332)

Group K					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
QSISNW (781)	KAS (782)	QQYHSYSYT (783)	GFTFSRFW (784)	INQDGTEK (785)	ANTYYDFWSGH FDY (786)
QGIRND (787)	TAS (788)	LQHNSYPLT (789)	GFTFSNFG (790)	LWSDGSNK (791)	ARGRGAPGIPI FGY (792)
QGIRND (787)	AAS (793)	LQHNNYPYT (794)	GFTFSNAW (795)	IKRKTDGGTT (796)	TTDDIVVVPAV MREYYFGMDV (797)
QTLVHGDGNTY (798)	KVS (799)	MQATHFPIT (800)	GYSFTGYY (801)	INPNSGTK (802)	ARDEDWNFGSW FDS (803)
PSLVHSDGNTY (804)	KIS (805)	MQATHFPIT (800)	GYTFTGYY (806)	LNPNTGTT (807)	ARDEDWNYGSW FDT (808)
QSINSY (809)	VAS (810)	QQSYSTPPIT (811)	GFTFDDYG (812)	IHWHGKRT (813)	VRGGMSTGDWF DP (814)
QSISSY (815)	VAS (810)	QQSYSTPPIT (811)	GFTFDDYG (812)	IHWSGRST (816)	ARGGMSTGDWF DP (817)
QTINIY (818)	AAS (793)	HQSYSTPPIT (819)	GFTVGSNY (820)	IYSGGST (821)	ARGIRGLDV (822)
QSMSSY (1011)	AAS (793)	QQSYSTPPIT (811)	GITVGTNY (1012)	ISSGGNT (1013)	ARGIRGLDV (822)
QSFNFNY (823)	GAS (824)	QQYESAPWT (825)	GGIFSSST (826)	IIPVFGTV (827)	ARNWGLGSFYI (828)
QSISSY (815)	AAS (793)	QQSYCTPPIT (829)	GFPFDEYA (830)	ISWSNNNI (831)	AKSGIFDS (832)
QSISSY (815)	AAS (793)	QQSYSTPPIT (811)	GFTFSSYG (833)	ISYEGRNK (834)	AKDRTLYGMDV (835)
QVISNY (836)	AAS (793)	QKYNSAPRT (837)	GFSLSTNRMC (838)	IDWDGVK (839)	ARSTSLTFYYF DY (840)
QNINNY (841)	AAS (793)	QQSYNTPLT (842)	EFTVGTNH (843)	IYSGGNT (844)	ARGLGGMDV (845)
QTISTY (846)	AAS (793)	LQHNSYPYT (847)	GFTFSKYW (848)	IKGDGSEK (849)	ARDYWGSGYYF DF (850)

QSISSY (815)	VVS (851)	QQSYSTPFT (852)	GFTFSSYW (853)	IKQDGSEK (854)	ARDDIVVVPAP MGYYYYYFGMD V (855)
	AAS (793)	QQSYSTPPIT (811)	GFTFDDFA (856)	ISWTGGNM (857)	VKDIRGIVATG GAFDI (858)
			GFTVGTNY (859)	IYSGGST (821)	ARGIRGFDI (860)
			GFTISTNY (861)	IYSSGST (862)	ARGIRGFDI (860)
			GFTIDDSA (863)	ISWKSGSI (864)	VKDIRGNWNYG GNWFDP (865)
			GFTVGVNH (866)	IFSSGRT (867)	ARGIGGLDI (868)
			GFTFDDYA (869)	ISWTGGTI (870)	TRDIRGNWKYG GWFDP (871)
			GYTFTAYY (872)	ISPNSGFT (873)	AREGSTHHNSF DP (874)
			GFTVGTNF (875)	IIPILGAA (876)	ARGGGMDV (877)
			GGTFNTYV (878)	ISPYNGYT (879)	ARDRTSGGFDP (880)
			GYIFTHYG (881)		SRGRGPYWSFD L (882)

Group L					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
QASESVYSNNY LS (1014)	LASTLAS (1015)	IGGKSSSTDG NA (1016)	SNGLT (1017)	TINKDASAYYASWAK G (1018)	IAFKTGTSI (1019)

Group M					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)

RSSKSLLHSNGITYLY (1020)	QMSNLAS (1021)	AQNLEPPLT (1022)	DYYTH (1023)	WIDPENGKTAYAPKFQG (1024)	GGYDVYFLDY (1025)

Group N					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
KASQDVGIVVA (1026)	WASIRHT (1027)	QQYSNYPLYT (1028)	GFSLTSYGVH (1029)	VIWAGGSTNYNSALMS (1030)	AKPYGNSAMDY (1031)
				VIWAGGSTNYVDSVKG (1032)	AKPYGTSAMDY (1033)
				VIWAGGSTNYADSVKG (1034)	

Group O					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
ASQSVSTSSSSFMH (1035)	YASNLES (1036)	QHSWEIPYT (1037)	SYGMS (1038)	SISSGGSTYYPDSVKG (1039)	GYDSGFAY (1040)
RASQSVSTSSSSYMH (1041)	YASNLES (1036)	QHSWEIPYT (1037)	SYGMS (1038)	SISSGGTTYYPDSVKG (1042)	GYDSGFAY (1040)
KASQSVSNDVA (1043)	YAANRYT (1044)	QQDYTSPYT (1045)	TYGVH (1046)	VIWRGVTTDYNAAFMAS (1047)	LGFYAMDY (1048)
KASQSVSNDVG (1049)	YASNRYS (1050)	QQDYTSPYT (1045)	SYGVH (1051)	VIWSGGVTDYNAAFIS (1052)	LGFYAMDY (1048)
RSSQIIVHSNANTYLE (1053)	KVSNRFS (1054)	FQGSHVPYT (1055)	TYWMH (1056)	QINPDSTTINTAPSLKD (1057)	PGDYGYDFDC (1058)
SASSSVSSSYLY (1059)	NTSNLAS (1060)	HQWRSYPPT (1061)	SGYWN (1062)	YISYSGSTYYNPSLKS (1063)	SLLWFSTGFAY (1064)
SANSSVSYMH (1065)	DTSKLAS (1066)	QQWSSNPWT (1067)	SYGVH (1051)	YIWSGGITDYNAAFKS (1068)	LGFYAMDY (1048)
RASQSVSTSSYSYMH (1069)	YASNLES (1036)	QNSWEIPYT (1070)	STGMS (1071)	SISSGGTTYYLGSVQG (1072)	GYDAGFAY (1073)

KSSQSLLYSSNQKNSLA (1074)	WASNRES (1075)	QQYYSYPLT (1076)	SGYWT (1077)	YIYTGSTYYNPSLKS (1078)	QRDWLGFAY (1079)
RASQSVSTSSYSYVH (1080)	YASNLES (1036)	QHSWEIPYT (1037)	SYGMS (1038)	SISSGGSIYYPDSVKG (1081)	GYDAGFAF (1082)

Group P					
VL			VH		
CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)	CDR1 (SEQ ID NO:)	CDR2 (SEQ ID NO:)	CDR3 (SEQ ID NO:)
			GFTFSMYMMM (1083)		
			GFTFSAYAMA (1084)		
			GFTFSAYRMF (1085)		
			GFTFSAYLMV (1086)		
			GFTFSAYVMF (1087)		
			GFTFSAYVMS (1088)		
			GFTFSGYLMV (1089)		
			GFTFSGYQML (1090)		
			GFTFSGYSMF (1091)		
			GFTFSGYWMA (1092)		
			GFTFSQYLMY (1093)		
			GFTFSQYVMF (1094)		
			GFTFSQYYMY (1095)		
			GFTFSSYLMS (1096)		

			GFTFSSYLMT (1097)		
			GFTFSSYQMV (1098)		
			GFTFSSYSMA (1099)		
			GFTFSSYVMF (1100)		
			GFTFSSYVMS (1101)		
			GFTFSSYVMY (1102)		
			GFTFSSYYMF (1103)		
			GFTFSSYYMV (1104)		
			GFTFSYYSMV (1105)		
			GFTFSWYLMA (1106)		
			GFTFSWYQMS (1107)		

[000329] The ABs in the activatable antibodies of the disclosure specifically bind a PDL1 target, such as, for example, mammalian PDL1, and/or human PDL1. Also included in the disclosure are ABs that bind to the same PDL1 epitope as an antibody of the disclosure and/or an activated activatable antibody described herein. Also included in the disclosure are ABs that compete with an anti-PDL1 antibody and/or an activated anti-PDL1 activatable antibody described herein for binding to a PDL1 target, e.g., human PDL1. Also included in the disclosure are ABs that cross-compete with an anti-PDL1 antibody and/or an activated anti-PDL1 activatable antibody described herein for binding to a PDL1 target, e.g., human PDL1.

[000330] The activatable anti-PDL1 antibodies provided herein include a masking moiety. In some embodiments, the masking moiety is an amino acid sequence that is coupled or otherwise attached to the anti-PDL1 antibody and is positioned within the activatable anti-PDL1 antibody construct such that the masking moiety reduces the ability of the anti-PDL1 antibody to specifically bind PDL1. Suitable masking moieties are

identified using any of a variety of known techniques. For example, peptide masking moieties are identified using the methods described in PCT Publication No. WO 2009/025846 by Daugherty et al., the contents of which are hereby incorporated by reference in their entirety.

[000331] The activatable anti-PDL1 antibodies provided herein include a cleavable moiety. In some embodiments, the cleavable moiety includes an amino acid sequence that is a substrate for a protease, usually an extracellular protease. Suitable substrates are identified using any of a variety of known techniques. For example, peptide substrates are identified using the methods described in U.S. Patent No. 7,666,817 by Daugherty et al.; in U.S. Patent No. 8,563,269 by Stagliano et al.; and in PCT Publication No. WO 2014/026136 by La Porte et al., the contents of each of which are hereby incorporated by reference in their entirety. (*See also* Boulware et al. "Evolutionary optimization of peptide substrates for proteases that exhibit rapid hydrolysis kinetics." Biotechnol Bioeng. 106.3 (2010): 339-46).

[000332] Exemplary substrates include but are not limited to substrates cleavable by one or more of the following enzymes or proteases listed in Table 12.

Table 12: Exemplary Proteases and/or Enzymes

ADAMS, ADAMTS, *e.g.*	Cysteine proteinases, *e.g.*,	Serine proteases, *e.g.*,
ADAM8	Cruzipain	activated protein C
ADAM9	Legumain	Cathepsin A
ADAM10	Otubain-2	Cathepsin G
ADAM12		Chymase
ADAM15	KLKs, *e.g.*,	coagulation factor proteases
ADAM17/TACE	KLK4	(*e.g.*, FVIIa, FIXa, FXa, FXIa, FXIIa)
ADAMDEC1	KLK5	
ADAMTS1	KLK6	Elastase
ADAMTS4	KLK7	Granzyme B
ADAMTS5	KLK8	Guanidinobenzoatase
	KLK10	HtrA1
Aspartate proteases, *e.g.*,	KLK11	Human Neutrophil Elastase
BACE	KLK13	Lactoferrin
Renin	KLK14	Marapsin
		NS3/4A
Aspartic cathepsins, *e.g.*,	Metallo proteinases, *e.g.*,	PACE4
Cathepsin D	Meprin	Plasmin
Cathepsin E	Neprilysin	PSA
	PSMA	tPA
Caspases, *e.g.*,	BMP-1	Thrombin
Caspase 1		Tryptase
Caspase 2	MMPs, *e.g.*,	uPA

Caspase 3	MMP1	
Caspase 4	MMP2	Type II Transmembrane
Caspase 5	MMP3	Serine Proteases (TTSPs), *e.g.*,
Caspase 6	MMP7	DESC1
Caspase 7	MMP8	DPP-4
Caspase 8	MMP9	FAP
Caspase 9	MMP10	Hepsin
Caspase 10	MMP11	Matriptase-2
Caspase 14	MMP12	MT-SP1/Matriptase
	MMP13	TMPRSS2
Cysteine cathepsins, *e.g.*,	MMP14	TMPRSS3
Cathepsin B	MMP15	TMPRSS4
Cathepsin C	MMP16	
Cathepsin K	MMP17	
Cathepsin L	MMP19	
Cathepsin S	MMP20	
Cathepsin V/L2	MMP23	
Cathepsin X/Z/P	MMP24	
	MMP26	
	MMP27	

[000333] The activatable anti-PDL1 antibodies described herein overcome a limitation of antibody therapeutics, particularly antibody therapeutics that are known to be toxic to at least some degree *in vivo*. Target-mediated toxicity constitutes a major limitation for the development of therapeutic antibodies. The activatable anti-PDL1 antibodies provided herein are designed to address the toxicity associated with the inhibition of the target in normal tissues by traditional therapeutic antibodies. These activatable anti-PDL1 antibodies remain masked until proteolytically activated at the site of disease. Starting with an anti-PDL1 antibody as a parental therapeutic antibody, the activatable anti-PDL1 antibodies of the invention were engineered by coupling the antibody to an inhibitory mask through a linker that incorporates a protease substrate.

[000334] When the AB is modified with a MM and is in the presence of the target, specific binding of the AB to its target is reduced or inhibited, as compared to the specific binding of the AB not modified with an MM or the specific binding of the parental AB to the target.

[000335] The K_d of the AB modified with a MM towards the target is at least 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 50,000, 100,000, 500,000, 1,000,000, 5,000,000, 10,000,000, 50,000,000 or greater, or between 5-10, 10-100, 10-1,000, 10-10,000, 10-100,000, 10-1,000,000, 10-10,000,000, 100-1,000, 100-10,000, 100-100,000,

100-1,000,000, 100-10,000,000, 1,000-10,000, 1,000-100,000, 1,000-1,000,000, 1000-10,000,000, 10,000-100,000, 10,000-1,000,000, 10,000-10,000,000, 100,000-1,000,000, or 100,000-10,000,000 times greater than the K_d of the AB not modified with an MM or of the parental AB towards the target. Conversely, the binding affinity of the AB modified with a MM towards the target is at least 2, 3, 4, 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 50,000, 100,000, 500,000, 1,000,000, 5,000,000, 10,000,000, 50,000,000 or greater, or between 5-10, 10-100, 10-1,000, 10-10,000, 10-100,000, 10-1,000,000, 10-10,000,000, 100-1,000, 100-10,000, 100-100,000, 100-1,000,000, 100-10,000,000, 1,000-10,000, 1,000-100,000, 1,000-1,000,000, 1000-10,000,000, 10,000-100,000, 10,000-1,000,000, 10,000-10,000,000, 100,000-1,000,000, or 100,000-10,000,000 times lower than the binding affinity of the AB not modified with an MM or of the parental AB towards the target.

[000336] In some embodiments, the dissociation constant (K_d) of the MM towards the AB is generally greater than the K_d of the AB towards the target. The K_d of the MM towards the AB can be at least 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 100,000, 1,000,000 or even 10,000,000 times greater than the K_d of the AB towards the target. Conversely, the binding affinity of the MM towards the AB is generally lower than the binding affinity of the AB towards the target. The binding affinity of MM towards the AB can be at least 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 100,000, 1,000,000 or even 10,000,000 times lower than the binding affinity of the AB towards the target.

[000337] In some embodiments, the dissociation constant (K_d) of the MM towards the AB is approximately equal to the K_d of the AB towards the target. In some embodiments, the dissociation constant (K_d) of the MM towards the AB is no more than the dissociation constant of the AB towards the target.

[000338] In some embodiments, the dissociation constant (K_d) of the MM towards the AB is less than the dissociation constant of the AB towards the target.

[000339] In some embodiments, the dissociation constant (K_d) of the MM towards the AB is greater than the dissociation constant of the AB towards the target.

[000340] In some embodiments, the MM has a K_d for binding to the AB that is no more than the K_d for binding of the AB to the target.

[000341] In some embodiments, the MM has a K_d for binding to the AB that is no less than the K_d for binding of the AB to the target.

[000342] In some embodiments, the MM has a K_d for binding to the AB that is approximately equal to the K_d for binding of the AB to the target.

[000343] In some embodiments, the MM has a K_d for binding to the AB that is less than the K_d for binding of the AB to the target.

[000344] In some embodiments, the MM has a K_d for binding to the AB that is greater than the K_d for binding of the AB to the target.

[000345] In some embodiments, the MM has a K_d for binding to the AB that is no more than 2, 3, 4, 5, 10, 25, 50, 100, 250, 500, or 1,000 fold greater than the K_d for binding of the AB to the target. In some embodiments, the MM has a K_d for binding to the AB that is between 1-5, 2-5, 2-10, 5-10, 5-20, 5-50, 5-100, 10-100, 10-1,000, 20-100, 20-1000, or 100-1,000 fold greater than the K_d for binding of the AB to the target.

[000346] In some embodiments, the MM has an affinity for binding to the AB that is less than the affinity of binding of the AB to the target.

[000347] In some embodiments, the MM has an affinity for binding to the AB that is no more than the affinity of binding of the AB to the target.

[000348] In some embodiments, the MM has an affinity for binding to the AB that is approximately equal of the affinity of binding of the AB to the target.

[000349] In some embodiments, the MM has an affinity for binding to the AB that is no less than the affinity of binding of the AB to the target.

[000350] In some embodiments, the MM has an affinity for binding to the AB that is greater than the affinity of binding of the AB to the target.

[000351] In some embodiments, the MM has an affinity for binding to the AB that is 2, 3, 4, 5, 10, 25, 50, 100, 250, 500, or 1,000 less than the affinity of binding of the AB to the target. I In some embodiments, the MM has an affinity for binding to the AB that is between 1-5, 2-5, 2-10, 5-10, 5-20, 5-50, 5-100, 10-100, 10-1,000, 20-100, 20-1000, or 100-1,000 fold less than the affinity of binding of the AB to the target. In some embodiments, the MM has an affinity for binding to the AB that is 2 to 20 fold less than the affinity of binding of the AB to the target. In some embodiments, a MM not covalently linked to the AB and at equimolar concentration to the AB does not inhibit the binding of the AB to the target.

[000352] When the AB is modified with a MM and is in the presence of the target specific binding of the AB to its target is reduced or inhibited, as compared to the specific binding of the AB not modified with an MM or the specific binding of the parental AB to the target. When compared to the binding of the AB not modified with an MM or the binding of the parental AB to the target the AB's ability to bind the target when modified

with an MM can be reduced by at least 50%, 60%, 70%, 80%, 90%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% and even 100% for at least 2, 4, 6, 8, 12, 28, 24, 30, 36, 48, 60, 72, 84, or 96 hours, or 5, 10, 15, 30, 45, 60, 90, 120, 150, or 180 days, or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 months or more when measured *in vivo* or in an *in vitro* assay.

[000353] The MM inhibits the binding of the AB to the target. The MM binds the antigen binding domain of the AB and inhibits binding of the AB to the target. The MM can sterically inhibit the binding of the AB to the target. The MM can allosterically inhibit the binding of the AB to its target. In these embodiments when the AB is modified or coupled to a MM and in the presence of target there is no binding or substantially no binding of the AB to the target, or no more than 0.001%, 0.01%, 0.1%, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, or 50% binding of the AB to the target, as compared to the binding of the AB not modified with an MM, the parental AB, or the AB not coupled to an MM to the target, for at least 2, 4, 6, 8, 12, 28, 24, 30, 36, 48, 60, 72, 84, or 96 hours, or 5, 10, 15, 30, 45, 60, 90, 120, 150, or 180 days, or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 months or longer when measured *in vivo* or in an *in vitro* assay.

[000354] When an AB is coupled to or modified by a MM, the MM 'masks' or reduces or otherwise inhibits the specific binding of the AB to the target. When an AB is coupled to or modified by a MM, such coupling or modification can effect a structural change that reduces or inhibits the ability of the AB to specifically bind its target.

[000355] An AB coupled to or modified with an MM can be represented by the following formulae (in order from an amino (N) terminal region to carboxyl (C) terminal region:

(MM)-(AB)

(AB)-(MM)

(MM)-L-(AB)

(AB)-L-(MM)

where MM is a masking moiety, the AB is an antibody or antibody fragment thereof, and the L is a linker. In many embodiments, it may be desirable to insert one or more linkers, *e.g.*, flexible linkers, into the composition so as to provide for flexibility.

[000356] In certain embodiments, the MM is not a natural binding partner of the AB. In some embodiments, the MM contains no or substantially no homology to any natural binding partner of the AB. In some embodiments, the MM is no more than 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, or 80% similar to any

natural binding partner of the AB. In some embodiments, the MM is no more than 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, or 80% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 25% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 50% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 20% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 10% identical to any natural binding partner of the AB.

[000357] In some embodiments, the activatable antibodies include an AB that is modified by an MM and also includes one or more cleavable moieties (CM). Such activatable antibodies exhibit activatable/switchable binding, to the AB's target. Activatable antibodies generally include an antibody or antibody fragment (AB), modified by or coupled to a masking moiety (MM) and a modifiable or cleavable moiety (CM). In some embodiments, the CM contains an amino acid sequence that serves as a substrate for at least one protease.

[000358] The elements of the activatable antibodies are arranged so that the MM and CM are positioned such that in a cleaved (or relatively active) state and in the presence of a target, the AB binds a target while the activatable antibody is in an uncleaved (or relatively inactive) state in the presence of the target, specific binding of the AB to its target is reduced or inhibited. The specific binding of the AB to its target can be reduced due to the inhibition or masking of the AB's ability to specifically bind its target by the MM.

[000359] The K_d of the AB modified with a MM and a CM towards the target is at least 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 50,000, 100,000, 500,000, 1,000,000, 5,000,000, 10,000,000, 50,000,000 or greater, or between 5-10, 10-100, 10-1,000, 10-10,000, 10-100,000, 10-1,000,000, 10-10,000,000, 100-1,000, 100-10,000, 100-100,000, 100-1,000,000, 100-10,000,000, 1,000-10,000, 1,000-100,000, 1,000-1,000,000, 1000-10,000,000, 10,000-100,000, 10,000-1,000,000, 10,000-10,000,000, 100,000-1,000,000, or 100,000-10,000,000 times greater than the K_d of the AB not modified with an MM and a CM or of the parental AB towards the target. Conversely, the binding affinity of the AB modified with a MM and a CM towards the target is at least 5, 10, 25, 50, 100, 250, 500, 1,000, 2,500, 5,000, 10,000, 50,000, 100,000, 500,000, 1,000,000, 5,000,000, 10,000,000, 50,000,000 or greater, or between 5-10, 10-100, 10-1,000, 10-10,000, 10-100,000, 10-1,000,000, 10-10,000,000, 100-1,000, 100-10,000, 100-100,000, 100-

1,000,000, 100-10,000,000, 1,000-10,000, 1,000-100,000, 1,000-1,000,000, 1000-10,000,000, 10,000-100,000, 10,000-1,000,000, 10,000-10,000,000, 100,000-1,000,000, or 100,000-10,000,000 times lower than the binding affinity of the AB not modified with an MM and a CM or of the parental AB towards the target.

[000360] When the AB is modified with a MM and a CM and is in the presence of the target but not in the presence of a modifying agent (for example at least one protease), specific binding of the AB to its target is reduced or inhibited, as compared to the specific binding of the AB not modified with an MM and a CM or of the parental AB to the target. When compared to the binding of the parental AB or the binding of an AB not modified with an MM and a CM to its target, the AB's ability to bind the target when modified with an MM and a CM can be reduced by at least 50%, 60%, 70%, 80%, 90%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% and even 100% for at least 2, 4, 6, 8, 12, 28, 24, 30, 36, 48, 60, 72, 84, or 96 hours or 5, 10, 15, 30, 45, 60, 90, 120, 150, or 180 days, or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 months or longer when measured *in vivo* or in an *in vitro* assay.

[000361] As used herein, the term cleaved state refers to the condition of the activatable antibodies following modification of the CM by at least one protease. The term uncleaved state, as used herein, refers to the condition of the activatable antibodies in the absence of cleavage of the CM by a protease. As discussed above, the term "activatable antibodies" is used herein to refer to an activatable antibody in both its uncleaved (native) state, as well as in its cleaved state. It will be apparent to the ordinarily skilled artisan that in some embodiments a cleaved activatable antibody may lack an MM due to cleavage of the CM by protease, resulting in release of at least the MM (*e.g.*, where the MM is not joined to the activatable antibodies by a covalent bond (*e.g.*, a disulfide bond between cysteine residues).

[000362] By activatable or switchable is meant that the activatable antibody exhibits a first level of binding to a target when the activatable antibody is in a inhibited, masked or uncleaved state (*i.e.*, a first conformation), and a second level of binding to the target in the uninhibited, unmasked and/or cleaved state (*i.e.*, a second conformation), where the second level of target binding is greater than the first level of binding. In general, the access of target to the AB of the activatable antibody is greater in the presence of a cleaving agent capable of cleaving the CM, i.e., a protease, than in the absence of such a cleaving agent. Thus, when the activatable antibody is in the uncleaved state, the AB is inhibited from target binding and can be masked from target binding (*i.e.*, the first conformation is such the

AB cannot bind the target), and in the cleaved state the AB is not inhibited or is unmasked to target binding.

[000363] The CM and AB of the activatable antibodies are selected so that the AB represents a binding moiety for a given target, and the CM represents a substrate for a protease. In some embodiments, the protease is co-localized with the target at a treatment site or diagnostic site in a subject. As used herein, co-localized refers to being at the same site or relatively close nearby. In some embodiments, a protease cleaves a CM yielding an activated antibody that binds to a target located nearby the cleavage site. The activatable antibodies disclosed herein find particular use where, for example, a protease capable of cleaving a site in the CM, i.e., a protease, is present at relatively higher levels in or in close proximity to target-containing tissue of a treatment site or diagnostic site than in tissue of non-treatment sites (for example in healthy tissue). In some embodiments, a CM of the disclosure is also cleaved by one or more other proteases. In some embodiments, it is the one or more other proteases that is co-localized with the target and that is responsible for cleavage of the CM *in vivo*.

[000364] In some embodiments activatable antibodies provide for reduced toxicity and/or adverse side effects that could otherwise result from binding of the AB at non-treatment sites if the AB were not masked or otherwise inhibited from binding to the target.

[000365] In general, an activatable antibody can be designed by selecting an AB of interest and constructing the remainder of the activatable antibody so that, when conformationally constrained, the MM provides for masking of the AB or reduction of binding of the AB to its target. Structural design criteria can be to be taken into account to provide for this functional feature.

[000366] Activatable antibodies exhibiting a switchable phenotype of a desired dynamic range for target binding in an inhibited versus an uninhibited conformation are provided. Dynamic range generally refers to a ratio of (a) a maximum detected level of a parameter under a first set of conditions to (b) a minimum detected value of that parameter under a second set of conditions. For example, in the context of an activatable antibody, the dynamic range refers to the ratio of (a) a maximum detected level of target protein binding to an activatable antibody in the presence of at least one protease capable of cleaving the CM of the activatable antibodies to (b) a minimum detected level of target protein binding to an activatable antibody in the absence of the protease. The dynamic range of an activatable antibody can be calculated as the ratio of the dissociation constant of an

activatable antibody cleaving agent (*e.g.*, enzyme) treatment to the dissociation constant of the activatable antibodies cleaving agent treatment. The greater the dynamic range of an activatable antibody, the better the switchable phenotype of the activatable antibody. Activatable antibodies having relatively higher dynamic range values (*e.g.*, greater than 1) exhibit more desirable switching phenotypes such that target protein binding by the activatable antibodies occurs to a greater extent (*e.g.*, predominantly occurs) in the presence of a cleaving agent (*e.g.*, enzyme) capable of cleaving the CM of the activatable antibodies than in the absence of a cleaving agent.

[000367] Activatable antibodies can be provided in a variety of structural configurations. Exemplary formulae for activatable antibodies are provided below. It is specifically contemplated that the N- to C-terminal order of the AB, MM and CM may be reversed within an activatable antibody. It is also specifically contemplated that the CM and MM may overlap in amino acid sequence, *e.g.*, such that the CM is contained within the MM.

[000368] For example, activatable antibodies can be represented by the following formula (in order from an amino (N) terminal region to carboxyl (C) terminal region:

(MM)-(CM)-(AB)

(AB)-(CM)-(MM)

where MM is a masking moiety, CM is a cleavable moiety, and AB is an antibody or fragment thereof. It should be noted that although MM and CM are indicated as distinct components in the formulae above, in all exemplary embodiments (including formulae) disclosed herein it is contemplated that the amino acid sequences of the MM and the CM could overlap, *e.g.*, such that the CM is completely or partially contained within the MM. In addition, the formulae above provide for additional amino acid sequences that may be positioned N-terminal or C-terminal to the activatable antibodies elements.

[000369] In certain embodiments, the MM is not a natural binding partner of the AB. In some embodiments, the MM contains no or substantially no homology to any natural binding partner of the AB. In some embodiments, the MM is no more than 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, or 80% similar to any natural binding partner of the AB. In some embodiments, the MM is no more than 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, or 80% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 50% identical to any natural binding partner of the AB. In some embodiments,

the MM is no more than 25% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 20% identical to any natural binding partner of the AB. In some embodiments, the MM is no more than 10% identical to any natural binding partner of the AB.

[000370] In many embodiments it may be desirable to insert one or more linkers, *e.g.*, flexible linkers, into the activatable antibody construct so as to provide for flexibility at one or more of the MM-CM junction, the CM-AB junction, or both. For example, the AB, MM, and/or CM may not contain a sufficient number of residues (*e.g.*, Gly, Ser, Asp, Asn, especially Gly and Ser, particularly Gly) to provide the desired flexibility. As such, the switchable phenotype of such activatable antibody constructs may benefit from introduction of one or more amino acids to provide for a flexible linker. In addition, as described below, where the activatable antibody is provided as a conformationally constrained construct, a flexible linker can be operably inserted to facilitate formation and maintenance of a cyclic structure in the uncleaved activatable antibody.

[000371] For example, in certain embodiments an activatable antibody comprises one of the following formulae (where the formula below represent an amino acid sequence in either N- to C-terminal direction or C- to N-terminal direction):

(MM)-L1-(CM)-(AB)

(MM)-(CM)-L2-(AB)

(MM)-L1-(CM)-L2-(AB)

wherein MM, CM, and AB are as defined above; wherein L1 and L2 are each independently and optionally present or absent, are the same or different flexible linkers that include at least 1 flexible amino acid (*e.g.*, Gly). In addition, the formulae above provide for additional amino acid sequences that may be positioned N-terminal or C-terminal to the activatable antibodies elements. Examples include, but are not limited to, targeting moieties (*e.g.*, a ligand for a receptor of a cell present in a target tissue) and serum half-life extending moieties (*e.g.*, polypeptides that bind serum proteins, such as immunoglobulin (*e.g.*, IgG) or serum albumin (*e.g.*, human serum albumin (HAS)).

[000372] The CM is specifically cleaved by at least one protease at a rate of about 0.001-1500 x 10^4 $M^{-1}S^{-1}$ or at least 0.001, 0.005, 0.01, 0.05, 0.1, 0.5, 1, 2.5, 5, 7.5, 10, 15, 20, 25, 50, 75, 100, 125, 150, 200, 250, 500, 750, 1000, 1250, or 1500 x 10^4 $M^{-1}S^{-1}$. In some embodiments, the CM is specifically cleaved at a rate of about 100,000 $M^{-1}S^{-1}$. In some

embodiments, the CM is specifically cleaved at a rate from about 1x10E2 to about 1x10E6 $M^{-1}S^{-1}$ (i.e., from about $1x10^2$ to about $1x10^6$ $M^{-1}S^{-1}$).

[000373] For specific cleavage by an enzyme, contact between the enzyme and CM is made. When the activatable antibody comprising an AB coupled to a MM and a CM is in the presence of target and sufficient enzyme activity, the CM can be cleaved. Sufficient enzyme activity can refer to the ability of the enzyme to make contact with the CM and effect cleavage. It can readily be envisioned that an enzyme may be in the vicinity of the CM but unable to cleave because of other cellular factors or protein modification of the enzyme.

[000374] Linkers suitable for use in compositions described herein are generally ones that provide flexibility of the modified AB or the activatable antibodies to facilitate the inhibition of the binding of the AB to the target. Such linkers are generally referred to as flexible linkers. Suitable linkers can be readily selected and can be of any of a suitable of different lengths, such as from 1 amino acid (*e.g.*, Gly) to 20 amino acids, from 2 amino acids to 15 amino acids, from 3 amino acids to 12 amino acids, including 4 amino acids to 10 amino acids, 5 amino acids to 9 amino acids, 6 amino acids to 8 amino acids, or 7 amino acids to 8 amino acids, and may be 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, or 20 amino acids in length.

[000375] Exemplary flexible linkers include glycine polymers (G)n, glycine-serine polymers (including, for example, (GS)n, (GSGGS)n (SEQ ID NO: 191) and (GGGS)n (SEQ ID NO: 192), where n is an integer of at least one), glycine-alanine polymers, alanine-serine polymers, and other flexible linkers known in the art. Glycine and glycine-serine polymers are relatively unstructured, and therefore may be able to serve as a neutral tether between components. Glycine accesses significantly more phi-psi space than even alanine, and is much less restricted than residues with longer side chains (see Scheraga, Rev. Computational Chem. 11173-142 (1992)). Exemplary flexible linkers include, but are not limited to Gly-Gly-Ser-Gly (SEQ ID NO: 193), Gly-Gly-Ser-Gly-Gly (SEQ ID NO: 194), Gly-Ser-Gly-Ser-Gly (SEQ ID NO: 195), Gly-Ser-Gly-Gly-Gly (SEQ ID NO: 196), Gly-Gly-Gly-Ser-Gly (SEQ ID NO: 197), Gly-Ser-Ser-Ser-Gly (SEQ ID NO: 198), and the like. The ordinarily skilled artisan will recognize that design of an activatable antibodies can include linkers that are all or partially flexible, such that the linker can include a flexible linker as well as one or more portions that confer less flexible structure to provide for a desired activatable antibodies structure.

[000376] The disclosure also provides compositions and methods that include an activatable anti-PDL1 antibody that includes an antibody or antibody fragment (AB) that specifically binds PDL1, where the AB is coupled to a masking moiety (MM) that decreases the ability of the AB to bind its target. In some embodiments, the activatable anti-PDL1 antibody further includes a cleavable moiety (CM) that is a substrate for a protease. The compositions and methods provided herein enable the attachment of one or more agents to one or more cysteine residues in the AB without compromising the activity (e.g., the masking, activating or binding activity) of the activatable anti-PDL1 antibody. In some embodiments, the compositions and methods provided herein enable the attachment of one or more agents to one or more cysteine residues in the AB without reducing or otherwise disturbing one or more disulfide bonds within the MM. The compositions and methods provided herein produce an activatable anti-PDL1 antibody that is conjugated to one or more agents, *e.g.*, any of a variety of therapeutic, diagnostic and/or prophylactic agents, for example, in some embodiments, without any of the agent(s) being conjugated to the MM of the activatable anti-PDL1 antibody. The compositions and methods provided herein produce conjugated activatable anti-PDL1 antibodies in which the MM retains the ability to effectively and efficiently mask the AB of the activatable antibody in an uncleaved state. The compositions and methods provided herein produce conjugated activatable anti-PDL1 antibodies in which the activatable antibody is still activated, *i.e.*, cleaved, in the presence of a protease that can cleave the CM.

[000377] The activatable anti-PDL1 antibodies have at least one point of conjugation for an agent, but in the methods and compositions provided herein less than all possible points of conjugation are available for conjugation to an agent. In some embodiments, the one or more points of conjugation are sulfur atoms involved in disulfide bonds. In some embodiments, the one or more points of conjugation are sulfur atoms involved in interchain disulfide bonds. In some embodiments, the one or more points of conjugation are sulfur atoms involved in interchain sulfide bonds, but not sulfur atoms involved in intrachain disulfide bonds. In some embodiments, the one or more points of conjugation are sulfur atoms of cysteine or other amino acid residues containing a sulfur atom. Such residues may occur naturally in the antibody structure or may be incorporated into the antibody by site-directed mutagenesis, chemical conversion, or mis-incorporation of non-natural amino acids.

[000378] Also provided are methods of preparing a conjugate of an activatable anti-PDL1 antibody having one or more interchain disulfide bonds in the AB and one or more intrachain disulfide bonds in the MM, and a drug reactive with free thiols is provided. The method generally includes partially reducing interchain disulfide bonds in the activatable antibody with a reducing agent, such as, for example, TCEP; and conjugating the drug reactive with free thiols to the partially reduced activatable antibody. As used herein, the term partial reduction refers to situations where an activatable anti-PDL1 antibody is contacted with a reducing agent and less than all disulfide bonds, *e.g.*, less than all possible sites of conjugation are reduced. In some embodiments, less than 99%, 98%, 97%, 96%, 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%, 45%, 40%, 35%, 30%, 25%, 20%, 15%, 10% or less than 5% of all possible sites of conjugation are reduced.

[000379] In yet other embodiments, a method of reducing and conjugating an agent, e.g., a drug, to an activatable anti-PDL1 antibody resulting in selectivity in the placement of the agent is provided. The method generally includes partially reducing the activatable anti-PDL1 antibody with a reducing agent such that any conjugation sites in the masking moiety or other non-AB portion of the activatable antibody are not reduced, and conjugating the agent to interchain thiols in the AB. The conjugation site(s) are selected so as to allow desired placement of an agent to allow conjugation to occur at a desired site. The reducing agent is, for example, TCEP. The reduction reaction conditions such as, for example, the ratio of reducing agent to activatable antibody, the length of incubation, the temperature during the incubation, the pH of the reducing reaction solution, etc., are determined by identifying the conditions that produce a conjugated activatable antibody in which the MM retains the ability to effectively and efficiently mask the AB of the activatable antibody in an uncleaved state. The ratio of reduction agent to activatable anti-PDL1 antibody will vary depending on the activatable antibody. In some embodiments, the ratio of reducing agent to activatable anti-PDL1 antibody will be in a range from about 20:1 to 1:1, from about 10:1 to 1:1, from about 9:1 to 1:1, from about 8:1 to 1:1, from about 7:1 to 1:1, from about 6:1 to 1:1, from about 5:1 to 1:1, from about 4:1 to 1:1, from about 3:1 to 1:1, from about 2:1 to 1:1, from about 20:1 to 1:1.5, from about 10:1 to 1:1.5, from about 9:1 to 1:1.5, from about 8:1 to 1:1.5, from about 7:1 to 1:1.5, from about 6:1 to 1:1.5, from about 5:1 to 1:1.5, from about 4:1 to 1:1.5, from about 3:1 to 1:1.5, from about 2:1 to 1:1.5, from about 1.5:1 to 1:1.5, or from about 1:1 to 1:1.5. In some embodiments, the ratio is in a range of from about 5:1 to 1:1. In some embodiments, the ratio is in a range of from about 5:1 to 1.5:1. In some

embodiments, the ratio is in a range of from about 4:1 to 1:1. In some embodiments, the ratio is in a range from about 4:1 to 1.5:1. In some embodiments, the ratio is in a range from about 8:1 to about 1:1. In some embodiments, the ratio is in a range of from about 2.5:1 to 1:1.

[000380] In some embodiments, a method of reducing interchain disulfide bonds in the AB of an activatable anti-PDL1 antibody and conjugating an agent, e.g., a thiol-containing agent such as a drug, to the resulting interchain thiols to selectively locate agent(s) on the AB is provided. The method generally includes partially reducing the AB with a reducing agent to form at least two interchain thiols without forming all possible interchain thiols in the activatable antibody; and conjugating the agent to the interchain thiols of the partially reduced AB. For example, the AB of the activatable antibody is partially reduced for about 1 hour at about 37°C at a desired ratio of reducing agent:activatable antibody. In some embodiments, the ratio of reducing agent to activatable antibody will be in a range from about 20:1 to 1:1, from about 10:1 to 1:1, from about 9:1 to 1:1, from about 8:1 to 1:1, from about 7:1 to 1:1, from about 6:1 to 1:1, from about 5:1 to 1:1, from about 4:1 to 1:1, from about 3:1 to 1:1, from about 2:1 to 1:1, from about 20:1 to 1:1.5, from about 10:1 to 1:1.5, from about 9:1 to 1:1.5, from about 8:1 to 1:1.5, from about 7:1 to 1:1.5, from about 6:1 to 1:1.5, from about 5:1 to 1:1.5, from about 4:1 to 1:1.5, from about 3:1 to 1:1.5, from about 2:1 to 1:1.5, from about 1.5:1 to 1:1.5, or from about 1:1 to 1:1.5. In some embodiments, the ratio is in a range of from about 5:1 to 1:1. In some embodiments, the ratio is in a range of from about 5:1 to 1.5:1. In some embodiments, the ratio is in a range of from about 4:1 to 1:1. In some embodiments, the ratio is in a range from about 4:1 to 1.5:1. In some embodiments, the ratio is in a range from about 8:1 to about 1:1. In some embodiments, the ratio is in a range of from about 2.5:1 to 1:1.

[000381] The thiol-containing reagent can be, for example, cysteine or N-acetyl cysteine. The reducing agent can be, for example, TCEP. In some embodiments, the reduced activatable antibody can be purified prior to conjugation, using for example, column chromatography, dialysis, or diafiltration. Alternatively, the reduced antibody is not purified after partial reduction and prior to conjugation.

[000382] The invention also provides partially reduced activatable anti-PDL1 antibodies in which at least one interchain disulfide bond in the activatable antibody has been reduced with a reducing agent without disturbing any intrachain disulfide bonds in the activatable antibody, wherein the activatable antibody includes an antibody or an antigen

binding fragment thereof (AB) that specifically binds to PDL1, a masking moiety (MM) that inhibits the binding of the AB of the activatable antibody in an uncleaved state to the PDL1 target, and a cleavable moiety (CM) coupled to the AB, wherein the CM is a polypeptide that functions as a substrate for a protease. In some embodiments the MM is coupled to the AB via the CM. In some embodiments, one or more intrachain disulfide bond(s) of the activatable antibody is not disturbed by the reducing agent. In some embodiments, one or more intrachain disulfide bond(s) of the MM within the activatable antibody is not disturbed by the reducing agent. In some embodiments, the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM. In some embodiments, reducing agent is TCEP.

[000383] The disclosure also provides partially reduced activatable antibodies in which at least one interchain disulfide bond in the activatable antibody has been reduced with a reducing agent without disturbing any intrachain disulfide bonds in the activatable antibody, wherein the activatable antibody includes an antibody or an antigen binding fragment thereof (AB) that specifically binds to the target, e.g., PDL1, a masking moiety (MM) that inhibits the binding of the AB of the activatable antibody in an uncleaved state to the target, and a cleavable moiety (CM) coupled to the AB, wherein the CM is a polypeptide that functions as a substrate for at least one protease. In some embodiments, the MM is coupled to the AB via the CM. In some embodiments, one or more intrachain disulfide bond(s) of the activatable antibody is not disturbed by the reducing agent. In some embodiments, one or more intrachain disulfide bond(s) of the MM within the activatable antibody is not disturbed by the reducing agent. In some embodiments, the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM. In some embodiments, reducing agent is TCEP.

[000384] In some embodiments, the activatable antibodies described herein also include an agent conjugated to the activatable antibody. In some embodiments, the conjugated agent is a therapeutic agent, such as an anti-inflammatory and/or an antineoplastic agent. In such embodiments, the agent is conjugated to a carbohydrate moiety of the activatable antibody, for example, in some embodiments, where the carbohydrate moiety is located outside the antigen-binding region of the antibody or antigen-binding

fragment in the activatable antibody. In some embodiments, the agent is conjugated to a sulfhydryl group of the antibody or antigen-binding fragment in the activatable antibody.

[000385] In some embodiments, the agent is a cytotoxic agent such as a toxin (*e.g.*, an enzymatically active toxin of bacterial, fungal, plant, or animal origin, or fragments thereof), or a radioactive isotope (*i.e.*, a radioconjugate).

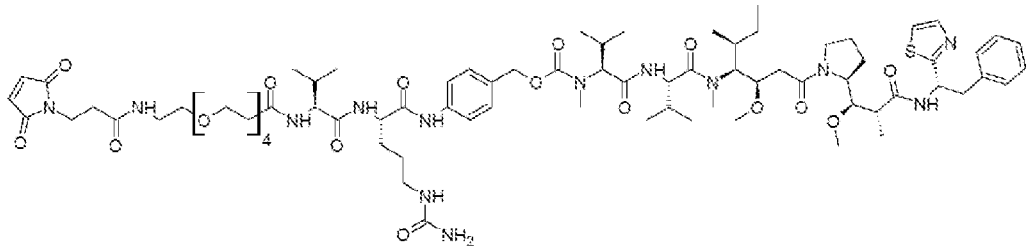
[000386] In some embodiments, the agent is a detectable moiety such as, for example, a label or other marker. For example, the agent is or includes a radiolabeled amino acid, one or more biotinyl moieties that can be detected by marked avidin (*e.g.*, streptavidin containing a fluorescent marker or enzymatic activity that can be detected by optical or calorimetric methods), one or more radioisotopes or radionuclides, one or more fluorescent labels, one or more enzymatic labels, and/or one or more chemiluminescent agents. In some embodiments, detectable moieties are attached by spacer molecules.

[000387] The disclosure also pertains to immunoconjugates comprising an antibody conjugated to a cytotoxic agent such as a toxin (*e.g.*, an enzymatically active toxin of bacterial, fungal, plant, or animal origin, or fragments thereof), or a radioactive isotope (*i.e.*, a radioconjugate). Suitable cytotoxic agents include, for example, dolastatins and derivatives thereof (*e.g.* auristatin E, AFP, MMAF, MMAE, MMAD, DMAF, DMAE). For example, the agent is monomethyl auristatin E (MMAE) or monomethyl auristatin D (MMAD). In some embodiments, the agent is an agent selected from the group listed in Table 11. In some embodiments, the agent is a dolastatin. In some embodiments, the agent is an auristatin or derivative thereof. In some embodiments, the agent is auristatin E or a derivative thereof. In some embodiments, the agent is monomethyl auristatin E (MMAE). In some embodiments, the agent is monomethyl auristatin D (MMAD). In some embodiments, the agent is a maytansinoid or maytansinoid derivative. In some embodiments, the agent is DM1 or DM4. In some embodiments, the agent is a duocarmycin or derivative thereof. In some embodiments, the agent is a calicheamicin or derivative thereof. In some embodiments, the agent is a pyrrolobenzodiazepine. In some embodiments, the agent is a pyrrolobenzodiazepine dimer.

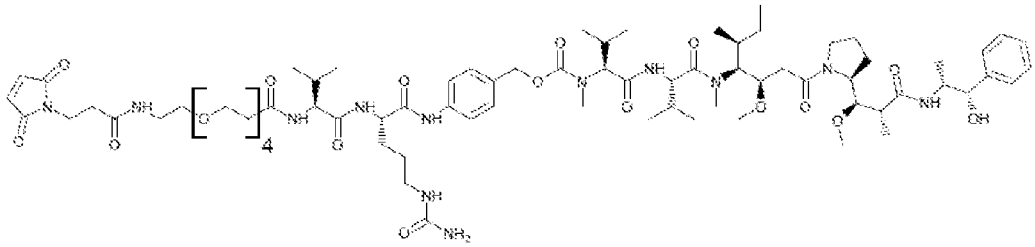
[000388] In some embodiments, the agent is linked to the AB using a maleimide caproyl-valine-citrulline linker or a maleimide PEG-valine-citrulline linker. In some embodiments, the agent is linked to the AB using a maleimide caproyl-valine-citrulline linker. In some embodiments, the agent is linked to the AB using a maleimide PEG-valine-citrulline linker In some embodiments, the agent is monomethyl auristatin D (MMAD)

linked to the AB using a maleimide PEG-valine-citrulline-para-aminobenzyloxycarbonyl linker, and this linker payload construct is referred to herein as "vc-MMAD." In some embodiments, the agent is monomethyl auristatin E (MMAE) linked to the AB using a maleimide PEG-valine-citrulline-para-aminobenzyloxycarbonyl linker, and this linker payload construct is referred to herein as "vc-MMAE." The structures of vc-MMAD and vc-MMAE are shown below:

vc-MMAD:



vc-MMAE:



[000389] The disclosure also provides conjugated activatable antibodies that include an activatable antibody linked to monomethyl auristatin D (MMAD) payload, wherein the activatable antibody includes an antibody or an antigen binding fragment thereof (AB) that specifically binds to a target, a masking moiety (MM) that inhibits the binding of the AB of the activatable antibody in an uncleaved state to the target, and cleavable moiety (CM) coupled to the AB, and the CM is a polypeptide that functions as a substrate for at least one MMP protease.

[000390] In some embodiments, the MMAD-conjugated activatable antibody can be conjugated using any of several methods for attaching agents to ABs: (a) attachment to the carbohydrate moieties of the AB, or (b) attachment to sulfhydryl groups of the AB, or (c) attachment to amino groups of the AB, or (d) attachment to carboxylate groups of the AB.

[000391] In some embodiments, the MMAD payload is conjugated to the AB via a linker. In some embodiments, the MMAD payload is conjugated to a cysteine in the AB via

a linker. In some embodiments, the MMAD payload is conjugated to a lysine in the AB via a linker. In some embodiments, the MMAD payload is conjugated to another residue of the AB via a linker, such as those residues disclosed herein. In some embodiments, the linker is a thiol-containing linker. In some embodiments, the linker is a cleavable linker. In some embodiments, the linker is a non-cleavable linker. In some embodiments, the linker is selected from the group consisting of the linkers shown in Tables 13 and 14. In some embodiments, the activatable antibody and the MMAD payload are linked via a maleimide caproyl-valine-citrulline linker. In some embodiments, the activatable antibody and the MMAD payload are linked via a maleimide PEG-valine-citrulline linker. In some embodiments, the activatable antibody and the MMAD payload are linked via a maleimide caproyl-valine-citrulline-para-aminobenzyloxycarbonyl linker. In some embodiments, the activatable antibody and the MMAD payload are linked via a maleimide PEG-valine-citrulline-para-aminobenzyloxycarbonyl linker. In some embodiments, the MMAD payload is conjugated to the AB using the partial reduction and conjugation technology disclosed herein.

[000392] In some embodiments, the polyethylene glycol (PEG) component of a linker of the present disclosure is formed from 2 ethylene glycol monomers, 3 ethylene glycol monomers, 4 ethylene glycol monomers, 5 ethylene glycol monomers, 6 ethylene glycol monomers, 7 ethylene glycol monomers 8 ethylene glycol monomers, 9 ethylene glycol monomers, or at least 10 ethylene glycol monomers. In some embodiments of the present disclosure, the PEG component is a branched polymer. In some embodiments of the present disclosure, the PEG component is an unbranched polymer. In some embodiments, the PEG polymer component is functionalized with an amino group or derivative thereof, a carboxyl group or derivative thereof, or both an amino group or derivative thereof and a carboxyl group or derivative thereof.

[000393] In some embodiments, the PEG component of a linker of the present disclosure is an amino-tetra-ethylene glycol-carboxyl group or derivative thereof. In some embodiments, the PEG component of a linker of the present disclosure is an amino-tri-ethylene glycol-carboxyl group or derivative thereof. In some embodiments, the PEG component of a linker of the present disclosure is an amino-di-ethylene glycol-carboxyl group or derivative thereof. In some embodiments, an amino derivative is the formation of an amide bond between the amino group and a carboxyl group to which it is conjugated. In some embodiments, a carboxyl derivative is the formation of an amide bond between the

carboxyl group and an amino group to which it is conjugated. In some embodiments, a carboxyl derivative is the formation of an ester bond between the carboxyl group and an hydroxyl group to which it is conjugated.

[000394] Enzymatically active toxins and fragments thereof that can be used include diphtheria A chain, nonbinding active fragments of diphtheria toxin, exotoxin A chain (from Pseudomonas aeruginosa), ricin A chain, abrin A chain, modeccin A chain, alpha-sarcin, Aleurites fordii proteins, dianthin proteins, Phytolaca americana proteins (PAPI, PAPII, and PAP-S), momordica charantia inhibitor, curcin, crotin, sapaonaria officinalis inhibitor, gelonin, mitogellin, restrictocin, phenomycin, enomycin, and the tricothecenes. A variety of radionuclides are available for the production of radioconjugated antibodies. Examples include ^{212}Bi, ^{131}I, ^{131}In, ^{90}Y, and ^{186}Re.

[000395] Conjugates of the antibody and cytotoxic agent are made using a variety of bifunctional protein-coupling agents such as N-succinimidyl-3-(2-pyridyldithiol) propionate (SPDP), iminothiolane (IT), bifunctional derivatives of imidoesters (such as dimethyl adipimidate HCL), active esters (such as disuccinimidyl suberate), aldehydes (such as glutareldehyde), bis-azido compounds (such as bis (p-azidobenzoyl) hexanediamine), bis-diazonium derivatives (such as bis-(p-diazoniumbenzoyl)-ethylenediamine), diisocyanates (such as tolyene 2,6-diisocyanate), and bis-active fluorine compounds (such as 1,5-difluoro-2,4-dinitrobenzene). For example, a ricin immunotoxin can be prepared as described in Vitetta et al., Science 238: 1098 (1987). Carbon-14-labeled 1-isothiocyanatobenzyl-3-methyldiethylene triaminepentaacetic acid (MX-DTPA) is an exemplary chelating agent for conjugation of radionucleotide to the antibody. (*See* WO94/11026).

[000396] Table 11 lists some of the exemplary pharmaceutical agents that may be employed in the herein described disclosure but in no way is meant to be an exhaustive list.

Table 11: Exemplary Pharmaceutical Agents for Conjugation

CYTOTOXIC AGENTS	
Auristatins	Turbostatin
Auristatin E	Phenstatins
Monomethyl auristatin D (MMAD)	Hydroxyphenstatin
Monomethyl auristatin E (MMAE)	Spongistatin 5
Desmethyl auristatin E (DMAE)	Spongistatin 7
Auristatin F	Halistatin 1
Monomethyl auristatin F (MMAF)	Halistatin 2
Desmethyl auristatin F (DMAF)	Halistatin 3
Auristatin derivatives, *e.g.*, amides thereof	Modified Bryostatins
Auristatin tyramine	Halocomstatins

Auristatin quinoline
Dolastatins
Dolastatin derivatives
Dolastatin 16 DmJ
Dolastatin 16 Dpv
Maytansinoids, *e.g.* DM-1; DM-4
Maytansinoid derivatives
Duocarmycin
Duocarmycin derivatives
Alpha-amanitin
Anthracyclines
Doxorubicin

Daunorubicin
Bryostatins
Camptothecin
Camptothecin derivatives
7-substituted Camptothecin
10, 11-
Difluoromethylenedioxycamptothecin
Combretastatins
Debromoaplysiatoxin

Kahalalide-F
Discodermolide
Ecteinascidins

ANTIVIRALS

Acyclovir
Vira A
Symmetrel

ANTIFUNGALS
Nystatin

ADDITIONAL ANTI-NEOPLASTICS
Adriamycin
Cerubidine
Bleomycin
Alkeran
Velban
Oncovin
Fluorouracil
Methotrexate
Thiotepa
Bisantrene
Novantrone
Thioguanine
Procarabizine

Pyrrolobenzimidazoles (PBI)
Cibrostatin6
Doxaliform
Anthracyclins analogues

Cemadotin analogue (CemCH2-SH)
Pseudomonas toxin A (PE38) variant
Pseudomonas toxin A (ZZ-PE38) variant
ZJ-101
OSW-1
4-Nitrobenzyloxycarbonyl Derivatives of
O6-Benzylguanine
Topoisomerase inhibitors
Hemiasterlin
Cephalotaxine
Homoharringtonine
Pyrrolobenzodiazepine dimers (PBDs)
Pyrrolobenzodiazepenes

Functionalized pyrrolobenzodiazepenes
Functionalized pyrrolobenzodiazepene
dimers
Calicheamicins
Podophyllotoxins
Taxanes
Vinca alkaloids

CONJUGATABLE DETECTION REAGENTS
Fluorescein and derivatives thereof
Fluorescein isothiocyanate (FITC)

RADIOPHARMACEUTICALS
^{125}I
^{131}I
^{89}Zr
^{111}In
^{123}I
^{131}I
^{99}mTc
^{201}Tl
^{133}Xe
^{11}C
^{62}Cu
^{18}F
^{68}Ga
^{13}N
^{15}O
^{38}K

Cytarabine

ANTI-BACTERIALS
Aminoglycosides
Streptomycin
Neomycin
Kanamycin
Amikacin
Gentamicin
Tobramycin
Streptomycin B
Spectinomycin
Ampicillin
Sulfanilamide
Polymyxin
Chloramphenicol

^{82}Rb
^{99}mTc (Technetium)

HEAVY METALS
Barium
Gold
Platinum

ANTI-MYCOPLASMALS
Tylosine
Spectinomycin

[000397] Those of ordinary skill in the art will recognize that a large variety of possible moieties can be coupled to the resultant antibodies of the disclosure. (*See, for example*, "Conjugate Vaccines", Contributions to Microbiology and Immunology, J. M. Cruse and R. E. Lewis, Jr (eds), Carger Press, New York, (1989), the entire contents of which are incorporated herein by reference).

[000398] Coupling may be accomplished by any chemical reaction that will bind the two molecules so long as the antibody and the other moiety retain their respective activities. This linkage can include many chemical mechanisms, for instance covalent binding, affinity binding, intercalation, coordinate binding and complexation. In some embodiments, the binding is, however, covalent binding. Covalent binding can be achieved either by direct condensation of existing side chains or by the incorporation of external bridging molecules. Many bivalent or polyvalent linking agents are useful in coupling protein molecules, such as the antibodies of the present disclosure, to other molecules. For example, representative coupling agents can include organic compounds such as thioesters, carbodiimides, succinimide esters, diisocyanates, glutaraldehyde, diazobenzenes and hexamethylene diamines. This listing is not intended to be exhaustive of the various classes of coupling agents known in the art but, rather, is exemplary of the more common coupling agents. (*See* Killen and Lindstrom, Jour. Immun. 133:1335-2549 (1984); Jansen et al., Immunological Reviews 62:185-216 (1982); and Vitetta et al., Science 238:1098 (1987).

[000399] In some embodiments, in addition to the compositions and methods provided herein, the conjugated activatable antibody can also be modified for site-specific conjugation through modified amino acid sequences inserted or otherwise included in the activatable antibody sequence. These modified amino acid sequences are designed to allow for controlled placement and/or dosage of the conjugated agent within a conjugated activatable antibody. For example, the activatable antibody can be engineered to include cysteine substitutions at positions on light and heavy chains that provide reactive thiol groups and do not negatively impact protein folding and assembly, nor alter antigen binding. In some embodiments, the activatable antibody can be engineered to include or otherwise introduce one or more non-natural amino acid residues within the activatable antibody to provide suitable sites for conjugation. In some embodiments, the activatable antibody can be engineered to include or otherwise introduce enzymatically activatable peptide sequences within the activatable antibody sequence.

[000400] Suitable linkers are described in the literature. (*See*, *for example*, Ramakrishnan, S. et al., Cancer Res. 44:201-208 (1984) describing use of MBS (M-maleimidobenzoyl-N-hydroxysuccinimide ester). *See also*, U.S. Patent No. 5,030,719, describing use of halogenated acetyl hydrazide derivative coupled to an antibody by way of an oligopeptide linker. In some embodiments, suitable linkers include: (i) EDC (1-ethyl-3-(3-dimethylamino-propyl) carbodiimide hydrochloride; (ii) SMPT (4-succinimidyloxycarbonyl-alpha-methyl-alpha-(2-pridyl-dithio)-toluene (Pierce Chem. Co., Cat. (21558G); (iii) SPDP (succinimidyl-6 [3-(2-pyridyldithio) propionamido]hexanoate (Pierce Chem. Co., Cat #21651G); (iv) Sulfo-LC-SPDP (sulfosuccinimidyl 6 [3-(2-pyridyldithio)-propianamide] hexanoate (Pierce Chem. Co. Cat. #2165-G); and (v) sulfo-NHS (N-hydroxysulfo-succinimide: Pierce Chem. Co., Cat. #24510) conjugated to EDC. Additional linkers include, but are not limited to, SMCC, sulfo-SMCC, SPDB, or sulfo-SPDB.

[000401] The linkers described above contain components that have different attributes, thus leading to conjugates with differing physio-chemical properties. For example, sulfo-NHS esters of alkyl carboxylates are more stable than sulfo-NHS esters of aromatic carboxylates. NHS-ester containing linkers are less soluble than sulfo-NHS esters. Further, the linker SMPT contains a sterically hindered disulfide bond, and can form conjugates with increased stability. Disulfide linkages, are in general, less stable than other linkages because the disulfide linkage is cleaved *in vitro*, resulting in less conjugate

available. Sulfo-NHS, in particular, can enhance the stability of carbodimide couplings. Carbodimide couplings (such as EDC) when used in conjunction with sulfo-NHS, forms esters that are more resistant to hydrolysis than the carbodimide coupling reaction alone.

[000402] In some embodiments, the linkers are cleavable. In some embodiments, the linkers are non-cleavable. In some embodiments, two or more linkers are present. The two or more linkers are all the same, *i.e.*, cleavable or non-cleavable, or the two or more linkers are different, *i.e.*, at least one cleavable and at least one non-cleavable.

[000403] The present disclosure utilizes several methods for attaching agents to ABs: (a) attachment to the carbohydrate moieties of the AB, or (b) attachment to sulfhydryl groups of the AB, or (c) attachment to amino groups of the AB, or (d) attachment to carboxylate groups of the AB. According to the disclosure, ABs may be covalently attached to an agent through an intermediate linker having at least two reactive groups, one to react with AB and one to react with the agent. The linker, which may include any compatible organic compound, can be chosen such that the reaction with AB (or agent) does not adversely affect AB reactivity and selectivity. Furthermore, the attachment of linker to agent might not destroy the activity of the agent. Suitable linkers for reaction with oxidized antibodies or oxidized antibody fragments include those containing an amine selected from the group consisting of primary amine, secondary amine, hydrazine, hydrazide, hydroxylamine, phenylhydrazine, semicarbazide and thiosemicarbazide groups. Such reactive functional groups may exist as part of the structure of the linker, or may be introduced by suitable chemical modification of linkers not containing such groups.

[000404] According to the present disclosure, suitable linkers for attachment to reduced ABs include those having certain reactive groups capable of reaction with a sulfhydryl group of a reduced antibody or fragment. Such reactive groups include, but are not limited to: reactive haloalkyl groups (including, for example, haloacetyl groups), p-mercuribenzoate groups and groups capable of Michael-type addition reactions (including, for example, maleimides and groups of the type described by Mitra and Lawton, 1979, J. Amer. Chem. Soc. 101: 3097-3110).

[000405] According to the present disclosure, suitable linkers for attachment to neither oxidized nor reduced Abs include those having certain functional groups capable of reaction with the primary amino groups present in unmodified lysine residues in the Ab. Such reactive groups include, but are not limited to, NHS carboxylic or carbonic esters, sulfo-NHS carboxylic or carbonic esters, 4-nitrophenyl carboxylic or carbonic esters,

pentafluorophenyl carboxylic or carbonic esters, acyl imidazoles, isocyanates, and isothiocyanates.

[000406] According to the present disclosure, suitable linkers for attachment to neither oxidized nor reduced Abs include those having certain functional groups capable of reaction with the carboxylic acid groups present in aspartate or glutamate residues in the Ab, which have been activated with suitable reagents. Suitable activating reagents include EDC, with or without added NHS or sulfo-NHS, and other dehydrating agents utilized for carboxamide formation. In these instances, the functional groups present in the suitable linkers would include primary and secondary amines, hydrazines, hydroxylamines, and hydrazides.

[000407] The agent may be attached to the linker before or after the linker is attached to the AB. In certain applications it may be desirable to first produce an AB-linker intermediate in which the linker is free of an associated agent. Depending upon the particular application, a specific agent may then be covalently attached to the linker. In some embodiments, the AB is first attached to the MM, CM and associated linkers and then attached to the linker for conjugation purposes.

[000408] *Branched Linkers*: In specific embodiments, branched linkers that have multiple sites for attachment of agents are utilized. For multiple site linkers, a single covalent attachment to an AB would result in an AB-linker intermediate capable of binding an agent at a number of sites. The sites may be aldehyde or sulfhydryl groups or any chemical site to which agents can be attached.

[000409] In some embodiments, higher specific activity (or higher ratio of agents to AB) can be achieved by attachment of a single site linker at a plurality of sites on the AB. This plurality of sites may be introduced into the AB by either of two methods. First, one may generate multiple aldehyde groups and/or sulfhydryl groups in the same AB. Second, one may attach to an aldehyde or sulfhydryl of the AB a "branched linker" having multiple functional sites for subsequent attachment to linkers. The functional sites of the branched linker or multiple site linker may be aldehyde or sulfhydryl groups, or may be any chemical site to which linkers may be attached. Still higher specific activities may be obtained by combining these two approaches, that is, attaching multiple site linkers at several sites on the AB.

[000410] *Cleavable Linkers*: Peptide linkers that are susceptible to cleavage by enzymes of the complement system, such as but not limited to u-plasminogen activator, tissue plasminogen activator, trypsin, plasmin, or another enzyme having proteolytic

activity may be used in one embodiment of the present disclosure. According to one method of the present disclosure, an agent is attached via a linker susceptible to cleavage by complement. The antibody is selected from a class that can activate complement. The antibody-agent conjugate, thus, activates the complement cascade and releases the agent at the target site. According to another method of the present disclosure, an agent is attached via a linker susceptible to cleavage by enzymes having a proteolytic activity such as a u-plasminogen activator, a tissue plasminogen activator, plasmin, or trypsin. These cleavable linkers are useful in conjugated activatable antibodies that include an extracellular toxin, *e.g.*, by way of non-limiting example, any of the extracellular toxins shown in Table 11.

[000411] Non-limiting examples of cleavable linker sequences are provided in Table 13.

Table 13: Exemplary Linker Sequences for Conjugation

Types of Cleavable Sequences	Amino Acid Sequence
Plasmin cleavable sequences	
Pro-urokinase	PRFKIIGG (SEQ ID NO: 396) PRFRIIGG (SEQ ID NO: 397)
TGFβ	SSRHRRALD (SEQ ID NO: 398)
Plasminogen	RKSSIIIRMRDVVL (SEQ ID NO: 399)
Staphylokinase	SSSFDKGKYKKGDDA (SEQ ID NO: 400) SSSFDKGKYKRGDDA (SEQ ID NO: 401)
Factor Xa cleavable sequences	IEGR (SEQ ID NO: 402) IDGR (SEQ ID NO: 403) GGSIDGR (SEQ ID NO: 404)
MMP cleavable sequences	
Gelatinase A	PLGLWA (SEQ ID NO: 405)
Collagenase cleavable sequences	
Calf skin collagen (α1(I) chain)	GPQGIAGQ (SEQ ID NO: 406)
Calf skin collagen (α2(I) chain)	GPQGLLGA (SEQ ID NO: 407)
Bovine cartilage collagen (α1(II) chain)	GIAGQ (SEQ ID NO: 408)
Human liver collagen (α1(III) chain)	GPLGIAGI (SEQ ID NO: 409)
Human α_2M	GPEGLRVG (SEQ ID NO: 410)
Human PZP	YGAGLGVV (SEQ ID NO: 411) AGLGVVER (SEQ ID NO: 412) AGLGISST (SEQ ID NO: 413)
Rat α_1M	EPQALAMS (SEQ ID NO: 414) QALAMSAI (SEQ ID NO: 415)
Rat α_2M	AAYHLVSQ (SEQ ID NO: 416) MDAFLESS (SEQ ID NO: 417)
Rat α_1I_3(2J)	ESLPVVAV (SEQ ID NO: 418)

Rat α_1I_3(27J) Human fibroblast collagenase (autolytic cleavages)	SAPAVESE (SEQ ID NO: 419) DVAQFVLT (SEQ ID NO: 420) VAQFVLTE (SEQ ID NO: 421) AQFVLTEG (SEQ ID NO: 422) PVQPIGPQ (SEQ ID NO: 423)

[000412] In addition, agents may be attached via disulfide bonds (for example, the disulfide bonds on a cysteine molecule) to the AB. Since many tumors naturally release high levels of glutathione (a reducing agent) this can reduce the disulfide bonds with subsequent release of the agent at the site of delivery. In some embodiments, the reducing agent that would modify a CM would also modify the linker of the conjugated activatable antibody.

[000413] *Spacers and Cleavable Elements*: In some embodiments, it may be necessary to construct the linker in such a way as to optimize the spacing between the agent and the AB of the activatable antibody. This may be accomplished by use of a linker of the general structure:

$$W - (CH_2)n - Q$$

wherein

W is either --NH--CH_2-- or --CH_2--;

Q is an amino acid, peptide; and

n is an integer from 0 to 20.

[000414] In some embodiments, the linker may comprise a spacer element and a cleavable element. The spacer element serves to position the cleavable element away from the core of the AB such that the cleavable element is more accessible to the enzyme responsible for cleavage. Certain of the branched linkers described above may serve as spacer elements.

[000415] Throughout this discussion, it should be understood that the attachment of linker to agent (or of spacer element to cleavable element, or cleavable element to agent) need not be particular mode of attachment or reaction. Any reaction providing a product of suitable stability and biological compatibility is acceptable.

[000416] *Serum Complement and Selection of Linkers*: According to one method of the present disclosure, when release of an agent is desired, an AB that is an antibody of a class that can activate complement is used. The resulting conjugate retains both the ability to bind antigen and activate the complement cascade. Thus, according to this embodiment of the present disclosure, an agent is joined to one end of the cleavable linker or cleavable

element and the other end of the linker group is attached to a specific site on the AB. For example, if the agent has an hydroxy group or an amino group, it may be attached to the carboxy terminus of a peptide, amino acid or other suitably chosen linker via an ester or amide bond, respectively. For example, such agents may be attached to the linker peptide via a carbodimide reaction. If the agent contains functional groups that would interfere with attachment to the linker, these interfering functional groups can be blocked before attachment and deblocked once the product conjugate or intermediate is made. The opposite or amino terminus of the linker is then used either directly or after further modification for binding to an AB that is capable of activating complement.

[000417] Linkers (or spacer elements of linkers) may be of any desired length, one end of which can be covalently attached to specific sites on the AB of the activatable antibody. The other end of the linker or spacer element may be attached to an amino acid or peptide linker.

[000418] Thus when these conjugates bind to antigen in the presence of complement the amide or ester bond that attaches the agent to the linker will be cleaved, resulting in release of the agent in its active form. These conjugates, when administered to a subject, will accomplish delivery and release of the agent at the target site, and are particularly effective for the in vivo delivery of pharmaceutical agents, antibiotics, antimetabolites, antiproliferative agents and the like as presented in but not limited to those in Table 11.

[000419] *Linkers for Release without Complement Activation*: In yet another application of targeted delivery, release of the agent without complement activation is desired since activation of the complement cascade will ultimately lyse the target cell. Hence, this approach is useful when delivery and release of the agent should be accomplished without killing the target cell. Such is the goal when delivery of cell mediators such as hormones, enzymes, corticosteroids, neurotransmitters, genes or enzymes to target cells is desired. These conjugates may be prepared by attaching the agent to an AB that is not capable of activating complement via a linker that is mildly susceptible to cleavage by serum proteases. When this conjugate is administered to an individual, antigen-antibody complexes will form quickly whereas cleavage of the agent will occur slowly, thus resulting in release of the compound at the target site.

[000420] *Biochemical Cross Linkers*: In some embodiments, the activatable antibody may be conjugated to one or more therapeutic agents using certain biochemical cross-linkers. Cross-linking reagents form molecular bridges that tie together functional groups of

two different molecules. To link two different proteins in a step-wise manner, hetero-bifunctional cross-linkers can be used that eliminate unwanted homopolymer formation.

[000421] Peptidyl linkers cleavable by lysosomal proteases are also useful, for example, Val-Cit, Val-Ala or other dipeptides. In addition, acid-labile linkers cleavable in the low-pH environment of the lysosome may be used, for example: bis-sialyl ether. Other suitable linkers include cathepsin-labile substrates, particularly those that show optimal function at an acidic pH.

[000422] Exemplary hetero-bifunctional cross-linkers are referenced in Table 14.

Table 14: Exemplary Hetero-Bifunctional Cross Linkers

HETERO-BIFUNCTIONAL CROSS-LINKERS

Linker	Reactive Toward	Advantages and Applications	Spacer Arm Length after cross-linking (Angstroms)
SMPT	Primary amines Sulfhydryls	Greater stability	11.2 Å
SPDP	Primary amines Sulfhydryls	Thiolation Cleavable cross-linking	6.8 Å
LC-SPDP	Primary amines Sulfhydryls	Extended spacer arm	15.6 Å
Sulfo-LC-SPDP	Primary amines Sulfhydryls	Extender spacer arm Water-soluble	15.6 Å
SMCC	Primary amines Sulfhydryls	Stable maleimide reactive group Enzyme-antibody conjugation Hapten-carrier protein conjugation	11.6 Å
Sulfo-SMCC	Primary amines Sulfhydryls	Stable maleimide reactive group Water-soluble Enzyme-antibody conjugation	11.6 Å
MBS	Primary amines Sulfhydryls	Enzyme-antibody conjugation Hapten-carrier protein conjugation	9.9 Å
Sulfo-MBS	Primary amines Sulfhydryls	Water-soluble	9.9 Å
SIAB	Primary amines Sulfhydryls	Enzyme-antibody conjugation	10.6 Å
Sulfo-SIAB	Primary amines Sulfhydryls	Water-soluble	10.6 Å
SMPB	Primary amines Sulfhydryls	Extended spacer arm Enzyme-antibody conjugation	14.5 Å
Sulfo-SMPB	Primary amines Sulfhydryls	Extended spacer arm Water-soluble	14.5 Å

EDE/Sulfo-NHS	Primary amines Carboxyl groups	Hapten-Carrier conjugation	0
ABH	Carbohydrates Nonselective	Reacts with sugar groups	11.9 Å

[000423] *Non-Cleavable Linkers or Direct Attachment*: In some embodiments of the disclosure, the conjugate may be designed so that the agent is delivered to the target but not released. This may be accomplished by attaching an agent to an AB either directly or via a non-cleavable linker.

[000424] These non-cleavable linkers may include amino acids, peptides, D-amino acids or other organic compounds that may be modified to include functional groups that can subsequently be utilized in attachment to ABs by the methods described herein. A-general formula for such an organic linker could be

$$W - (CH_2)n - Q$$

wherein

W is either --NH--CH_2-- or --CH_2--;

Q is an amino acid, peptide; and

n is an integer from 0 to 20.

[000425] *Non-Cleavable Conjugates*: In some embodiments, a compound may be attached to ABs that do not activate complement. When using ABs that are incapable of complement activation, this attachment may be accomplished using linkers that are susceptible to cleavage by activated complement or using linkers that are not susceptible to cleavage by activated complement.

[000426] The antibodies disclosed herein can also be formulated as immunoliposomes. Liposomes containing the antibody are prepared by methods known in the art, such as described in Epstein et al., Proc. Natl. Acad. Sci. USA, 82: 3688 (1985); Hwang et al., Proc. Natl Acad. Sci. USA, 77: 4030 (1980); and U.S. Pat. Nos. 4,485,045 and 4,544,545. Liposomes with enhanced circulation time are disclosed in U.S. Patent No. 5,013,556.

[000427] Particularly useful liposomes can be generated by the reverse-phase evaporation method with a lipid composition comprising phosphatidylcholine, cholesterol, and PEG-derivatized phosphatidylethanolamine (PEG-PE). Liposomes are extruded through filters of defined pore size to yield liposomes with the desired diameter. Fab' fragments of the antibody of the present disclosure can be conjugated to the liposomes as described in Martin et al., J. Biol. Chem., 257: 286-288 (1982) via a disulfide-interchange reaction.

Definitions:

[000428] Unless otherwise defined, scientific and technical terms used in connection with the present disclosure shall have the meanings that are commonly understood by those of ordinary skill in the art. The term "a" entity or "an" entity refers to one or more of that entity. For example, a compound refers to one or more compounds. As such, the terms "a", "an", "one or more" and "at least one" can be used interchangeably. Further, unless otherwise required by context, singular terms shall include pluralities and plural terms shall include the singular. Generally, nomenclatures utilized in connection with, and techniques of, cell and tissue culture, molecular biology, and protein and oligo- or polynucleotide chemistry and hybridization described herein are those well-known and commonly used in the art. Standard techniques are used for recombinant DNA, oligonucleotide synthesis, and tissue culture and transformation (*e.g.*, electroporation, lipofection). Enzymatic reactions and purification techniques are performed according to manufacturer's specifications or as commonly accomplished in the art or as described herein. The foregoing techniques and procedures are generally performed according to conventional methods well known in the art and as described in various general and more specific references that are cited and discussed throughout the present specification. *See e.g.*, Sambrook *et al.* Molecular Cloning: A Laboratory Manual (2d ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. (1989)). The nomenclatures utilized in connection with, and the laboratory procedures and techniques of, analytical chemistry, synthetic organic chemistry, and medicinal and pharmaceutical chemistry described herein are those well-known and commonly used in the art. Standard techniques are used for chemical syntheses, chemical analyses, pharmaceutical preparation, formulation, and delivery, and treatment of patients.

[000429] As utilized in accordance with the present disclosure, the following terms, unless otherwise indicated, shall be understood to have the following meanings:

[000430] As used herein, the term "antibody" refers to immunoglobulin molecules and immunologically active portions of immunoglobulin (Ig) molecules, *i.e.*, molecules that contain an antigen binding site that specifically binds (immunoreacts with) an antigen. By "specifically bind" or "immunoreacts with" or "immunospecifically bind" is meant that the antibody reacts with one or more antigenic determinants of the desired antigen and does not react with other polypeptides or binds at much lower affinity ($K_d > 10^{-6}$). Antibodies include, but are not limited to, polyclonal, monoclonal, chimeric, domain antibody, single chain, Fab, and $F(ab')_2$ fragments, scFvs, and an Fab expression library.

[000431] The basic antibody structural unit is known to comprise a tetramer. Each tetramer is composed of two identical pairs of polypeptide chains, each pair having one "light" (about 25 kDa) and one "heavy" chain (about 50-70 kDa). The amino-terminal portion of each chain includes a variable region of about 100 to 110 or more amino acids primarily responsible for antigen recognition. The carboxy-terminal portion of each chain defines a constant region primarily responsible for effector function. In general, antibody molecules obtained from humans relate to any of the classes IgG, IgM, IgA, IgE and IgD, which differ from one another by the nature of the heavy chain present in the molecule. Certain classes have subclasses as well, such as IgG_1, IgG_2, and others. Furthermore, in humans, the light chain may be a kappa chain or a lambda chain.

[000432] The term "monoclonal antibody" (mAb) or "monoclonal antibody composition", as used herein, refers to a population of antibody molecules that contain only one molecular species of antibody molecule consisting of a unique light chain gene product and a unique heavy chain gene product. In particular, the complementarity determining regions (CDRs) of the monoclonal antibody are identical in all the molecules of the population. MAbs contain an antigen binding site capable of immunoreacting with a particular epitope of the antigen characterized by a unique binding affinity for it.

[000433] The term "antigen-binding site" or "binding portion" refers to the part of the immunoglobulin molecule that participates in antigen binding. The antigen binding site is formed by amino acid residues of the N-terminal variable ("V") regions of the heavy ("H") and light ("L") chains. Three highly divergent stretches within the V regions of the heavy and light chains, referred to as "hypervariable regions," are interposed between more conserved flanking stretches known as "framework regions," or "FRs". Thus, the term "FR" refers to amino acid sequences that are naturally found between, and adjacent to, hypervariable regions in immunoglobulins. In an antibody molecule, the three hypervariable regions of a light chain and the three hypervariable regions of a heavy chain are disposed relative to each other in three dimensional space to form an antigen-binding surface. The antigen-binding surface is complementary to the three-dimensional surface of a bound antigen, and the three hypervariable regions of each of the heavy and light chains are referred to as "complementarity-determining regions," or "CDRs." The assignment of amino acids to each domain is in accordance with the definitions of Kabat Sequences of Proteins of Immunological Interest (National Institutes of Health, Bethesda, Md. (1987 and

1991)), or Chothia & Lesk J. Mol. Biol. 196:901-917 (1987), Chothia *et al.* Nature 342:878-883 (1989).

[000434] As used herein, the term "epitope" includes any protein determinant capable of specific binding to an immunoglobulin, an scFv, or a T-cell receptor. The term "epitope" includes any protein determinant capable of specific binding to an immunoglobulin or T-cell receptor. Epitopic determinants usually consist of chemically active surface groupings of molecules such as amino acids or sugar side chains and usually have specific three dimensional structural characteristics, as well as specific charge characteristics. For example, antibodies may be raised against N-terminal or C-terminal peptides of a polypeptide. An antibody is said to specifically bind an antigen when the dissociation constant is ≤ 1 μM; in some embodiments, ≤ 100 nM and in some embodiments, ≤ 10 nM.

[000435] As used herein, the terms "specific binding," "immunological binding," and "immunological binding properties" refer to the non-covalent interactions of the type which occur between an immunoglobulin molecule and an antigen for which the immunoglobulin is specific. The strength, or affinity of immunological binding interactions can be expressed in terms of the dissociation constant (K_d) of the interaction, wherein a smaller K_d represents a greater affinity. Immunological binding properties of selected polypeptides can be quantified using methods well known in the art. One such method entails measuring the rates of antigen-binding site/antigen complex formation and dissociation, wherein those rates depend on the concentrations of the complex partners, the affinity of the interaction, and geometric parameters that equally influence the rate in both directions. Thus, both the "on rate constant" (K_{on}) and the "off rate constant" (K_{off}) can be determined by calculation of the concentrations and the actual rates of association and dissociation. (*See* Nature 361:186-87 (1993)). The ratio of K_{off} /K_{on} enables the cancellation of all parameters not related to affinity, and is equal to the dissociation constant K_d. (*See, generally*, Davies et al. (1990) Annual Rev Biochem 59:439-473). An antibody of the present disclosure is said to specifically bind to the target, when the binding constant (K_d) is ≤ 1 μM, in some embodiments ≤ 100 nM, in some embodiments ≤ 10 nM, and in some embodiments ≤ 100 pM to about 1 pM, as measured by assays such as radioligand binding assays or similar assays known to those skilled in the art.

[000436] The term "isolated polynucleotide" as used herein shall mean a polynucleotide of genomic, cDNA, or synthetic origin or some combination thereof, which by virtue of its origin the "isolated polynucleotide" (1) is not associated with all or a portion

of a polynucleotide in which the "isolated polynucleotide" is found in nature, (2) is operably linked to a polynucleotide which it is not linked to in nature, or (3) does not occur in nature as part of a larger sequence. Polynucleotides in accordance with the disclosure include the nucleic acid molecules encoding the heavy chain immunoglobulin molecules shown herein, and nucleic acid molecules encoding the light chain immunoglobulin molecules shown herein.

[000437] The term "isolated protein" referred to herein means a protein of cDNA, recombinant RNA, or synthetic origin or some combination thereof, which by virtue of its origin, or source of derivation, the "isolated protein" (1) is not associated with proteins found in nature, (2) is free of other proteins from the same source, *e.g.,* free of murine proteins, (3) is expressed by a cell from a different species, or (4) does not occur in nature.

[000438] The term "polypeptide" is used herein as a generic term to refer to native protein, fragments, or analogs of a polypeptide sequence. Hence, native protein fragments, and analogs are species of the polypeptide genus. Polypeptides in accordance with the disclosure comprise the heavy chain immunoglobulin molecules shown herein, and the light chain immunoglobulin molecules shown herein, as well as antibody molecules formed by combinations comprising the heavy chain immunoglobulin molecules with light chain immunoglobulin molecules, such as kappa light chain immunoglobulin molecules, and vice versa, as well as fragments and analogs thereof.

[000439] The term "naturally-occurring" as used herein as applied to an object refers to the fact that an object can be found in nature. For example, a polypeptide or polynucleotide sequence that is present in an organism (including viruses) that can be isolated from a source in nature and that has not been intentionally modified by man in the laboratory or otherwise is naturally-occurring.

[000440] The term "operably linked" as used herein refers to positions of components so described are in a relationship permitting them to function in their intended manner. A control sequence "operably linked" to a coding sequence is ligated in such a way that expression of the coding sequence is achieved under conditions compatible with the control sequences.

[000441] The term "control sequence" as used herein refers to polynucleotide sequences that are necessary to effect the expression and processing of coding sequences to which they are ligated. The nature of such control sequences differs depending upon the host organism in prokaryotes, such control sequences generally include promoter, ribosomal

binding site, and transcription termination sequence in eukaryotes, generally, such control sequences include promoters and transcription termination sequence. The term "control sequences" is intended to include, at a minimum, all components whose presence is essential for expression and processing, and can also include additional components whose presence is advantageous, for example, leader sequences and fusion partner sequences. The term "polynucleotide" as referred to herein means nucleotides of at least 10 bases in length, either ribonucleotides or deoxynucleotides or a modified form of either type of nucleotide. The term includes single and double stranded forms of DNA.

[000442] The term oligonucleotide referred to herein includes naturally occurring, and modified nucleotides linked together by naturally occurring, and non-naturally occurring oligonucleotide linkages. Oligonucleotides are a polynucleotide subset generally comprising a length of 200 bases or fewer. In some embodiments, oligonucleotides are 10 to 60 bases in length and in some embodiments, 12, 13, 14, 15, 16, 17, 18, 19, or 20 to 40 bases in length. Oligonucleotides are usually single stranded, *e.g.*, for probes, although oligonucleotides may be double stranded, *e.g.*, for use in the construction of a gene mutant. Oligonucleotides of the disclosure are either sense or antisense oligonucleotides.

[000443] The term "naturally occurring nucleotides" referred to herein includes deoxyribonucleotides and ribonucleotides. The term "modified nucleotides" referred to herein includes nucleotides with modified or substituted sugar groups and the like. The term "oligonucleotide linkages" referred to herein includes oligonucleotide linkages such as phosphorothioate, phosphorodithioate, phosphoroselerloate, phosphorodiselenoate, phosphoroanilothioate, phoshoraniladate, phosphoronmidate, and the like. *See e.g.*, LaPlanche *et al.* Nucl. Acids Res. 14:9081 (1986); Stec *et al.* J. Am. Chem. Soc. 106:6077 (1984), Stein *et al.* Nucl. Acids Res. 16:3209 (1988), Zon *et al.* Anti Cancer Drug Design 6:539 (1991); Zon *et al.* Oligonucleotides and Analogues: A Practical Approach, pp. 87-108 (F. Eckstein, Ed., Oxford University Press, Oxford England (1991)); Stec *et al.* U.S. Patent No. 5,151,510; Uhlmann and Peyman Chemical Reviews 90:543 (1990). An oligonucleotide can include a label for detection, if desired.

[000444] As used herein, the twenty conventional amino acids and their abbreviations follow conventional usage. *See* Immunology - A Synthesis (2nd Edition, E.S. Golub and D.R. Green, Eds., Sinauer Associates, Sunderland, Mass. (1991)). Stereoisomers (*e.g.*, D-amino acids) of the twenty conventional amino acids, unnatural amino acids such as α-, α-disubstituted amino acids, N-alkyl amino acids, lactic acid, and other unconventional amino

acids may also be suitable components for polypeptides of the present disclosure. Examples of unconventional amino acids include: 4 hydroxyproline, γ-carboxyglutamate, ε-N,N,N-trimethyllysine, ε -N-acetyllysine, O-phosphoserine, N- acetylserine, N-formylmethionine, 3-methylhistidine, 5-hydroxylysine, σ-N-methylarginine, and other similar amino acids and imino acids (*e.g.,* 4- hydroxyproline). In the polypeptide notation used herein, the left-hand direction is the amino terminal direction and the right-hand direction is the carboxy-terminal direction, in accordance with standard usage and convention.

[000445] Similarly, unless specified otherwise, the left-hand end of single- stranded polynucleotide sequences is the 5' end the left-hand direction of double-stranded polynucleotide sequences is referred to as the 5' direction. The direction of 5' to 3' addition of nascent RNA transcripts is referred to as the transcription direction sequence regions on the DNA strand having the same sequence as the RNA and that are 5' to the 5' end of the RNA transcript are referred to as "upstream sequences", sequence regions on the DNA strand having the same sequence as the RNA and that are 3' to the 3' end of the RNA transcript are referred to as "downstream sequences".

[000446] As applied to polypeptides, the term "substantial identity" means that two peptide sequences, when optimally aligned, such as by the programs GAP or BESTFIT using default gap weights, share at least 80 percent sequence identity, in some embodiments, at least 90 percent sequence identity, in some embodiments, at least 95 percent sequence identity, and in some embodiments, at least 99 percent sequence identity.

[000447] In some embodiments, residue positions that are not identical differ by conservative amino acid substitutions.

[000448] As discussed herein, minor variations in the amino acid sequences of antibodies or immunoglobulin molecules are contemplated as being encompassed by the present disclosure, providing that the variations in the amino acid sequence maintain at least 75%, in some embodiments, at least 80%, 90%, 95%, and in some embodiments, 99%. In particular, conservative amino acid replacements are contemplated. Conservative replacements are those that take place within a family of amino acids that are related in their side chains. Genetically encoded amino acids are generally divided into families: (1) acidic amino acids are aspartate, glutamate; (2) basic amino acids are lysine, arginine, histidine; (3) non-polar amino acids are alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan, and (4) uncharged polar amino acids are glycine, asparagine, glutamine, cysteine, serine, threonine, tyrosine. The hydrophilic amino acids include

arginine, asparagine, aspartate, glutamine, glutamate, histidine, lysine, serine, and threonine. The hydrophobic amino acids include alanine, cysteine, isoleucine, leucine, methionine, phenylalanine, proline, tryptophan, tyrosine and valine. Other families of amino acids include (i) serine and threonine, which are the aliphatic-hydroxy family; (ii) asparagine and glutamine, which are the amide containing family; (iii) alanine, valine, leucine and isoleucine, which are the aliphatic family; and (iv) phenylalanine, tryptophan, and tyrosine, which are the aromatic family. For example, it is reasonable to expect that an isolated replacement of a leucine with an isoleucine or valine, an aspartate with a glutamate, a threonine with a serine, or a similar replacement of an amino acid with a structurally related amino acid will not have a major effect on the binding or properties of the resulting molecule, especially if the replacement does not involve an amino acid within a framework site. Whether an amino acid change results in a functional peptide can readily be determined by assaying the specific activity of the polypeptide derivative. Assays are described in detail herein. Fragments or analogs of antibodies or immunoglobulin molecules can be readily prepared by those of ordinary skill in the art. Suitable amino- and carboxy-termini of fragments or analogs occur near boundaries of functional domains. Structural and functional domains can be identified by comparison of the nucleotide and/or amino acid sequence data to public or proprietary sequence databases. In some embodiments, computerized comparison methods are used to identify sequence motifs or predicted protein conformation domains that occur in other proteins of known structure and/or function. Methods to identify protein sequences that fold into a known three-dimensional structure are known. Bowie *et al.* Science 253:164 (1991). Thus, the foregoing examples demonstrate that those of skill in the art can recognize sequence motifs and structural conformations that may be used to define structural and functional domains in accordance with the disclosure.

[000449] Suitable amino acid substitutions are those that: (1) reduce susceptibility to proteolysis, (2) reduce susceptibility to oxidation, (3) alter binding affinity for forming protein complexes, (4) alter binding affinities, and (5) confer or modify other physicochemical or functional properties of such analogs. Analogs can include various muteins of a sequence other than the naturally-occurring peptide sequence. For example, single or multiple amino acid substitutions (for example, conservative amino acid substitutions) may be made in the naturally- occurring sequence (for example, in the portion of the polypeptide outside the domain(s) forming intermolecular contacts. A conservative amino acid substitution should not substantially change the structural characteristics of the

parent sequence (*e.g.*, a replacement amino acid should not tend to break a helix that occurs in the parent sequence, or disrupt other types of secondary structure that characterizes the parent sequence). Examples of art-recognized polypeptide secondary and tertiary structures are described in Proteins, Structures and Molecular Principles (Creighton, Ed., W. H. Freeman and Company, New York (1984)); Introduction to Protein Structure (C. Branden and J. Tooze, eds., Garland Publishing, New York, N.Y. (1991)); and Thornton et at. Nature 354:105 (1991).

[000450] The term "polypeptide fragment" as used herein refers to a polypeptide that has an amino terminal and/or carboxy-terminal deletion and/or one or more internal deletion(s), but where the remaining amino acid sequence is identical to the corresponding positions in the naturally-occurring sequence deduced, for example, from a full length cDNA sequence. Fragments typically are at least 5, 6, 8 or 10 amino acids long, in some embodiments, at least 14 amino acids long, in some embodiments, at least 20 amino acids long, usually at least 50 amino acids long, and in some embodiments, at least 70 amino acids long. The term "analog" as used herein refers to polypeptides that are comprised of a segment of at least 25 amino acids that has substantial identity to a portion of a deduced amino acid sequence and that has specific binding to the target, under suitable binding conditions. Typically, polypeptide analogs comprise a conservative amino acid substitution (or addition or deletion) with respect to the naturally- occurring sequence. Analogs typically are at least 20 amino acids long, in some embodiments, at least 50 amino acids long or longer, and can often be as long as a full-length naturally-occurring polypeptide.

[000451] The term "agent" is used herein to denote a chemical compound, a mixture of chemical compounds, a biological macromolecule, or an extract made from biological materials.

[000452] As used herein, the terms "label" or "labeled" refers to incorporation of a detectable marker, *e.g.*, by incorporation of a radiolabeled amino acid or attachment to a polypeptide of biotinyl moieties that can be detected by marked avidin (*e.g.*, streptavidin containing a fluorescent marker or enzymatic activity that can be detected by optical or calorimetric methods). In certain situations, the label or marker can also be therapeutic. Various methods of labeling polypeptides and glycoproteins are known in the art and may be used. Examples of labels for polypeptides include, but are not limited to, the following: radioisotopes or radionuclides (*e.g.*, ^{3}H, ^{14}C, ^{15}N, ^{35}S, ^{90}Y, ^{99}Tc, ^{111}In, ^{125}I, ^{131}I), fluorescent labels (*e.g.*, FITC, rhodamine, lanthanide phosphors), enzymatic labels (*e.g.*, horseradish

peroxidase, p-galactosidase, luciferase, alkaline phosphatase), chemiluminescent, biotinyl groups, predetermined polypeptide epitopes recognized by a secondary reporter (*e.g.*, leucine zipper pair sequences, binding sites for secondary antibodies, metal binding domains, epitope tags). In some embodiments, labels are attached by spacer arms of various lengths to reduce potential steric hindrance. The term "pharmaceutical agent or drug" as used herein refers to a chemical compound or composition capable of inducing a desired therapeutic effect when properly administered to a patient.

[000453] Other chemistry terms herein are used according to conventional usage in the art, as exemplified by The McGraw-Hill Dictionary of Chemical Terms (Parker, S., Ed., McGraw-Hill, San Francisco (1985)).

[000454] As used herein, "substantially pure" means an object species is the predominant species present (*i.e.,* on a molar basis it is more abundant than any other individual species in the composition), and in some embodiments, a substantially purified fraction is a composition wherein the object species comprises at least about 50 percent (on a molar basis) of all macromolecular species present.

[000455] Generally, a substantially pure composition will comprise more than about 80 percent of all macromolecular species present in the composition, in some embodiments, more than about 85%, 90%, 95%, and 99%. In some embodiments, the object species is purified to essential homogeneity (contaminant species cannot be detected in the composition by conventional detection methods) wherein the composition consists essentially of a single macromolecular species.

[000456] The term patient includes human and veterinary subjects.

[000457] Antibodies and/or activatable antibodies of the disclosure specifically bind a given target, e.g., a human target protein such as human PDL1. Also included in the disclosure are antibodies and/or activatable antibodies that bind to the same epitope as the antibodies and/or activatable antibodies described herein. Also included in the disclosure are antibodies and/or antibodies activatable antibodies that compete with an anti-PDL1 antibody and/or an anti-PDL1 activatable antibody described herein for binding to PDL1, e.g., human PDL1. Also included in the disclosure are antibodies and/or antibodies activatable antibodies that cross-compete with an anti-PDL1 antibody and/or an anti-PDL1 activatable antibody described herein for binding to PDL1, e.g., human PDL1.

[000458] Those skilled in the art will recognize that it is possible to determine, without undue experimentation, if a monoclonal antibody (*e.g.*, a murine monoclonal or humanized

antibody) has the same specificity as a monoclonal antibody used in the methods described herein by ascertaining whether the former prevents the latter from binding to the target. If the monoclonal antibody being tested competes with the monoclonal antibody of the disclosure, as shown by a decrease in binding by the monoclonal antibody of the disclosure, then the two monoclonal antibodies bind to the same, or a closely related, epitope. An alternative method for determining whether a monoclonal antibody has the specificity of a monoclonal antibody of the disclosure is to pre-incubate the monoclonal antibody of the disclosure with the target and then add the monoclonal antibody being tested to determine if the monoclonal antibody being tested is inhibited in its ability to bind the target. If the monoclonal antibody being tested is inhibited then, in all likelihood, it has the same, or functionally equivalent, epitopic specificity as the monoclonal antibody of the disclosure.

Multispecific Activatable Antibodies

[000459] The disclosure also provides multispecific anti-PDL1 activatable antibodies. The multispecific activatable antibodies provided herein are multispecific antibodies that recognize PDL1 and at least one or more different antigens or epitopes and that include at least one masking moiety (MM) linked to at least one antigen- or epitope-binding domain of the multispecific antibody such that coupling of the MM reduces the ability of the antigen- or epitope-binding domain to bind its target. In some embodiments, the MM is coupled to the antigen- or epitope-binding domain of the multispecific antibody via a cleavable moiety (CM) that functions as a substrate for at least one protease. The activatable multispecific antibodies provided herein are stable in circulation, activated at intended sites of therapy and/or diagnosis but not in normal, *i.e.*, healthy tissue, and, when activated, exhibit binding to a target that is at least comparable to the corresponding, unmodified multispecific antibody.

[000460] In some embodiments, the multispecific activatable antibodies are designed to engage immune effector cells, also referred to herein as immune-effector cell engaging multispecific activatable antibodies. In some embodiments, the multispecific activatable antibodies are designed to engage leukocytes, also referred to herein as leukocyte engaging multispecific activatable antibodies. In some embodiments, the multispecific activatable antibodies are designed to engage T cells, also referred to herein as T-cell engaging multispecific activatable antibodies. In some embodiments, the multispecific activatable antibodies engage a surface antigen on a leukocyte, such as on a T cell, on a natural killer (NK) cell, on a myeloid mononuclear cell, on a macrophage, and/or on another immune

effector cell. In some embodiments, the immune effector cell is a leukocyte. In some embodiments, the immune effector cell is a T cell. In some embodiments, the immune effector cell is a NK cell. In some embodiments, the immune effector cell is a mononuclear cell, such as a myeloid mononuclear cell. In some embodiments, the multispecific activatable antibodies are designed to bind or otherwise interact with more than one target and/or more than one epitope, also referred to herein as multi-antigen targeting activatable antibodies. As used herein, the terms "target" and "antigen" are used interchangeably.

[000461] In some embodiments, immune effector cell engaging multispecific activatable antibodies of the disclosure include a targeting antibody or antigen-binding fragment thereof that binds PDL1 and an immune effector cell engaging antibody or antigen-binding portion thereof, where at least one of the targeting antibody or antigen-binding fragment thereof and/or the immune effector cell engaging antibody or antigen-binding portion thereof is masked. In some embodiments, the immune effector cell engaging antibody or antigen binding fragment thereof includes a first antibody or antigen-binding fragment thereof (AB1) that binds a first, immune effector cell engaging target, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind the first target. In some embodiments, the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1. In some embodiments, the immune effector cell engaging antibody or antigen binding fragment thereof includes a first antibody or antigen-binding fragment thereof (AB1) that binds a first, immune effector cell engaging target, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind the first target, and the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1. In some embodiments, the non-immune effector cell engaging antibody is a cancer targeting antibody. In some embodiments the non-immune cell effector antibody is an IgG. In some embodiments the immune effector cell engaging antibody is a scFv. In some embodiments the PDL1-targeting antibody (e.g., non-immune cell effector antibody) is an IgG and the immune effector cell engaging

antibody is a scFv. In some embodiments, the immune effector cell is a leukocyte. In some embodiments, the immune effector cell is a T cell. In some embodiments, the immune effector cell is a NK cell. In some embodiments, the immune effector cell is a myeloid mononuclear cell.

[000462] In some embodiments, T-cell engaging multispecific activatable antibodies of the disclosure include a PDL1-targeting antibody or antigen-binding fragment thereof and a T-cell engaging antibody or antigen-binding portion thereof, where at least one of the PDL1-targeting antibody or antigen-binding fragment thereof and/or the T-cell engaging antibody or antigen-binding portion thereof is masked. In some embodiments, the T-cell engaging antibody or antigen binding fragment thereof includes a first antibody or antigen-binding fragment thereof (AB1) that binds a first, T-cell engaging target, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind the first target. In some embodiments, the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1. In some embodiments, the T-cell engaging antibody or antigen binding fragment thereof includes a first antibody or antigen-binding fragment thereof (AB1) that binds a first, T-cell engaging target, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind the first target, and the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1.

[000463] In some embodiments of an immune effector cell engaging multispecific activatable antibody, one antigen is PDL1, and another antigen is typically a stimulatory or inhibitory receptor present on the surface of a T-cell, natural killer (NK) cell, myeloid mononuclear cell, macrophage, and/or other immune effector cell, such as, but not limited to, B7-H4, BTLA, CD3, CD4, CD8, CD16a, CD25, CD27, CD28, CD32, CD56, CD137, CTLA-4, GITR, HVEM, ICOS, LAG3, NKG2D, OX40, PD1, TIGIT, TIM3, or VISTA. In some embodiments, the antigen is a stimulatory receptor present on the surface of a T cell or NK cell; examples of such stimulatory receptors include, but are not limited to, CD3, CD27, CD28, CD137 (also referred to as 4-1BB), GITR, HVEM, ICOS, NKG2D, and OX40. In

some embodiments, the antigen is an inhibitory receptor present on the surface of a T-cell; examples of such inhibitory receptors include, but are not limited to, BTLA, CTLA-4, LAG3, PD1, TIGIT, TIM3, and NK-expressed KIRs. The antibody domain conferring specificity to the T-cell surface antigen may also be substituted by a ligand or ligand domain that binds to a T-cell receptor, a NK-cell receptor, a macrophage receptor, and/or other immune effector cell receptor, such as, but not limited to, B7-1, B7-2, B7H3, PDL1, PDL2, or TNFSF9.

[000464] In some embodiments, the T-cell engaging multispecific activatable antibody includes an anti-CD3 epsilon (CD3ε, also referred to herein as CD3e and CD3) scFv and a targeting antibody or antigen-binding fragment thereof, where at least one of the anti-CD3ε scFv and/or the targeting antibody or antigen-binding portion thereof is masked. In some embodiments, the CD3ε scFv includes a first antibody or antigen-binding fragment thereof (AB1) that binds CD3ε, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind CD3ε. In some embodiments, the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1. In some embodiments, the CD3ε scFv includes a first antibody or antigen-binding fragment thereof (AB1) that binds CD3ε, where the AB1 is attached to a masking moiety (MM1) such that coupling of the MM1 reduces the ability of the AB1 to bind CD3ε, and the targeting antibody or antigen-binding fragment thereof includes a second antibody or fragment thereof that includes a second antibody or antigen-binding fragment thereof (AB2) that binds PDL1, where the AB2 is attached to a masking moiety (MM2) such that coupling of the MM2 reduces the ability of the AB2 to bind PDL1.

[000465] In some embodiments, the multi-antigen targeting antibodies and/or multi-antigen targeting activatable antibodies include at least a first antibody or antigen-binding fragment thereof that binds a first target and/or first epitope and a second antibody or antigen-binding fragment thereof that binds a second target and/or a second epitope. In some embodiments, the multi-antigen targeting antibodies and/or multi-antigen targeting activatable antibodies bind two or more different targets. In some embodiments, the multi-antigen targeting antibodies and/or multi-antigen targeting activatable antibodies bind two or more different epitopes on the same target. In some embodiments, the multi-antigen

targeting antibodies and/or multi-antigen targeting activatable antibodies bind a combination of two or more different targets and two or more different epitopes on the same target.

[000466] In some embodiments, a multispecific activatable antibody comprising an IgG has the IgG variable domains masked. In some embodiments, a multispecific activatable antibody comprising a scFv has the scFv domains masked. In some embodiments, a multispecific activatable antibody has both IgG variable domains and scFv domains, where at least one of the IgG variable domains is coupled to a masking moiety. In some embodiments, a multispecific activatable antibody has both IgG variable domains and scFv domains, where at least one of the scFv domains is coupled to a masking moiety. In some embodiments, a multispecific activatable antibody has both IgG variable domains and scFv domains, where at least one of the IgG variable domains is coupled to a masking moiety and at least one of the scFv domains is coupled to a masking moiety. In some embodiments, a multispecific activatable antibody has both IgG variable domains and scFv domains, where each of the IgG variable domains and the scFv domains is coupled to its own masking moiety. In some embodiments, one antibody domain of a multispecific activatable antibody has specificity for a target antigen and another antibody domain has specificity for a T-cell surface antigen. In some embodiments, one antibody domain of a multispecific activatable antibody has specificity for a target antigen and another antibody domain has specificity for another target antigen. In some embodiments, one antibody domain of a multispecific activatable antibody has specificity for an epitope of a target antigen and another antibody domain has specificity for another epitope of the target antigen.

[000467] In a multispecific activatable antibody, a scFv can be fused to the carboxyl terminus of the heavy chain of an IgG activatable antibody, to the carboxyl terminus of the light chain of an IgG activatable antibody, or to the carboxyl termini of both the heavy and light chains of an IgG activatable antibody. In a multispecific activatable antibody, a scFv can be fused to the amino terminus of the heavy chain of an IgG activatable antibody, to the amino terminus of the light chain of an IgG activatable antibody, or to the amino termini of both the heavy and light chains of an IgG activatable antibody. In a multispecific activatable antibody, a scFv can be fused to any combination of one or more carboxyl termini and one or more amino termini of an IgG activatable antibody. In some embodiments, a masking moiety (MM) linked to a cleavable moiety (CM) is attached to and masks an antigen

binding domain of the IgG. In some embodiments, a masking moiety (MM) linked to a cleavable moiety (CM) is attached to and masks an antigen binding domain of at least one scFv. In some embodiments, a masking moiety (MM) linked to a cleavable moiety (CM) is attached to and masks an antigen binding domain of an IgG and a masking moiety (MM) linked to a cleavable moiety (CM) is attached to and masks an antigen binding domain of at least one scFv.

[000468] The disclosure provides examples of multispecific activatable antibody structures which include, but are not limited to, the following: $(VL\text{-}CL)_2$:(VH-CH1-CH2-CH3-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$; $(VL\text{-}CL)_2$:(VH-CH1-CH2-CH3-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$; $(MM\text{-}L1\text{-}CM\text{-}L2\text{-}VL\text{-}CL)_2$:(VH-CH1-CH2-CH3-L4-VH*-L3-VL*)$_2$; $(MM\text{-}L1\text{-}CM\text{-}L2\text{-}VL\text{-}CL)_2$:(VH-CH1-CH2-CH3-L4-VL*-L3-VH*)$_2$; $(VL\text{-}CL)_2$:(MM-L1-CM-L2-VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; $(VL\text{-}CL)_2$:(MM-L1-CM-L2-VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; $(MM\text{-}L1\text{-}CM\text{-}L2\text{-}VL\text{-}CL)_2$:(VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; $(MM\text{-}L1\text{-}CM\text{-}L2\text{-}VL\text{-}CL)_2$:(VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$:(VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$:(VH-CH1-CH2-CH3)$_2$; (MM-L1-CM-L2-VL*-L3-VH*-L4-VL-CL)$_2$:(VH-CH1-CH2-CH3)$_2$; (MM-L1-CM-L2-VH*-L3-VL*-L4-VL-CL)$_2$:(VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$: (MM-L1-CM-L2-VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$: (MM-L1-CM-L2-VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$: (MM-L1-CM-L2-VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$: (MM-L1-CM-L2-VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*)$_2$: (MM-L1-CM-L2-VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*)$_2$: (MM-L1-CM-L2-VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*)$_2$: (MM-L1-CM-L2-VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*)$_2$: (MM-L1-CM-L2-VH*-L3-VL*-L4-VH-CH1-CH2-CH3)2; (VL-CL-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$: (VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VH*-L3-VL*-L2-CM-L1-MM)$_2$: (VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$; (VL-CL-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$: (VL*-L3-VH*-L4-VH-CH1-CH2-CH3)$_2$; or (VL-CL-L4-VL*-L3-VH*-L2-CM-L1-MM)$_2$: (VH*-L3-VL*-L4-VH-CH1-CH2-CH3)$_2$, wherein: VL and VH represent the light and heavy variable domains of the first specificity, contained in the IgG; VL* and VH* represent the variable domains of the second specificity, contained in the scFv; L1 is a linker peptide connecting the masking moiety

(MM) and the cleavable moiety (CM); L2 is a linker peptide connecting the cleavable moiety (CM), and the antibody; L3 is a linker peptide connecting the variable domains of the scFv; L4 is a linker peptide connecting the antibody of the first specificity to the antibody of the second specificity; CL is the light-chain constant domain; and CH1, CH2, CH3 are the heavy chain constant domains. The first and second specificities may be toward any antigen or epitope.

[000469] In some embodiments of a T-cell engaging multispecific activatable antibody, one antigen is PDL1, and another antigen is typically a stimulatory (also referred to herein as activating) or inhibitory receptor present on the surface of a T-cell, natural killer (NK) cell, myeloid mononuclear cell, macrophage, and/or other immune effector cell, such as, but not limited to, B7-H4, BTLA, CD3, CD4, CD8, CD16a, CD25, CD27, CD28, CD32, CD56, CD137 (also referred to as TNFRSF9), CTLA-4, GITR, HVEM, ICOS, LAG3, NKG2D, OX40, PD1, TIGIT, TIM3, or VISTA. The antibody domain conferring specificity to the T-cell surface antigen may also be substituted by a ligand or ligand domain that binds to a T-cell receptor, a NK-cell receptor, a macrophage receptor, and/or other immune effector cell receptor, such as, but not limited to, PDL1.

[000470] In some embodiments, the targeting antibody is an anti-PDL1 antibody disclosed herein. In some embodiments, the targeting antibody can be in the form an activatable antibody. In some embodiments, the scFv(s) can be in the form of a Pro-scFv (see, e.g., WO 2009/025846, WO 2010/081173).

[000471] In some embodiments, the scFv is specific for binding CD3ε, and comprises or is derived from an antibody or fragment thereof that binds CD3ε, e.g., CH2527, FN18, H2C, OKT3, 2C11, UCHT1, or V9. In some embodiments, the scFv is specific for binding CTLA-4 (also referred to herein as CTLA and CTLA4).

[000472] In some embodiments, the anti-CTLA-4 scFv includes the amino acid sequence:

GGGSGGGGSGSGGGSGGGGSGGGEIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQKPGQA
PRLLIYGASSRATGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGSSPLTFGGGTKVEIKRSG
GSTITSYNVYYTKLSSSGTQVQLVQTGGGVVQPGRSLRLSCAASGSTFSSYAMSWVRQAPGKGLEWV
SAISGSGGSTYYADSVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCATNSLYWYFDLWGRGTLVT
VSSAS (SEQ ID NO: 424)

[000473] In some embodiments, the anti-CTLA-4 scFv includes the amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the amino acid sequence of SEQ ID NO: 424.

[000474] In some embodiments, the anti-CD3ε scFv includes the amino acid sequence:

GGGSGGGGSGSGGGSGGGGSGGGQVQLQQSGAELARPGASVKMSCKASGYTFTRYTMHWVKQRPGQG
LEWIGYINPSRGYTNYNQKFKDKATLTTDKSSSTAYMQLSSLTSEDSAVYYCARYYDDHYCLDYWGQ
GTTLTVSSGGGGSGGGGSGGGGSQIVLTQSPAIMSASPGEKVTMTCSASSSVSYMNWYQQKSGTSPK
RWIYDTSKLASGVPAHFRGSGSGTSYSLTISGMEAEDAATYYCQQWSSNPFTFGSGTKLEINR
(SEQ ID NO: 425)

[000475] In some embodiments, the anti-CD3ε scFv includes the amino acid sequence that is at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or more identical to the amino acid sequence of SEQ ID NO: 425.

[000476] In some embodiments, the scFv is specific for binding one or more T-cells, one or more NK-cells and/or one or more macrophages. In some embodiments, the scFv is specific for binding a target selected from the group consisting of B7-H4, BTLA, CD3, CD4, CD8, CD16a, CD25, CD27, CD28, CD32, CD56, CD137, CTLA-4, GITR, HVEM, ICOS, LAG3, NKG2D, OX40, PD1, TIGIT, TIM3, or VISTA.

[000477] In some embodiments, the multispecific activatable antibody also includes an agent conjugated to the AB. In some embodiments, the agent is a therapeutic agent. In some embodiments, the agent is an antineoplastic agent. In some embodiments, the agent is a toxin or fragment thereof. In some embodiments, the agent is conjugated to the multispecific activatable antibody via a linker. In some embodiments, the agent is conjugated to the AB via a cleavable linker. In some embodiments, the linker is a non-cleavable linker. In some embodiments, the agent is a microtubule inhibitor. In some embodiments, the agent is a nucleic acid damaging agent, such as a DNA alkylator or DNA intercalator, or other DNA damaging agent. In some embodiments, the linker is a cleavable linker. In some embodiments, the agent is an agent selected from the group listed in Table 11. In some embodiments, the agent is a dolastatin. In some embodiments, the agent is an auristatin or derivative thereof. In some embodiments, the agent is auristatin E or a derivative thereof. In some embodiments, the agent is monomethyl auristatin E (MMAE). In some embodiments, the agent is monomethyl auristatin D (MMAD). In some embodiments, the agent is a maytansinoid or maytansinoid derivative. In some embodiments, the agent is

DM1 or DM4. In some embodiments, the agent is a duocarmycin or derivative thereof. In some embodiments, the agent is a calicheamicin or derivative thereof. In some embodiments, the agent is a pyrrolobenzodiazepine. In some embodiments, the agent is a pyrrolobenzodiazepine dimer.

[000478] In some embodiments, the multispecific activatable antibody also includes a detectable moiety. In some embodiments, the detectable moiety is a diagnostic agent.

[000479] In some embodiments, the multispecific activatable antibody naturally contains one or more disulfide bonds. In some embodiments, the multispecific activatable antibody can be engineered to include one or more disulfide bonds.

[000480] The disclosure also provides an isolated nucleic acid molecule encoding a multispecific activatable antibody described herein, as well as vectors that include these isolated nucleic acid sequences. The disclosure provides methods of producing a multispecific activatable antibody by culturing a cell under conditions that lead to expression of the activatable antibody, wherein the cell comprises such a nucleic acid molecule. In some embodiments, the cell comprises such a vector.

[000481] The disclosure also provides a method of manufacturing multispecific activatable antibodies of the disclosure by (a) culturing a cell comprising a nucleic acid construct that encodes the multispecific activatable antibody under conditions that lead to expression of the multispecific activatable, and (b) recovering the multispecific activatable antibody. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

[000482] The disclosure also provides multispecific activatable antibodies and/or multispecific activatable antibody compositions that include at least a first antibody or antigen-binding fragment thereof (AB1) that specifically binds a first target or first epitope and a second antibody or antigen-biding fragment thereof (AB2) that binds a second target or a second epitope, where at least AB1 is coupled or otherwise attached to a masking moiety (MM1), such that coupling of the MM1 reduces the ability of AB1 to bind its target. In some embodiments, the MM1 is coupled to AB1 via a first cleavable moiety (CM1) sequence that includes a substrate for a protease, for example, a protease that is co-localized with the target of AB1 at a treatment site or a diagnostic site in a subject. The multispecific activatable antibodies provided herein are stable in circulation, activated at intended sites of therapy and/or diagnosis but not in normal, *i.e.*, healthy tissue, and, when activated, exhibit binding to the target of AB1 that is at least comparable to the corresponding, unmodified

multispecific antibody. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

[000483] The disclosure also provides compositions and methods that include a multispecific activatable antibody that includes at least a first antibody or antibody fragment (AB1) that specifically binds a target and a second antibody or antibody fragment (AB2), where at least the first AB in the multispecific activatable antibody is coupled to a masking moiety (MM1) that decreases the ability of AB1 to bind its target. In some embodiments, each AB is coupled to a MM that decreases the ability of its corresponding AB to each target. For example, in bispecific activatable antibody embodiments, AB1 is coupled to a first masking moiety (MM1) that decreases the ability of AB1 to bind its target, and AB2 is coupled to a second masking moiety (MM2) that decreases the ability of AB2 to bind its target. In some embodiments, the multispecific activatable antibody comprises more than two AB regions; in such embodiments, AB1 is coupled to a first masking moiety (MM1) that decreases the ability of AB1 to bind its target, AB2 is coupled to a second masking moiety (MM2) that decreases the ability of AB2 to bind its target, AB3 is coupled to a third masking moiety (MM3) that decreases the ability of AB3 to bind its target, and so on for each AB in the multispecific activatable antibody. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

[000484] In some embodiments, the multispecific activatable antibody further includes at least one cleavable moiety (CM) that is a substrate for a protease, where the CM links a MM to an AB. For example, in some embodiments, the multispecific activatable antibody includes at least a first antibody or antibody fragment (AB1) that specifically binds a target and a second antibody or antibody fragment (AB2), where at least the first AB in the multispecific activatable antibody is coupled via a first cleavable moiety (CM1) to a masking moiety (MM1) that decreases the ability of AB1 to bind its target. In some bispecific activatable antibody embodiments, AB1 is coupled via CM1 to MM1, and AB2 is coupled via a second cleavable moiety (CM2) to a second masking moiety (MM2) that decreases the ability of AB2 to bind its target. In some embodiments, the multispecific activatable antibody comprises more than two AB regions; in some of these embodiments, AB1 is coupled via CM1 to MM1, AB2 is coupled via CM2 to MM2, and AB3 is coupled via a third cleavable moiety (CM3) to a third masking moiety (MM3) that decreases the ability of AB3 to bind its target, and so on for each AB in the multispecific activatable

antibody. Suitable AB, MM, and/or CM include any of the AB, MM, and/or CM disclosed herein.

Activatable antibodies Having Non-Binding Steric Moieties or Binding Partners for Non-Binding Steric Moieties

[000485] The disclosure also provides activatable antibodies that include non-binding steric moieties (NB) or binding partners (BP) for non-binding steric moieties, where the BP recruits or otherwise attracts the NB to the activatable antibody. The activatable antibodies provided herein include, for example, an activatable antibody that includes a non-binding steric moiety (NB), a cleavable linker (CL) and antibody or antibody fragment (AB) that binds a target; an activatable antibody that includes a binding partner for a non-binding steric moiety (BP), a CL and an AB; and an activatable antibody that includes a BP to which an NB has been recruited, a CL and an AB that binds the target. Activatable antibodies in which the NB is covalently linked to the CL and AB of the activatable antibody or is associated by interaction with a BP that is covalently linked to the CL and AB of the activatable antibody are referred to herein as "NB-containing activatable antibodies." By activatable or switchable is meant that the activatable antibody exhibits a first level of binding to a target when the activatable antibody is in an inhibited, masked or uncleaved state (*i.e.*, a first conformation), and a second level of binding to the target when the activatable antibody is in an uninhibited, unmasked and/or cleaved state (*i.e.*, a second conformation, *i.e.*, activated antibody), where the second level of target binding is greater than the first level of target binding. The activatable antibody compositions can exhibit increased bioavailability and more favorable biodistribution compared to conventional antibody therapeutics.

[000486] In some embodiments, activatable antibodies provide for reduced toxicity and/or adverse side effects that could otherwise result from binding of the at non-treatment sites and/or non-diagnostic sites if the AB were not masked or otherwise inhibited from binding to such a site.

[000487] Anti-PDL1 activatable antibodies that include a non-binding steric moiety (NB) can be made using the methods set forth in PCT Publication No. WO 2013/192546, the contents of which are hereby incorporated by reference in their entirety.

Use Of Antibodies, Conjugated Antibodies, Activatable Antibodies, and Conjugated Activatable Antibodies

[000488] It will be appreciated that administration of therapeutic entities in accordance with the disclosure will be administered with suitable carriers, excipients, and other agents that are incorporated into formulations to provide improved transfer, delivery, tolerance, and the like. A multitude of appropriate formulations can be found in the formulary known to all pharmaceutical chemists: Remington's Pharmaceutical Sciences (15th ed, Mack Publishing Company, Easton, PA (1975)), particularly Chapter 87 by Blaug, Seymour, therein. These formulations include, for example, powders, pastes, ointments, jellies, waxes, oils, lipids, lipid (cationic or anionic) containing vesicles (such as Lipofectin™), DNA conjugates, anhydrous absorption pastes, oil-in-water and water-in-oil emulsions, emulsions carbowax (polyethylene glycols of various molecular weights), semi-solid gels, and semi-solid mixtures containing carbowax. Any of the foregoing mixtures may be appropriate in treatments and therapies in accordance with the present disclosure, provided that the active ingredient in the formulation is not inactivated by the formulation and the formulation is physiologically compatible and tolerable with the route of administration. *See* also Baldrick P. "Pharmaceutical excipient development: the need for preclinical guidance." Regul. Toxicol Pharmacol. 32(2):210-8 (2000), Wang W. "Lyophilization and development of solid protein pharmaceuticals." Int. J. Pharm. 203(1-2):1-60 (2000), Charman WN "Lipids, lipophilic drugs, and oral drug delivery-some emerging concepts." J Pharm Sci.89(8):967-78 (2000), Powell *et al.* "Compendium of excipients for parenteral formulations" PDA J Pharm Sci Technol. 52:238-311 (1998) and the citations therein for additional information related to formulations, excipients and carriers well known to pharmaceutical chemists.

[000489] Therapeutic formulations of the disclosure, which include an anti-PDL1 antibody and/or activatable anti-PDL1 antibody, such as by way of non-limiting example, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody, are used to prevent, treat or otherwise ameliorate a disease or disorder associated with aberrant target expression and/or activity. For example, therapeutic formulations of the disclosure, which include an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody, are used to treat or otherwise ameliorate a cancer or other neoplastic condition, inflammation, an inflammatory disorder, and/or an autoimmune disease. In some embodiments, the cancer is a solid tumor or a hematologic malignancy where the target is expressed. In some embodiments, the cancer is a solid tumor

where the target is expressed. In some embodiments, the cancer is a hematologic malignancy where the target is expressed. In some embodiments, the target is expressed on parenchyma (e.g., in cancer, the portion of an organ or tissue that often carries out function(s) of the organ or tissue). In some embodiments, the target is expressed on a cell, tissue, or organ. In some embodiments, the target is expressed on stroma (i.e., the connective supportive framework of a cell, tissue, or organ). In some embodiments, the target is expressed on an osteoblast. In some embodiments, the target is expressed on the endothelium (vasculature). In some embodiments, the target is expressed on a cancer stem cell. In some embodiments, the agent to which the antibody and/or the activatable antibody is conjugated is a microtubule inhibitor. In some embodiments, the agent to which the antibody and/or the activatable antibody is conjugated is a nucleic acid damaging agent.

[000490] Efficaciousness of prevention, amelioration or treatment is determined in association with any known method for diagnosing or treating the disease or disorder associated with target expression and/or activity, such as, for example, aberrant target expression and/or activity. Prolonging the survival of a subject or otherwise delaying the progression of the disease or disorder associated with target expression and/or activity, e.g., aberrant target expression and/or activity, in a subject indicates that the antibody, conjugated antibody, activatable antibody and/or conjugated activatable antibody confers a clinical benefit.

[000491] An antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody can be administered in the form of pharmaceutical compositions. Principles and considerations involved in preparing such compositions, as well as guidance in the choice of components are provided, for example, in Remington : The Science And Practice Of Pharmacy 19th ed. (Alfonso R. Gennaro, et al., editors) Mack Pub. Co., Easton, Pa.: 1995; Drug Absorption Enhancement: Concepts, Possibilities, Limitations, And Trends, Harwood Academic Publishers, Langhorne, Pa., 1994; and Peptide And Protein Drug Delivery (Advances In Parenteral Sciences, Vol. 4), 1991, M. Dekker, New York.

[000492] In some embodiments where antibody fragments are used, the smallest fragment that specifically binds to the binding domain of the target protein is selected. For example, based upon the variable-region sequences of an antibody, peptide molecules can be designed that retain the ability to bind the target protein sequence. Such peptides can be synthesized chemically and/or produced by recombinant DNA technology. (*See*, *e.g.*,

Marasco et al., Proc. Natl. Acad. Sci. USA, 90: 7889-7893 (1993)). The formulation can also contain more than one active compounds as necessary for the particular indication being treated, for example, in some embodiments, those with complementary activities that do not adversely affect each other. In some embodiments, or in addition, the composition can comprise an agent that enhances its function, such as, for example, a cytotoxic agent, cytokine, chemotherapeutic agent, or growth-inhibitory agent. Such molecules are suitably present in combination in amounts that are effective for the purpose intended.

[000493] The active ingredients can also be entrapped in microcapsules prepared, for example, by coacervation techniques or by interfacial polymerization, for example, hydroxymethylcellulose or gelatin-microcapsules and poly-(methylmethacrylate) microcapsules, respectively, in colloidal drug delivery systems (for example, liposomes, albumin microspheres, microemulsions, nano-particles, and nanocapsules) or in macroemulsions.

[000494] The formulations to be used for *in vivo* administration must be sterile. This is readily accomplished by filtration through sterile filtration membranes.

[000495] Sustained-release preparations can be prepared. Suitable examples of sustained-release preparations include semipermeable matrices of solid hydrophobic polymers containing the antibody, which matrices are in the form of shaped articles, *e.g.*, films, or microcapsules. Examples of sustained-release matrices include polyesters, hydrogels (for example, poly(2-hydroxyethyl-methacrylate), or poly(vinylalcohol)), polylactides (U.S. Pat. No. 3,773,919), copolymers of L-glutamic acid and γ ethyl-L-glutamate, non-degradable ethylene-vinyl acetate, degradable lactic acid-glycolic acid copolymers such as the LUPRON DEPOT ™ (injectable microspheres composed of lactic acid-glycolic acid copolymer and leuprolide acetate), and poly-D-(-)-3-hydroxybutyric acid. While polymers such as ethylene-vinyl acetate and lactic acid-glycolic acid enable release of molecules for over 100 days, certain hydrogels release proteins for shorter time periods.

[000496] In some embodiments, the antibody, the conjugated antibody, activatable antibody and/or conjugated activatable antibody contains a detectable label. An intact antibody, or a fragment thereof (*e.g.*, Fab, scFv, or $F(ab)_2$) is used. The term "labeled", with regard to the probe or antibody, is intended to encompass direct labeling of the probe or antibody by coupling (*i.e.*, physically linking) a detectable substance to the probe or antibody, as well as indirect labeling of the probe or antibody by reactivity with another reagent that is directly labeled. Examples of indirect labeling include detection of a primary

antibody using a fluorescently-labeled secondary antibody and end-labeling of a DNA probe with biotin such that it can be detected with fluorescently-labeled streptavidin. The term "biological sample" is intended to include tissues, cells and biological fluids isolated from a subject, as well as tissues, cells and fluids present within a subject. Included within the usage of the term "biological sample", therefore, is blood and a fraction or component of blood including blood serum, blood plasma, or lymph. That is, the detection method of the disclosure can be used to detect an analyte mRNA, protein, or genomic DNA in a biological sample *in vitro* as well as *in vivo*. For example, *in vitro* techniques for detection of an analyte mRNA include Northern hybridizations and *in situ* hybridizations. *In vitro* techniques for detection of an analyte protein include enzyme linked immunosorbent assays (ELISAs), Western blots, immunoprecipitations, immunochemical staining, and immunofluorescence. *In vitro* techniques for detection of an analyte genomic DNA include Southern hybridizations. Procedures for conducting immunoassays are described, for example in "ELISA: Theory and Practice: Methods in Molecular Biology", Vol. 42, J. R. Crowther (Ed.) Human Press, Totowa, NJ, 1995; "Immunoassay", E. Diamandis and T. Christopoulus, Academic Press, Inc., San Diego, CA, 1996; and "Practice and Theory of Enzyme Immunoassays", P. Tijssen, Elsevier Science Publishers, Amsterdam, 1985. Furthermore, *in vivo* techniques for detection of an analyte protein include introducing into a subject a labeled anti-analyte protein antibody. For example, the antibody can be labeled with a radioactive marker whose presence and location in a subject can be detected by standard imaging techniques.

[000497] The antibodies, conjugated antibodies, activatable antibodies and/or conjugated activatable antibodies of the disclosure are also useful in a variety of diagnostic and prophylactic formulations. In one embodiment, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody is administered to patients that are at risk of developing one or more of the aforementioned disorders. A patient's or organ's predisposition to one or more of the aforementioned disorders can be determined using genotypic, serological or biochemical markers.

[000498] In some embodiments of the disclosure, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody is administered to human individuals diagnosed with a clinical indication associated with one or more of the aforementioned disorders. Upon diagnosis, an antibody, a conjugated antibody, an

activatable antibody and/or a conjugated activatable antibody is administered to mitigate or reverse the effects of the clinical indication.

[000499] An antibody, a conjugated antibody, an activatable antibody, and/or a conjugated activatable antibody of the disclosure is also useful in the detection of a target in patient samples and accordingly are useful as diagnostics. For example, the antibodies and/or activatable antibodies, and conjugated versions thereof, of the disclosure are used in *in vitro* assays, *e.g.*, ELISA, to detect target levels in a patient sample.

[000500] In one embodiment, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody of the disclosure is immobilized on a solid support (*e.g.*, the well(s) of a microtiter plate). The immobilized antibody, conjugated antibody, activatable antibody and/or conjugated activatable antibody serves as a capture antibody for any target that may be present in a test sample. Prior to contacting the immobilized antibody and/or activatable antibody, and/or conjugated versions thereof, with a patient sample, the solid support is rinsed and treated with a blocking agent such as milk protein or albumin to prevent nonspecific adsorption of the analyte.

[000501] Subsequently the wells are treated with a test sample suspected of containing the antigen, or with a solution containing a standard amount of the antigen. Such a sample is, *e.g.*, a serum sample from a subject suspected of having levels of circulating antigen considered to be diagnostic of a pathology. After rinsing away the test sample or standard, the solid support is treated with a second antibody that is detectably labeled. The labeled second antibody serves as a detecting antibody. The level of detectable label is measured, and the concentration of target antigen in the test sample is determined by comparison with a standard curve developed from the standard samples.

[000502] It will be appreciated that based on the results obtained using the antibodies and activatable antibodies of the disclosure, and conjugated versions thereof, in an *in vitro* diagnostic assay, it is possible to stage a disease in a subject based on expression levels of the target antigen. For a given disease, samples of blood are taken from subjects diagnosed as being at various stages in the progression of the disease, and/or at various points in the therapeutic treatment of the disease. Using a population of samples that provides statistically significant results for each stage of progression or therapy, a range of concentrations of the antigen that may be considered characteristic of each stage is designated.

[000503] An antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody can also be used in diagnostic and/or imaging methods. In some embodiments, such methods are *in vitro* methods. In some embodiments, such methods are *in vivo* methods. In some embodiments, such methods are *in situ* methods. In some embodiments, such methods are *ex vivo* methods. For example, activatable antibodies having an enzymatically cleavable CM can be used to detect the presence or absence of an enzyme that is capable of cleaving the CM. Such activatable antibodies can be used in diagnostics, which can include *in vivo* detection (*e.g.*, qualitative or quantitative) of enzyme activity (or, in some embodiments, an environment of increased reduction potential such as that which can provide for reduction of a disulfide bond) through measured accumulation of activated antibodies (i.e., antibodies resulting from cleavage of an activatable antibody) in a given cell or tissue of a given host organism. Such accumulation of activated antibodies indicates not only that the tissue expresses enzymatic activity (or an increased reduction potential depending on the nature of the CM) but also that the tissue expresses target to which the activated antibody binds.

[000504] For example, the CM can be selected to be substrate for at least one protease found at the site of a tumor, at the site of a viral or bacterial infection at a biologically confined site (*e.g.*, such as in an abscess, in an organ, and the like), and the like. The AB can be one that binds a target antigen. Using methods as disclosed herein, or when appropriate, methods familiar to one skilled in the art, a detectable label (*e.g.*, a fluorescent label or radioactive label or radiotracer) can be conjugated to an AB or other region of an antibody and/or activatable antibody. Suitable detectable labels are discussed in the context of the above screening methods and additional specific examples are provided below. Using an AB specific to a protein or peptide of the disease state, along with at least one protease whose activity is elevated in the disease tissue of interest, activatable antibodies will exhibit an increased rate of binding to disease tissue relative to tissues where the CM specific enzyme is not present at a detectable level or is present at a lower level than in disease tissue or is inactive (e.g., in zymogen form or in complex with an inhibitor). Since small proteins and peptides are rapidly cleared from the blood by the renal filtration system, and because the enzyme specific for the CM is not present at a detectable level (or is present at lower levels in non-disease tissues or is present in inactive conformation), accumulation of activated antibodies in the disease tissue is enhanced relative to non-disease tissues.

[000505] In another example, activatable antibodies can be used to detect the presence or absence of a cleaving agent in a sample. For example, where the activatable antibodies contain a CM susceptible to cleavage by an enzyme, the activatable antibodies can be used to detect (either qualitatively or quantitatively) the presence of an enzyme in the sample. In another example, where the activatable antibodies contain a CM susceptible to cleavage by reducing agent, the activatable antibodies can be used to detect (either qualitatively or quantitatively) the presence of reducing conditions in a sample. To facilitate analysis in these methods, the activatable antibodies can be detectably labeled, and can be bound to a support (*e.g.*, a solid support, such as a slide or bead). The detectable label can be positioned on a portion of the activatable antibody that is not released following cleavage, for example, the detectable label can be a quenched fluorescent label or other label that is not detectable until cleavage has occurred. The assay can be conducted by, for example, contacting the immobilized, detectably labeled activatable antibodies with a sample suspected of containing an enzyme and/or reducing agent for a time sufficient for cleavage to occur, then washing to remove excess sample and contaminants. The presence or absence of the cleaving agent (*e.g.*, enzyme or reducing agent) in the sample is then assessed by a change in detectable signal of the activatable antibodies prior to contacting with the sample *e.g.*, the presence of and/or an increase in detectable signal due to cleavage of the activatable antibody by the cleaving agent in the sample.

[000506] Such detection methods can be adapted to also provide for detection of the presence or absence of a target that is capable of binding the AB of the activatable antibodies when cleaved. Thus, the assays can be adapted to assess the presence or absence of a cleaving agent and the presence or absence of a target of interest. The presence or absence of the cleaving agent can be detected by the presence of and/or an increase in detectable label of the activatable antibodies as described above, and the presence or absence of the target can be detected by detection of a target-AB complex *e.g.*, by use of a detectably labeled anti-target antibody.

[000507] Activatable antibodies are also useful in *in situ* imaging for the validation of activatable antibody activation, *e.g.*, by protease cleavage, and binding to a particular target. *In situ* imaging is a technique that enables localization of proteolytic activity and target in biological samples such as cell cultures or tissue sections. Using this technique, it is possible to confirm both binding to a given target and proteolytic activity based on the presence of a detectable label (e.g., a fluorescent label).

[000508] These techniques are useful with any frozen cells or tissue derived from a disease site (*e.g.* tumor tissue) or healthy tissues. These techniques are also useful with fresh cell or tissue samples.

[000509] In these techniques, an activatable antibody is labeled with a detectable label. The detectable label may be a fluorescent dye, (e.g. a fluorophore, Fluorescein Isothiocyanate (FITC), Rhodamine Isothiocyanate (TRITC), an Alexa Fluor® label), a near infrared (NIR) dye (e.g., Qdot® nanocrystals), a colloidal metal, a hapten, a radioactive marker, biotin and an amplification reagent such as streptavidin, or an enzyme (e.g. horseradish peroxidase or alkaline phosphatase).

[000510] Detection of the label in a sample that has been incubated with the labeled, activatable antibody indicates that the sample contains the target and contains a protease that is specific for the CM of the activatable antibody. In some embodiments, the presence of the protease can be confirmed using broad spectrum protease inhibitors such as those described herein, and/or by using an agent that is specific for the protease, for example, an antibody such as A11, which is specific for the protease matriptase and inhibits the proteolytic activity of matriptase; see e.g., International Publication Number WO 2010/129609, published 11 November 2010. The same approach of using broad spectrum protease inhibitors such as those described herein, and/or by using a more selective inhibitory agent can be used to identify a protease that is specific for the CM of the activatable antibody. In some embodiments, the presence of the target can be confirmed using an agent that is specific for the target, *e.g.*, another antibody, or the detectable label can be competed with unlabeled target. In some embodiments, unlabeled activatable antibody could be used, with detection by a labeled secondary antibody or more complex detection system.

[000511] Similar techniques are also useful for *in vivo* imaging where detection of the fluorescent signal in a subject, *e.g.*, a mammal, including a human, indicates that the disease site contains the target and contains a protease that is specific for the CM of the activatable antibody.

[000512] These techniques are also useful in kits and/or as reagents for the detection, identification or characterization of protease activity in a variety of cells, tissues, and organisms based on the protease-specific CM in the activatable antibody.

[000513] The disclosure provides methods of using the antibodies and/or activatable antibodies in a variety of diagnostic and/or prophylactic indications. For example, the

disclosure provides methods of detecting presence or absence of a cleaving agent and a target of interest in a subject or a sample by (i) contacting a subject or sample with an activatable antibody, wherein the activatable antibody comprises a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, and an antigen binding domain or fragment thereof (AB) that specifically binds the target of interest, wherein the activatable antibody in an uncleaved, non-activated state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB and is not a modified form of a natural binding partner of the AB; and (b) wherein, in an uncleaved, non-activated state, the MM interferes with specific binding of the AB to the target, and in a cleaved, activated state the MM does not interfere or compete with specific binding of the AB to the target; and (ii) measuring a level of activated activatable antibody in the subject or sample, wherein a detectable level of activated activatable antibody in the subject or sample indicates that the cleaving agent and the target are present in the subject or sample and wherein no detectable level of activated activatable antibody in the subject or sample indicates that the cleaving agent, the target or both the cleaving agent and the target are absent and/or not sufficiently present in the subject or sample. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000514] The disclosure also provides methods of detecting presence or absence of a cleaving agent in a subject or a sample by (i) contacting a subject or sample with an activatable antibody in the presence of a target of interest, *e.g.*, the target, wherein the activatable antibody comprises a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, and an antigen binding domain or fragment thereof (AB) that specifically binds the target of interest, wherein the activatable antibody in an uncleaved, non-activated state comprises a structural arrangement from N-terminus to C-

terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB and is not a modified form of a natural binding partner of the AB; and (b) wherein, in an uncleaved, non-activated state, the MM interferes with specific binding of the AB to the target, and in a cleaved, activated state the MM does not interfere or compete with specific binding of the AB to the target; and (ii) measuring a level of activated activatable antibody in the subject or sample, wherein a detectable level of activated activatable antibody in the subject or sample indicates that the cleaving agent is present in the subject or sample and wherein no detectable level of activated activatable antibody in the subject or sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or sample. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000515] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent and the target in a subject or a sample, where the kits include at least an activatable antibody comprises a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, and an antigen binding domain or fragment thereof (AB) that specifically binds the target of interest, wherein the activatable antibody in an uncleaved, non-activated state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB and is not a modified form of a natural binding partner of the AB; and (b) wherein, in an uncleaved, non-activated state, the MM interferes with specific binding of the AB to the target, and in a cleaved, activated state the MM does not interfere or compete with specific binding of the AB to the target; and (ii) measuring a level of activated activatable antibody in the subject or sample, wherein a detectable level of activated activatable antibody in the subject or

sample indicates that the cleaving agent is present in the subject or sample and wherein no detectable level of activated activatable antibody in the subject or sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or sample. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000516] The disclosure also provides methods of detecting presence or absence of a cleaving agent in a subject or a sample by (i) contacting a subject or sample with an activatable antibody, wherein the activatable antibody comprises a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, an antigen binding domain (AB) that specifically binds the target, and a detectable label, wherein the activatable antibody in an uncleaved, non-activated state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB and is not a modified form of a natural binding partner of the AB; wherein, in an uncleaved, non-activated state, the MM interferes with specific binding of the AB to the target, and in a cleaved, activated state the MM does not interfere or compete with specific binding of the AB to the target; and wherein the detectable label is positioned on a portion of the activatable antibody that is released following cleavage of the CM; and (ii) measuring a level of detectable label in the subject or sample, wherein a detectable level of the detectable label in the subject or sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or sample and wherein no detectable level of the detectable label in the subject or sample indicates that the cleaving agent is present in the subject or sample. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In

some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000517] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent and the target in a subject or a sample, where the kits include at least an activatable antibody and/or conjugated activatable antibody (e.g., an activatable antibody to which a therapeutic agent is conjugated) described herein for use in contacting a subject or biological sample and means for detecting the level of activated activatable antibody and/or conjugated activatable antibody in the subject or biological sample, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent and the target are present in the subject or biological sample and wherein no detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent, the target or both the cleaving agent and the target are absent and/or not sufficiently present in the subject or biological sample, such that the target binding and/or protease cleavage of the activatable antibody cannot be detected in the subject or biological sample.

[000518] The disclosure also provides methods of detecting presence or absence of a cleaving agent in a subject or a sample by (i) contacting a subject or biological sample with an activatable antibody in the presence of the target, and (ii) measuring a level of activated activatable antibody in the subject or biological sample, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is present in the subject or biological sample and wherein no detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or biological sample at a detectable level, such that protease cleavage of the activatable antibody cannot be detected in the subject or biological sample. Such an activatable antibody includes a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, and an antigen binding domain or fragment thereof (AB) that specifically binds the target, wherein the activatable antibody in an uncleaved (*i.e.*, non-activated) state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding

partner of the AB; and (b) wherein the MM of the activatable antibody in an uncleaved state interferes with specific binding of the AB to the target, and wherein the MM of an activatable antibody in a cleaved (*i.e.*, activated) state does not interfere or compete with specific binding of the AB to the target. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the detectable label is attached to the masking moiety. In some embodiments, the detectable label is attached to the cleavable moiety N-terminal to the protease cleavage site. In some embodiments, a single antigen binding site of the AB is masked. In some embodiments wherein an antibody of the disclosure has at least two antigen binding sites, at least one antigen binding site is masked and at least one antigen binding site is not masked. In some embodiments all antigen binding sites are masked. In some embodiments, the measuring step includes use of a secondary reagent comprising a detectable label.

[000519] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent and the target in a subject or a sample, where the kits include at least an activatable antibody and/or conjugated activatable antibody described herein for use in contacting a subject or biological sample with an activatable antibody in the presence of the target, and measuring a level of activated activatable antibody in the subject or biological sample, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is present in the subject or biological sample and wherein no detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or biological sample at a detectable level, such that protease cleavage of the activatable antibody cannot be detected in the subject or biological sample. Such an activatable antibody includes a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, e.g., a protease, and an antigen binding domain or fragment thereof (AB) that specifically binds the target, wherein the activatable antibody in an uncleaved (*i.e.*, non-activated) state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB; and (b) wherein the MM of the activatable antibody in an uncleaved state interferes with specific binding of the AB to the target, and wherein the MM of an activatable antibody in a cleaved (*i.e.*, activated) state

does not interfere or compete with specific binding of the AB to the target. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the detectable label is attached to the masking moiety. In some embodiments, the detectable label is attached to the cleavable moiety N-terminal to the protease cleavage site. In some embodiments, a single antigen binding site of the AB is masked. In some embodiments wherein an antibody of the disclosure has at least two antigen binding sites, at least one antigen binding site is masked and at least one antigen binding site is not masked. In some embodiments all antigen binding sites are masked. In some embodiments, the measuring step includes use of a secondary reagent comprising a detectable label.

[000520] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent in a subject or a sample, where the kits include at least an activatable antibody and/or conjugated activatable antibody described herein for use in contacting a subject or biological sample and means for detecting the level of activated activatable antibody and/or conjugated activatable antibody in the subject or biological sample, wherein the activatable antibody includes a detectable label that is positioned on a portion of the activatable antibody that is released following cleavage of the CM, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or biological sample such that the target binding and/or protease cleavage of the activatable antibody cannot be detected in the subject or biological sample, and wherein no detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent is present in the subject or biological sample at a detectable level.

[000521] The disclosure provides methods of detecting presence or absence of a cleaving agent and the target in a subject or a sample by (i) contacting a subject or biological sample with an activatable antibody, wherein the activatable antibody includes a detectable label that is positioned on a portion of the activatable antibody that is released following cleavage of the CM and (ii) measuring a level of activated activatable antibody in the subject or biological sample, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent, the target or both the cleaving agent and the target are absent and/or not sufficiently present in the subject or biological sample, such that the target binding and/or protease cleavage of the activatable

antibody cannot be detected in the subject or biological sample, and wherein a reduced detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent and the target are present in the subject or biological sample. A reduced level of detectable label is, for example, a reduction of about 5%, about 10%, about 15%, about 20%, about 25%, about 30%, about 35%, about 40%, about 45%, about 50%, about 55%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90%, about 95% and/or about 100%. Such an activatable antibody includes a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, and an antigen binding domain or fragment thereof (AB) that specifically binds the target, wherein the activatable antibody in an uncleaved (*i.e.*, non-activated) state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB; and (b) wherein the MM of the activatable antibody in an uncleaved state interferes with specific binding of the AB to the target, and wherein the MM of an activatable antibody in a cleaved (*i.e.*, activated) state does not interfere or compete with specific binding of the AB to the target. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000522] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent and the target in a subject or a sample, where the kits include at least an activatable antibody and/or conjugated activatable antibody described herein for use in contacting a subject or biological sample and means for detecting the level of activated activatable antibody and/or conjugated activatable antibody in the subject or biological sample, wherein a detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent, the target or both the cleaving agent and the target are absent and/or not sufficiently present in the subject or biological sample, such that the target binding and/or protease cleavage of the activatable antibody cannot be

detected in the subject or biological sample, and wherein a reduced detectable level of activated activatable antibody in the subject or biological sample indicates that the cleaving agent and the target are present in the subject or biological sample. A reduced level of detectable label is, for example, a reduction of about 5%, about 10%, about 15%, about 20%, about 25%, about 30%, about 35%, about 40%, about 45%, about 50%, about 55%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90%, about 95% and/or about 100%.

[000523] The disclosure also provides methods of detecting presence or absence of a cleaving agent in a subject or a sample by (i) contacting a subject or biological sample with an activatable antibody, wherein the activatable antibody includes a detectable label that is positioned on a portion of the activatable antibody that is released following cleavage of the CM; and (ii) measuring a level of detectable label in the subject or biological sample, wherein a detectable level of the detectable label in the subject or biological sample indicates that the cleaving agent is absent and/or not sufficiently present in the subject or biological sample at a detectable level, such that protease cleavage of the activatable antibody cannot be detected in the subject or biological sample, and wherein a reduced detectable level of the detectable label in the subject or biological sample indicates that the cleaving agent is present in the subject or biological sample. A reduced level of detectable label is, for example, a reduction of about 5%, about 10%, about 15%, about 20%, about 25%, about 30%, about 35%, about 40%, about 45%, about 50%, about 55%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90%, about 95% and/or about 100%. Such an activatable antibody includes a masking moiety (MM), a cleavable moiety (CM) that is cleaved by the cleaving agent, and an antigen binding domain or fragment thereof (AB) that specifically binds the target, wherein the activatable antibody in an uncleaved (*i.e.*, non-activated) state comprises a structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM; (a) wherein the MM is a peptide that inhibits binding of the AB to the target, and wherein the MM does not have an amino acid sequence of a naturally occurring binding partner of the AB; and (b) wherein the MM of the activatable antibody in an uncleaved state interferes with specific binding of the AB to the target, and wherein the MM of an activatable antibody in a cleaved (*i.e.*, activated) state does not interfere or compete with specific binding of the AB to the target. In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an

agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000524] The disclosure also provides kits for use in methods of detecting presence or absence of a cleaving agent of interest in a subject or a sample, where the kits include at least an activatable antibody and/or conjugated activatable antibody described herein for use in contacting a subject or biological sample and means for detecting the level of activated activatable antibody and/or conjugated activatable antibody in the subject or biological sample, wherein the activatable antibody includes a detectable label that is positioned on a portion of the activatable antibody that is released following cleavage of the CM, wherein a detectable level of the detectable label in the subject or biological sample indicates that the cleaving agent, the target, or both the cleaving agent and the target are absent and/or not sufficiently present in the subject or biological sample, such that the target binding and/or protease cleavage of the activatable antibody cannot be detected in the subject or biological sample, and wherein a reduced detectable level of the detectable label in the subject or biological sample indicates that the cleaving agent and the target are present in the subject or biological sample. A reduced level of detectable label is, for example, a reduction of about 5%, about 10%, about 15%, about 20%, about 25%, about 30%, about 35%, about 40%, about 45%, about 50%, about 55%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90%, about 95% and/or about 100%.

[000525] In some embodiments of these methods and kits, the activatable antibody includes a detectable label. In some embodiments of these methods and kits, the detectable label includes an imaging agent, a contrasting agent, an enzyme, a fluorescent label, a chromophore, a dye, one or more metal ions, or a ligand-based label. In some embodiments of these methods and kits, the imaging agent comprises a radioisotope. In some embodiments of these methods and kits, the radioisotope is indium or technetium. In some embodiments of these methods and kits, the contrasting agent comprises iodine, gadolinium or iron oxide. In some embodiments of these methods and kits, the enzyme comprises horseradish peroxidase, alkaline phosphatase, or β-galactosidase. In some embodiments of these methods and kits, the fluorescent label comprises yellow fluorescent protein (YFP),

cyan fluorescent protein (CFP), green fluorescent protein (GFP), modified red fluorescent protein (mRFP), red fluorescent protein tdimer2 (RFP tdimer2), HCRED, or a europium derivative. In some embodiments of these methods and kits, the luminescent label comprises an N- methylacrydium derivative. In some embodiments of these methods, the label comprises an Alexa Fluor® label, such as Alex Fluor® 680 or Alexa Fluor® 750. In some embodiments of these methods and kits, the ligand-based label comprises biotin, avidin, streptavidin or one or more haptens.

[000526] In some embodiments of these methods and kits, the subject is a mammal. In some embodiments of these methods and kits, the subject is a human. In some embodiments, the subject is a non-human mammal, such as a non-human primate, companion animal (e.g., cat, dog, horse), farm animal, work animal, or zoo animal. In some embodiments, the subject is a rodent.

[000527] In some embodiments of these methods, the method is an *in vivo* method. In some embodiments of these methods, the method is an *in situ* method. In some embodiments of these methods, the method is an *ex vivo* method. In some embodiments of these methods, the method is an *in vitro* method.

[000528] In some embodiments, *in situ* imaging and/or *in vivo* imaging are useful in methods to identify which patients to treat. For example, in *in situ* imaging, the activatable antibodies are used to screen patient samples to identify those patients having the appropriate protease(s) and target(s) at the appropriate location, *e.g.*, at a tumor site.

[000529] In some embodiments *in situ* imaging is used to identify or otherwise refine a patient population suitable for treatment with an activatable antibody of the disclosure. For example, patients that test positive for both the target (e.g., the target) and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody being tested (e.g., accumulate activated antibodies at the disease site) are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. Likewise, patients that test negative for either or both of the target (*e.g.*, the target) and the protease that cleaves the substrate in the CM in the activatable antibody being tested using these methods might be identified as suitable candidates for another form of therapy. In some embodiments, such patients that test negative with respect to a first activatable antibody can be tested with other activatable antibodies comprising different CMs until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a CM that is cleaved by the patient at the site of disease). In some embodiments,

the patient is then administered a therapeutically effective amount of the activatable antibody for which the patient tested positive.

[000530] In some embodiments *in vivo* imaging is used to identify or otherwise refine a patient population suitable for treatment with an activatable antibody of the disclosure. For example, patients that test positive for both the target (e.g., the target) and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody being tested (e.g., accumulate activated antibodies at the disease site) are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. Likewise, patients that test negative might be identified as suitable candidates for another form of therapy. In some embodiments, such patients that test negative with respect to a first activatable antibody can be tested with other activatable antibodies comprising different CMs until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a CM that is cleaved by the patient at the site of disease). In some embodiments, the patient is then administered a therapeutically effective amount of the activatable antibody for which the patient tested positive.

[000531] In some embodiments of the methods and kits, the method or kit is used to identify or otherwise refine a patient population suitable for treatment with an activatable antibody of the disclosure. For example, patients that test positive for both the target (e.g., the target) and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody being tested in these methods are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. Likewise, patients that test negative for both of the targets (*e.g.*, the target) and the protease that cleaves the substrate in the CM in the activatable antibody being tested using these methods might be identified as suitable candidates for another form of therapy. In some embodiments, such patients can be tested with other activatable antibodies until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a CM that is cleaved by the patient at the site of disease). In some embodiments, patients that test negative for either of the target (*e.g.*, the target) are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. In some embodiments, patients that test negative for either of the target (*e.g.*, the target) are identified as not being suitable candidates for treatment with such an activatable antibody comprising such a CM. In some embodiments, such patients can be tested with other activatable antibodies until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a

CM that is cleaved by the patient at the site of disease). In some embodiments, the activatable antibody is an activatable antibody to which a therapeutic agent is conjugated. In some embodiments, the activatable antibody is not conjugated to an agent. In some embodiments, the activatable antibody comprises a detectable label. In some embodiments, the detectable label is positioned on the AB. In some embodiments, measuring the level of activatable antibody in the subject or sample is accomplished using a secondary reagent that specifically binds to the activated antibody, wherein the reagent comprises a detectable label. In some embodiments, the secondary reagent is an antibody comprising a detectable label.

[000532] In some embodiments, a method or kit is used to identify or otherwise refine a patient population suitable for treatment with an anti-the target activatable antibody and/or conjugated activatable antibody (e.g., activatable antibody to which a therapeutic agent is conjugated) of the disclosure, followed by treatment by administering that activatable antibody and/or conjugated activatable antibody to a subject in need thereof. For example, patients that test positive for both the targets (e.g., the target) and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody and/or conjugated activatable antibody being tested in these methods are identified as suitable candidates for treatment with such antibody and/or such a conjugated activatable antibody comprising such a CM, and the patient is then administered a therapeutically effective amount of the activatable antibody and/or conjugated activatable antibody that was tested. Likewise, patients that test negative for either or both of the target (e.g., the target) and the protease that cleaves the substrate in the CM in the activatable antibody being tested using these methods might be identified as suitable candidates for another form of therapy. In some embodiments, such patients can be tested with other antibody and/or conjugated activatable antibody until a suitable antibody and/or conjugated activatable antibody for treatment is identified (*e.g.*, an activatable antibody and/or conjugated activatable antibody comprising a CM that is cleaved by the patient at the site of disease). In some embodiments, the patient is then administered a therapeutically effective amount of the activatable antibody and/or conjugated activatable antibody for which the patient tested positive.

[000533] In some embodiments of these methods and kits, the MM is a peptide having a length from about 4 to 40 amino acids. In some embodiments of these methods and kits, the activatable antibody comprises a linker peptide, wherein the linker peptide is positioned between the MM and the CM. In some embodiments of these methods and kits, the

activatable antibody comprises a linker peptide, where the linker peptide is positioned between the AB and the CM. In some embodiments of these methods and kits, the activatable antibody comprises a first linker peptide (L1) and a second linker peptide (L2), wherein the first linker peptide is positioned between the MM and the CM and the second linker peptide is positioned between the AB and the CM. In some embodiments of these methods and kits, each of L1 and L2 is a peptide of about 1 to 20 amino acids in length, and wherein each of L1 and L2 need not be the same linker. In some embodiments of these methods and kits, one or both of L1 and L2 comprises a glycine-serine polymer. In some embodiments of these methods and kits, at least one of L1 and L2 comprises an amino acid sequence selected from the group consisting of (GS)n, (GSGGS)n (SEQ ID NO: 191) and (GGGS)n (SEQ ID NO: 192), where n is an integer of at least one. In some embodiments of these methods and kits, at least one of L1 and L2 comprises an amino acid sequence having the formula (GGS)n, where n is an integer of at least one. In some embodiments of these methods and kits, at least one of L1 and L2 comprises an amino acid sequence selected from the group consisting of Gly-Gly-Ser-Gly (SEQ ID NO: 193), Gly-Gly-Ser-Gly-Gly (SEQ ID NO: 194), Gly-Ser-Gly-Ser-Gly (SEQ ID NO: 195), Gly-Ser-Gly-Gly-Gly (SEQ ID NO: 196), Gly-Gly-Gly-Ser-Gly (SEQ ID NO: 197), and Gly-Ser-Ser-Ser-Gly (SEQ ID NO: 198).

[000534] In some embodiments of these methods and kits, the AB comprises an antibody or antibody fragment sequence selected from the cross-reactive antibody sequences presented herein. In some embodiments of these methods and kits, the AB comprises a Fab fragment, a scFv or a single chain antibody (scAb).

[000535] In some embodiments of these methods and kits, the cleaving agent is a protease that is co-localized in the subject or sample with the target and the CM is a polypeptide that functions as a substrate for the protease, wherein the protease cleaves the CM in the activatable antibody when the activatable antibody is exposed to the protease. In some embodiments of these methods and kits, the CM is a polypeptide of up to 15 amino acids in length. In some embodiments of these methods and kits, the CM is coupled to the N-terminus of the AB. In some embodiments of these methods and kits, the CM is coupled to the C-terminus of the AB. In some embodiments of these methods and kits, the CM is coupled to the N-terminus of a VL chain of the AB.

[000536] The antibodies, conjugated antibodies, activatable antibodies and/or conjugated activatable antibodies of the disclosure are used in diagnostic and prophylactic

formulations. In one embodiment, an activatable antibody is administered to patients that are at risk of developing one or more of the aforementioned inflammation, inflammatory disorders, cancer or other disorders.

[000537] A patient's or organ's predisposition to one or more of the aforementioned disorders can be determined using genotypic, serological or biochemical markers.

[000538] In some embodiments of the disclosure, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody is administered to human individuals diagnosed with a clinical indication associated with one or more of the aforementioned disorders. Upon diagnosis, an antibody, a conjugated antibody, an activatable antibody and/or a conjugated activatable antibody is administered to mitigate or reverse the effects of the clinical indication.

[000539] Antibodies, conjugated antibodies, activatable antibodies and/or conjugated activatable antibodies of the disclosure are also useful in the detection of the target in patient samples and accordingly are useful as diagnostics. For example, the antibodies, conjugated antibodies, the activatable antibodies and/or conjugated activatable antibodies of the disclosure are used in *in vitro* assays, *e.g.*, ELISA, to detect target levels in a patient sample.

[000540] In one embodiment, an antibody and/or activatable antibody of the disclosure is immobilized on a solid support (*e.g.*, the well(s) of a microtiter plate). The immobilized antibody and/or activatable antibody serves as a capture antibody for any target that may be present in a test sample. Prior to contacting the immobilized antibody and/or activatable antibody with a patient sample, the solid support is rinsed and treated with a blocking agent such as milk protein or albumin to prevent nonspecific adsorption of the analyte.

[000541] Subsequently the wells are treated with a test sample suspected of containing the antigen, or with a solution containing a standard amount of the antigen. Such a sample is, *e.g.*, a serum sample from a subject suspected of having levels of circulating antigen considered to be diagnostic of a pathology. After rinsing away the test sample or standard, the solid support is treated with a second antibody that is detectably labeled. The labeled second antibody serves as a detecting antibody. The level of detectable label is measured, and the concentration of target antigen in the test sample is determined by comparison with a standard curve developed from the standard samples.

[000542] It will be appreciated that based on the results obtained using the antibodies and/or activatable antibodies of the disclosure in an *in vitro* diagnostic assay, it is possible

to stage a disease in a subject based on expression levels of the Target antigen. For a given disease, samples of blood are taken from subjects diagnosed as being at various stages in the progression of the disease, and/or at various points in the therapeutic treatment of the disease. Using a population of samples that provides statistically significant results for each stage of progression or therapy, a range of concentrations of the antigen that may be considered characteristic of each stage is designated.

[000543] Antibodies, conjugated antibodies, activatable antibodies and/or conjugated activatable antibodies can also be used in diagnostic and/or imaging methods. In some embodiments, such methods are *in vitro* methods. In some embodiments, such methods are *in vivo* methods. In some embodiments, such methods are *in situ* methods. In some embodiments, such methods are *ex vivo* methods. For example, activatable antibodies having an enzymatically cleavable CM can be used to detect the presence or absence of an enzyme that is capable of cleaving the CM. Such activatable antibodies can be used in diagnostics, which can include *in vivo* detection (*e.g.*, qualitative or quantitative) of enzyme activity (or, in some embodiments, an environment of increased reduction potential such as that which can provide for reduction of a disulfide bond) through measured accumulation of activated antibodies (i.e., antibodies resulting from cleavage of an activatable antibody) in a given cell or tissue of a given host organism. Such accumulation of activated antibodies indicates not only that the tissue expresses enzymatic activity (or an increased reduction potential depending on the nature of the CM) but also that the tissue expresses target to which the activated antibody binds.

[000544] For example, the CM can be selected to be a protease substrate for a protease found at the site of a tumor, at the site of a viral or bacterial infection at a biologically confined site (*e.g.*, such as in an abscess, in an organ, and the like), and the like. The AB can be one that binds a target antigen. Using methods familiar to one skilled in the art, a detectable label (*e.g.*, a fluorescent label or radioactive label or radiotracer) can be conjugated to an AB or other region of an activatable antibody. Suitable detectable labels are discussed in the context of the above screening methods and additional specific examples are provided below. Using an AB specific to a protein or peptide of the disease state, along with a protease whose activity is elevated in the disease tissue of interest, activatable antibodies will exhibit an increased rate of binding to disease tissue relative to tissues where the CM specific enzyme is not present at a detectable level or is present at a lower level than in disease tissue or is inactive (e.g., in zymogen form or in complex with an

inhibitor). Since small proteins and peptides are rapidly cleared from the blood by the renal filtration system, and because the enzyme specific for the CM is not present at a detectable level (or is present at lower levels in non-disease tissues or is present in inactive conformation), accumulation of activated antibodies in the disease tissue is enhanced relative to non-disease tissues.

[000545] In another example, activatable antibodies can be used to detect the presence or absence of a cleaving agent in a sample. For example, where the activatable antibodies contain a CM susceptible to cleavage by an enzyme, the activatable antibodies can be used to detect (either qualitatively or quantitatively) the presence of an enzyme in the sample. In another example, where the activatable antibodies contain a CM susceptible to cleavage by reducing agent, the activatable antibodies can be used to detect (either qualitatively or quantitatively) the presence of reducing conditions in a sample. To facilitate analysis in these methods, the activatable antibodies can be detectably labeled, and can be bound to a support (*e.g.*, a solid support, such as a slide or bead). The detectable label can be positioned on a portion of the activatable antibody that is not released following cleavage, for example, the detectable label can be a quenched fluorescent label or other label that is not detectable until cleavage has occurred. The assay can be conducted by, for example, contacting the immobilized, detectably labeled activatable antibodies with a sample suspected of containing an enzyme and/or reducing agent for a time sufficient for cleavage to occur, then washing to remove excess sample and contaminants. The presence or absence of the cleaving agent (*e.g.*, enzyme or reducing agent) in the sample is then assessed by a change in detectable signal of the activatable antibodies prior to contacting with the sample *e.g.*, the presence of and/or an increase in detectable signal due to cleavage of the activatable antibody by the cleaving agent in the sample.

[000546] Such detection methods can be adapted to also provide for detection of the presence or absence of a target that is capable of binding the AB of the activatable antibodies when cleaved. Thus, the assays can be adapted to assess the presence or absence of a cleaving agent and the presence or absence of a target of interest. The presence or absence of the cleaving agent can be detected by the presence of and/or an increase in detectable label of the activatable antibodies as described above, and the presence or absence of the target can be detected by detection of a target-AB complex *e.g.*, by use of a detectably labeled anti-target antibody.

[000547] Activatable antibodies are also useful in *in situ* imaging for the validation of activatable antibody activation, *e.g.*, by protease cleavage, and binding to a particular target. *In situ* imaging is a technique that enables localization of proteolytic activity and target in biological samples such as cell cultures or tissue sections. Using this technique, it is possible to confirm both binding to a given target and proteolytic activity based on the presence of a detectable label (e.g., a fluorescent label).

[000548] These techniques are useful with any frozen cells or tissue derived from a disease site (*e.g.* tumor tissue) or healthy tissues. These techniques are also useful with fresh cell or tissue samples.

[000549] In these techniques, an activatable antibody is labeled with a detectable label. The detectable label may be a fluorescent dye, (e.g. Fluorescein Isothiocyanate (FITC), Rhodamine Isothiocyanate (TRITC), a near infrared (NIR) dye (e.g., Qdot® nanocrystals), a colloidal metal, a hapten, a radioactive marker, biotin and an amplification reagent such as streptavidin, or an enzyme (e.g. horseradish peroxidase or alkaline phosphatase).

[000550] Detection of the label in a sample that has been incubated with the labeled, activatable antibody indicates that the sample contains the target and contains a protease that is specific for the CM of the activatable antibody. In some embodiments, the presence of the protease can be confirmed using broad spectrum protease inhibitors such as those described herein, and/or by using an agent that is specific for the protease, for example, an antibody such as A11, which is specific for the protease matriptase and inhibits the proteolytic activity of matriptase; see e.g., International Publication Number WO 2010/129609, published 11 November 2010. The same approach of using broad spectrum protease inhibitors such as those described herein, and/or by using a more selective inhibitory agent can be used to identify a protease or class of proteases specific for the CM of the activatable antibody. In some embodiments, the presence of the target can be confirmed using an agent that is specific for the target, *e.g.*, another antibody, or the detectable label can be competed with unlabeled target. In some embodiments, unlabeled activatable antibody could be used, with detection by a labeled secondary antibody or more complex detection system.

[000551] Similar techniques are also useful for *in vivo* imaging where detection of the fluorescent signal in a subject, *e.g.*, a mammal, including a human, indicates that the disease site contains the target and contains a protease that is specific for the CM of the activatable antibody.

[000552] These techniques are also useful in kits and/or as reagents for the detection, identification or characterization of protease activity in a variety of cells, tissues, and organisms based on the protease-specific CM in the activatable antibody.

[000553] In some embodiments, *in situ* imaging and/or *in vivo* imaging are useful in methods to identify which patients to treat. For example, in *in situ* imaging, the activatable antibodies are used to screen patient samples to identify those patients having the appropriate protease(s) and target(s) at the appropriate location, *e.g.*, at a tumor site.

[000554] In some embodiments *in situ* imaging is used to identify or otherwise refine a patient population suitable for treatment with an activatable antibody of the disclosure. For example, patients that test positive for both the target and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody being tested (e.g., accumulate activated antibodies at the disease site) are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. Likewise, patients that test negative for either or both of the target and the protease that cleaves the substrate in the CM in the activatable antibody being tested using these methods are identified as suitable candidates for another form of therapy (*i.e.*, not suitable for treatment with the activatable antibody being tested). In some embodiments, such patients that test negative with respect to a first activatable antibody can be tested with other activatable antibodies comprising different CMs until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a CM that is cleaved by the patient at the site of disease).

[000555] In some embodiments *in vivo* imaging is used to identify or otherwise refine a patient population suitable for treatment with an activatable antibody of the disclosure. For example, patients that test positive for both the target and a protease that cleaves the substrate in the cleavable moiety (CM) of the activatable antibody being tested (e.g., accumulate activated antibodies at the disease site) are identified as suitable candidates for treatment with such an activatable antibody comprising such a CM. Likewise, patients that test negative are identified as suitable candidates for another form of therapy (*i.e.*, not suitable for treatment with the activatable antibody being tested). In some embodiments, such patients that test negative with respect to a first activatable antibody can be tested with other activatable antibodies comprising different CMs until a suitable activatable antibody for treatment is identified (e.g., an activatable antibody comprising a CM that is cleaved by the patient at the site of disease).

Pharmaceutical compositions

[000556] The antibodies, conjugated antibodies, activatable antibodies and/or conjugated activatable antibodies of the disclosure (also referred to herein as "active compounds"), and derivatives, fragments, analogs and homologs thereof, can be incorporated into pharmaceutical compositions suitable for administration. Such compositions typically comprise the antibody, the conjugated antibody, activatable antibody and/or conjugated activatable antibody and a pharmaceutically acceptable carrier. As used herein, the term "pharmaceutically acceptable carrier" is intended to include any and all solvents, dispersion media, coatings, antibacterial and antifungal agents, isotonic and absorption delaying agents, and the like, compatible with pharmaceutical administration. Suitable carriers are described in the most recent edition of Remington's Pharmaceutical Sciences, a standard reference text in the field, which is incorporated herein by reference. Suitable examples of such carriers or diluents include, but are not limited to, water, saline, ringer's solutions, dextrose solution, and 5% human serum albumin. Liposomes and non-aqueous vehicles such as fixed oils may also be used. The use of such media and agents for pharmaceutically active substances is well known in the art. Except insofar as any conventional media or agent is incompatible with the active compound, use thereof in the compositions is contemplated. Supplementary active compounds can also be incorporated into the compositions.

[000557] A pharmaceutical composition of the disclosure is formulated to be compatible with its intended route of administration. Examples of routes of administration include parenteral, *e.g.*, intravenous, intradermal, subcutaneous, oral (*e.g.*, inhalation), transdermal (*i.e.*, topical), transmucosal, and rectal administration. Solutions or suspensions used for parenteral, intradermal, or subcutaneous application can include the following components: a sterile diluent such as water for injection, saline solution, fixed oils, polyethylene glycols, glycerine, propylene glycol or other synthetic solvents; antibacterial agents such as benzyl alcohol or methyl parabens; antioxidants such as ascorbic acid or sodium bisulfite; chelating agents such as ethylenediaminetetraacetic acid (EDTA); buffers such as acetates, citrates or phosphates, and agents for the adjustment of tonicity such as sodium chloride or dextrose. The pH can be adjusted with acids or bases, such as hydrochloric acid or sodium hydroxide. The parenteral preparation can be enclosed in ampoules, disposable syringes or multiple dose vials made of glass or plastic.

[000558] Pharmaceutical compositions suitable for injectable use include sterile aqueous solutions (where water soluble) or dispersions and sterile powders for the extemporaneous preparation of sterile injectable solutions or dispersion. For intravenous administration, suitable carriers include physiological saline, bacteriostatic water, Cremophor EL™ (BASF, Parsippany, N.J.) or phosphate buffered saline (PBS). In all cases, the composition must be sterile and should be fluid to the extent that easy syringeability exists. It must be stable under the conditions of manufacture and storage and must be preserved against the contaminating action of microorganisms such as bacteria and fungi. 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 coating such as lecithin, by the maintenance of the required particle size in the case of dispersion and by the use of surfactants. Prevention of the action of microorganisms can be achieved by various antibacterial and antifungal agents, for example, parabens, chlorobutanol, phenol, ascorbic acid, thimerosal, and the like. In some embodiments, it will be desirable to include isotonic agents, for example, sugars, polyalcohols such as manitol, sorbitol, sodium chloride in the composition. Prolonged absorption of the injectable compositions can be brought about by including in the composition an agent that delays absorption, for example, aluminum monostearate and gelatin.

[000559] Sterile injectable solutions can be prepared by incorporating the active compound in the required amount in an appropriate solvent with one or a combination of ingredients enumerated above, as required, followed by filtered sterilization. Generally, dispersions are prepared by incorporating the active compound into a sterile vehicle that contains a basic dispersion medium and the required other ingredients from those enumerated above. In the case of sterile powders for the preparation of sterile injectable solutions, methods of preparation are vacuum drying and freeze-drying that yields a powder of the active ingredient plus any additional desired ingredient from a previously sterile-filtered solution thereof.

[000560] Oral compositions generally include an inert diluent or an edible carrier. They can be enclosed in gelatin capsules or compressed into tablets. For the purpose of oral therapeutic administration, the active compound can be incorporated with excipients and used in the form of tablets, troches, or capsules. Oral compositions can also be prepared using a fluid carrier for use as a mouthwash, wherein the compound in the fluid carrier is

applied orally and swished and expectorated or swallowed. Pharmaceutically compatible binding agents, and/or adjuvant materials can be included as part of the composition. The tablets, pills, capsules, troches and the like can contain any of the following ingredients, or compounds of a similar nature: a binder such as microcrystalline cellulose, gum tragacanth or gelatin; an excipient such as starch or lactose, a disintegrating agent such as alginic acid, Primogel, or corn starch; a lubricant such as magnesium stearate or Sterotes; a glidant such as colloidal silicon dioxide; a sweetening agent such as sucrose or saccharin; or a flavoring agent such as peppermint, methyl salicylate, or orange flavoring.

[000561] For administration by inhalation, the compounds are delivered in the form of an aerosol spray from pressured container or dispenser that contains a suitable propellant, *e.g.*, a gas such as carbon dioxide, or a nebulizer.

[000562] Systemic administration can also be by transmucosal or transdermal means. For transmucosal or transdermal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art, and include, for example, for transmucosal administration, detergents, bile salts, and fusidic acid derivatives. Transmucosal administration can be accomplished through the use of nasal sprays or suppositories. For transdermal administration, the active compounds are formulated into ointments, salves, gels, or creams as generally known in the art.

[000563] The compounds can also be prepared in the form of suppositories (*e.g.*, with conventional suppository bases such as cocoa butter and other glycerides) or retention enemas for rectal delivery.

[000564] In one embodiment, the active compounds are prepared with carriers that will protect the compound against rapid elimination from the body, such as a controlled release formulation, including implants and microencapsulated delivery systems. Biodegradable, biocompatible polymers can be used, such as ethylene vinyl acetate, polyanhydrides, polyglycolic acid, collagen, polyorthoesters, and polylactic acid. Methods for preparation of such formulations will be apparent to those skilled in the art. The materials can also be obtained commercially from Alza Corporation and Nova Pharmaceuticals, Inc. Liposomal suspensions (including liposomes targeted to infected cells with monoclonal antibodies to viral antigens) can also be used as pharmaceutically acceptable carriers. These can be prepared according to methods known to those skilled in the art, for example, as described in U.S. Patent No. 4,522,811.

[000565] It is especially advantageous to formulate oral or parenteral compositions in dosage unit form for ease of administration and uniformity of dosage. Dosage unit form as used herein refers to physically discrete units suited as unitary dosages for the subject to be treated; each unit containing a predetermined quantity of active compound calculated to produce the desired therapeutic effect in association with the required pharmaceutical carrier. The specification for the dosage unit forms of the disclosure are dictated by and directly dependent on the unique characteristics of the active compound and the particular therapeutic effect to be achieved, and the limitations inherent in the art of compounding such an active compound for the treatment of individuals.

[000566] The pharmaceutical compositions can be included in a container, pack, or dispenser together with instructions for administration.

[000567] The invention will be further described in the following examples, which do not limit the scope of the invention described in the claims.

Examples

EXAMPLE 1. Selection of human ScFvs of the embodiments that bind human and/or mouse PDL1

[000568] This Example demonstrates that ScFvs (single-chain variable fragments) of the embodiments that bind PDL1 can be selected from a phage display library of ScFvs with diverse CDR sequences, and that such binding can inhibit PDL1 binding to PD1 and B7-1.

[000569] ScFvs were selected from a fully human ScFv library displayed on M13 bacteriophage; ScFv phage selection was conducted under contract with Creative Biolabs, Shirley, NY. A fusion protein comprised of the extracellular domain (ECD) of human PDL1 or mouse PDL1, with a carboxy terminal His6 tag (Sino Biological, Cat. No. 10084-H02H-200) was used as the antigen in three alternating rounds of selection for ScFvs displayed on M13 bacteriophage that bind PDL1. In the first round, bound phage were released by trypsin digestion, and in subsequent rounds, phage were eluted by human PD1 fusion protein (R&D Systems; Cat. No. 1080-PD-050) competition. Five (5) unique ScFvs that bind PDL1 were isolated. Table 1 lists the 5 ScFvs and SEQ ID NOs of their respective nucleic acid sequences and amino acid sequences.

Table 1. SEQ ID NOs of selected ScFvs

ScFv	Nucleic acid sequence	Amino acid sequence
PDL1 c8	SEQ ID NO: 1	SEQ ID NO: 2
PDL1 c12	SEQ ID NO: 3	SEQ ID NO: 4
PDL1 c16	SEQ ID NO: 5	SEQ ID NO: 6
PDL1 c20	SEQ ID NO: 7	SEQ ID NO: 8
PDL1 c60	SEQ ID NO: 9	SEQ ID NO: 10

[000570] The nucleic acid and amino acid sequences of each of the anti-PDL1 ScFvs (with CDRs underlined) are shown below:

SEQ ID NO: 1

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAGATATTACTGCGTCGGGTTAGAGGACAACGTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAGATCGAAGATTGCTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGCGGTGGAGGCGGTTCAGGCGGAGGTGGCAGCGGCGGTGGCGGGTCGACGGACATC
CAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGG
CAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCT
GATCTATAAGGCATCCCGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACA
GATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGCGTG
CGCTTAAGCCTGTGACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 2

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSDITASGQRTTYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCARSKIAFDYWGQGTLVTVSSGGGGSGGGGSGGGGSTDI
QMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYKASRLQSGVPSRFSGSGSGT
DFTLTISSLQPEDFATYYCQQRALKPVTFGQGTKVEIKR

SEQ ID NO: 3

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTATCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTAATAAGGATGGTCATTATACAAGTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAAAATCTTGATGAGTTTGACTACTGGGGCCAGGGAACCCTGGT

CACCGTCTCGAGCGGTGGAGGCGGTTCAGGCGGAGGTGGCAGCGGCGGTGGCGGGTCGACGGACATC
CAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGG
CAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCT
GATCTATGCTGCATCCAGTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACA
GATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGAGTT
ACAGTACCCCTAATACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 4
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSINKDGHYTSYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKNLDEFDYWGQGTLVTVSSGGGGSGGGGSGGGGSTDI
QMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGT
DFTLTISSLQPEDFATYYCQQSYSTPNTFGQGTKVEIKR

SEQ ID NO: 5
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCTATTATGGCTACTGGTGCTGGTACATTGTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAAGATGGTGCGGGGTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGCGGTGGAGGCGGTTCAGGCGGAGGTGGCAGCGGCGGTGGCGGGTCGACGGACATC
CAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGG
CAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCT
GATCTATTCTGCATCCCAGTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACA
GATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGGCGA
ATTCGCGGCCTTCTACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 6
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIMATGAGTLYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKDGAGFDYWGQGTLVTVSSGGGGSGGGGSGGGGSTDI
QMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYSASQLQSGVPSRFSGSGSGT
DFTLTISSLQPEDFATYYCQQANSRPSTFGQGTKVEIKR

SEQ ID NO: 7
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GTAGTGGGTCTCAACTATTACTTCTTCTGGTGCTGCTACATATTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAAAATTATACTGGTTTTGACTACTGGGGCCAGGGAACCCTGGT

CACCGTCTCGAGCGGTGGAGGCGGTTCAGGCGGAGGTGGCAGCGGCGGTGGCGGGTCGACGGACATC
CAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGG
CAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCT
GATCTATAATGCATCCTCCTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACA
GATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGTATA
CTTATGGTCCTGGTACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 8
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLQWVSTITSSGAATYYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKNYTGFDYWGQGTLVTVSSGGGGSGGGGSGGGGSTDI
QMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYNASSLQSGVPSRFSGSGSGT
DFTLTISSLQPEDFATYYCQQYTYGPGTFGQGTKVEIKR

SEQ ID NO: 9
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGCGGTGGAGGCGGTTCAGGCGGAGGTGGCAGCGGCGGTGGCGGGTCGACGGACATC
CAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTTGCCGGG
CAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAAGCTCCT
GATCTATTATGCATCCACTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCTGGGACA
GATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAACAGGATA
ATGGTTATCCTTCTACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 10
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSSGGGGSGGGGSGGGGSTDI
QMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYYASTLQSGVPSRFSGSGSGT
DFTLTISSLQPEDFATYYCQQDNGYPSTFGQGTKVEIKR

[000571] Figure 1 shows by ELISA-based binding that PDL1 c60 ScFv-phage binds specifically to human and mouse PDL1. Briefly, human PDL1, mouse PDL1, human PD1, mouse PD1, human 41BBLig or Notch1 (R&D Systems) were adsorbed to separate wells of a 96-well ELISA plate. Phage were applied to the plate and allowed to bind. Bound phage were visualized with an anti-M13-HRP conjugate (GE Healthcare, Piscataway, NY) and

developed with the chromogenic substrate tetramethyl benzidine (TMB) (Thermo Scientific, Rockford, IL).

[000572] Figure 2 shows that inclusion of PD1 can inhibit the binding of PDL1 ScFv-phage binding to PDL1 in an ELISA binding assay. Briefly, human PDL1 or mouse PDL1 (R&D Systems) was adsorbed to separate wells of a 96-well ELISA plate. Phage were applied to the plate in the presence or absence of human or mouse PD1-Fc (R&D Systems) and allowed to bind. Bound phage were visualized with an anti-M13-HRP conjugate (GE Healthcare, Piscataway, NY) and developed with the chromogenic substrate tetramethyl benzidine (TMB) (Thermo Scientific, Rockford, IL). Phage binding was reduced in the presence of PD1-Fc, demonstrating that the binding epitope of the phage overlaps with that of PD1 binding.

EXAMPLE 2. Production and testing of fully human anti-PDL1 c60 IgG antibodies

[000573] This Example demonstrates that PDL1 c60 ScFv-phage that bind human and mouse PDL1 can be converted into fully human IgG antibodies that retain human and mouse PDL1 binding.

[000574] Production of fully human IgGs comprising the variable domains of PDL1 c60 was accomplished using techniques similar to those described in PCT Publication No. WO 2010/081173. DNA molecules encoding the variable domains of PDL1 c60 ScFv-phage were cloned into expression vectors for the expression of fully human IgGs. Light chain (Lc) variable domains were amplified from the ScFv templates. Vector (LcpOP (modified from pCDNA3, Invitrogen, Carlsbad, CA)) and amplified DNA were cut with *Bsi*WI and *Eco*RI overnight, combined by ligation and transformed into *E. coli* MC1061 cells. Heavy chain (Hc) variable domains were amplified from ScFv templates. Fully human IgGs anti-PDL1 c60 were expressed from transiently transfected HEK-293 cells and purified from the culture supernatant by Protein A chromatography.

[000575] Figure 3 shows that the fully human anti-PDL1 c60 IgG binds human and mouse PDL1, with affinity for human PDL1 of 1 nM and for mouse PDL1 of 30 nM. Briefly human PDL1-Fc or mouse PDL1-Fc (R & D Systems, Minneapolis, MN) was adsorbed to the wells of a 96-well ELISA plate. Purified anti-PDL1 c60 was applied to the plate and allowed to bind. Bound antibody was visualized with an anti-human IgG-HRP conjugate, Fab specific, (Sigma, St Louis, MO; Cat # A0293-1ML) and developed with the chromogenic substrate TMB.

EXAMPLE 3. Affinity maturation of anti-PDL1 antibodies of the embodiments

[000576] This Example demonstrates the isolation of antibodies of the embodiments with improved binding kinetics and manufacturability profile.

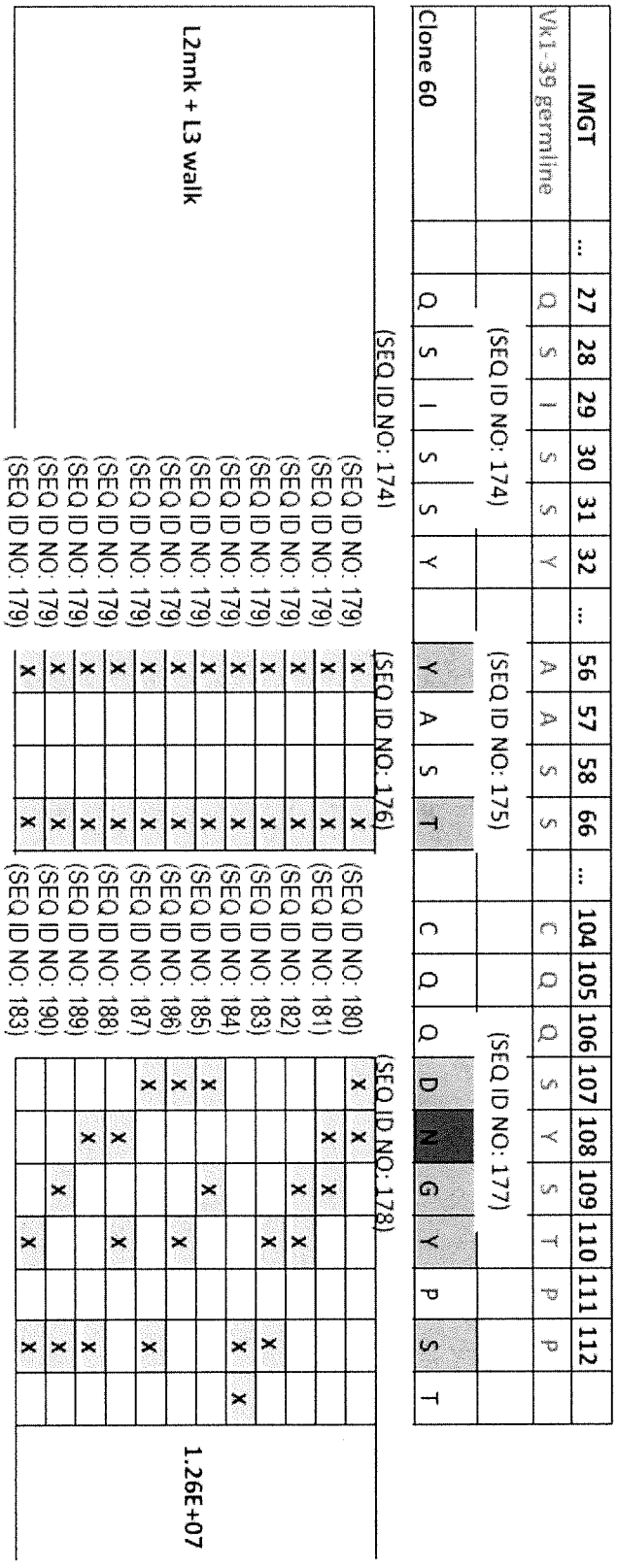
[000577] Anti-PDL1 antibodies were isolated from libraries with CDRs modified from anti-PDL1 c60. Such libraries were designed as shown in Tables 2 and 3. Four libraries of Fab-Phage, based on the sequence of anti-PDL1 c60, were constructed using degenerate synthetic DNA. Residues were either varied by randomization at each indicated nucleotide. In addition, within libraries 3 and 6, additional randomized residues were added to CDR3 of the heavy chain. Libraries were transfected into *E. coli* strain TG1 and phage were prepared following super-infection with M13KO7 (Invitrogen).

[000578] Three rounds of selection were performed for each library with increasing stringency. Three alternating rounds of selection were done by mixing biotinylated Human PDL1 or Biotinylated mouse PDL1 with phage that were blocked with 100 μg/mL pooled human IgG (huIgG, or hIgG) and 2% non-fat dried milk (NFDM) in Tris-buffered saline (TBS; 40 mM Tris, 129 mM NaCl, pH 7.4). Following incubation at room temperature Bio-PDL1 bound to phage were captured with streptavidin magnetic beads which were washed extensively at 37^0C and the remaining bound phage eluted with 100 mM triethanolamine (TEA) (Sigma, St. Louis, MO) and expanded through *E. coli* TG1. Selected Lc libraries were combined with Hc libraries and each subjected to an additional seven rounds of selection.

Table 2. CDR sequences for affinity maturation variable heavy chain libraries

																						H3					
IMGT	...	**32**	**33**	**34**	**39**	**40**	...	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**66**	**67**	...	**107**	**108**	**109**	**110**	**111**	**112**	**113**	
VH-23 germline		S	Y	A	M	S		A	I	S	G	S	G	G	S	T	Y	Y		-	-	-	-	-	-	-	
		(SEQ ID NO: 158)								(SEQ ID NO: 159)																	
Clone 60		S	Y	A	M	S		S	I	Y	S	T	G	G	A	T	A	Y		S	S	A	G	F	D	Y	
		(SEQ ID NO: 158)						(SEQ ID NO: 160)												(SEQ ID NO: 162)							
H2							x		x	x	x		x	x		x											**3.36E+07**

Table 3. CDR sequences for affinity maturation variable light chain libraries



[00579] Forty seven (47) individual isolates were chosen from the final pool. Phage were derived from each isolate and assayed for binding to human PDL1-Fc, human B7-1-Fc

and human CD28-Fc antigens (R&D Systems). Briefly, the antigens were adsorbed to the wells of a 96-well ELISA plate, each ligand on a separate plate. Phage were applied to correlative wells on each plate and allowed to bind. Bound phage were visualized with an anti-M13-HRP conjugate and developed with the chromogenic substrate TMB. Based on the results of the ELISA and DNA sequence, 6 unique clones with matured heavy variable CDR3 domains and 10 heavy variable CDR2 domains were chosen for further study. Thirteen phage clones, 10 CDR2 and 3 CDR3 were analyzed for their ability to bind mouse and human PDL1, and the results of a phage ELISA are shown in Figure 4A and Figure 4B. All phage clones bind human PDL1 but not B7-1, in addition, CDR2 clones C05 and G12 show strong binding to mouse PDL1 and CDR3 clone H9 showed weak binding to mouse PDL1. Table 4 lists the heavy variable domains encoded by the clones and SEQ ID NOs for the nucleic acid sequences and amino acid sequences of their respective heavy chains. The light variable domains for each are identical to that of c60 (SEQ ID NO 11 and 12).

SEQ ID NO: 11

GACATCCAGATGACCCAGTCTCCATCCTCCCTGTCTGCATCTGTAGGAGACAGAGTCACCATCACTT
GCCGGGCAAGTCAGAGCATTAGCAGCTATTTAAATTGGTATCAGCAGAAACCAGGGAAAGCCCCTAA
GCTCCTGATCTATTATGCATCCACTTTGCAAAGTGGGGTCCCATCAAGGTTCAGTGGCAGTGGATCT
GGGACAGATTTCACTCTCACCATCAGCAGTCTGCAACCTGAAGATTTTGCAACTTACTACTGTCAAC
AGGATAATGGTTATCCTTCTACGTTCGGCCAAGGGACCAAGGTGGAAATCAAACGG

SEQ ID NO: 12

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYYASTLQSGVPSRFSGSGS
GTDFTLTISSLQPEDFATYYCQQDNGYPSTFGQGTKVEIKR

Table 4: Matured anti-PDL1 variable domains

VH	Nucleic acid sequence	Amino acid sequence
PDL1 c1	SEQ ID NO: 13	SEQ ID NO: 14
PDL1 d1	SEQ ID NO: 15	SEQ ID NO: 16
PDL1 g7	SEQ ID NO: 17	SEQ ID NO: 18
PDL1 h9	SEQ ID NO: 19	SEQ ID NO: 20
PDL1 b10	SEQ ID NO: 21	SEQ ID NO: 22
PDL1 E10	SEQ ID NO: 23	SEQ ID NO: 24
PDL1 A05	SEQ ID NO: 25	SEQ ID NO: 26

PDL1 C05	SEQ ID NO: 27	SEQ ID NO: 28
PDL1 C10	SEQ ID NO: 29	SEQ ID NO: 30
PDL1 D08	SEQ ID NO: 31	SEQ ID NO: 32
PDL1 G09	SEQ ID NO: 33	SEQ ID NO: 34
PDL1 G10	SEQ ID NO: 35	SEQ ID NO: 36
PDL1 G12	SEQ ID NO: 37	SEQ ID NO: 38
PDL1 E11	SEQ ID NO: 39	SEQ ID NO: 40
PDL1 D01	SEQ ID NO: 41	SEQ ID NO: 42
PDL1 H06	SEQ ID NO: 43	SEQ ID NO: 44

SEQ ID NO: 13

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTAGTCGGCCGGGTTTTGACTACTGGGGCCA
GGGAACCCTGGTCACCGTCTCGAGC

SEQ ID NO: 14

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGQSRPGFDYWGQGTLVTVSS

SEQ ID NO: 15

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTCGTGGCCGGGTTTTGACTACTGGGGCCA
GGGAACCCTGGTCACCGTCTCGAGC

SEQ ID NO: 16

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGQSWPGFDYWGQGTLVTVSS

SEQ ID NO: 17

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTCAGTCGTTTCCGGGTTTTGACTACTGGGG
CCAGGGAACCCTGGTCACCGTCTCGAGC

SEQ ID NO: 18

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGQSFPGFDYWGQGTLVTVSS

SEQ ID NO: 19

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGCTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 20

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSS

SEQ ID NO: 21

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGCTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 22

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAGYDYWGQGTLVTVSS

SEQ ID NO: 23

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTATTCTACTGGTGGTGCTACAGCTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTAAGGGTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 24

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIYSTGGATAYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSKGFDYWGQGTLVTVSS

SEQ ID NO: 25

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGAAGTAGGGTATTGTGACAGTGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 26

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWKQGIVTVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTV

SEQ ID NO: 27

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 28

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 29
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAGATATTTGGAAGTAGGGTATGGTTACAGTGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 30
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSDIWKQGMVTVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 31
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCGATTTGGAGGTAGGGTCTGGCGACAGCGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 32
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRQGLATAYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 33
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAGAGATTGTGGCTACTGGTATTTTGACAAGTAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC
SEQ ID NO: 34
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSEIVATGILTSYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 35
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG

CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCGATTGGTCGGTAGGGTTTGATTACAGTTAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 36
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIGRQGLITVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 37
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCTATTTGGTATTAGGGTCTGGTGACAGTTAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 38
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWYQGLVTVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 39
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAGATATTTGGAAGTAGGGTTTTGCTACAGCGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 40
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSDIWKQGFATADSVKGRFT
ISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 41
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT

GGAGTGGGTCTCAAGTATTTGGAAGTAGGGTATTGTGACAGTGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 42
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWKQGIVTVYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

SEQ ID NO: 43
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCGATTTGGAGGTAGGGTCTGGCGACAGCGAGCTTACGCAGACTCCGTGAAGGG
CCGGTTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCC
GAGGACACGGCCGTATATTACTGTGCGAAATCTTCTGCTGGTTTTGACTACTGGGGCCAGGGAACCC
TGGTCACCGTCTCGAGC

SEQ ID NO: 44
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRQGLATAYDSVKGRF
TISRDNSKNTLYLQMNSLRAEDTAVYYCAKSSAGFDYWGQGTLVTVSS

EXAMPLE 4. Isolation and testing of affinity matured anti-PDL1 antibodies of the embodiments

[000580] This Example demonstrates that matured PDL1 Fab-phage that bind human and mouse PDL1 can be converted into fully human IgG antibodies that retain human and show enhanced mouse PDL1 binding.

[000581] Production of fully human IgGs comprising the variable domains of the matured clones was accomplished using techniques similar to those described in PCT Publication No. WO 2010/081173. DNA encoding the variable domains of anti-PDL1 Fab-Phage clones C1, D1, G7, C05, G12 and combinations of heavy variable CDR3 domains of anti-PDL1 Fab-Phage clones C05 or G12 with anti-PDL1 Fab-Phage clones heavy variable CDR2 domains of B10, E10 or H9 were cloned into expression vectors for the expression of fully human IgGs. The light variable domains for each are identical to that of c60 (SEQ ID NO: 10). Light chain (Lc) variable domains were amplified from the Fab templates. Vector (LcpOP (modified from pCDNA3, Invitrogen, Carlsbad, CA)) and amplified DNA were cut

with *Bsi*WI and *Eco*RI overnight, combined by ligation and transformed into *E. coli* MC1061 cells. Heavy chain (Hc) variable domains were amplified from Fab templates. Fully human IgGs anti-PDL1 antibodies were expressed from transiently transfected HEK-293 cells and purified from the culture supernatant by Protein A chromatography.

[000582] The affinity matured anti-PDL1 antibodies were analyzed for their ability to bind human and mouse PDL1. Briefly human PDL1-Fc or mouse PDL1-Fc (R & D Systems, Minneapolis, MN) was adsorbed to the wells of a 96-well ELISA plate. Purified anti-PDL1 antibodies were applied to the plate and allowed to bind. Bound antibody was visualized with an anti-human IgG-HRP conjugate, Fab specific, (Sigma, St Louis, MO; Cat # A0293-1ML) and developed with the chromogenic substrate TMB. Figure 5 shows that combining the matured heavy variable CDR3 domains with the heavy variable CDR2 domains results in antibodies with enhanced affinity towards human PDL1. In addition, the combination of the matured heavy variable CDR2 domain C05 with the heavy variable CD3 domain H9 results in an antibody with high affinity for both human and mouse PDL1. Table 5 provides the SEQ ID NOs for the nucleic acid sequences and amino acids sequences of the respective variable heavy chains.

[000583] The anti-PDL1 antibodies C5H9, C5B10 and C5E10 were further characterized for their species specificity towards binding to PDL1 and other closely related proteins. Briefly human PDL1-Fc, mouse PDL1-Fc (R & D Systems, Minneapolis, MN) or cynomolgus monkey (cyno) PDL1-Fc (Sino biological) were adsorbed to the wells of a 96-well ELISA plate. Purified anti-PDL1 antibodies were applied to the plate and allowed to bind. Bound antibody was visualized with an anti-human IgG-HRP conjugate, Fab specific, (Sigma, St Louis, MO; Cat # A0293-1ML) and developed with the chromogenic substrate TMB. Figures 6A and 6B show that C5H9 binds to human and mouse PDL1 with near equal affinity and C5B10 and C5E10 only bind human PDL1. None of the antibodies tested bind to either human B7-1 (Figure 6D) or human CD28 (Figure 6C), two closely related proteins. Figure 7 shows that anti-PDL1 antibody C5H9 binds with high and equal affinity to human, mouse and cyno PDL1, but not to human B7H3 (also referred to as B7-H3) (R&D Systems, Minneapolis, MN).

Table 5: Variable heavy domains of PDL1 antibodies of the embodiments

VH	Nucleic acid sequence	Amino acid sequence
PDL1 C5H9	SEQ ID NO: 45	SEQ ID NO: 46

PDL1 C5B10	SEQ ID NO: 47	SEQ ID NO: 48
PDL1 C5E10	SEQ ID NO: 49	SEQ ID NO: 50
PDL1 G12H9	SEQ ID NO: 51	SEQ ID NO: 52
PDL1 G12B10	SEQ ID NO: 53	SEQ ID NO: 54
PDL1 G12E10	SEQ ID NO: 55	SEQ ID NO: 56

SEQ ID NO: 45

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGCTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 46

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSS

SEQ ID NO: 47

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGGTTATGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 48

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAGYDYWGQGTLVTVSS

SEQ ID NO: 49

GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG

ACACGGCCGTATATTACTGTGCGAAATGGTCTAAGGGTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 50
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSKGFDYWGQGTLVTVSS

SEQ ID NO: 51
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCATCTATTTGGTATCAGGGTCTGGTGACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGCTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 52
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWYQGLVTVYAD
SVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSS

SEQ ID NO: 53
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG
ACACGGCCGTATATTACTGTGCGAAATGGTCTGCTGGTTATGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 54
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWYQGLVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAGYDYWGQGTLVTVSS

SEQ ID NO: 55
GAGGTGCAGCTGTTGGAGTCTGGGGGAGGCTTGGTACAGCCTGGGGGGTCCCTGAGACTCTCCTGTG
CAGCCTCTGGATTCACCTTTAGCAGCTATGCCATGAGCTGGGTCCGCCAGGCTCCAGGGAAGGGGCT
GGAGTGGGTCTCAAGTATTTGGCGGAATGGTATTGTTACAGTTTACGCAGACTCCGTGAAGGGCCGG
TTCACCATCTCCAGAGACAATTCCAAGAACACGCTGTATCTGCAAATGAACAGCCTGAGAGCCGAGG

ACACGGCCGTATATTACTGTGCGAAATGGTCTAAGGGTTTTGACTACTGGGGCCAGGGAACCCTGGT
CACCGTCTCGAGC

SEQ ID NO: 56
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWYQGLVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSKGFDYWGQGTLVTVSS

EXAMPLE 5. Germline revisions in anti-PDL1 antibody C5H9 light variable domain enhances manufacturability and reduces potential immunogenicity.

[000584] This example describes an additional anti-PDL1 antibody embodiment that exhibits reduced predicted immunogenicity, reduced aggregation, and improved expression.

[000585] In silico immunogenicity prediction, using ProPred revealed a strong potential epitope in CDR2 of the light variable domain of C5H9; anti-PDL1 antibody C5H9, also referred to herein as C5H9, comprises a light chain comprising SEQ ID NO: 12 and a heavy chain comprising SEQ ID NO: 46. Alignment of the light variable domain of C5H9 with human germline antibodies revealed two amino acids in CDR2 that when reverted to germline eliminated the predicted epitope. The residues are underlined and in bold text in the sequence shown below in SEQ ID NO: 12.

[000586] Furthermore, framework 4 of the C5H9 light chain was modified as indicated with bold italics in SEQ ID NO: 58 substituting glycine (G) for glutamine (Q) in the J region. This modification was aimed at increasing the flexibility of the junction between variable and constant regions, potentially reducing the tendency of C5H9 to form aggregates. The resultant DNA and amino acid sequences are described by SEQ ID NO: 57 and SEQ ID NO: 58, respectively. The resultant anti-PDL1 antibody, referred to herein as anti-PDL1 antibody C5H9v2, also referred to herein as C5H9v2, comprises a light chain comprising SEQ ID NO: 58 and a heavy chain comprising SEQ ID NO: 46.

SEQ ID NO: 12
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIY**Y**AS**T**LQSGVPSRFSGSGS
GTDFTLTISSLQPEDFATYYCQQDNGYPSTFGQGTKVEIKR

SEQ ID NO: 57
GATATTCAGATGACCCAGAGCCCGAGCAGCCTGAGCGCGAGCGTGGGCGATCGCGTGACCATTACCT
GCCGCGCGAGCCAGAGCATTAGCAGCTATCTGAACTGGTATCAGCAGAAACCGGGCAAAGCGCCGAA
ACTGCTGATTTATGCGGCGAGCAGCCTGCAGAGCGGCGTGCCGAGCCGCTTTAGCGGCAGCGGCAGC

GGCACCGATTTTACCCTGACCATTAGCAGCCTGCAGCCGGAAGATTTTGCGACCTATTATTGCCAGC
AGGATAACGGCTATCCGAGCACCTTTGGCGGCGGCACCAAAGTGGAAATTAAACGC

SEQ ID NO: 58
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGS
GTDFTLTISSLQPEDFATYYCQQDNGYPSTFG*G*GTKVEIKR

[000587] Figures 8A and 8B show that germline revisions described in SEQ ID NO: 58 reduces the predicted immunogenicity (top panel) and aggregation potential, and increases the expression level by three fold.

EXAMPLE 6. ***In vitro*** **characterization of anti-PDL1 antibodies C5H9 and C5H9v2.**

[000588] This Example demonstrates the binding specificities and biological activities of anti-PDL1 antibodies of the disclosure.

[000589] Production of fully human IgGs comprising the variable domains of the matured clones was accomplished using techniques similar to those described in PCT Publication No. WO 2010/081173. DNA encoding the heavy variable domains of anti-PDL1 antibody C5H9 (nucleic acid SEQ ID NO: 45; amino acid SEQ ID NO: 46) were amplified and cloned into vectors for the expression of fully human IgGs. DNA encoding the light variable domains of anti-PDL1 antibody C5H9 (nucleic acid SEQ ID NO: 11; amino acid SEQ ID NO: 12) were amplified and cloned into vectors for the expression of fully human IgGs. Similarly, DNA encoding the heavy variable domains of anti-PDL1 antibody C5H9 (nucleic acid SEQ ID NO: 45; amino acid SEQ ID NO: 46) were amplified and cloned into vectors for the expression of chimeric mouse IgG2as. DNA encoding the light variable domains of anti-PDL1 antibody C5H9v2 (nucleic acid SEQ ID NO: 57; amino acid SEQ ID NO: 58) were amplified and cloned into vectors for the expression of chimeric mouse IgG2as. Fully human IgGs or chimeric mouse IgG2a anti-PDL1 antibodies were expressed from transiently transfected HEK-293 cells and purified from the culture supernatant by Protein A chromatography. Anti-PDL1 IgG antibody C5H9 comprises a heavy chain comprising a heavy variable domain comprising SEQ ID NO: 46 and a light chain comprising a light variable domain comprising SEQ ID NO: 12. Anti-PDL1 IgG antibody C5H9v2 comprises a heavy chain comprising a heavy variable domain comprising SEQ ID NO: 46 and a light chain comprising a light variable domain comprising SEQ ID NO: 58.

[000590] Anti-PDL1 antibody C5H9v2 was characterized for species specific binding to PDL1 and whether that antibody would bind a panel of human proteins. Briefly human PDL1-Fc, mouse PDL1-Fc (R & D Systems, Minneapolis, MN) or cynomolgus monkey (cyno) PDL1-Fc (Sino biological) was adsorbed to the wells of a 96-well ELISA plate. Purified anti-PDL1 antibodies C5H9 and C5H9v2 were applied to the plate and allowed to bind. Bound antibody was visualized with an anti-human IgG-HRP conjugate, Fab specific, (Sigma, St Louis, MO; Cat # A0293-1ML) and developed with the chromogenic substrate TMB. Figure 9 shows that both anti-PDL1 antibodies C5H9 and C5H9v2 bind human, mouse and cyno PDL1 with near equal affinity. EC_{50} values for anti-PDL1 antibody C5H9v2 to human, cyno, rat and mouse PDL1 were also similar: 0.25 nM, 0.28 nM, 0.31 nM, and 0.30 nM, respectively.

[000591] In a similar experiment the binding of anti-PDL1 antibody C5H9 was evaluated for binding to a panel of human and mouse proteins. Briefly, each protein, listed in Figure 10, was absorbed to the wells of an ELISA plate. Purified anti-PDL1 antibodies C5H9 and C5H9v2 were applied to the plate and allowed to bind. Bound antibody was visualized with an anti-human IgG-HRP conjugate, Fab specific, (Sigma, St Louis, MO; Cat # A0293-1ML) and developed with the chromogenic substrate TMB. Anti-PDL1 antibody C5H9v2 binds only to human and mouse PDL1 demonstrating specificity toward PDL1.

[000592] The biological activity of PDL1 is mediated through binding to PD1 and/or to B7-1. Blockade of binding is a desired characteristic for a therapeutic antibody; therefore, the potency of blocking the interaction of PDL1 with PD1 and B7-1 was measured. Briefly, human, mouse or cyno PDL1 was adsorbed to the well of an ELISA plate. Biotinylated human, mouse or cyno PD1 or B7-1 was applied to the wells in the absence or the presence of an increasing concentration of either anti-PDL1 antibody C5H9 or anti-PDL1 antibody C5H9v2 and allowed to bind. Bound biotinylated PD1 or B7-1 was visualized with a Streptavidin-HRP conjugate (Thermo Scientific, Cat. No. 21126) and developed with the chromogenic substrate TMB. Figure 11 shows that both anti-PDL1 antibody C5H9 and anti-PDL1 antibody C5H9v2 are potent blockers of either B7-1 or PD1 binding to PDL1, and that blockade includes all three species human, cyno and mouse with single digit nM EC_{50}'s.

EXAMPLE 7: An anti-PDL1 antibody of the disclosure accelerates induction of diabetes in NOD mice

[000593] In this Example, anti-PDL1 antibody C5H9 was analyzed for the ability to induce diabetes in NOD mice.

[000594] The NOD mice, substrain NOD/ShiLtJ, were obtained from Jackson Laboratory at 6 weeks and acclimated on site for 1 week. At 7 weeks, mice were checked for diabetes prior to enrollment, grouped, and dosed as set forth in Table 6.

Table 6. Groups and Doses for NOD study

Group	Count	Treatment	Dose (mg/kg) Loading/regular	Dose volume (mL/kg)	Schedule	Route
1	6	Control	20/10	10	q2dx6	IP
2	6	Anti-PDL1(C5H9)	20/10	10	q2dx6	IP
3	6	Anti-PDL1 (10F9G2)	20/10	10	q2dx6	IP

[000595] Figure 12, which plots % non-diabetic versus number of days post initial dose, shows that anti-PDL1 antibody C5H9 antibody (Gr2-C5H9) induces diabetes in NOD mice similar to positive control anti-PDL1 antibody 10F9G2 antibody. A control rat IgG2b did not induce diabetes in NOD mice.

[000596] Anti-PDL1 antibody C5H9v2 was also tested for the ability to induce diabetes in NOD mice in a dose dependent matter, using a method similar to that described above, with 9-week old animals using the groups and doses set forth in Table 7.

Table 7. Groups and doses for dose dependent NOD study

Group	Count	Gender	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	8	F	mIgG2a (C1.18.4)	25	10	Single dose	IP
2	8	F	Anti-PDL1(C5H9v2)	25	10	Single dose	IP
3	8	F	Anti-PDL1(C5H9v2)	5	10	Single dose	IP
4	8	F	Anti-PDL1(C5H9v2)	1	10	Single dose	IP
5	8	F	Anti-PDL1(C5H9v2)	0.2	10	Single dose	IP

[000597] Figure 13, which plots % non-diabetic versus number of days post initial dose, demonstrates that anti-PDL1 antibody C5H9v2 induces diabetes in NOD mice in a dose dependent matter.

EXAMPLE 8. An anti-PDL1 antibody of the embodiments reduces MC38 tumors in mice

[000598] In this Example, anti-PDL1 antibody C5H9v2 was analyzed for the ability to reduce the growth of MC38 syngeneic tumors.

[000599] The mouse colon carcinoma cell line MC38 was obtained from ATCC (American Type Culture Collection, Manassas, VA). MC38 cells were grown in RPMI-1640 supplemented with 10% fetal bovine serum at 37°C in an atmosphere of 5% CO_2 in air. Cells were harvested during the logarithmic growth period, resuspended in PBS, and kept on ice for tumor induction.

[000600] Each mouse was inoculated subcutaneously at the right flank with $1X10^6$ of MC38 cells in PBS for tumor development. The treatments were started when the mean tumor size reached approximately 100-200 mm^3 (no more than 200 mm^3). Tumor sizes were measured twice weekly in two dimensions using a caliper, and the volume was expressed in mm^3 using the formula: $V = 0.5\ a \times b^2$ where a and b are the long and short diameters of the tumor, respectively.

[000601] The mice were grouped and dosed as set forth in Table 8.

Table 8. Groups and doses for MC38 syngeneic study

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	10	Anti-PDL1 (10F9G2)	10	10	t.i.w. for 2 weeks (MWF)	IP
2	10	Anti-PDL1(C5H9v2)	10	10	t.i.w. for 2 weeks (MWF)	IP
3	10	mIgG2a + Hamster IgG1	10	10	t.i.w. for 2 weeks (MWF)	IP

[000602] Figure 14, which plots tumor volume versus number of days post initial dose, demonstrates that anti-PDL1 antibody C5H9v2 inhibits the growth of MC38 syngeneic tumors similar to positive control anti-PDL1 antibody 10F9G2.

EXAMPLE 9. Anti-PDL1 activatable antibody C5H9v2 masking moieties

[000603] This Example describes identification of masking moieties (MM) to reduce binding of activatable antibodies of anti-PDL1 antibody C5H9v2 to their target.

[000604] Anti-PDL1 antibody C5H9v2 and Fab were used to screen the libraries using a method similar to that described in PCT International Publication Number WO 2010/081173, published 15 July 2010. The screening consisted of one round of MACS and three rounds of FACS sorting. The initial MACS was done with protein-A Dynabeads (Invitrogen) and the anti-PDL1 antibody C5H9v2 at a concentration of 100 nM. For MACS, approximately $1x10^{11}$ cells were screened for binding and $6x10^{6}$ cells were collected. Anti-PDL1 antibody C5H9v2, directly labeled with Alexafluor-488, was used as a probe for all FACS selections. In the first round of FACS, the cells were labeled with 100 nM AlexaFluor- anti-PDL1 antibody C5H9v2. In the second round of FACS, the cells were labeled with 10 nM AlexaFluor- anti-PDL1 antibody C5H9v2. In the third round of FACS, the cells were labeled with 1 nM AlexaFluor- anti-PDL1 antibody C5H9v2. The positive population from the third FACS round was verified to be inhibited by recombinant human PDL1 protein from binding to the anti-PDL1 antibody C5H9v2 and Fab. Individual peptide clones were identified by sequence analysis and subsequently verified for their ability to bind the anti-PDL1 antibody C5H9v2 and Fab.

[000605] The sequences of the anti-PDL1 antibody C5H9v2 masking moieties are listed in Table 9.

Table 9. anti-PDL1 antibody C5H9v2 masking moieties (MM)

MM	Amino Acid Sequence	SEQ ID NO
PL01	YCEVSELFVLPWCMG	SEQ ID NO: 208
PL02	SCLMHPHYAHDYCYV	SEQ ID NO: 426
PL03	LCEVLMLLQHPWCMG	SEQ ID NO: 59
PL04	IACRHFMEQLPFCHH	SEQ ID NO: 60
PL05	FGPRCGEASTCVPYE	SEQ ID NO: 61
PL06	ILYCDSWGAGCLTRP	SEQ ID NO: 62
PL07	GIALCPSHFCQLPQT	SEQ ID NO: 63
PL08	DGPRCFVSGECSPIG	SEQ ID NO: 64
PL09	LCYKLDYDDRSYCHI	SEQ ID NO: 65

PL10	PCHPHPYDARPYCNV	SEQ ID NO: 66
PL11	PCYWHPFFAYRYCNT	SEQ ID NO: 67
PL12	VCYYMDWLGRNWCSS	SEQ ID NO: 68
PL13	LCDLFKLREFPYCMG	SEQ ID NO: 69
PL14	YLPCHFVPIGACNNK	SEQ ID NO: 70
PL15	IFCHMGVVVPQCANY	SEQ ID NO: 71
PL16	ACHPHPYDARPYCNV	SEQ ID NO: 72
PL17	PCHPAPYDARPYCNV	SEQ ID NO: 73
PL18	PCHPHAYDARPYCNV	SEQ ID NO: 74
PL19	PCHPHPADARPYCNV	SEQ ID NO: 75
PL20	PCHPHPYAARPYCNV	SEQ ID NO: 76
PL21	PCHPHPYDAAPYCNV	SEQ ID NO: 77
PL22	PCHPHPYDARPACNV	SEQ ID NO: 78
PL23	PCHPHPYDARPYCAV	SEQ ID NO: 79
PL24	PCHAHPYDARPYCNV	SEQ ID NO: 80
PL25	PCHPHPYDARAYCNV	SEQ ID NO: 81

EXAMPLE 10. Activatable antibodies comprising anti-PDL1 antibody C5H9v2

[000606] This Example describes examples of activatable antibodies of the disclosure comprising anti-PDL1 antibody C5H9v2.

[000607] Anti-PDL1 activatable antibodies comprising an anti-PDL1 antibody C5H9v2 masking moiety, a cleavable moiety, and anti-PDL1 antibody C5H9v2 were produced according to methods similar to those described in PCT Publication Nos. WO 2009/025846 and WO 2010/081173. Quality control of the resultant activatable antibodies indicated that most comprised at least 95% monomer. The amino acid and nucleic acid sequences of several activatable antibodies comprising anti-PDL1 antibody C5H9v2 are provided below. Each activatable antibody comprises anti-PDL1 antibody C5H9v2 having the variable heavy chain amino acid sequence shown in SEQ ID NO: 46 and a light chain amino acid sequence selected from the group consisting of the amino acid sequences shown in SEQ ID NO: 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959,

2016233495 06 Oct 2017

961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1144-1191, 1200, and 1201 below.

[000608] While the sequences shown below include the spacer sequence of SEQ ID NO: 923, those of ordinary skill in the art appreciate that the activatable anti-PDL1 antibodies of the disclosure can include any suitable spacer sequence, such as, for example, a spacer sequence selected from the group consisting of QGQSGS (SEQ ID NO: 923); GQSGS (SEQ ID NO: 1192); QSGS (SEQ ID NO: 1193); SGS (SEQ ID NO: 1194); GS (SEQ ID NO: 1195); S; QGQSGQG (SEQ ID NO: 924); GQSGQG (SEQ ID NO: 395); QSGQG (SEQ ID NO: 925); SGQG (SEQ ID NO: 926); GQG (SEQ ID NO: 927); QG (SEQ ID NO: 928); G; QGQSGQ (SEQ ID NO: 1196); GQSGQ (SEQ ID NO: 1197); QSGQ (SEQ ID NO: 1198); SGQ (SEQ ID NO: 616); GQ (SEQ ID NO: 1199); and Q. While the sequences shown below include the spacer sequence of SEQ ID NO: 923, those of ordinary skill in the art will also appreciate that activatable anti-PDL1 antibodies of the disclosure in some embodiments do not include a spacer sequence.

C5H9v2 VH amino acid sequence
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSS (SEQ ID NO: 46)

[spacer (SEQ ID NO: 929)][PL01-0003 LC (SEQ ID NO: 930)]
[CAAGGTCAGTCTGGATCC][TATTGCGAGGTTAGTGAGCTGTTTGTTCTTCCTTGGTGCATGGGTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 82)

[spacer (SEQ ID NO: 923)][PL01-0003 LC (SEQ ID NO: 931)]
[QGQSGS][YCEVSELFVLPWCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 83)

PL01-0003 LC nucleotide sequence

TATTGCGAGGTTAGTGAGCTGTTTGTTCTTCCTTGGTGCATGGGTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 930)

PL01-0003 LC amino acid sequence

YCEVSELFVLPWCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 931)

[spacer (SEQ ID NO: 929)][PL02-0003 LC (SEQ ID NO: 932)]

[CAAGGTCAGTCTGGATCC][TCTTGCCTTATGCATCCGCATTATGCTCATGATTATTGCTATGTTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 84)

[spacer (SEQ ID NO: 923)][PL02-0003 LC (SEQ ID NO: 933)]

[QGQSGS][SCLMHPHYAHDYCYVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 85)

PL02-0003 LC nucleotide sequence

TCTTGCCTTATGCATCCGCATTATGCTCATGATTATTGCTATGTTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC

CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 932)

PL02-0003 LC amino acid sequence
SCLMHPHYAHDYCYVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 933)

[spacer (SEQ ID NO: 929)][PL03-0003 LC (SEQ ID NO: 934)]
[CAAGGTCAGTCTGGATCC][TTGTGCGAGGTTTTGATGTTGTTGCAGCATCCGTGGTGCATGGGGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 86)

[spacer (SEQ ID NO: 923)][PL03-0003 LC (SEQ ID NO: 935)]
[QGQSGS][LCEVLMLLQHPWCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 87)

PL03-0003 LC nucleotide sequence
TTGTGCGAGGTTTTGATGTTGTTGCAGCATCCGTGGTGCATGGGGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 934)

PL03-0003 LC amino acid sequence
LCEVLMLLQHPWCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 935)

[spacer (SEQ ID NO: 929)][PL04-0003 LC (SEQ ID NO: 936)]
[CAAGGTCAGTCTGGATCC][ATTGCGTGCCGGCATTTTATGGAGCAGTTGCCGTTTTGCCATCATG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 88)

[spacer (SEQ ID NO: 923)][PL04-0003 LC (SEQ ID NO: 937)]
[QGQSGS][IACRHFMEQLPFCHHGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 89)

PL04-0003 LC nucleotide sequence
ATTGCGTGCCGGCATTTTATGGAGCAGTTGCCGTTTTGCCATCATGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 936)

PL04-0003 LC amino acid sequence
IACRHFMEQLPFCHHGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 937)

[spacer (SEQ ID NO: 929)][PL05-0003 LC (SEQ ID NO: 938)]
[CAAGGTCAGTCTGGATCC][TTTGGTCCTAGGTGCGGTGAGGCTTCTACTTGCGTTCCGTATGAGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 90)

[spacer (SEQ ID NO: 923)][PL05-0003 LC (SEQ ID NO: 939)]
[QGQSGS][FGPRCGEASTCVPYEGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 91)

PL05-0003 LC nucleotide sequence
TTTGGTCCTAGGTGCGGTGAGGCTTCTACTTGCGTTCCGTATGAGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 938)

PL05-0003 LC amino acid sequence
FGPRCGEASTCVPYEGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 939)

[spacer (SEQ ID NO: 929)][PL06-0003 LC (SEQ ID NO: 940)]
[CAAGGTCAGTCTGGATCC][ATTCTTTATTGCGATAGTTGGGGGGCGGGGTGCTTGACGCGGCCGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT

TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 92)

[spacer (SEQ ID NO: 923)][PL06-0003 LC (SEQ ID NO: 941)]
[QGQSGS][ILYCDSWGAGCLTRPGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 93)

PL06-0003 LC nucleotide sequence
ATTCTTTATTGCGATAGTTGGGGGGCGGGGTGCTTGACGCGGCCGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 940)

PL06-0003 LC amino acid sequence
ILYCDSWGAGCLTRPGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 941)

[spacer (SEQ ID NO: 929)][PL07-0003 LC (SEQ ID NO: 942)]
[CAAGGTCAGTCTGGATCC][GGGATTGCGTTGTGCCCGTCTCATTTTTGCCAGCTGCCTCAGACTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 94)

[spacer (SEQ ID NO: 923)][PL07-0003 LC (SEQ ID NO: 943)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 95)

PL07-0003 LC nucleotide sequence
GGGATTGCGTTGTGCCCGTCTCATTTTTGCCAGCTGCCTCAGACTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 942)

PL07-0003 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 943)

[spacer (SEQ ID NO: 929)][PL08-0003 LC (SEQ ID NO: 944)]
[CAAGGTCAGTCTGGATCC][GATGGGCCGCGTTGCTTTGTGTCGGGGGAGTGCTCTCCGATTGGTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 96)

[spacer (SEQ ID NO: 923)][PL08-0003 LC (SEQ ID NO: 945)]
[QGQSGS][DGPRCFVSGECSPIGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 97)

PL08-0003 LC nucleotide sequence

GATGGGCCGCGTTGCTTTGTGTCGGGGGAGTGCTCTCCGATTGGTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 944)

PL08-0003 LC amino acid sequence

DGPRCFVSGECSPIGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 945)

[spacer (SEQ ID NO: 929)][PL09-0003 LC (SEQ ID NO: 946)]

[CAAGGTCAGTCTGGATCC][TTGTGCTATAAGCTGGATTATGATGATAGGTCTTATTGCCATATTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 98)

[spacer (SEQ ID NO: 923)][PL09-0003 LC (SEQ ID NO: 947)]

[QGQSGS][LCYKLDYDDRSYCHIGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 99)

PL09-0003 LC nucleotide sequence

TTGTGCTATAAGCTGGATTATGATGATAGGTCTTATTGCCATATTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC

CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 946)

PL09-0003 LC amino acid sequence
LCYKLDYDDRSYCHIGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 947)

[spacer (SEQ ID NO: 929)][PL10-0003 LC (SEQ ID NO: 948)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 100)

[spacer (SEQ ID NO: 923)][PL10-0003 LC (SEQ ID NO: 949)]
[QGQSGS][PCHPHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR](SEQ ID NO: 101)

PL10-0003 LC nucleotide sequence
CCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 948)

PL10-0003 LC amino acid sequence
PCHPHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR(SEQ ID NO: 949)

[spacer (SEQ ID NO: 929)][PL11-0003 LC (SEQ ID NO: 950)]
[CAAGGTCAGTCTGGATCC][CCTTGCTATTGGCATCCTTTTTTTGCGTATAGGTATTGCAATACTG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 102)

[spacer (SEQ ID NO: 923)][PL11-0003 LC (SEQ ID NO: 951)]
[QGQSGS][PCYWHPFFAYRYCNTGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 103)

PL11-0003 LC nucleotide sequence
CCTTGCTATTGGCATCCTTTTTTTGCGTATAGGTATTGCAATACTGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 950)

PL11-0003 LC amino acid sequence
PCYWHPFFAYRYCNTGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 951)

[spacer (SEQ ID NO: 929)][PL12-0003 LC (SEQ ID NO: 952)]
[CAAGGTCAGTCTGGATCC][GTTTGCTATTATATGGATTGGTTGGGGCGGAATTGGTGCTCTTCGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 104)

[spacer (SEQ ID NO: 923)][PL12-0003 LC (SEQ ID NO: 953)]
[QGQSGS][VCYYMDWLGRNWCSSGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 105)

PL12-0003 LC nucleotide sequence
GTTTGCTATTATATGGATTGGTTGGGGCGGAATTGGTGCTCTTCGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 952)

PL12-0003 LC amino acid sequence
VCYYMDWLGRNWCSSGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 953)

[spacer (SEQ ID NO: 929)][PL13-0003 LC (SEQ ID NO: 954)]
[CAAGGTCAGTCTGGATCC][CTGTGCGATCTGTTTAAGTTGCGTGAGTTTCCTTATTGCATGGGGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT

TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 106)

[spacer (SEQ ID NO: 923)][PL13-0003 LC (SEQ ID NO: 955)]
[QGQSGS][LCDLFKLREFPYCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 107)

PL13-0003 LC nucleotide sequence
CTGTGCGATCTGTTTAAGTTGCGTGAGTTTCCTTATTGCATGGGGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 954)

PL13-0003 LC amino acid sequence
LCDLFKLREFPYCMGGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 955)

[spacer (SEQ ID NO: 929)][PL14-0003 LC (SEQ ID NO: 956)]
[CAAGGTCAGTCTGGATCC][TATCTTCCGTGCCATTTTGTTCCGATTGGGGCTTGCAATAATAAGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 108)

[spacer (SEQ ID NO: 923)][PL14-0003 LC (SEQ ID NO: 957)]
[QGQSGS][YLPCHFVPIGACNNKGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 109)

PL14-0003 LC nucleotide sequence
TATCTTCCGTGCCATTTTGTTCCGATTGGGGCTTGCAATAATAAGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 956)

PL14-0003 LC amino acid sequence
YLPCHFVPIGACNNKGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 957)

[spacer (SEQ ID NO: 929)][PL15-0003 LC (SEQ ID NO: 958)]
[CAAGGTCAGTCTGGATCC][ATTTTTTGCCATATGGGTGTTGTGGTTCCTCAGTGCGCGAATTATG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 110)

[spacer (SEQ ID NO: 923)][PL15-0003 LC (SEQ ID NO: 959)]
[QGQSGS][IFCHMGVVVPQCANYGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 111)

PL15-0003 LC nucleotide sequence

ATTTTTTGCCATATGGGTGTTGTGGTTCCTCAGTGCGCGAATTATGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 958)

PL15-0003 LC amino acid sequence

IFCHMGVVVPQCANYGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 959)

[spacer (SEQ ID NO: 929)][PL16-0003 LC (SEQ ID NO: 960)]

[CAAGGTCAGTCTGGATCC][GCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 112)

[spacer (SEQ ID NO: 923)][PL16-0003 LC (SEQ ID NO: 961)]

[QGQSGS][ACHPHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 113)

PL16-0003 LC nucleotide sequence

GCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC

CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 960)

PL16-0003 LC amino acid sequence
ACHPHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 961)

[spacer (SEQ ID NO: 929)][PL17-0003 LC (SEQ ID NO: 962)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGGCTCCTTATGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 114)

[spacer (SEQ ID NO: 923)][PL17-0003 LC (SEQ ID NO: 963)]
[QGQSGS][PCHPAPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 115)

PL17-0003 LC nucleotide sequence
CCGTGCCATCCGGCTCCTTATGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 962)

PL17-0003 LC amino acid sequence
PCHPAPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 963)

[spacer (SEQ ID NO: 929)][PL18-0003 LC (SEQ ID NO: 964)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATGCTTATGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 116)

[spacer (SEQ ID NO: 923)][PL18-0003 LC (SEQ ID NO: 965)]
[QGQSGS][PCHPHAYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 117)

PL18-0003 LC nucleotide sequence
CCGTGCCATCCGCATGCTTATGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 964)

PL18-0003 LC amino acid sequence
PCHPHAYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 965)

[spacer (SEQ ID NO: 929)][PL19-0003 LC (SEQ ID NO: 966)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTGCTGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 118)

[spacer (SEQ ID NO: 923)][PL19-0003 LC (SEQ ID NO: 967)]
[QGQSGS][PCHPHPADARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 119)

PL19-0003 LC nucleotide sequence
CCGTGCCATCCGCATCCTGCTGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 966)

PL19-0003 LC amino acid sequence
PCHPHPADARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 967)

[spacer (SEQ ID NO: 929)][PL20-0003 LC (SEQ ID NO: 968)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGCTGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT

TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 120)

[spacer (SEQ ID NO: 923)][PL20-0003 LC (SEQ ID NO: 969)]
[QGQSGS][PCHPHPYAARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 121)

PL20-0003 LC nucleotide sequence
CCGTGCCATCCGCATCCTTATGCTGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 968)

PL20-0003 LC amino acid sequence
PCHPHPYAARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 969)

[spacer (SEQ ID NO: 929)][PL21-0003 LC (SEQ ID NO: 970)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGATGCTGCTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 122)

[spacer (SEQ ID NO: 923)][PL21-0003 LC (SEQ ID NO: 971)]
[QGQSGS][PCHPHPYDAAPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 123)

PL21-0003 LC nucleotide sequence
CCGTGCCATCCGCATCCTTATGATGCTGCTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 970)

PL21-0003 LC amino acid sequence
PCHPHPYDAAPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 971)

[spacer (SEQ ID NO: 929)][PL22-0003 LC (SEQ ID NO: 972)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGATGCTCGTCCTGCTTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 124)

[spacer (SEQ ID NO: 923)][PL22-0003 LC (SEQ ID NO: 973)]
[QGQSGS][PCHPHPYDARPACNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 125)

PL22-0003 LC nucleotide sequence

CCGTGCCATCCGCATCCTTATGATGCTCGTCCTGCTTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 972)

PL22-0003 LC amino acid sequence

PCHPHPYDARPACNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 973)

[spacer (SEQ ID NO: 929)][PL23-0003 LC (SEQ ID NO: 974)]

[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCGCTGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 126)

[spacer (SEQ ID NO: 923)][PL23-0003 LC (SEQ ID NO: 975)]

[QGQSGS][PCHPHPYDARPYCAVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 127)

PL23-0003 LC nucleotide sequence

CCGTGCCATCCGCATCCTTATGATGCTCGTCCTTATTGCGCTGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC

CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 974)

PL23-0003 LC amino acid sequence
PCHPHPYDARPYCAVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 975)

[spacer (SEQ ID NO: 929)][PL24-0003 LC (SEQ ID NO: 976)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATGCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 128)

[spacer (SEQ ID NO: 923)][PL24-0003 LC (SEQ ID NO: 977)]
[QGQSGS][PCHAHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 129)

PL24-0003 LC nucleotide sequence
CCGTGCCATGCGCATCCTTATGATGCTCGTCCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 976)

PL24-0003 LC amino acid sequence
PCHAHPYDARPYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 977)

[spacer (SEQ ID NO: 929)][PL25-0003 LC (SEQ ID NO: 978)]
[CAAGGTCAGTCTGGATCC][CCGTGCCATCCGCATCCTTATGATGCTCGTGCTTATTGCAATGTGG
GAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCC
ACGTGGCGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGAC
AGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGC
CCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATT
TTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCC
ACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCA
AGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTG
T] (SEQ ID NO: 130)

[spacer (SEQ ID NO: 923)][PL25-0003 LC (SEQ ID NO: 979)]
[QGQSGS][PCHPHPYDARAYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASV
GDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPED
FATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 131)

PL25-0003 LC nucleotide sequence
CCGTGCCATCCGCATCCTTATGATGCTCGTGCTTATTGCAATGTGGGAGGTGGCTCGAGCGGTGGCA
GCGGTGGCTCTGGTGGTACTAGCACCTCTGGTCGTTCCGCTAACCCACGTGGCGGCGGTTCTGACAT
CCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGA
GCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGC
TGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCAC
CGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGAC
AACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACA
AGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATGAGTGT (SEQ ID NO: 978)

PL25-0003 LC amino acid sequence
PCHPHPYDARAYCNVGGGSSGGSGGSGGTSTSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTITCR
ASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQD
NGYPSTFGGGTKVEIKR (SEQ ID NO: 979)

[spacer (SEQ ID NO: 929)][PL03-2001 LC (SEQ ID NO: 980)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT
GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 132)

[spacer (SEQ ID NO: 923)][PL03-2001 LC (SEQ ID NO: 981)]
[QGQSGS][LCEVLMLLQHPWCMGGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 133)

PL03-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 980)

PL03-2001 LC amino acid sequence
LCEVLMLLQHPWCMGGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 981)

[spacer (SEQ ID NO: 923)][PL04-2001 LC (SEQ ID NO: 1183)]
[QGQSGS][IACRHFMEQLPFCHHGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1182)

PL04-2001 LC amino acid sequence
IACRHFMEQLPFCHHGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1183)

[spacer (SEQ ID NO: 929)][PL06-2001-mk LC (SEQ ID NO: 982)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT
GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 134)

[spacer (SEQ ID NO: 923)][PL06-2001-mk LC (SEQ ID NO: 983)]
[QGQSGS][ILYCDSWGAGCLTRPGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 135)

PL06-2001-mk LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 982)

PL06-2001-mk LC amino acid sequence
ILYCDSWGAGCLTRPGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 983)

[spacer (SEQ ID NO: 929)][PL07-2001 LC (SEQ ID NO: 984)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT
GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 136)

[spacer (SEQ ID NO: 923)][PL07-2001 LC (SEQ ID NO: 985)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 137)

PL07-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 984)

PL07-2001 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 985)

[spacer (SEQ ID NO: 929)][PL10-2001 LC (SEQ ID NO: 986)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT

GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 138)

[spacer (SEQ ID NO: 923)][PL10-2001 LC (SEQ ID NO: 987)]
[QGQSGS][PCHPHPYDARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 139)

PL10-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 986)

PL10-2001 LC amino acid sequence
PCHPHPYDARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 987)

[spacer (SEQ ID NO: 923)][PL11-2001 LC (SEQ ID NO: 1185)]
[QGQSGS][PCYWHPFFAYRYCNTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1184)

PL11-2001 LC amino acid sequence
PCYWHPFFAYRYCNTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1185)

[spacer (SEQ ID NO: 923)][PL12-2001 LC (SEQ ID NO: 1187)]
[QGQSGS][VCYYMDWLGRNWCSSGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1186)

PL12-2001 LC amino acid sequence
VCYYMDWLGRNWCSSGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1187)

[spacer (SEQ ID NO: 929)][PL14-2001 LC (SEQ ID NO: 988)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT
GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 140)

[spacer (SEQ ID NO: 923)][PL14-2001 LC (SEQ ID NO: 989)]
[QGQSGS][YLPCHFVPIGACNNKGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 141)

PL14-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 988)

PL14-2001 LC amino acid sequence
YLPCHFVPIGACNNKGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 989)

[spacer (SEQ ID NO: 929)][PL15-2001 LC (SEQ ID NO: 990)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT
GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 142)

[spacer (SEQ ID NO: 923)][PL15-2001 LC (SEQ ID NO: 991)]
[QGQSGS][IFCHMGVVVPQCANYGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 143)

PL15-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 990)

PL15-2001 LC amino acid sequence
IFCHMGVVVPQCANYGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 991)

[spacer (SEQ ID NO: 929)][PL18-2001 LC (SEQ ID NO: 992)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCA
GTGGTCTGTTAAGCGGTCGTAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAG
CAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGC
TACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTC
TGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAG
CTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTT

GGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTG
TCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 144)

[spacer (SEQ ID NO: 923)][PL18-2001 LC (SEQ ID NO: 993)]
[QGQSGS][PCHPHAYDARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 145)

PL18-2001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGGCTCTGGTGGTATTAGCAGTGGTCTGTTAAGCGGTCGTA
GCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGTGGG
CGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAGCAG
AAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCAGCA
GATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGACTT
CGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTGGAA
ATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGAATG
AGTGT (SEQ ID NO: 992)

PL18-2001 LC amino acid sequence
PCHPHAYDARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 993)

[spacer (SEQ ID NO: 923)][PL19-2001 LC (SEQ ID NO: 1189)]
[QGQSGS][PCHPHPADARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1188)

PL19-2001 LC amino acid sequence
PCHPHPADARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1189)

[spacer (SEQ ID NO: 923)][PL20-2001 LC (SEQ ID NO: 1191)]
[QGQSGS][PCHPHPYAARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1190)

PL20-2001 LC amino acid sequence
PCHPHPYAARPYCNVGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1191)

[spacer (SEQ ID NO: 929)][PL03-1004/GG/0001 (also referred to herein as PL03-3001) LC (SEQ ID NO: 994)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC
CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC
CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC
AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT
CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT
CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC
TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCA
TTGTCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 146)

[spacer (SEQ ID NO: 923)][PL03-1004/GG/0001 LC (SEQ ID NO: 995)]
[QGQSGS][LCEVLMLLQHPWCMGGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA
SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP
EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 147)

PL03-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC
GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT
GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG
CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA
GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA
CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG
GAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGA
ATGAGTGT (SEQ ID NO: 994)

PL03-1004/GG/0001 LC amino acid sequence
LCEVLMLLQHPWCMGGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT
CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ
QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 995)

[spacer (SEQ ID NO: 929)][PL06-1004/GG/0001 (also referred to herein as PL06-3001) LC (SEQ ID NO: 996)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCG TCACAAAGAGCTTCAACAGGGGAGAGTGT] (SEQ ID NO: 148)

[spacer (SEQ ID NO: 923)][PL06-1004/GG/0001 LC (SEQ ID NO: 997)]
[QGQSGS][ILYCDSWGAGCLTRPGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 149)

PL06-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG GAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGG GAGAGTGT (SEQ ID NO: 996)

PL06-1004/GG/0001 LC amino acid sequence
ILYCDSWGAGCLTRPGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 997)

[spacer (SEQ ID NO: 929)][PL07-1004/GG/0001 (also referred to herein as PL07-3001) LC (SEQ ID NO: 998)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT

CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT
CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC
TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCG
TCACAAAGAGCTTCAACAGGGGAGAGTGT] (SEQ ID NO: 150)

[spacer (SEQ ID NO: 923)][PL01-1004/GG/0001 LC (SEQ ID NO: 999)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA
SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP
EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 151)

PL07-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC
GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT
GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG
CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA
GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA
CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG
GAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGG
GAGAGTGT (SEQ ID NO: 998)

PL07-1004/GG/0001 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT
CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ
QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 999)

[spacer (SEQ ID NO: 929)][PL14-1004/GG/0001 (also referred to
herein as PL14-3001) LC (SEQ ID NO: 1000)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC
CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC
CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC
AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT
CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT
CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC
TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCG
TCACAAAGAGCTTCAACAGGGGAGAGTGT] (SEQ ID NO: 152)

[spacer (SEQ ID NO: 923)][PL14-1004/GG/0001 LC (SEQ ID NO: 1001)]
[QGQSGS][YLPCHFVPIGACNNKGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA
SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP
EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 153)

PL14-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC
GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT
GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG
CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA
GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA
CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG
GAAATCAAGCGTTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGG
GAGAGTGT (SEQ ID NO: 1000)

PL14-1004/GG/0001 LC amino acid sequence
YLPCHFVPIGACNNKGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT
CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ
QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1001)

[spacer (SEQ ID NO: 929)][PL15-1004/GG/0001 (also referred to
herein as PL15-3001) LC (SEQ ID NO: 1002)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC
CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC
CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC
AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT
CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT
CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC
TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCA
TTGTCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 154)

[spacer (SEQ ID NO: 923)][PL15-1004/GG/0001 LC (SEQ ID NO: 1003)]
[QGQSGS][IFCHMGVVVPQCANYGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA
SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP
EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 155)

PL15-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC
GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT
GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG
CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA
GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA
CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG
GAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGA
ATGAGTGT (SEQ ID NO: 1002)

PL15-1004/GG/0001 LC amino acid sequence
IFCHMGVVVPQCANYGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT
CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ
QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1003)

[spacer (SEQ ID NO: 929)][PL18-1004/GG/0001 (also referred to herein as PL18-3001) LC (SEQ ID NO: 1004)]
[CAAGGTCAGTCTGGATCC][GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTC
CCCCGGGCGGCCTGTCCGGCCGCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCC
CAGCAGCCTGTCTGCTAGCGTGGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGC
AGCTACCTGAACTGGTATCAGCAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCT
CTCTGCAGTCTGGCGTGCCCAGCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCAT
CAGCTCCCTGCAGCCCGAGGACTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACC
TTTGGCGGAGGTACCAAGGTGGAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCA
TTGTCAAGAGCTTCAACAGGAATGAGTGT] (SEQ ID NO: 156)

[spacer (SEQ ID NO: 923)][PL18-1004/GG/0001 LC (SEQ ID NO: 1005)]
[QGQSGS][PCHPHAYDARPYCNVGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSA
SVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQP
EDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 157)

PL18-1004/GG/0001 LC nucleotide sequence
GGAGGTGGCTCGAGCGGTGGCAGCGGTGCTGTGGGTCTCCTGGCTCCCCCGGGCGGCCTGTCCGGCC
GCAGCGATAATCATGGCGGTTCTGACATCCAGATGACCCAGAGCCCCAGCAGCCTGTCTGCTAGCGT
GGGCGACAGAGTGACCATCACCTGTAGAGCCAGCCAGAGCATCAGCAGCTACCTGAACTGGTATCAG
CAGAAGCCCGGCAAGGCCCCCAAACTGCTGATCTACGCCGCCAGCTCTCTGCAGTCTGGCGTGCCCA
GCAGATTTTCCGGCAGCGGCTCTGGCACCGACTTCACCCTGACCATCAGCTCCCTGCAGCCCGAGGA

CTTCGCCACCTACTACTGCCAGCAGGACAACGGCTACCCCAGCACCTTTGGCGGAGGTACCAAGGTG
GAAATCAAGCGTTGTGAGGCCACTCACAAGACATCAACTTCACCCATTGTCAAGAGCTTCAACAGGA
ATGAGTGT (SEQ ID NO: 1004)

PL18-1004/GG/0001 LC amino acid sequence
PCHPHAYDARPYCNVGGGSSGGSGAVGLLAPPGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTIT
CRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQ
QDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1005)

PL07-0001
[spacer (SEQ ID NO: 923)][PL07-0001 LC (SEQ ID NO: 1145)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1144)

PL07-0001 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITCRASQS
ISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNGYP
STFGGGTKVEIKR (SEQ ID NO: 1145)

PL07-0002
[spacer (SEQ ID NO: 923)][PL07-0002 LC (SEQ ID NO: 1147)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGLSGRSGNHGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1146)

PL07-0002 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGLSGRSGNHGGSDIQMTQSPSSLSASVGDRVTITCRASQS
ISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNGYP
STFGGGTKVEIKR (SEQ ID NO: 1147)

PL07-1001
[spacer (SEQ ID NO: 923)][PL07-1001 LC (SEQ ID NO: 1149)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSSGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1148)

PL07-1001 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSSGGSDIQMTQSPSSLSASVGDRVTITCRASQS
ISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNGYP
STFGGGTKVEIKR (SEQ ID NO: 1149)

PL07-1002
[spacer (SEQ ID NO: 923)][PL07-1002 LC (SEQ ID NO: 1151)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGQNQALRMAGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1150)

PL07-1002 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGQNQALRMAGGSDIQMTQSPSSLSASVGDRVTITCRASQS
ISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNGYP
STFGGGTKVEIKR (SEQ ID NO: 1151)

PL07-1003
[spacer (SEQ ID NO: 923)][PL07-1003 LC (SEQ ID NO: 1153)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGVHMPLGFLGPGGSDIQMTQSPSSLSASVGD
RVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFA
TYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1152)

PL07-1003 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGVHMPLGFLGPGGSDIQMTQSPSSLSASVGDRVTITCRAS
QSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNG
YPSTFGGGTKVEIKR (SEQ ID NO: 1153)

PL07-1004
[spacer (SEQ ID NO: 923)][PL07-1004 LC (SEQ ID NO: 1201)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1200)

PL07-1004 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPGGSDIQMTQSPSSLSASVGDRVTITCRASQS
ISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQDNGYP
STFGGGTKVEIKR (SEQ ID NO: 1201)

PL07-2002
[spacer (SEQ ID NO: 923)][PL07-2002 LC (SEQ ID NO: 1155)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSGNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1154)

PL07-2002 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSGNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1155)

PL07-2003
[spacer (SEQ ID NO: 923)][PL07-2003 LC (SEQ ID NO: 1157)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANPRGGGSDIQMTQSPSSLS
ASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQ
PEDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1156)

PL07-2003 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANPRGGGSDIQMTQSPSSLSASVGDRVTI
TCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYC
QQDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1157)

PL07-2004
[spacer (SEQ ID NO: 923)][PL07-2004 LC (SEQ ID NO: 1159)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPTSGRSANPRGGGSDIQMTQSPS
SLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTIS
SLQPEDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1158)

PL07-2004 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPTSGRSANPRGGGSDIQMTQSPSSLSASVGDR
VTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFAT
YYCQQDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1159)

PL07-2005
[spacer (SEQ ID NO: 923)][PL07-2005 LC (SEQ ID NO: 1161)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPSGRSANPRGGGSDIQMTQSPSS
LSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISS
LQPEDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1160)

PL07-2005 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPSGRSANPRGGGSDIQMTQSPSSLSASVGDRV
TITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATY
YCQQDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1161)

PL07-2006
[spacer (SEQ ID NO: 923)][PL07-2006 LC (SEQ ID NO: 1163)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDDHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1162)

PL07-2006 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDDHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1163)

PL07-2007
[spacer (SEQ ID NO: 923)][PL07-2007 LC (SEQ ID NO: 1165)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDIHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1164)

PL07-2007 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDIHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1165)

PL07-2008
[spacer (SEQ ID NO: 923)][PL07-2008 LC (SEQ ID NO: 1167)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDQHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1166)

PL07-2008 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDQHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1167)

PL07-2009
[spacer (SEQ ID NO: 923)][PL07-2009 LC (SEQ ID NO: 1169)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDTHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1168)

PL07-2009 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDTHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1169)

PL07-2010
[spacer (SEQ ID NO: 923)][PL07-2010 LC (SEQ ID NO: 1171)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDYHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1170)

PL07-2010 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDYHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1171)

PL07-2011
[spacer (SEQ ID NO: 923)][PL07-2011 LC (SEQ ID NO: 1173)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNPGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1172)

PL07-2011 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNPGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1173)

PL07-2012
[spacer (SEQ ID NO: 923)][PL07-2012 LC (SEQ ID NO: 1175)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANPGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1174)

PL07-2012 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANPGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1175)

PL07-2013
[spacer (SEQ ID NO: 923)][PL07-2013 LC (SEQ ID NO: 1177)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANIGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1176)

PL07-2013 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSANIGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1177)

PL07-2014
[spacer (SEQ ID NO: 923)][PL07-2014 LC (SEQ ID NO: 1179)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNIGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1178)

PL07-2014 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNIGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKR (SEQ ID NO: 1179)

PL07-1004/GG/0003
[spacer (SEQ ID NO: 923)][PL07-1004/GG/0003 LC (SEQ ID NO: 1181)]
[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPGGTSTSGRSANPRGGGSDIQMT
QSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFT
LTISSLQPEDFATYYCQQDNGYPSTFGGGTKVEIKR] (SEQ ID NO: 1180)

PL07-1004/GG/0003 LC amino acid sequence
GIALCPSHFCQLPQTGGGSSGGSGGSGGAVGLLAPPGGTSTSGRSANPRGGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKR (SEQ ID NO: 1181)

EXAMPLE 11. Anti-PDL1 activatable antibodies of the disclosure

[000609] This example demonstrates that anti-PDL1 activatable antibodies can be made in a variety of combinations of MM, CM, VL, and VH domains as well as in a variety of distinct human isotypes.

Table 18. Anti-PDL1 Activatable Antibody Components

Mask Sequence (MM)	Substrate Sequence (CM)	VL	VH
YCEVSELFVLPWCMG (SEQ ID NO: 208)	LSGRSDNH (SEQ ID NO: 341)	SEQ ID NO: 12	SEQ ID NO: 14

SCLMHPHYAHDYCYV (SEQ ID NO: 426)	TGRGPSWV (SEQ ID NO: 338)	SEQ ID NO: 58	SEQ ID NO: 16
LCEVLMLLQHPWCMG (SEQ ID NO: 59)	PLTGRSGG (SEQ ID NO: 344)		SEQ ID NO: 18
IACRHFMEQLPFCHH (SEQ ID NO: 60)	TARGPSFK (SEQ ID NO: 340)		SEQ ID NO: 20
FGPRCGEASTCVPYE (SEQ ID NO: 61)	NTLSGRSENHSG (SEQ ID NO: 435)		SEQ ID NO: 22
ILYCDSWGAGCLTRP (SEQ ID NO: 62)	NTLSGRSGNHGS (SEQ ID NO: 436)		SEQ ID NO: 24
GIALCPSHFCQLPQT (SEQ ID NO: 63)	TSTSGRSANPRG (SEQ ID NO: 437)		SEQ ID NO: 26
DGPRCFVSGECSPIG (SEQ ID NO: 64)	TSGRSANP (SEQ ID NO: 438)		SEQ ID NO: 28
LCYKLDYDDRSYCHI (SEQ ID NO: 65)	VHMPLGFLGP (SEQ ID NO: 352)		SEQ ID NO: 30
PCHPHPYDARPYCNV (SEQ ID NO: 66)	AVGLLAPP (SEQ ID NO: 372)		SEQ ID NO: 32
PCYWHPFFAYRYCNT (SEQ ID NO: 67)	AQNLLGMV (SEQ ID NO: 360)		SEQ ID NO: 34
VCYYMDWLGRNWCSS (SEQ ID NO: 68)	QNQALRMA (SEQ ID NO: 359)		SEQ ID NO: 36
LCDLFKLREFPYCMG (SEQ ID NO: 69)	LAAPLGLL (SEQ ID NO: 371)		SEQ ID NO: 38
YLPCHFVPIGACNNK (SEQ ID NO: 70)	STFPFGMF (SEQ ID NO: 361)		SEQ ID NO: 40
IFCHMGVVVPQCANY (SEQ ID NO: 71)	ISSGLLSS (SEQ ID NO: 364)		SEQ ID NO: 42
ACHPHPYDARPYCNV (SEQ ID NO: 72)	PAGLWLDP (SEQ ID NO: 374)		SEQ ID NO: 44
PCHPAPYDARPYCNV (SEQ ID NO: 73)	VAGRSMRP (SEQ ID NO: 439)		SEQ ID NO: 46
PCHPHAYDARPYCNV (SEQ ID NO: 74)	VVPEGRRS (SEQ ID NO: 440)		SEQ ID NO: 48

PCHPHPADARPYCNV (SEQ ID NO: 75)	ILPRSPAF (SEQ ID NO: 441)		SEQ ID NO: 50
PCHPHPYAARPYCNV (SEQ ID NO: 76)	MVLGRSLL (SEQ ID NO: 442)		SEQ ID NO: 52
PCHPHPYDAAPYCNV (SEQ ID NO: 77)	QGRAITFI (SEQ ID NO: 443)		SEQ ID NO: 54
PCHPHPYDARPACNV (SEQ ID NO: 78)	SPRSIMLA (SEQ ID NO: 444)		SEQ ID NO: 56
PCHPHPYDARPYCAV (SEQ ID NO: 79)	SMLRSMPL (SEQ ID NO: 445)		
PCHAHPYDARPYCNV (SEQ ID NO: 80)	ISSGLLSGRSDNH (SEQ ID NO: 377)		
PCHPHPYDARAYCNV (SEQ ID NO: 81)	AVGLLAPPGGLSGRSDNH (SEQ ID NO: 383)		
	ISSGLLSSGGSGGSLSGRSDNH (SEQ ID NO: 378)		
	LSGRSGNH (SEQ ID NO: 883)		
	SGRSANPRG (SEQ ID NO: 884)		
	LSGRSDDH (SEQ ID NO: 885)		
	LSGRSDIH (SEQ ID NO: 886)		
	LSGRSDQH (SEQ ID NO: 887)		
	LSGRSDTH (SEQ ID NO: 888)		
	LSGRSDYH (SEQ ID NO: 889)		
	LSGRSDNP (SEQ ID NO: 890)		
	LSGRSANP (SEQ ID NO: 891)		
	LSGRSANI (SEQ ID NO: 892)		

	LSGRSDNI (SEQ ID NO: 893)		
	MIAPVAYR (SEQ ID NO: 894)		
	RPSPMWAY (SEQ ID NO: 895)		
	WATPRPMR (SEQ ID NO: 896)		
	FRLLDWQW (SEQ ID NO: 897)		
	ISSGL (SEQ ID NO: 898)		
	ISSGLLS (SEQ ID NO: 899)		
	ISSGLL (SEQ ID NO: 900)		
	ISSGLLSGRSANPRG (SEQ ID NO: 901)		
	AVGLLAPPTSGRSANPRG (SEQ ID NO: 902)		
	AVGLLAPPSGRSANPRG (SEQ ID NO: 903)		
	ISSGLLSGRSDDH (SEQ ID NO: 904)		
	ISSGLLSGRSDIH (SEQ ID NO: 905)		
	ISSGLLSGRSDQH (SEQ ID NO: 906)		
	ISSGLLSGRSDTH (SEQ ID NO: 907)		
	ISSGLLSGRSDYH (SEQ ID NO: 908)		
	ISSGLLSGRSDNP (SEQ ID NO: 909)		
	ISSGLLSGRSANP (SEQ ID NO: 910)		

	ISSGLLSGRSANI (SEQ ID NO: 911)		
	AVGLLAPPGGLSGRSDDH (SEQ ID NO: 912)		
	AVGLLAPPGGLSGRSDIH (SEQ ID NO: 913)		
	AVGLLAPPGGLSGRSDQH (SEQ ID NO: 914)		
	AVGLLAPPGGLSGRSDTH (SEQ ID NO: 915)		
	AVGLLAPPGGLSGRSDYH (SEQ ID NO: 916)		
	AVGLLAPPGGLSGRSDNP (SEQ ID NO: 917)		
	AVGLLAPPGGLSGRSANP (SEQ ID NO: 918)		
	AVGLLAPPGGLSGRSANI (SEQ ID NO: 919)		
	ISSGLLSGRSDNI (SEQ ID NO: 920)		
	AVGLLAPPGGLSGRSDNI (SEQ ID NO: 921)		
	GLSGRSDNHGGAVGLLAPP (SEQ ID NO: 1009)		
	GLSGRSDNHGGVHMPLGFLGP (SEQ ID NO: 1010)		

[000610] Any of the combinations described in Table 18 can be combined with human immunoglobulin constant regions to result in fully human IgGs including IgG1, IgG2, IgG4 or mutated constant regions to result in human IgGs with altered functions such as IgG1 N297A, IgG1 N297Q, or IgG4 S228P. The combinations described in Table 18 are not limited by the particular combinations shown in any given row and include any mask sequence from column 1 matched with any substrate sequence from column 2 matched with any VL sequence from column 3 matched with any VH sequence from column 4. In

addition to the substrate sequences disclosed in column 2, any CM disclosed herein can be used.

[000611] As an example, a spacer sequence (SEQ ID NO: 923) and Mask SEQ ID NO: 63 can be combined with substrate ISSGLLSGRSDNH (SEQ ID NO: 377), VL SEQ ID NO: 58, and combined with human kappa constant domain to give SEQ ID NO: 428; or Mask SEQ ID NO: 63 can be combined with substrate ISSGLLSGRSDNH (SEQ ID NO: 377), VL SEQ ID NO: 58, and combined with human kappa constant domain to give SEQ ID NO: 1008. Furthermore, VH SEQ ID NO: 46 can be combined with human immunoglobulin heavy chain constant domains to give human IgG1 (SEQ ID NO: 430), mutated human IgG4 S228P (SEQ ID NO: 432), mutated human IgG1 N297A (SEQ ID NO: 434), or mutated human IgG1 N297Q (SEQ ID NO: 1202). Co-expression of SEQ ID NO: 427 with SEQ ID NO: 429 will yield a fully human IgG1 anti-PDL1 activatable antibody. Co-expression of SEQ ID NO: 427 with SEQ ID NO: 431 will yield a fully human IgG4S228P anti-PDL1 activatable antibody. Co-expression of SEQ ID NO: 427 with SEQ ID NO: 433 will yield a fully human IgG1 N297A anti-PDL1 activatable antibody. Co-expression of SEQ ID NO: 427 with a nucleic acid sequence encoding the amino acid sequence of SEQ ID NO: 1202 will yield a fully human IgG1 N297Q anti-PDL1 activatable antibody.

[Light chain sequence (SEQ ID NO: 1007) with spacer (SEQ ID NO: 1006)] (SEQ ID NO: 427)

[CAGGGCCAGTCCGGCTCA][TATCTGCCCTGCCACTTCGTGCCAATCGGGGCCTGTAACAATAAGG
GCGGTGGATCTAGTGGTGGCTCAGGCGGGTCTGGCGGCATTTCCAGTGGACTCTTGTCAGGACGATC
CGATAATCATGGCGGGTCCGACATCCAGATGACACAGAGCCCTTCTTCCCTCTCCGCAAGCGTTGGC
GACAGGGTCACCATTACCTGTAGGGCTTCTCAGAGCATCTCAAGCTATCTGAACTGGTACCAGCAGA
AACCTGGAAAGGCTCCAAAACTGCTGATTTACGCTGCCTCCAGTCTTCAGTCAGGCGTCCCCTCCAG
ATTTAGCGGATCAGGTAGTGGAACTGATTTTACCCTTACAATATCTTCTCTGCAGCCAGAGGACTTC
GCCACATACTATTGTCAGCAAGACAATGGTTACCCCAGTACATTTGGCGGAGGGACAAAGGTCGAGA
TCAAAAGGACCGTAGCAGCACCAAGCGTCTTTATTTTCCCCCCCAGTGACGAACAGCTGAAGAGCGG
AACAGCTTCAGTGGTGTGTCTCCTGAATAACTTCTATCCACGCGAGGCAAAGGTGCAGTGGAAGGTG
GACAATGCACTGCAGTCTGGTAATTCCCAAGAAAGTGTTACTGAGCAGGATTCCAAGGATTCAACTT
ACTCTCTGTCTAGCACCCTGACTCTTTCTAAAGCAGATTATGAGAAGCATAAGGTCTACGCTTGCGA
GGTGACCCACCAGGGGCTTTCCTCTCCAGTTACCAAGTCATTCAACCGGGGTGAGTGTTGATGAGAA
TTC] (SEQ ID NO: 427)

Light chain sequence without spacer

TATCTGCCCTGCCACTTCGTGCCAATCGGGGCCTGTAACAATAAGGGCGGTGGATCTAGTGGTGGCT
CAGGCGGGTCTGGCGGCATTTCCAGTGGACTCTTGTCAGGACGATCCGATAATCATGGCGGGTCCGA
CATCCAGATGACACAGAGCCCTTCTTCCCTCTCCGCAAGCGTTGGCGACAGGGTCACCATTACCTGT
AGGGCTTCTCAGAGCATCTCAAGCTATCTGAACTGGTACCAGCAGAAACCTGGAAAGGCTCCAAAAC
TGCTGATTTACGCTGCCTCCAGTCTTCAGTCAGGCGTCCCCTCCAGATTTAGCGGATCAGGTAGTGG
AACTGATTTTACCCTTACAATATCTTCTCTGCAGCCAGAGGACTTCGCCACATACTATTGTCAGCAA
GACAATGGTTACCCCAGTACATTTGGCGGAGGGACAAAGGTCGAGATCAAAAGGACCGTAGCAGCAC
CAAGCGTCTTTATTTTCCCCCCCAGTGACGAACAGCTGAAGAGCGGAACAGCTTCAGTGGTGTGTCT
CCTGAATAACTTCTATCCACGCGAGGCAAAGGTGCAGTGGAAGGTGGACAATGCACTGCAGTCTGGT
AATTCCCAAGAAAGTGTTACTGAGCAGGATTCCAAGGATTCAACTTACTCTCTGTCTAGCACCCTGA
CTCTTTCTAAAGCAGATTATGAGAAGCATAAGGTCTACGCTTGCGAGGTGACCCACCAGGGGCTTTC
CTCTCCAGTTACCAAGTCATTCAACCGGGGTGAGTGTTGATGAGAATTC (SEQ ID NO: 1007)

[Light chain sequence (SEQ ID NO: 1008) with spacer (SEQ ID NO: 923)] (SEQ ID NO: 428)

[QGQSGS][GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSAS
VGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPE
DFATYYCQQDNGYPSTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQW
KVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC]
(SEQ ID NO: 428)

Light chain sequence without spacer

GIALCPSHFCQLPQTGGGSSGGSGGSGGISSGLLSGRSDNHGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
DNGYPSTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSG
NSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC (SEQ ID NO: 1008)

SEQ ID NO: 429

GAAGTGCAGCTGCTCGAAAGCGGCGGAGGCTTGGTGCAGCCAGGAGGGAGCCTGCGACTGTCTTGCG
CAGCCAGCGGATTCACTTTCTCTTCCTATGCCATGAGCTGGGTTCGACAGGCACCCGGCAAAGGTCT
CGAGTGGGTGTCTAGCATCTGGCGAAACGGAATAGTTACAGTGTATGCCGATAGCGTGAAGGGTCGC
TTTACTATTTCACGGGATAATTCTAAGAACACCCTCTACCTGCAAATGAATAGCCTTAGGGCAGAAG
ATACCGCCGTGTACTACTGTGCCAAATGGTCCGCAGCCTTTGACTACTGGGGCCAGGGGACACTGGT
GACCGTGTCCTCTGCATCAACCAAGGGGCCATCAGTGTTCCCACTCGCCCCATCTTCCAAGAGTACT
TCCGGCGGAACCGCAGCCCTTGGCTGCCTTGTTAAGGACTATTTCCCAGAACCCGTGACCGTAAGTT

GGAACTCTGGCGCCCTTACTTCTGGGGTGCACACCTTCCCAGCAGTGTTGCAGTCCAGTGGCCTTTA
CTCTCTGTCTAGTGTAGTGACTGTGCCTTCCTCTAGTCTCGGTACCCAGACCTATATTTGTAATGTT
AACCATAAGCCCAGCAATACAAAGGTTGATAAGAAAGTGGAACCCAAGAGCTGCGATAAGACACATA
CCTGCCCACCTTGTCCAGCTCCCGAGCTGCTGGGCGGACCCTCAGTCTTTCTCTTCCCACCTAAACC
CAAGGATACCCTTATGATCTCCAGGACTCCTGAGGTGACCTGCGTTGTGGTCGACGTGTCACATGAG
GACCCTGAGGTAAAGTTTAACTGGTACGTGGACGGTGTGGAGGTACATAACGCTAAGACTAAGCCAC
GAGAGGAGCAATACGCTTCCACTTACAGGGTGGTCAGCGTCCTGACCGTTCTCCATCAGGACTGGCT
GAACGGGAAGGAATATAAGTGTAAGGTTAGCAACAAAGCTCTCCCTGCACCAATCGAGAAGACAATC
AGCAAGGCAAAAGGGCAGCCTCGGGAACCTCAGGTCTACACCCTCCCTCCTAGCAGGGAAGAGATGA
CAAAGAACCAGGTCTCTCTCACCTGCCTGGTGAAAGGCTTCTATCCATCTGACATTGCTGTGGAGTG
GGAATCCAACGGCCAGCCTGAAAATAATTATAAGACCACACCCCCCGTCCTTGATTCCGATGGATCT
TTCTTCCTGTACAGTAAACTCACCGTCGACAAATCACGGTGGCAGCAAGGTAACGTGTTCAGCTGTT
CTGTCATGCATGAGGCTCTGCATAACCATTACACACAAAAGTCTTTGTCATTGTCTCCAGGATGATG
AGAATTCATTGATCATAATCAGCCATACCAC

SEQ ID NO: 430

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSSASTKGPSVFPLAPSSKST
SGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNV
NHKPSNTKVDKKVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHE
DPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
SKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS
FFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG

SEQ ID NO: 431

GAAGTGCAGCTGCTCGAAAGCGGCGGAGGCTTGGTGCAGCCAGGAGGGAGCCTGCGACTGTCTTGCG
CAGCCAGCGGATTCACTTTCTCTTCCTATGCCATGAGCTGGGTTCGACAGGCACCCGGCAAAGGTCT
CGAGTGGGTGTCTAGCATCTGGCGAAACGGAATAGTTACAGTGTATGCCGATAGCGTGAAGGGTCGC
TTTACTATTTCACGGGATAATTCTAAGAACACCCTCTACCTGCAAATGAATAGCCTTAGGGCAGAAG
ATACCGCCGTGTACTACTGTGCCAAATGGTCCGCAGCCTTTGACTACTGGGGCCAGGGGACACTGGT
GACCGTGTCCTCTGCATCAACCAAGGGGCCATCAGTGTTCCCACTCGCCCCATGTAGCAGATCAACA
TCTGAATCCACCGCAGCCCTTGGCTGCCTTGTTAAGGACTATTTCCCAGAACCCGTGACCGTAAGTT
GGAACTCTGGCGCCCTTACTTCTGGGGTGCACACCTTCCCAGCAGTGTTGCAGTCCAGTGGCCTTTA
CTCTCTGTCTAGTGTAGTGACTGTGCCTTCCTCTAGTCTCGGTACCAAGACCTATACCTGCAACGTA
GATCATAAGCCCAGCAATACAAAGGTTGATAAGAGAGTAGAGTCAAAGTACGGCCCACCCTGCCCAC
CTTGTCCAGCTCCCGAGTTCCTGGGCGGACCCTCAGTCTTTCTCTTCCCACCTAAACCCAAGGATAC
CCTTATGATCTCCAGGACTCCTGAGGTGACCTGCGTTGTGGTCGACGTGTCACAAGAGGACCCTGAG

GTACAGTTTAACTGGTACGTGGACGGTGTGGAGGTACATAACGCTAAGACTAAGCCACGAGAGGAGC
AATTTAACTCCACTTACAGGGTGGTCAGCGTCCTGACCGTTCTCCATCAGGACTGGCTGAACGGGAA
GGAATATAAGTGTAAGGTTAGCAACAAAGGTCTGCCCAGTTCTATCGAGAAGACAATCAGCAAGGCA
AAAGGGCAGCCTCGGGAACCTCAGGTCTACACCCTCCCTCCTAGCCAGGAAGAGATGACAAAGAACC
AGGTCTCTCTCACCTGCCTGGTGAAAGGCTTCTATCCATCTGACATTGCTGTGGAGTGGGAATCCAA
CGGCCAGCCTGAAAATAATTATAAGACCACACCCCCCGTCCTTGATTCCGATGGATCTTTCTTCCTG
TACAGTCGCCTCACCGTCGACAAATCACGGTGGCAGGAAGGTAACGTGTTCAGCTGTTCTGTCATGC
ATGAGGCTCTGCATAACCATTACACACAAAAGTCTTTGTCATTGTCTCTCGGATGATGAGAATTCAT
TGATCATAATCAGCCATACCAC

SEQ ID NO: 432

EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSSASTKGPSVFPLAPCSRST
SESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNV
DHKPSNTKVDKRVESKYGPPCPPCPAPEFLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPE
VQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKA
KGQPREPQVYTLPPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFL
YSRLTVDKSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLG

SEQ ID NO: 433

GAAGTGCAGCTGCTCGAAAGCGGCGGAGGCTTGGTGCAGCCAGGAGGGAGCCTGCGACTGTCTTGCG
CAGCCAGCGGATTCACTTTCTCTTCCTATGCCATGAGCTGGGTTCGACAGGCACCCGGCAAAGGTCT
CGAGTGGGTGTCTAGCATCTGGCGAAACGGAATAGTTACAGTGTATGCCGATAGCGTGAAGGGTCGC
TTTACTATTTCACGGGATAATTCTAAGAACACCCTCTACCTGCAAATGAATAGCCTTAGGGCAGAAG
ATACCGCCGTGTACTACTGTGCCAAATGGTCCGCAGCCTTTGACTACTGGGGCCAGGGGACACTGGT
GACCGTGTCCTCTGCATCAACCAAGGGGCCATCAGTGTTCCCACTCGCCCCATCTTCCAAGAGTACT
TCCGGCGGAACCGCAGCCCTTGGCTGCCTTGTTAAGGACTATTTCCCAGAACCCGTGACCGTAAGTT
GGAACTCTGGCGCCCTTACTTCTGGGGTGCACACCTTCCCAGCAGTGTTGCAGTCCAGTGGCCTTTA
CTCTCTGTCTAGTGTAGTGACTGTGCCTTCCTCTAGTCTCGGTACCCAGACCTATATTTGTAATGTT
AACCATAAGCCCAGCAATACAAAGGTTGATAAGAAAGTGGAACCCAAGAGCTGCGATAAGACACATA
CCTGCCCACCTTGTCCAGCTCCCGAGCTGCTGGGCGGACCCTCAGTCTTTCTCTTCCCACCTAAACC
CAAGGATACCCTTATGATCTCCAGGACTCCTGAGGTGACCTGCGTTGTGGTCGACGTGTCACATGAG
GACCCTGAGGTAAAGTTTAACTGGTACGTGGACGGTGTGGAGGTACATAACGCTAAGACTAAGCCAC
GAGAGGAGCAATACGCTTCCACTTACAGGGTGGTCAGCGTCCTGACCGTTCTCCATCAGGACTGGCT
GAACGGGAAGGAATATAAGTGTAAGGTTAGCAACAAAGCTCTCCCTGCACCAATCGAGAAGACAATC
AGCAAGGCAAAAGGGCAGCCTCGGGAACCTCAGGTCTACACCCTCCCTCCTAGCAGGGAAGAGATGA
CAAAGAACCAGGTCTCTCTCACCTGCCTGGTGAAAGGCTTCTATCCATCTGACATTGCTGTGGAGTG

GGAATCCAACGGCCAGCCTGAAAATAATTATAAGACCACACCCCCCGTCCTTGATTCCGATGGATCT
TTCTTCCTGTACAGTAAACTCACCGTCGACAAATCACGGTGGCAGCAAGGTAACGTGTTCAGCTGTT
CTGTCATGCATGAGGCTCTGCATAACCATTACACACAAAAGTCTTTGTCATTGTCTCCAGGATGATG
AGAATTCATTGATCATAATCAGCCATACCAC

SEQ ID NO: 434
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSSASTKGPSVFPLAPSSKST
SGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNV
NHKPSNTKVDKKVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHE
DPEVKFNWYVDGVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
SKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS
FFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG

SEQ ID NO: 1202
EVQLLESGGGLVQPGGSLRLSCAASGFTFSSYAMSWVRQAPGKGLEWVSSIWRNGIVTVYADSVKGR
FTISRDNSKNTLYLQMNSLRAEDTAVYYCAKWSAAFDYWGQGTLVTVSSASTKGPSVFPLAPSSKST
SGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNV
NHKPSNTKVDKKVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHE
DPEVKFNWYVDGVEVHNAKTKPREEQYQSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
SKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS
FFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG

[000612] Additional examples of heavy chain constant domains include, but are not limited to, a heavy chain constant region having a mutation or deletion at one or more of the following amino acids: Ser 228, Leu234, Leu235, Gly236, Gly237, Asp265, Asp270, Asn297, Lys 320, Lys 322, Glu328, Pro329, Pro331 as numbered in the EU index as set forth in Kabat, such that the Fc domain has less affinity for a Fc-gamma receptor.

EXAMPLE 12. Evaluation of efficiency of masking moieties

[000613] This assay measures the ability of the masking peptide to block binding of the activatable antibody to antigen as compared to the binding of the unmodified antibody to antigen.

[000614] The general outline for this assay is as follows: Nunc, Maxisorp plates are coated overnight at 4°C with 100 µl/well of a 1 µg/mL solution of human PDL1 (R & D

Systems) in PBS, pH 7.4. Plates are washed 3 times with PBST (PBS, pH 7.4, 0.05% Tween-20), and wells are blocked with 200 ml/well of 10 mg/mL BSA in PBST for 2 hours at RT. Plates are washed 3 times with PBST (PBS, pH 7.4, 0.05% Tween-20). Dilution curves are prepared, in 10 mg/mL BSA in PBST, as shown below in Table 10.

Table 10. Plate layout for masking efficiency assay, one plate for each time point.

	[Antibody] = nM Columns 1-3	**[activatable antibody 1] = nM Columns 4-6**	**[activatable antibody 2] = nM Columns 7-9**	**[activatable antibody 3] = nM Columns 10-12**
A	**37**	**1000**	**1000**	**1000**
B	**12.3**	**333**	**333**	**333**
C	**4.1**	**111**	**111**	**111**
D	**1.34**	**37**	**37**	**37**
E	**0.45**	**12.3**	**12.3**	**12.3**
F	**0.15**	**4.1**	**4.1**	**4.1**
G	**0.03**	**1.34**	**1.34**	**1.34**
H	**0.01**	**0.45**	**0.45**	**Blank**

[000615] The binding solutions are added to the plates, which are then are incubated for 1 hour at room temperature (RT), and then washed 3 times with PBST (PBS, pH 7.4, 0.05% Tween-20). One hundred (100) µl/well 1:4000 dilution goat-anti-human IgG (Fab specific, Sigma cat # A0293) in 10 mg/mL BSA in PBST is added, and the plate is incubated for 1 hour at RT. The plate is developed with TMB and 1N HCl. Shown in Figures 15-17 are plots of binding isotherms for anti-PDL1 activatable antibodies that include the anti-PDL1 antibody C5H9v2 described herein. Plots are generated in Prizm (Sigma Plot) and the data are fit to a model of single site saturation and a Kd is determined. In Figure 17, PL03+ is an effector positive activatable antibody, namely wild type IgG1. PL03- is an effector negative activatable antibody, namely mutated IgG1 N297Q.

[000616] Masking efficiency is calculated by dividing the Kd for binding of the activatable antibodies by the Kd of the parental antibody. Masking efficiencies are shown in Figures 15-17.

EXAMPLE 13. Anti-PDL1 activatable antibodies of the disclosure delay induction of diabetes in NOD mice

[000617] In this Example, anti-PDL1 activatable antibodies PL15-0003-C5H9v2 and PL18-0003-C5H9v2 were analyzed for the ability to induce diabetes in NOD mice. The NOD mice, substrain NOD/ShiLtJ, were obtained from Jackson Laboratory at 6 weeks and acclimated on site. At 9.5 weeks, mice were checked for diabetes prior to enrollment, grouped, and dosed as set forth in Table 19.

Table 19. Groups and doses for diabetes study with anti-PDL1 activatable antibodies

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	8	mIgG2a (C1.18.4)	3	10	Day 0	IP
2	8	Anti-PDL1(C5H9v2)	1	10	Day 0	IP
3	8	Anti-PDL1(C5H9v2)	0.3	10	Day 0	IP
4	8	Activatable Antibody PL15-0003-C5H9v2	1	10	Day 0	IP
5	8	Activatable Antibody PL18-0003-C5H9v2	1	10	Day 0	IP

[000618] Figure 18A, which plots % non-diabetic versus number of days post initial dose, shows that anti-PDL1 antibody C5H9v2 induced diabetes in NOD mice at 1 mg/kg while the anti-PDL1 activatable antibody PL15-0003-C5H9v2 (labeled herein as Gr4 - PFl5) did not induce diabetes and the anti-PDL1 activatable antibody PL18-0003-C5H9v2 (labeled in Figure 18 as Gr 5 - PL18) exhibited delayed diabetes at 1 mg/kg. Control mIgG2a and anti-PDL1 antibody C5H9v2 at 0.3 mg/kg did not induce diabetes in NOD mice. In an additional group, a single 3 mg/kg dose of anti-PDL1 activatable antibody PL15-0003-C5H9v2 administered IP at a dose volume of 10 mL/kg induced diabetes in 2 of 8 mice (75% non-diabetic), providing a greater than three-fold safety margin relative to anti-PDL1 antibody C5H9v2 (Group 2). Results are shown in Figure 18B.

EXAMPLE 14. Anti-PDL1 activatable antibodies of the disclosure reduce MC38 tumors in mice

[000619] In this Example, anti-PDL1 activatable antibodies PL15-0003-C5H9v2 and PL18-0003-C5H9v2 were analyzed for the ability to reduce the growth of MC38 syngeneic tumors.

[000620] The mouse colon carcinoma cell line MC38 was obtained from ATCC. MC38 were grown in RPMI-1640 supplemented with 10% fetal bovine serum at 37°C in an atmosphere of 5% CO_2 in air. Cells were harvested during the logarithmic growth period, resuspended in PBS with proper cell concentration, and kept on ice for tumor induction.

[000621] Each mouse was inoculated subcutaneously in the right flank with $0.5X10^6$ of MC38 cells in PBS for tumor development. The treatments were started when the mean tumor size reached approximately 100-200 mm^3 (no more than 200 mm^3). Tumor sizes were measured twice weekly in two dimensions using a caliper, and the volume was expressed in mm^3 using the formula: $V = 0.5\ a \times b^2$ where a and b are the long and short diameters of the tumor, respectively.

[000622] The mice were grouped and dosed as set forth in Table 20.

Table 20. Groups and doses for MC38 syngeneic study with anti-PDL1 activatable antibodies

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	9	mIgG2a (C1.18.4)	10	10	t.i.w. for 2 weeks	IP
2	9	Anti-PDL1(C5H9v2)	10	10	t.i.w. for 2 weeks	IP
4	9	PL18-0003-C5H9v2	10	10	t.i.w. for 2 weeks	IP
6	9	PL15-0003-C5H9v2	10	10	t.i.w. for 2 weeks	IP

[000623] Figure 19, which plots tumor volume versus number of days post initial dose, demonstrates that anti-PDL1 activatable antibodies PL15-0003-C5H9v2 and PL18-0003-C5H9v2 inhibited the growth of MC38 syngeneic tumors similar to positive control anti-PDL1 antibody C5H9v2.

EXAMPLE 15. An anti-PDL1 activatable antibody of the disclosure demonstrates reduced PDL1 occupancy in blood and spleen from C57Bl/6 mice

[000624] Unlike an antibody that would bind target antigen indiscriminately, an activatable antibody would be a molecule that is inert unless it is activated in the tumor microenvironment. Once activated, the cleaved activatable antibody would bind the targeted antigen within the tumor only, sparing the antigens in the peripheral areas. PDL1 is expressed in tumor cells as well as T cells (CD4+ and CD8+) in circulation and the spleen. This example demonstrates that animals treated with anti-PDL1 activatable antibody did not have detectable activatable antibody on T cells in the periphery, while animals treated with anti-PDL1 antibody showed a detectable dose dependent presence of antibody on T cells in the periphery.

[000625] To measure whether anti-PDL1 activatable antibody PL15-0003-C5H9v2 is protected from binding T cells in circulation and the spleen compared to the anti-PDL1 antibody C5H9v2, 14-week old C57Bl/6 mice (with tumors ranging from 38-671mm3) were dosed as set forth in Table 21. Tumor sizes were measured in two dimensions using a caliper, and the volume was expressed in mm^3 using the formula: $V = 0.5\ a \times b^2$ where a and b are the long and short diameters of the tumor, respectively. After about 20 hours, animals were euthanized; and blood, spleen, and plasma were harvested from each animal.

Table 21. Groups and doses for PDL1 occupancy study

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	2	mIgG2a (C1.18.4)	1	10	Day 0	IP
2	2	Anti-PDL1(C5H9v2)	1	10	Day 0	IP
3	2	Anti-PDL1(C5H9v2)	0.3	10	Day 0	IP
4	2	Anti-PDL1(C5H9v2)	0.1	10	Day 0	IP
5	2	PL15-0003--C5H9v2	1	10	Day 0	IP
6	2	PL15-0003-C5H9v2	0.3	10	Day 0	IP

[000626] Whole blood was processed as follows: One volume of blood was added to 10 volumes of RBC Lysis Solution (130-094-183 Miltenyi Biotec) and processed using

manufacturer's protocol. Lymphocytes were resuspended in staining buffer (HBSS 2% FBS). Spleen was processed as follows: Spleen was placed in a 70uM cell strainer (352350 Corning/BD Falcon) with 1 mL of serum free RPMI-1640. The back of a 3-mL syringe was used to mash the spleen in a circular motion. The strainer was washed with media. Splenocytes were pelleted using a centrifuge and blood was lysed using 10 volumes of RBC Lysis Solution (130-094-183 Miltenyi Biotec) according to manufacturer's protocol. Splenocytes were refiltered after resuspending in staining buffer (HBSS 2% FBS). Lymphocytes from whole blood and lymphocytes from spleen were counted and were aliquoted to wells of a 96-well round bottom plates (5e5 cells/well). Cells were pelleted and mouse FcR Reagent was added 1:10 dilution according to manufacturer's protocol (130-092-575 Miltenyi Biotec). One set of cells was stained with a saturating amount, 100nM, of anti-PDL1 antibody C5H9v2 for 60 minutes to obtain a maximum saturation value. Cells were washed 3 times and are stained with a biotinylated 'a' allotype antibody, anti-mIgG2a(a) clone 8.3 (553502 BD Biosciences) at 300ng/mL for 60 minutes. Cells were washed 3 times and then stained with 1 ug/mL (also referred to herein as "µg/mL") of anti-CD4-Pacific Blue (558107 BD Bioscience), 1ug/mL of anti-CD8-APC (553035 BD Bioscience) and 1:500 dilution of SAPE (S-866 Life Technologies) for 30 minutes. Cells were washed 2 times and stained with 7-AAD according to manufacturer's protocol (559925 BD Bioscience). The MACSQuant flow cytometer was used to measure the amount of anti-PDL1 antibody C5H9v2 and anti-PDL1 activatable antibody PL15-0003-C5H9v2 bound to T cells from whole blood and the spleen. Briefly, at the most 30,000 events were collected in the lymphocyte gate. Live cells were gated from the 7AAD negative gate. CD4+ and CD8+ cells were gated separately and anti-PDL1 mAb and anti-PDL1 activatable antibody MFI were recorded for both CD4 and CD8. Percent occupancy was determined by taking the MFI of the sample compared to the average of the MFI for the maximum binding MFI. Figures 20A-20D demonstrate the percent of anti-PDL1 antibody C5H9v2 and anti-PDL1 activatable antibody PL15-0003-C5H9v2 bound to CD4+ and CD8+ T cells from peripheral blood (Figures 20A, 20B) or spleen (Figures 20C, 20D). In all graphs, the circle represents isotype, the square represents anti-PDL1 antibody C5H9v2, and the triangle represents anti-PDL1 activatable antibody PL15-0003-C5H9v2. Percent occupancy of the anti-PDL1 antibody C5H9v2 was reflective of the dose titration. Percent occupancy of the anti-PDL1 activatable antibody PL15-0003-C5H9v2 at 1 mg/kg was similar to isotype control mIgG2a at 1 mg/kg.

EXAMPLE 16. An anti-PDL1 activatable antibody of the disclosure demonstrates reduced PDL1 occupancy in blood and spleen from C57Bl/6 mice

[000627] This example demonstrates that animals treated with an anti-PDL1 activatable antibody of the disclosure exhibited reduced binding to blood T cells from tumor bearing mice compared to that exhibited by an anti-PDL1 antibody of the disclosure at a variety of doses.

[000628] The study was conducted in a manner similar to that described in Example 15. Briefly, mice bearing MC38 tumors between 100-200 mm^3 were treated with a single dose of anti-PDL1 antibody C5H9v2 or anti-PDL1 activatable antibody PL15-0003-C5H9v2 as indicated in Figures 21A and 21B, and blood was analyzed for surface bound antibody by flow cytometry four days after dosing. Plasma concentrations of the antibody and activatable antibody were determined by ELISA. Figures 21A and 21 B demonstrate that the presence of tumor-derived proteases capable of cleaving the activatable antibody did not lead to high levels of activated activatable antibody in the blood (Figure 21A); i.e., the activatable antibody (depicted by squares) demonstrated reduced peripheral PDL1 binding in tumor-bearing mice compared to the antibody (depicted by circles) or an isotype antibody (depicted by triangles) despite the plasma concentrations of the activatable antibody being higher than those of the antibody (Figure 21B).

EXAMPLE 17. Activity of an anti-PDL1 antibody and an anti-PDL1 activatable antibody of the embodiments in a human T-cell restimulation assay

[000629] In this example, peripheral blood mononuclear cells from a CMV-positive donor were incubated in the presence of CMV viral lysate and an anti-PDL1 antibody or an anti-PDL1 activatable antibody of the disclosure to assess the effect of such anti-PDL1 antibody or anti-PDL1 activatable antibody on interferon gamma (IFN-gamma) cytokine secretion.

[000630] PBMCs from a CMV-positive donor (Hemacare Donor C) were plated at 3.5 $\times 10^5$ cells per well in the presence of 4 µg/mL CMV viral lysate (Astarte) and either anti-PDL1 antibody C5H9v2, anti-PDL1 activatable antibody PL07-2001-C5H9v2, or an hIgG4 isotype control antibody. After four days, supernatant was removed from each well and IFN-gamma levels were assayed using IFN-gamma ELISA kit (Life Technologies, Carlsbad, CA). Figure 22 demonstrates that anti-PDL1 activatable antibody PL07-2001-

C5H9v2 exhibited increased CMV-stimulated IFN-gamma secretion compared with control hIgG4 but decreased potency relative to anti-PDL1 parental antibody C5H9v2 due to the activatable antibody being masked.

EXAMPLE 18. *In situ* imaging of an anti-PDL1 activatable antibody of the disclosure

[000631] This Example demonstrates the ability of anti-PDL1 activatable antibody PL15-0003-C5H9v2 to be activated and to bind frozen MC38 mouse cancer tissues using an *in situ* imaging method.

[000632] Fluorescently-labeled anti-PDL1 activatable antibody PL15-0003-C5H9v2 or anti-PDL1 antibody C5H9v2 was incubated on frozen PDL1+ MC38 tumor sections for 1 hour in a protease-compatible buffer in the presence or absence of a broad spectrum inhibitor cocktail as described in PCT International publication number WO 2014/107599, published July 10, 2014.

[000633] Results are shown in Figure 23. The tissue image in Figure 23A demonstrates binding of anti-PDL1 antibody C5H9v2 to the tumor section indicating the presence of PDL1 antigen in the tumor section. The tissue image in Figure 23B demonstrates that anti-PDL1 activatable antibody PL15-0003-C5H9v2 was activated by tumor-derived proteolytic cleavage of the anti-PDL1 activatable antibody to yield an anti-PDL1 antibody that bound to the PDL1 target in the tumor section. The tissue image in Figure 23D demonstrates that the fluorescent signal shown in Figure 23B was inhibited by pre-treatment of the tumor section with a 1:100 dilution of broad spectrum inhibitor cocktail set III and 50 mM EDTA, whereas no effect of broad spectrum protease inhibitors was detected on the binding of anti-PDL1 antibody C5H9v2 to the tumor section as demonstrated in the tissue image in Figure 23C. These results demonstrate that the tumor sections comprise sufficient protease activity to activate activatable antibodies of the disclosure.

EXAMPLE 19. Ability of an activatable antibody of the disclosure to demonstrate protease-dependent binding and blocking activity *in vitro*

[000634] This Example demonstrates the ability anti-PDL1 activatable antibody PL15-0003-C5H9v2 to exhibit protease-dependent binding and blocking activity *in vitro*.

[000635] Binding and blocking studies were conducted on anti-PDL1 antibody C5H9v2 and anti-PDL1 activatable antibody PL15-0003-C5H9v2 in a manner similar to

those described elsewhere in the Examples except that plates were coated with 0.5 μg/mL PDL1.

[000636] Figure 24 depicts that anti-PDL1 activatable antibody PL15-0003-C5H9v2 exhibited a higher EC_{50} for PDL1 binding and PD1 blocking than did the anti-PDL1 antibody as measured by ELISA. The figure further demonstrates that activation of anti-PDL1 activatable antibody PL15-0003-C5H9v2 by matriptase fully restored PDL1 binding and PD1 blocking activities to levels comparable to those of anti-PDL1 antibody C5H9v2.

EXAMPLE 20. Ability of an anti-PDL1 activatable antibody of the disclosure to reduce binding to PDL1 and to demonstrate protease-dependent blocking activity *in vitro*

[000637] This Example measures the ability of a masking peptide to reduce binding of an anti-PDL1 activatable antibody of the disclosure to PDL1 compared to the ability of the parental antibody to bind to PDL1 *in vitro*. This Example also demonstrates the ability of an anti-PDL1 activatable antibody of the disclosure to exhibit protease-dependent blocking activity *in vitro*.

[000638] The abilities of anti-PDL1 activatable antibodies PL07-2001-C5H9v2 and PF07-3001-C5H9v2 and anti-PDL1 antibody C5H9 to bind to human or murine PDL1 were tested in a manner similar to techniques described elsewhere in the Examples. Results are shown in Figure 25.

[000639] The abilities of anti-PDL1 activatable antibody PL07-2001-C5H9v2, uPA-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, MMP14-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, and anti-PDL1 antibody C5H9v2 to block PD1 (PD-1) or B7-1 binding to PDL1 were tested in a manner similar to techniques described elsewhere in the Examples.

[000640] Briefly, for the PD1 blockade assay, human, cyno or rat PDL1 was adsorbed to the well of an ELISA plate. Biotinylated human, cyno, or rat PD1 was applied to the wells in the absence or presence of an increasing concentration of either anti-PDL1 activatable antibody PL07-2001-C5H9v2, uPA-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, MMP14-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, or anti-PDL1 antibody C5H9v2. Results, shown in Figure 26, indicate that activatable antibody PF07-2001-C5H9v2 exhibited a higher EC_{50} for PD1 blocking than did the anti-PDL1 antibody as measured by ELISA. However, activation of the activatable

antibody by either uPA or MMP14 restored PD1 blocking activity to levels comparable to those of anti-PDL1 antibody C5H9v2.

[000641] Briefly, for the B7-1 blockade assay, human or cyno PDL1 was adsorbed to the well of an ELISA plate. Biotinylated human or cyno B7-1 was applied to the wells in the absence or presence of an increasing concentration of either anti-PDL1 activatable antibody PL07-2001-C5H9v2, uPA-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, MMP14-activated anti-PDL1 activatable antibody PL07-2001-C5H9v2, or anti-PDL1 antibody C5H9v2. Results, shown in Figure 27, indicate that activatable antibody PF07-2001-C5H9v2 exhibited a higher EC_{50} for B7-1 blocking than did the anti-PDL1 antibody as measured by ELISA. However, activation of the activatable antibody by either uPA or MMP14 restored B7-1 blocking activity to levels comparable to those of anti-PDL1 antibody C5H9v2.

EXAMPLE 21. Anti-PDL1 activatable antibodies of the disclosure reduce MC38 tumors in mice

[000642] In this Example, anti-PDL1 activatable antibodies PL15-0003-C5H9v2, PL15-2001-C5H9v2, and PL15-3001-C5H9v2 were analyzed for the ability to reduce the growth of MC38 syngeneic tumors.

[000643] The mouse colon carcinoma cell line MC38 was obtained from ATCC. MC38 were grown in RPMI-1640 supplemented with 10% fetal bovine serum at 37°C in an atmosphere of 5% CO_2 in air. Cells were harvested during the logarithmic growth period, resuspended in PBS with proper cell concentration, and kept on ice for tumor induction.

[000644] Each mouse was inoculated subcutaneously in the right flank with $0.5X10^6$ of MC38 cells in PBS for tumor development. The treatments were started when the mean tumor size reached approximately 100-200 mm^3 (no more than 200 mm^3). Tumor sizes were measured twice weekly in two dimensions using a caliper, and the volume was expressed in mm^3 using the formula: $V = 0.5\ a \times b^2$ where a and b are the long and short diameters of the tumor, respectively.

[000645] The mice were grouped and dosed as set forth in Table 24.

Table 24. Groups and doses for MC38 syngeneic study with anti-PDL1 activatable antibodies

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	9	mIgG2a (C1.18.4)	5	10	b.i.w.; 4 doses	IP
2	9	Anti-PDL1 (C5H9v2)	5	10	b.i.w.; 4 doses	IP
3	9	PL15-0003- C5H9v2	5	10	b.i.w.; 4 doses	IP
4	9	PL15-2001- C5H9v2	5	10	b.i.w.; 4 doses	IP
5	9	PL15-3001- C5H9v2	5	10	b.i.w.; 4 doses	IP

[000646] Figure 28, which plots tumor volume versus number of days post initial dose, demonstrates that anti-PDL1 activatable antibodies PL15-0003-C5H9v2, PL15-2001-C5H9v2, and PL15-3001-C5H9v2 inhibited the growth of MC38 syngeneic tumors similar to positive control anti-PDL1 antibody C5H9v2.

EXAMPLE 22. An anti-PDL1 activatable antibody of the disclosure demonstrates reduced PDL1 occupancy in blood from C57Bl/6 mice

[000647] This example demonstrates that animals treated with anti-PDL1 activatable antibodies of the disclosure exhibited reduced binding to blood T cells from tumor bearing mice compared to that exhibited by an anti-PDL1 antibody of the disclosure.

[000648] The study was conducted in a manner similar to that described in Example 15. Briefly, mice bearing MC38 tumors between 100-200 mm^3 were treated with a single dose of anti-PDL1 antibody C5H9v2 or anti-PDL1 activatable antibody PL15-0003-C5H9v2, PL15-2001-C5H9v2, or PL15-3001-C5H9v2 as indicated in Table 25, and blood was analyzed for surface bound antibody by flow cytometry four and eight days after dosing. Percent occupancy was calculated as described in Example 15.

Table 25. Groups and doses for PDL1 occupancy study

Group	Count	Treatment	Dose (mg/kg)	Dose volume (mL/kg)	Schedule	Route
1	9	mIgG2a (C1.18.4)	5	10	b.i.w.; 4 doses	IP

2	9	Anti-PD-L1(C5H9v2)	5	10	b.i.w.; 4 doses	IP
3	9	Anti-PD-L1(C5H9v2)	3	10	b.i.w.; 4 doses	IP
4	9	PL15-0003-C5H9v2	5	10	b.i.w.; 4 doses	IP
5	9	PL15-0003-C5H9v2	3	10	b.i.w.; 4 doses	IP
6	9	PL15-2001-C5H9v2	5	10	b.i.w.; 4 doses	IP
7	9	PL15-2001-C5H9v2	3	10	b.i.w.; 4 doses	IP
8	9	PL15-3001-C5H9v2	5	10	b.i.w.; 4 doses	IP
9	9	PL15-3001-C5H9v2	3	10	b.i.w.; 4 doses	IP

[000649] Plasma concentrations of the antibody and activatable antibodies were determined by ELISA. Figure 29 demonstrates that the presence of tumor-derived proteases capable of cleaving the activatable antibodies did not lead to high levels of activated activatable antibodies in the blood.

EXAMPLE 23. ***In vivo*** **imaging of an anti-PDL1 activatable antibody of the disclosure**

[000650] This Example demonstrates the ability of proteases in a tumor implanted into a mouse to activate an anti-PDL1 activatable antibody of the disclosure.

[000651] A MDA-MB-231-luc2 orthotopic xenograft breast cancer model was used for these studies. Female nu/nu mice were purchased from Charles River Laboratories to arrive at 7 week old. After 1 week acclimation, three million MDA-MD-231-luc2-4D3LN cells (Perkin Elmer) in 30 microliters (ul, also referred to herein as "µl") serum-free RPMI (1:1 matrigel) were injected into the fourth abdominal left mammary fat pad. Tumors were grown to 110-159 mm^3. Three mice per group were administered intravenously 5 mg/kg Alexa750-conjugated anti-PDL1 antibody C5H9v2 or anti-PDL1 activatable antibody PL07-2001-C5H9v2. Four mice were administered intravenously 5 mg/kg Alexa750-conjugated anti-RSV antibody control palivizumab (Synagis). Ninety-six hours after administration, optical images were collected from each of the mice. Results are shown in Figure 30. A high-intensity fluorescent signal was detected only in the tumors of mice dosed with the anti-PDL1 antibody or anti-PDL1 activatable antibody PL07-2001-C5H9v2, suggesting that the anti-PDL1 activatable antibody was activated and accumulated in the tumor through PDL1 binding.

EXAMPLE 24. Activation of an activatable antibody of the disclosure in human plasma samples

[000652] This Example determines whether an activatable antibody of the disclosure is activated in human plasma samples.

[000653] Anti-PDL1 activatable antibody PL07-2001-C5H9v2 was conjugated with Oregon Green dye (ThermoFisher Cat# O6149). The concentration and degree of labeling was determined with a spectrophotometer. Three uM (also referred to herein as "μM") of labeled anti-PDL1 activatable antibody PL07-2001-C5H9v2 was added into plasma samples obtained from healthy donors, patients with melanoma or lung cancer patients in a final activatable antibody to plasma ratio of 30:70. The samples were incubated for 48 hours in a 37° C humidifying chamber. Reactions of labeled anti-PDL1 activatable antibody PL07-2001-C5H9v2 in plasma were stopped at either 0 or 48 hours by freezing samples in -80° C or denaturing in Wes running buffer (ProteinSimple Cat #PS-MK14). Samples were analyzed by the Wes capillary western blot system (ProteinSimple) using antibodies against Oregon Green dye (ThermoFisher Cat# A-11095 at 100μg/ml) followed by HRP conjugated secondary antibody (Jackson ImmunoResearch Cat# 705-035-147 at 1/40 dilution). Analysis of percent activation of the labeled anti-PDL1 activatable antibody PL07-2001-C5H9v2 was determined using Compass (ProteinSimple) software.

[000654] There was no detectable activatable antibody activation in five normal patient samples, in five melanoma patient samples (three metastases in lymph nodes, two in the brain, and one on the skin of the back), nor in five lung cancer patient samples (one metastasis in the lower lobe of the left lung (stage IV), one in the lower lobe of the right lung (stage IV), one in the upper lobe of the left lung (stage IA), and two in the upper lobe of the right lung (stages IIIA and IB).

Other Embodiments

[000655] While the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims. Other aspects, advantages, and modifications are within the scope of the following.

2016233495 19 Feb 2020

In the present specification and claims, the word 'comprising' and its derivatives including 'comprises' and 'comprise' include each of the stated integers but does not exclude the inclusion of one or more further integers.

The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge.

Definitions of the specific embodiments of the invention as claimed herein follow.

According to a first embodiment of the invention, there is provided an isolated antibody or antigen binding fragment thereof (AB) wherein the AB comprises:

(a) a heavy chain variable region (VH) comprising:

i. a variable heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence of SEQ ID NO: 2.12;

ii. a variable heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence of SEQ ID NO: 246;

iii. a variable heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence of SEQ ID NO: 235; and

(b) a light chain variable region (VL) comprising:

i. a variable light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence of SEQ ID NO: 209;

ii. a variable light chain complementarity determining region 2 (VL CDR2) comprising an amino acid sequence of SEQ ID NOs: 215 or 227; and

iii. a variable light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence of SEQ ID NO: 228,

wherein the AB specifically binds mammalian PDL1.

According to a second embodiment of the invention, there is provided a conjugated antibody comprising the antibody of the first embodiment conjugated to an agent.

According to a third embodiment of the invention, there is provided a pharmaceutical composition comprising the antibody of the first embodiment and a carrier.

According to a fourth embodiment of the invention, there is provided a pharmaceutical composition comprising the conjugated antibody of the second embodiment and a carrier.

According to a fifth embodiment of the invention, there is provided an activatable antibody comprising the following structure:

(1) an antibody or an antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1, wherein the AB comprises:

2016233495 19 Feb 2020

(a) a variable heavy chain region (VH) comprising:

i. a variable heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence of SEQ ID NO: 212;

ii. a variable heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence of SEQ ID NO: 246; and

iii. a variable heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence of SEQ ID NO:235; and

(b) a variable light chain region (VL) comprising:

i. a variable light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence of SEQ ID NO: 209;

ii. a variable light chain complementarity determining region 2 (VL CDR2) comprising an amino acid sequence of SEQ ID NOs: 215 or 227; and

iii. a variable light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence of SEQ ID NO: 228;

(2) a masking moiety (MM) comprising the amino acid sequence of SEQ ID NO: 63; and

(3) a cleavable moiety (CM) comprising the amino acid sequence of SEQ ID NO: 377.

According to a sixth embodiment of the invention, there is provided a conjugated activatable antibody comprising the activatable antibody of the fifth embodiment conjugated to an agent.

According to a seventh embodiment of the invention, there is provided a pharmaceutical composition comprising the activatable antibody of the fifth embodiment and a carrier.

According to an eighth embodiment of the invention, there is provided a pharmaceutical composition comprising the antibody of the second embodiment and a carrier, wherein the VL CDR2 comprises the amino acid sequence of SEQ ID NO: 215.

According to a ninth embodiment of the invention, there is provided a pharmaceutical composition comprising the activatable antibody of the fifth embodiment and a carrier, wherein the VL CDR2 comprises the amino acid sequence of SEQ ID NO: 215.

According to a tenth embodiment of the invention, there is provided a pharmaceutical composition comprising the activatable antibody of the fifth embodiment and a carrier, wherein the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 428 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432.

2016233495 19 Feb 2020

According to an eleventh embodiment of the invention, there is provided a pharmaceutical composition comprising the activatable antibody of the fifth embodiment and a carrier, wherein the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 1008 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432.

According to a twelfth embodiment of the invention, there is provided a pharmaceutical composition comprising the activatable antibody of the fifth embodiment and a carrier, wherein the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 985 and a VH comprising the amino acid sequence of SEQ ID NO: 46.

According to a thirteenth embodiment of the invention, there is provided a pharmaceutical composition comprising the conjugated activatable antibody of the sixth embodiment and a carrier.

According to a fourteenth embodiment of the invention, there is provided a method of reducing PDL1 activity comprising administering an effective amount of the antibody of the first embodiment to a subject in need thereof.

According to a fifteenth embodiment of the invention, there is provided a method of blocking binding of a natural ligand to PDL1 comprising administering an effective amount of the antibody of the first embodiment to a subject in need thereof.

According to a sixteenth embodiment of the invention, there is provided a method of treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or disease comprising administering an effective amount of the antibody of the first embodiment to a subject in need thereof.

According to a seventeenth embodiment of the invention, there is provided a method of reducing PDL1 activity comprising administering an effective amount of the activatable antibody of the fifth embodiment to a subject in need thereof.

According to an eighteenth embodiment of the invention, there is provided a method of blocking binding of a natural ligand to PDL1 comprising administering an effective amount of the activatable antibody of the fifth embodiment to a subject in need thereof.

According to a nineteenth embodiment of the invention, there is provided a method of treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or

2016233495 19 Feb 2020

disease comprising administering a therapeutically effective amount of the activatable antibody of the fifth embodiment to a subject in need thereof.

According to a twentieth embodiment of the invention, there is provided the use of an effective amount of the antibody of the first embodiment in the preparation of a medicament for reducing PDL1 activity in a subject.

According to a twenty-first embodiment of the invention, there is provided the use of an effective amount of the antibody of the first embodiment in the preparation of a medicament for blocking binding of a natural ligand to PDL1 in a subject.

According to a twenty-second embodiment of the invention, there is provided the use of an effective amount of the antibody of the first embodiment in the preparation of a medicament for treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or disease in a subject.

According to a twenty-third embodiment of the invention, there is provided the use of an effective amount of the activatable antibody of the fifth embodiment in the preparation of a medicament for reducing PDL1 activity in a subject.

According to a twenty-fourth embodiment of the invention, there is provided the use of an effective amount of the activatable antibody of the fifth embodiment in the preparation of a medicament for blocking binding of a natural ligand to PDL1 in a subject.

According to a twenty-fifth embodiment of the invention, there is provided the use of an effective amount of the activatable antibody of the fifth embodiment in the preparation of a medicament for treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or disease in a subject.

2016233495 02 Feb 2022

CLAIMS:

1. An activatable antibody comprising the following structure:

(1) an antibody or an antigen binding fragment thereof (AB) that specifically binds to mammalian PDL1, wherein the AB comprises:

(a) a variable heavy chain region (VH) comprising:

i. a variable heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence of SEQ ID NO: 212;

ii. a variable heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence of SEQ ID NO: 246; and

iii. a variable heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence of SEQ ID NO:235; and

(b) a variable light chain region (VL) comprising:

i. a variable light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence of SEQ ID NO: 209;

ii. a variable light chain complementarity determining region 2 (VL CDR2) comprising an amino acid sequence of SEQ ID NOs: 215 or 227; and

iii. a variable light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence of SEQ ID NO: 228;

(2) a masking moiety (MM) comprising the amino acid sequence of SEQ ID NO: 63 or 71; and

(3) a cleavable moiety (CM) comprising the amino acid sequence of SEQ ID NO: 377.

2. The activatable antibody of claim 1, wherein the AB is linked to the CM.

3. The activatable antibody of claim 2, wherein the AB is linked directly to the CM or wherein the AB is linked to the CM via a linking peptide.

2016233495 02 Feb 2022

4. The activatable antibody of claim 3, wherein the MM is linked to the CM such that the activatable antibody in an uncleaved state comprises the structural arrangement from N-terminus to C-terminus as follows: MM-CM-AB or AB-CM-MM.

5. The activatable antibody of claim 4, wherein the activatable antibody comprises a linking peptide between the MM and the CM, a linking peptide between the CM and the AB, or both a linking peptide between the MM and the CM and a linking peptide between the CM and the AB.

6. The activatable antibody of claim 4, wherein the activatable antibody comprises a first linking peptide (LP1) and a second linking peptide (LP2), and wherein the activatable antibody in the uncleaved state has the structural arrangement from N-terminus to C-terminus as follows: MM-LP1-CM-LP2-AB or AB-LP2-CM-LP1-MM.

7. The activatable antibody of claim 6, wherein the two linking peptides need not be identical to each other, wherein each of LP1 and LP2 is a peptide of about 1 to 20 amino acids in length, or both.

8. The activatable antibody of any one of claims 1 to 7, wherein the VL CDR2 comprises the amino acid sequence of SEQ ID NO: 215.

9. The activatable antibody of any one of claims 1 to 7, wherein the AB comprises:

a) a VH comprising the amino acid sequence of SEQ ID NO: 46 and a VL comprising the amino acid sequence of SEQ ID NO: 12;

b) a VH comprising the amino acid sequence of SEQ ID NO: 46 and a VL comprising the amino acid sequence of SEQ ID NO: 58;

c) a light chain comprising the amino acid sequence of SEQ ID NO: 137 and a VH comprising the amino acid sequence of SEQ ID NO: 46;

d) a light chain comprising the amino acid sequence of SEQ ID NO: 985 and a VH comprising the amino acid sequence of SEQ ID NO: 46;

2016233495 02 Feb 2022

e) a light chain comprising the amino acid sequence of SEQ ID NO: 428 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432; or

f) a light chain comprising the amino acid sequence of SEQ ID NO: 1008 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432.

10. A conjugated activatable antibody comprising the activatable antibody of any one of claims 1 to 9 conjugated to an agent.

11. The conjugated activatable antibody of claim 10, wherein the agent has one or more of the following characteristics selected from the group consisting of:

(i) the agent is a toxin or fragment thereof;

(ii) the agent is a microtubule inhibitor;

(iii) the agent is a nucleic acid damaging agent;

(iv) the agent is a dolastatin or a derivative thereof;

(v) the agent is an auristatin or a derivative thereof;

(vi) the agent is a maytansinoid or a derivative thereof;

(vii) the agent is a duocarmycin or a derivative thereof;

(viii) the agent is a calicheamicin or a derivative thereof;

(ix) the agent is auristatin E or a derivative thereof;

(x) the agent is monomethyl auristatin E (MMAE);

(xi) the agent is monomethyl auristatin D (MMAD);

(xii) the agent is DM1;

(xiii) the agent is DM4;

(xiv) the agent is a detectable moiety;

(xv) the agent is a diagnostic agent;

(xvi) the agent is conjugated to the antibody via a linker;

(xvii) the agent is conjugated to the antibody via a cleavable linker; and

(xviii) the agent is conjugated to the antibody via a non-cleavable linker.

12. A pharmaceutical composition comprising:

a) the activatable antibody of any one of claims 1 to 9; and

2016233495 02 Feb 2022

b) a carrier.

13. The pharmaceutical composition of claim 12 comprising an additional agent.

14. The pharmaceutical composition of claim 13, wherein the additional agent is a therapeutic agent.

15. A method of treating, alleviating a symptom of, or delaying the progression of a PDL1-mediated disorder or disease comprising administering an effective amount the conjugated activatable antibody of claim 10 or 11, or the activatable antibody of any one of claims 1 to 9 to a subject in need thereof.

16. The method of claim 15, wherein the PDL1-mediated disorder or disease is cancer.

17. The method of claim 16, wherein the cancer is a bladder cancer, a bone cancer, a breast cancer, a carcinoid, a cervical cancer, a colon cancer, an endometrial cancer, a glioma, a head and neck cancer, a liver cancer, a lung cancer, a lymphoma, a melanoma, an ovarian cancer, a pancreatic cancer, a prostate cancer, a renal cancer, a sarcoma, a skin cancer, a stomach cancer, a testis cancer, a thyroid cancer, a urogenital cancer, or a urothelial cancer; or

wherein the cancer is selected from the group consisting of melanoma (MEL), renal cell carcinoma (RCC), squamous non-small cell lung cancer (NSCLC), non-squamous NSCLC, colorectal cancer (CRC), castration-resistant prostate cancer (CRPC), hepatocellular carcinoma (HCC), squamous cell carcinoma of the head and neck, carcinomas of the esophagus, ovary, gastrointestinal tract and breast, or a hematologic malignancy such as multiple myeloma, B-cell lymphoma, T-cell lymphoma, Hodgkin's lymphoma/primary mediastinal B-cell lymphoma, and chronic myelogenous leukemia.

18. The method of claim 15, wherein the method comprises administering an additional agent.

2016233495 02 Feb 2022

19. The method of claim 18, wherein the additional agent is a therapeutic agent.

20. The method of claim 15, wherein:

a) the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 428 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432;

b) the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 1008 and a heavy chain comprising the amino acid sequence of SEQ ID NO: 432; or

c) the activatable antibody comprises a light chain comprising the amino acid sequence of SEQ ID NO: 985 and a VH comprising the amino acid sequence of SEQ ID NO: 46,

and wherein the PDL1-mediated disorder or disease is cancer.

21. Use of an effective amount of the conjugated activatable antibody of claim 10 or 11, or the activatable antibody of any one of claims 1 to 9 in the preparation of a medicament for reducing PDLl activity in a subject.

22. Use of an effective amount of the conjugated activatable antibody of claim 10 or 11, or the activatable antibody of any one of claims 1 to 9 in the preparation of a medicament for blocking binding of a natural ligand to PDLl in a subject.

23. Use of an effective amount of the conjugated activatable antibody of claim 10 or 11, or the activatable antibody of any one of claims 1 to 9 in the preparation of a medicament for treating, alleviating a symptom of, or delaying the progression of a PDLl-mediated disorder or disease in a subject.

CytomX Therapeutics, Inc.

Patent Attorneys for the Applicant/Nominated Person

SPRUSON & FERGUSON

FIGURE 1

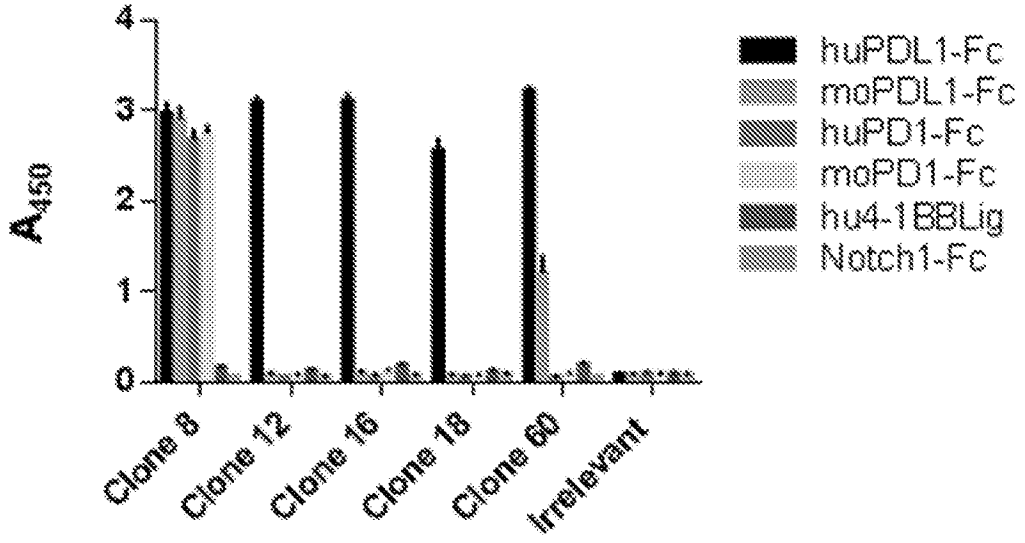


FIGURE 2

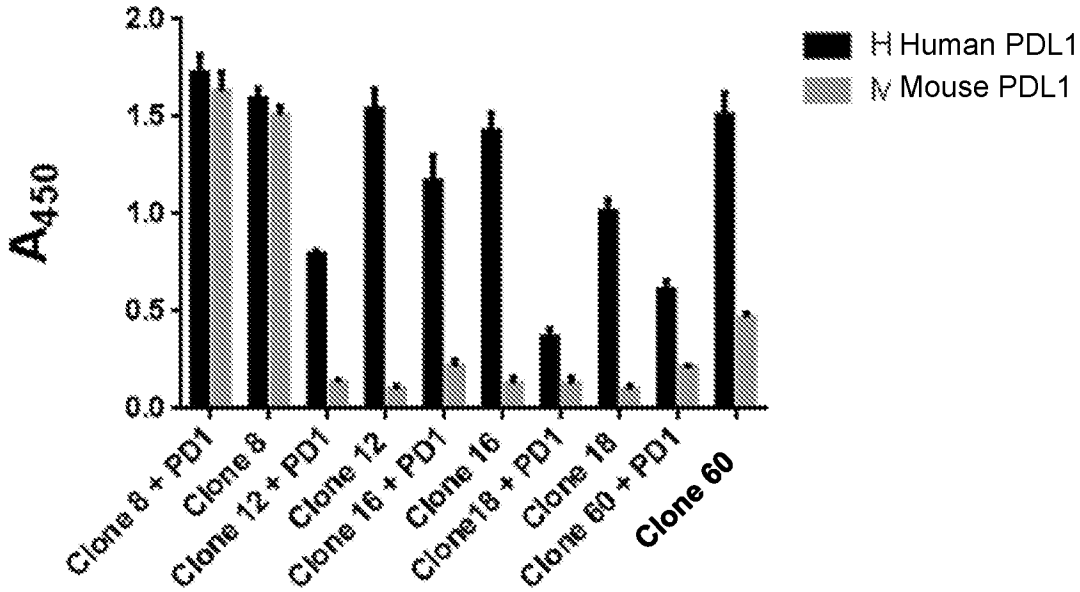


FIGURE 3

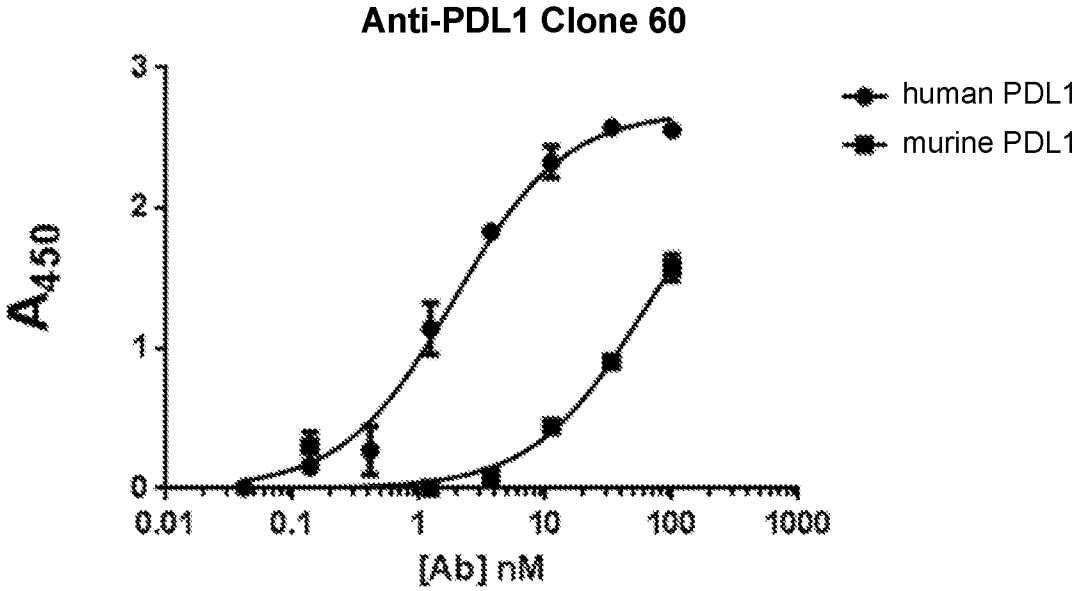


FIGURE 4A

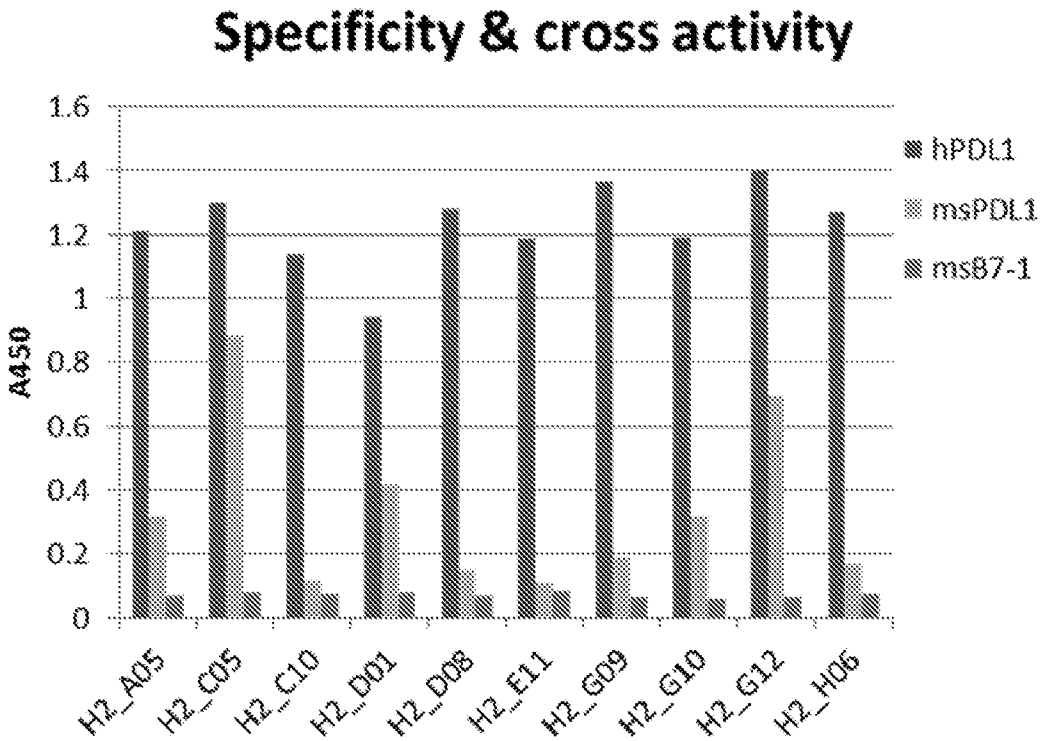


FIGURE 4B

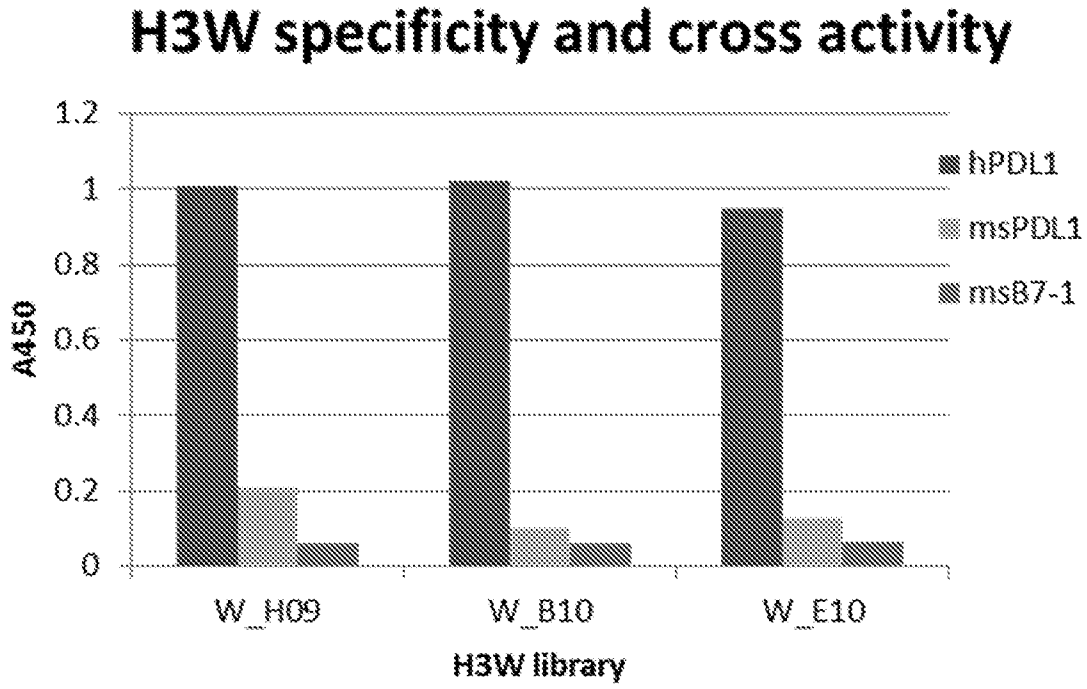


FIGURE 5A

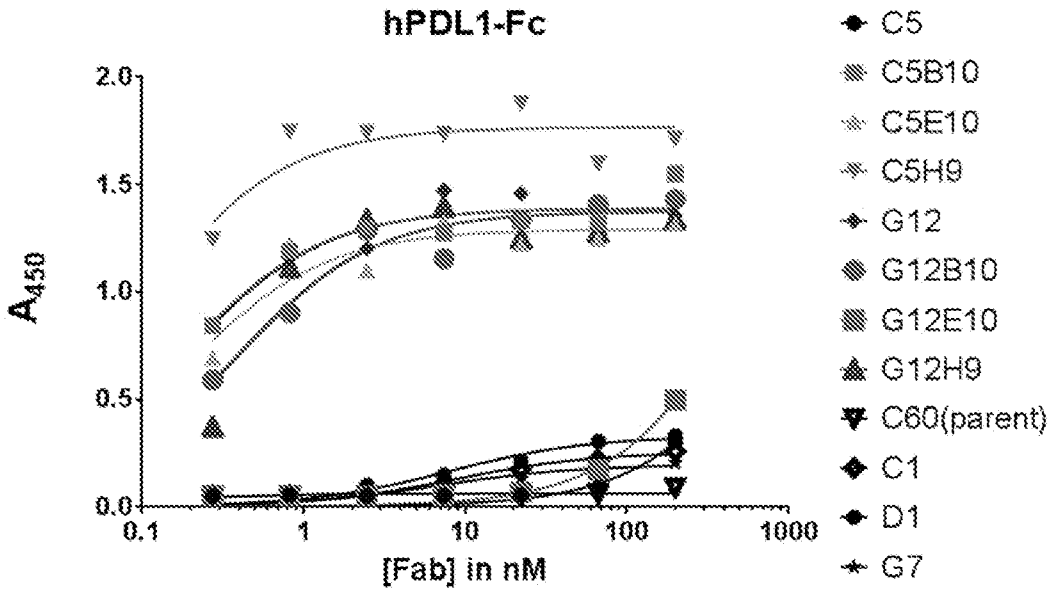


FIGURE 5B

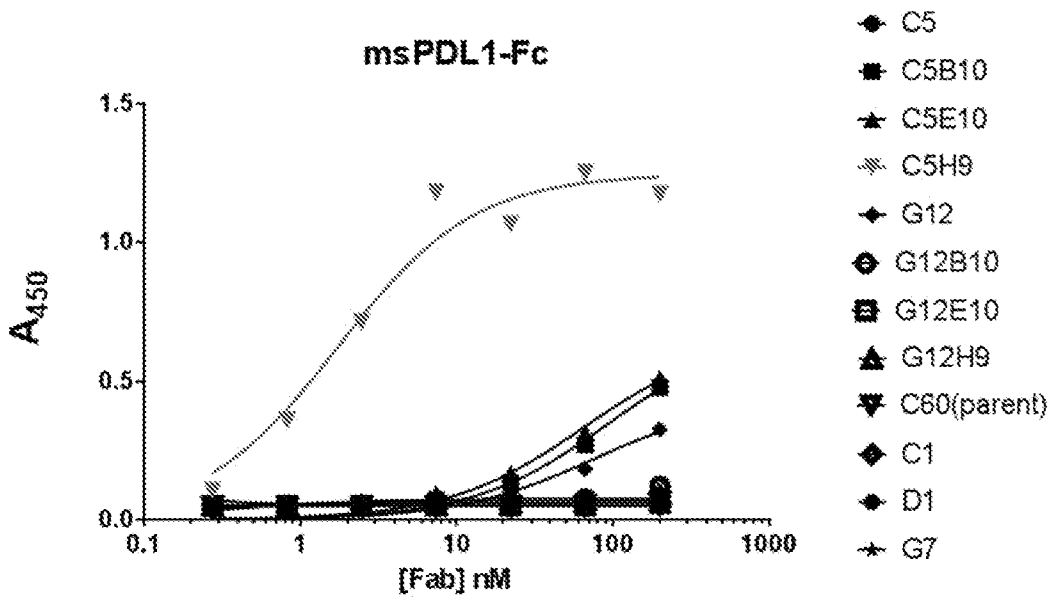


FIGURE 6A

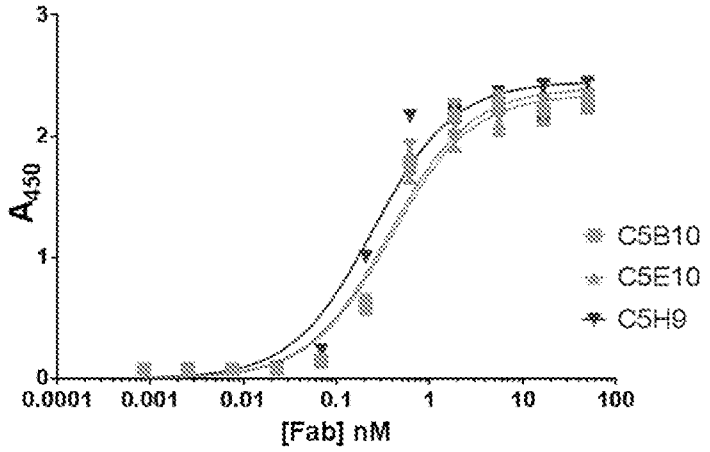


FIGURE 6B

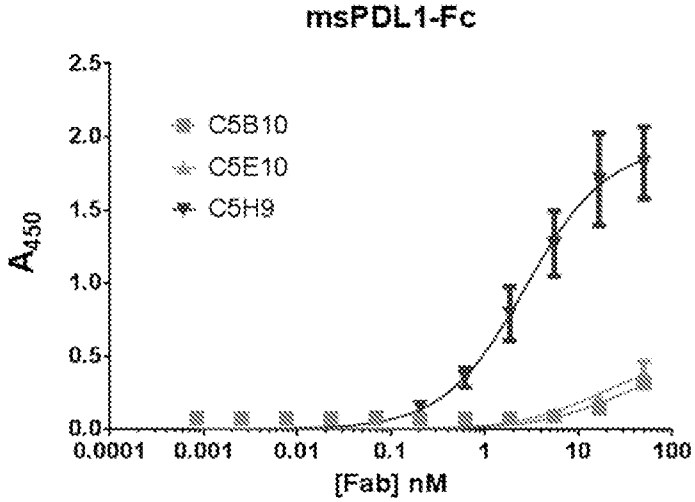


FIGURE 6C

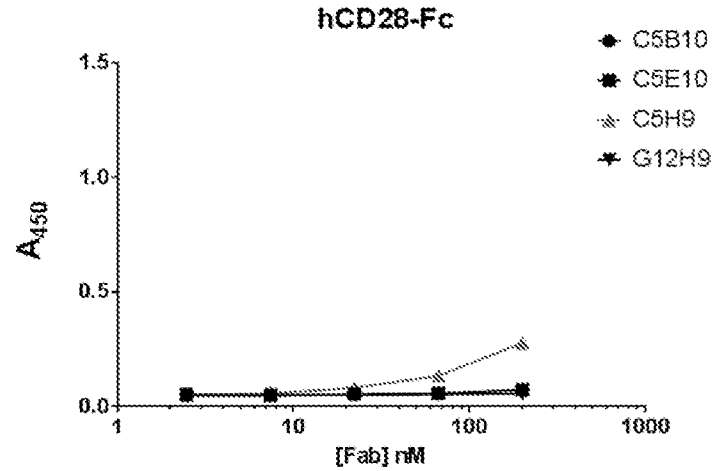


FIGURE 6D

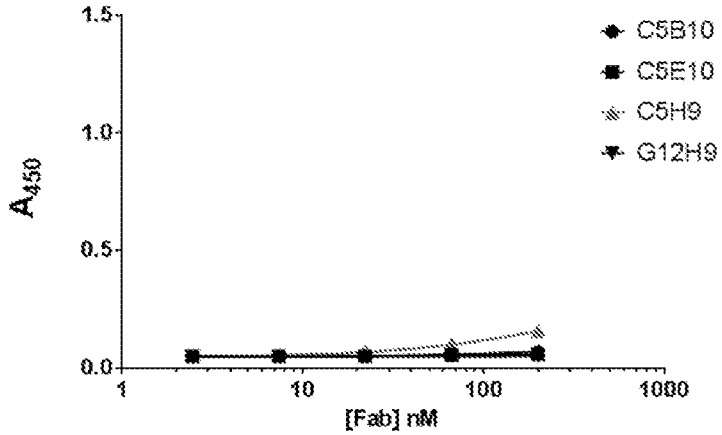
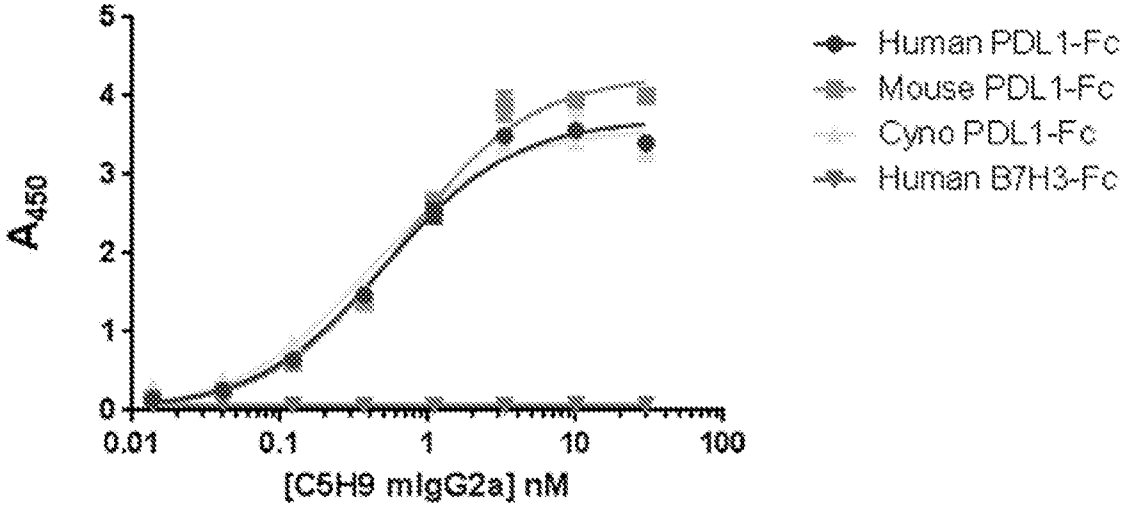


FIGURE 7



	Human	Mouse	Cynomolgus
K_d nM	0.5150	0.6657	0.3994

FIGURE 8A

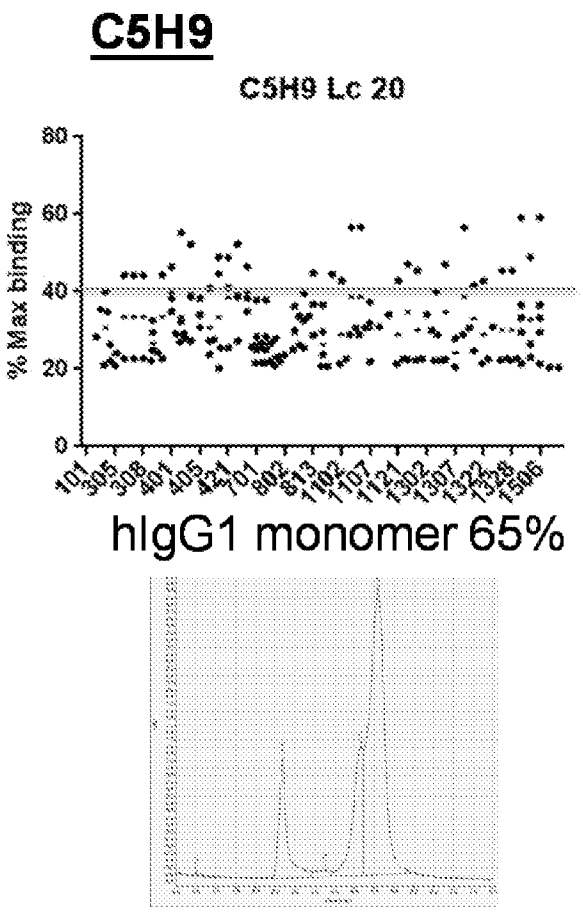


FIGURE 8B

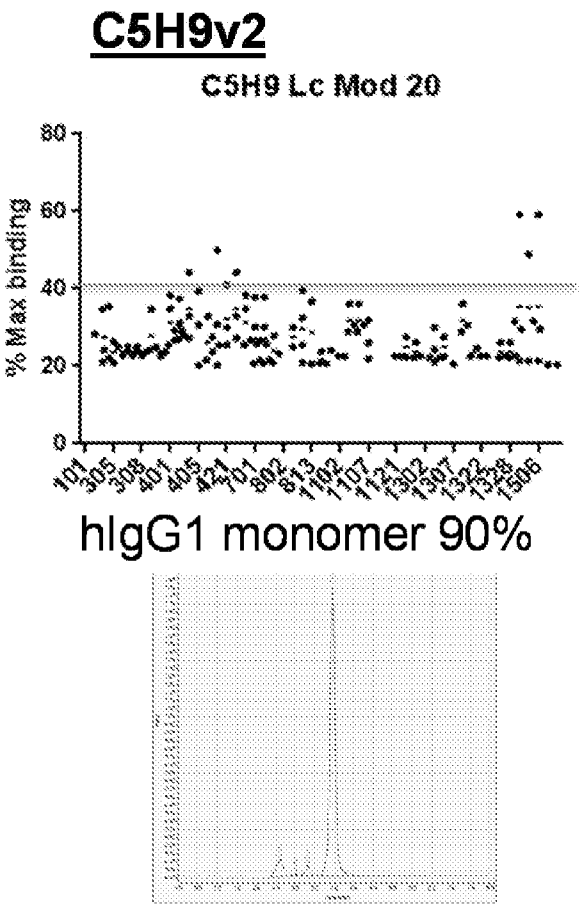


FIGURE 9A

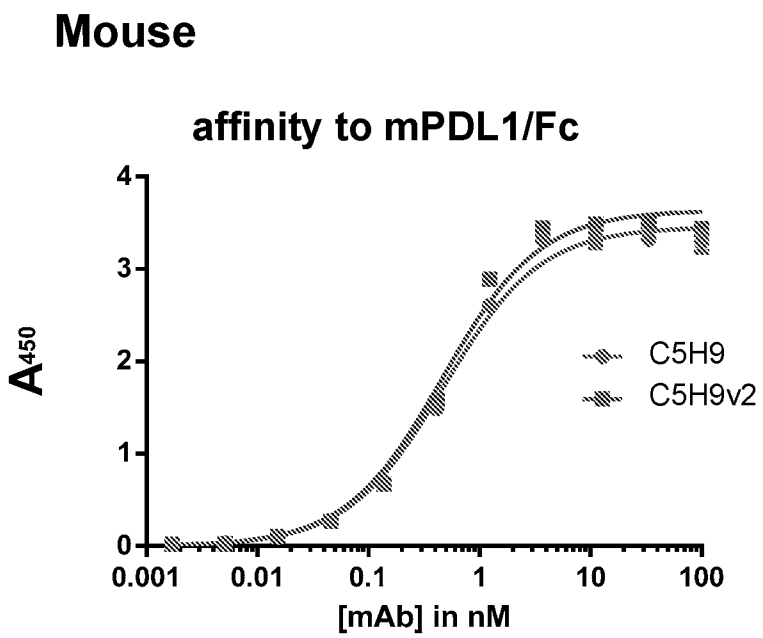


FIGURE 9B

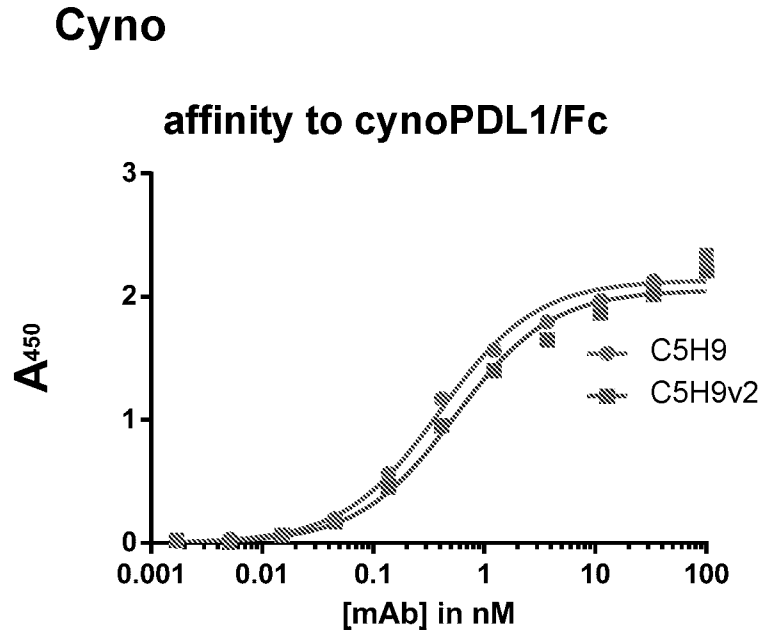
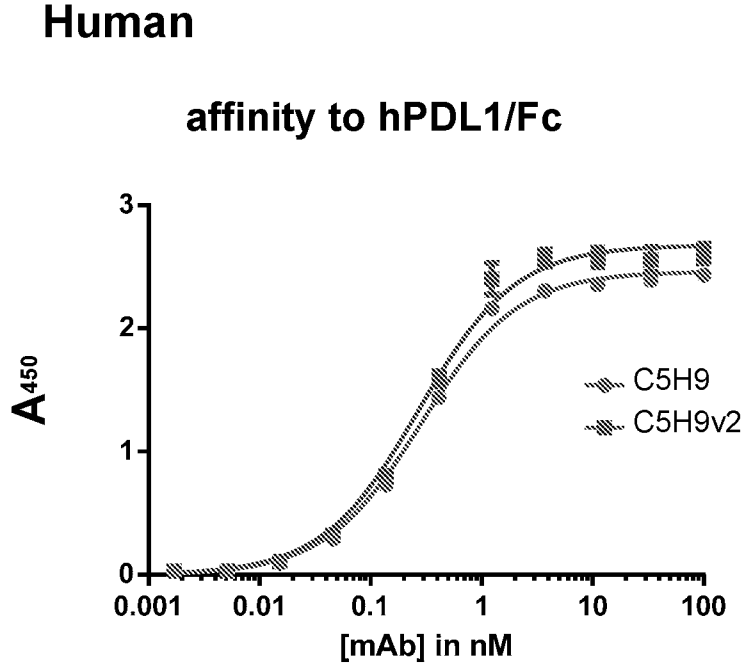


FIGURE 9C



	Kd (nM)	
	C5H9	C5H9v2
Mouse	0.4754	0.4637
Cyno	0.3981	0.5439
Human	0.2865	0.2716

FIGURE 10

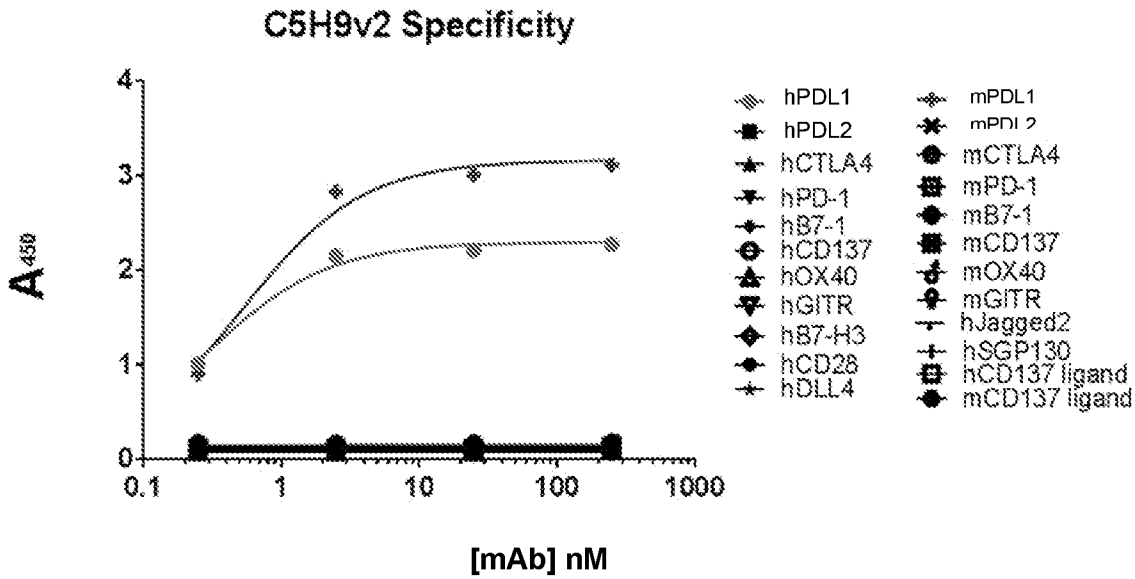
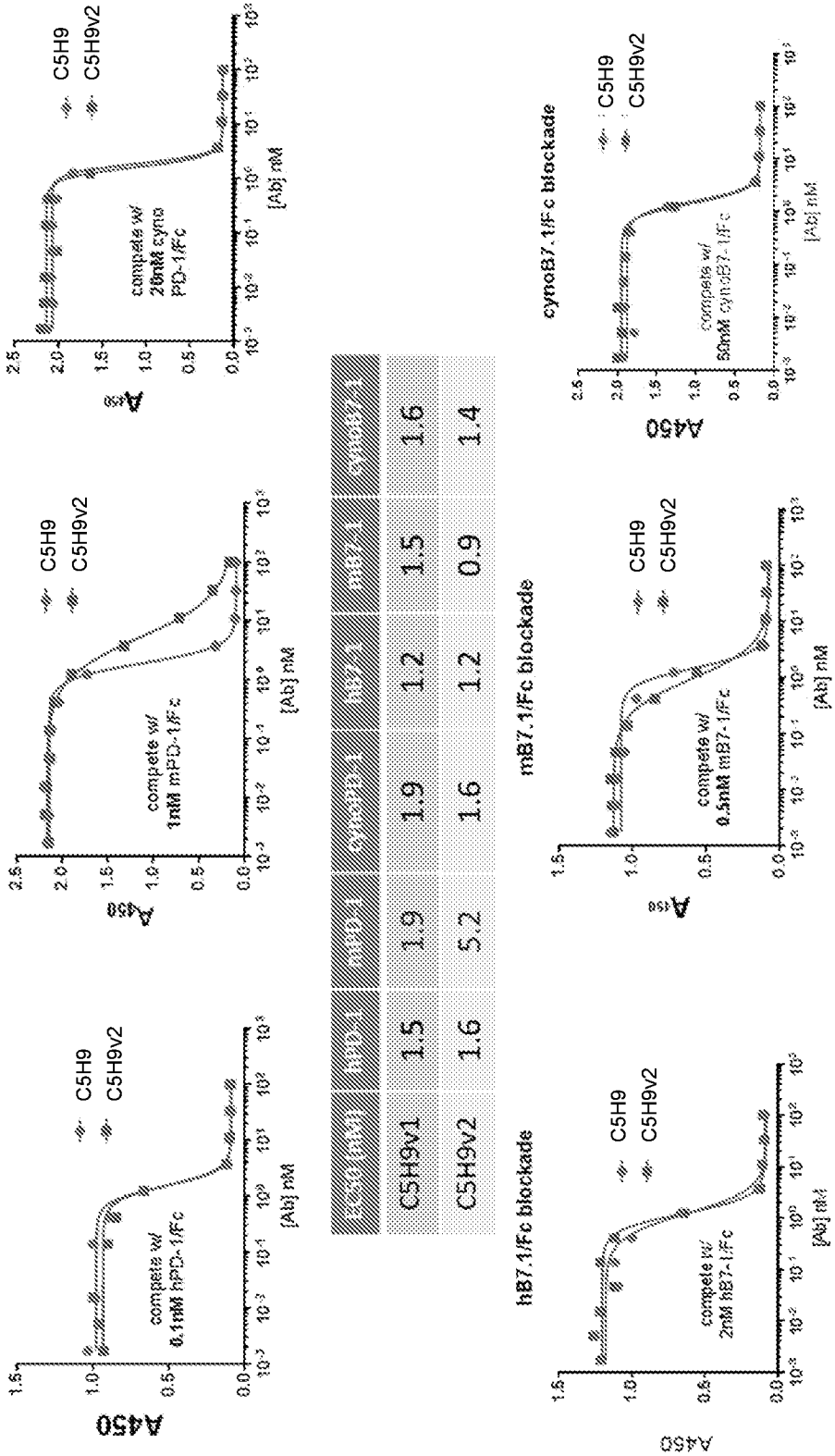

C5H9v2 Specificity
A450
4
3
2
1
0
0.1
1
10
100
1000
[mAb] nM
hPDL1
hPDL2
hCTLA4
hPD-1
hB7-1
hCD137
hOX40
hGITR
hB7-H3
hCD28
hDLL4
mPDL1
mPDL2
mCTLA4
mPD-1
mB7-1
mCD137
mOX40
mGITR
hJagged2
hSGP130
hCD137 ligand
mCD137 ligand

FIGURE 11



	hPD1	mPD1	cynoPD1	hB7.1	mB7.1	cynoB7.1
C5H9v1	1.5	1.9	1.9	1.2	1.5	1.6
C5H9v2	1.6	5.2	1.6	1.2	0.9	1.4

FIGURE 12

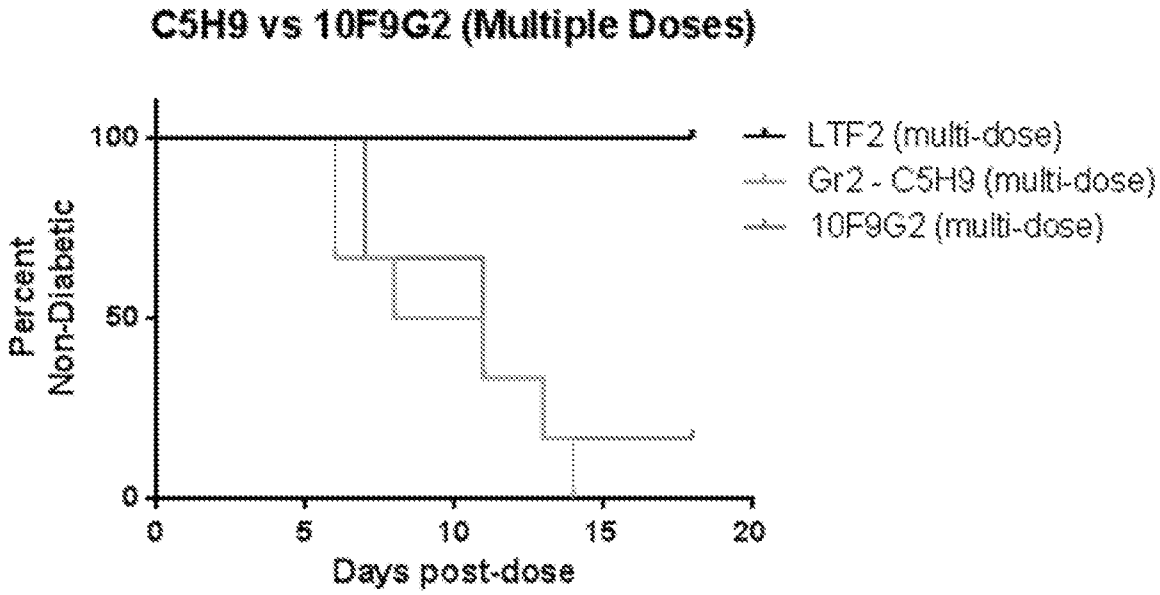


FIGURE 13

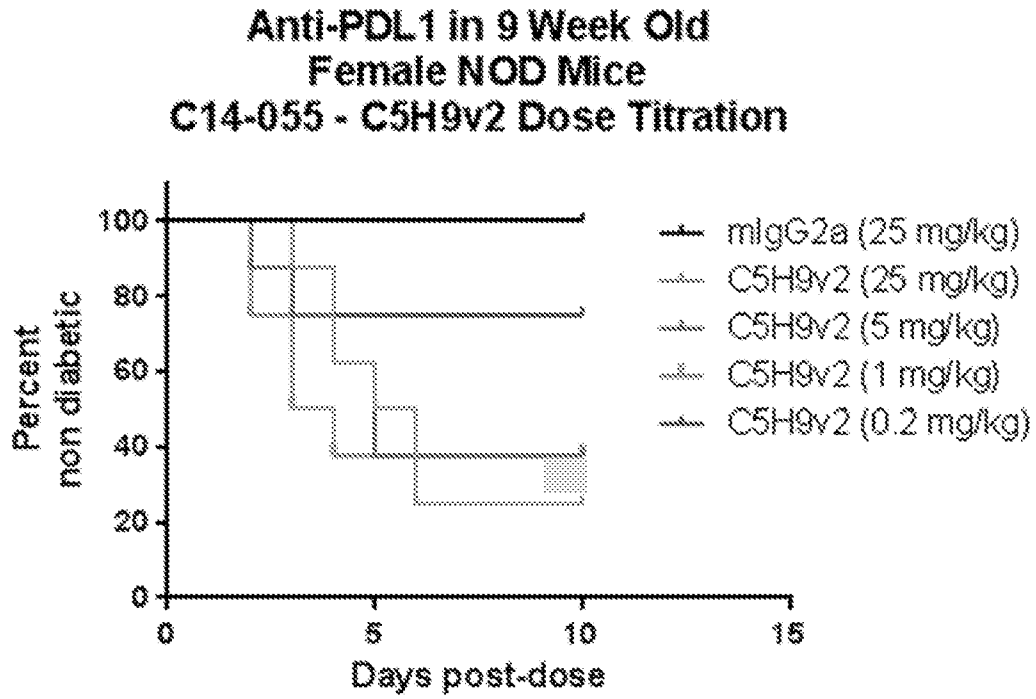


FIGURE 14

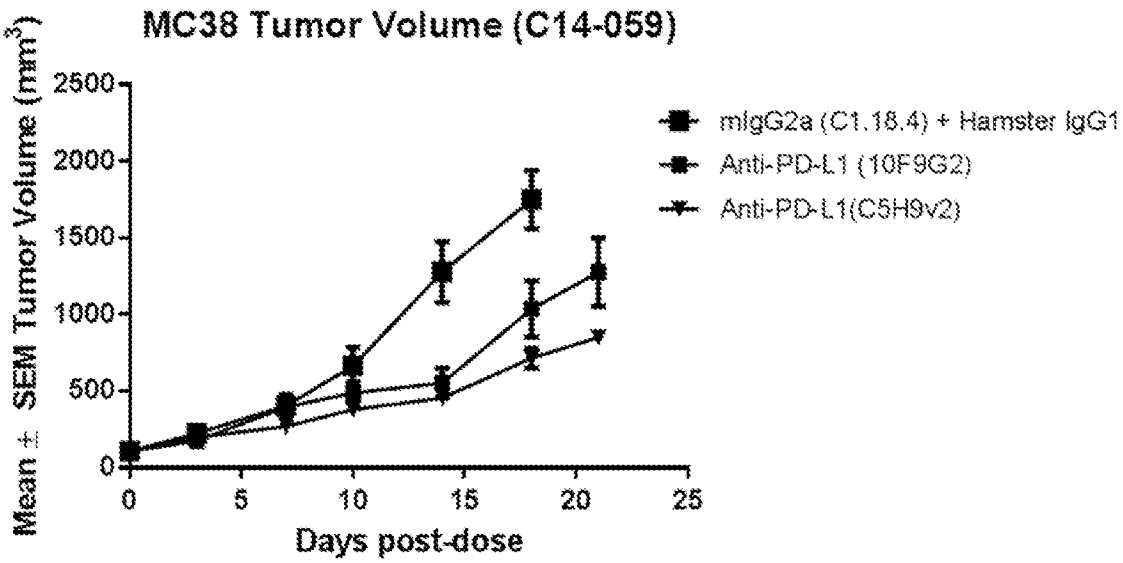


FIGURE 15A

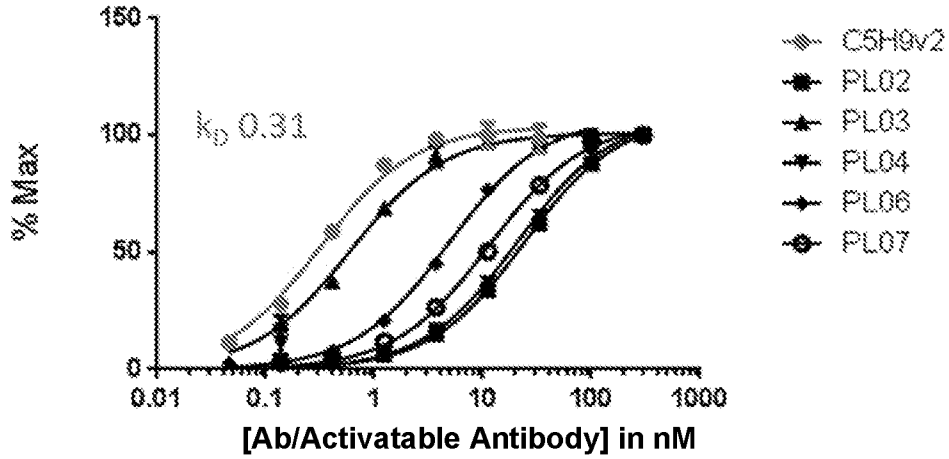
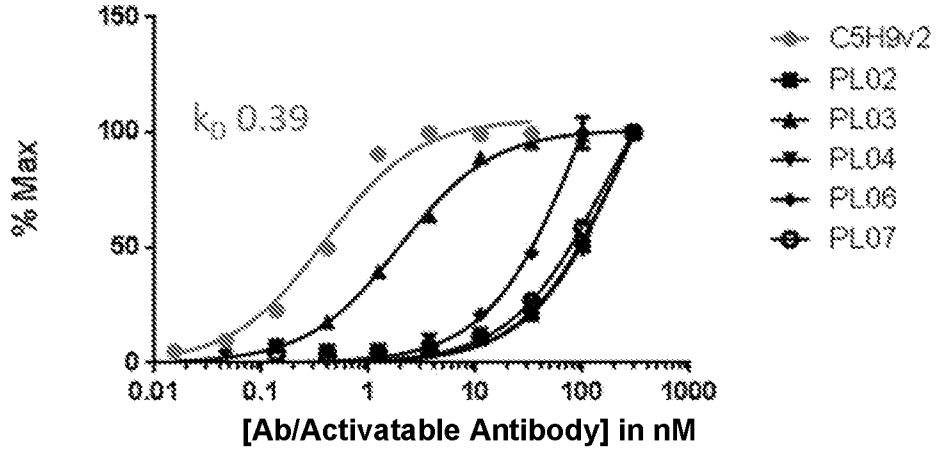
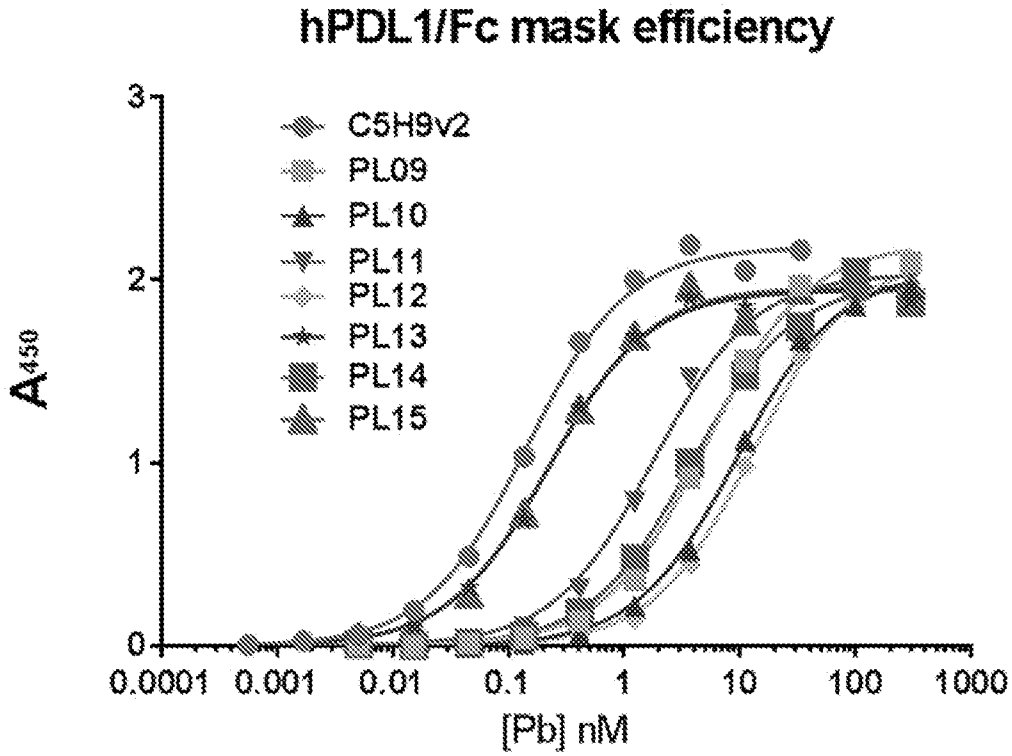


FIGURE 15B



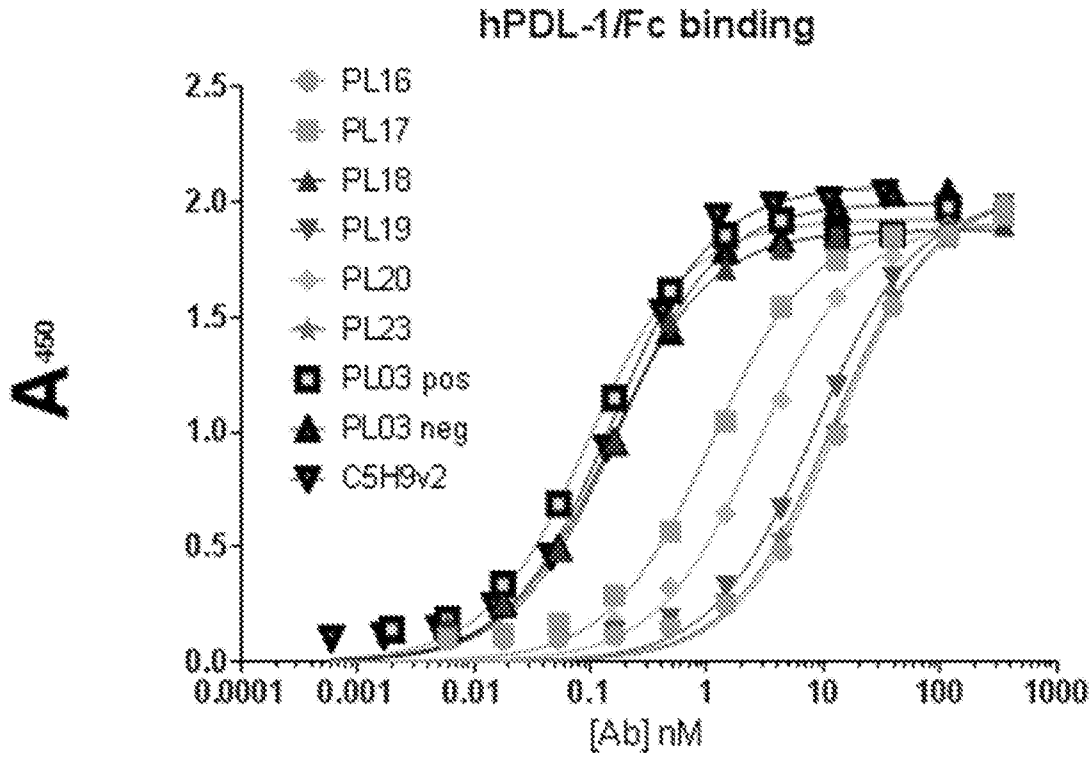
	Masking Efficiency		
	Media	Purified	
	Human	Human	Mouse
PL02	12	80	650
PL03	5	2	5
PL04	52	70	574
PL06	23	16	259
PL07	38	37	389

FIGURE 16



Mask efficiency	PL09	PL10	PL11	PL12	PL13	PL14	PL15
hPDL1	31	63	12	88	1.4	26	2
mPDL1	1518	2246	251	2940	4	1012	48

FIGURE 17



ME	PL16	PL17	PL18	PL19	PL20	PL23	PL03+	PL03-
hPDL1	88	7.2	1.0	56	18.3	77.7	0.6	1.1
mPDL1	n/a	421	25	954	645	n/a	1	2.2

FIGURE 18A

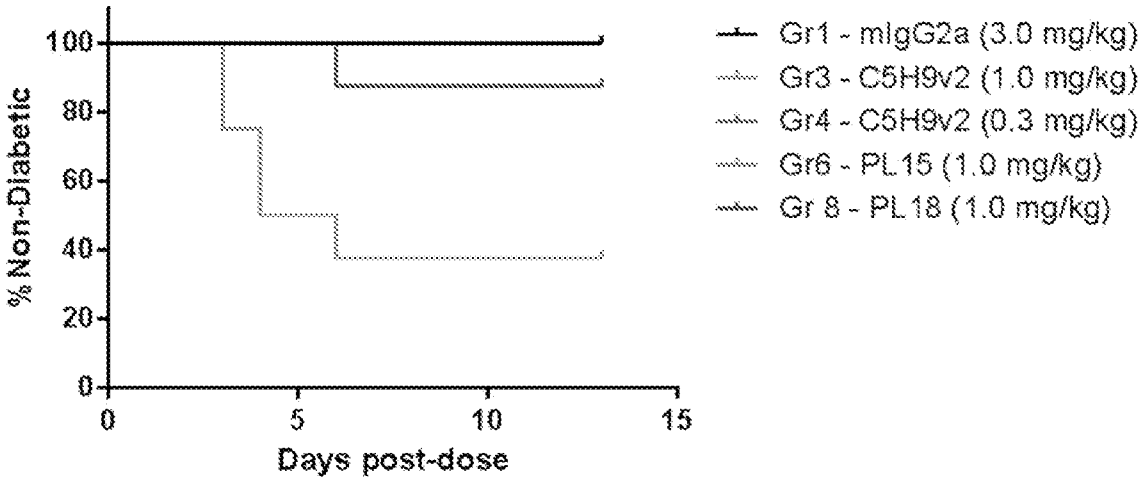


FIGURE 18B

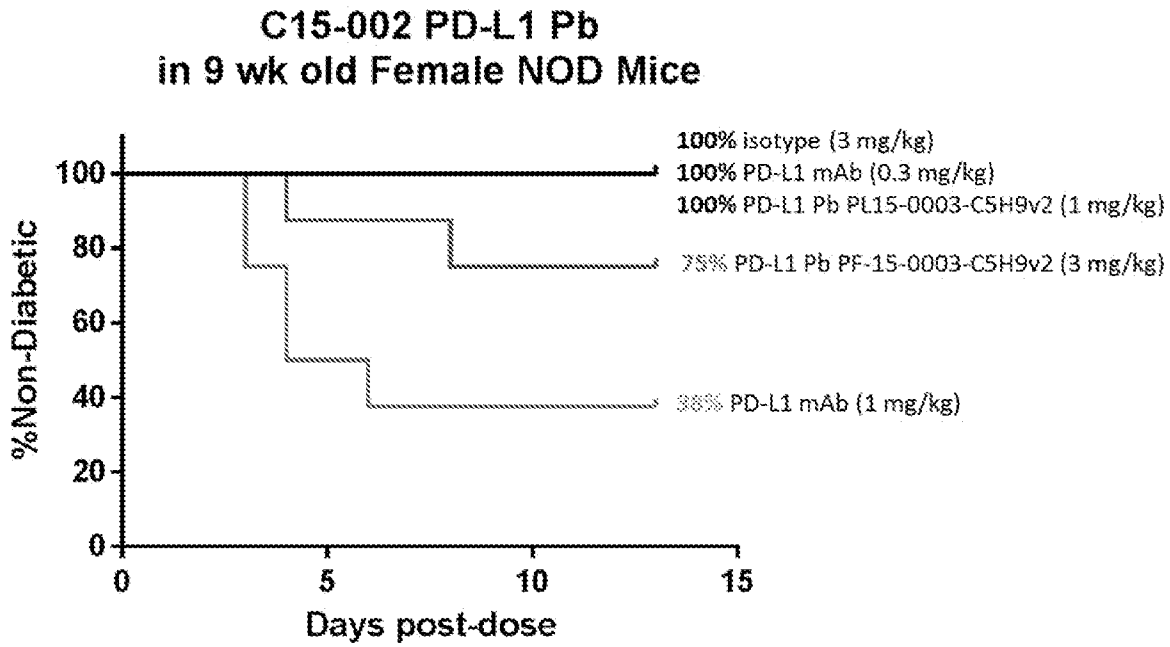


FIGURE 19

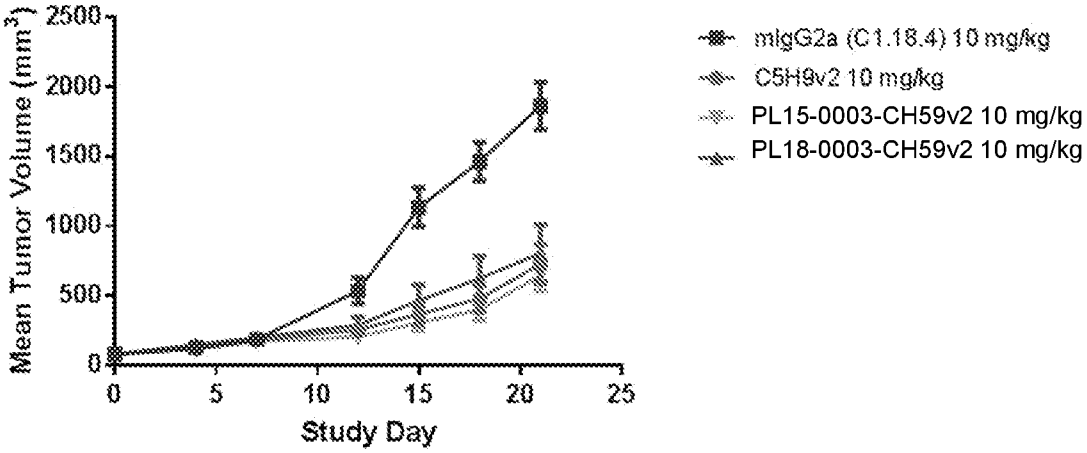


FIGURE 20A

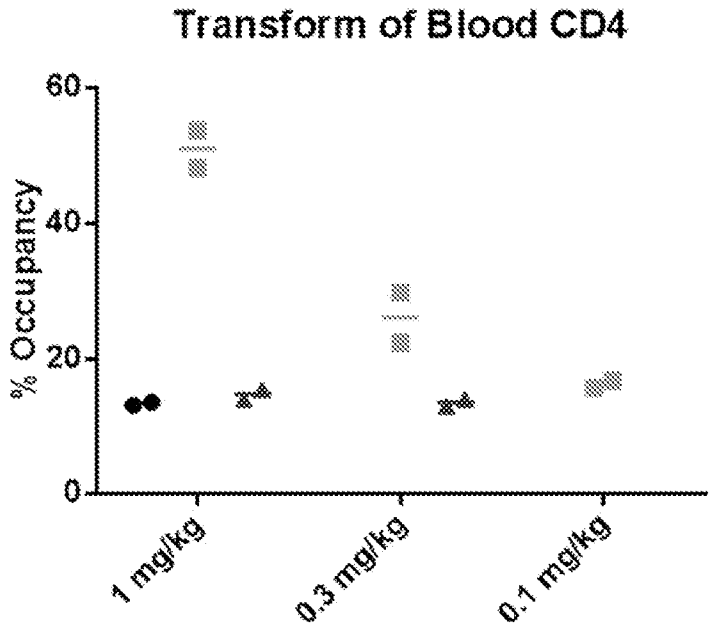


FIGURE 20B

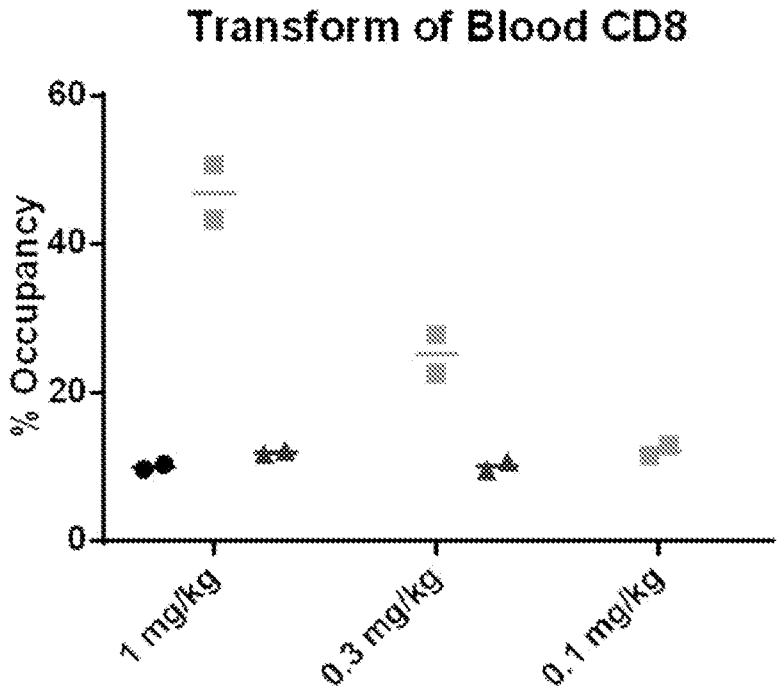


FIGURE 20C

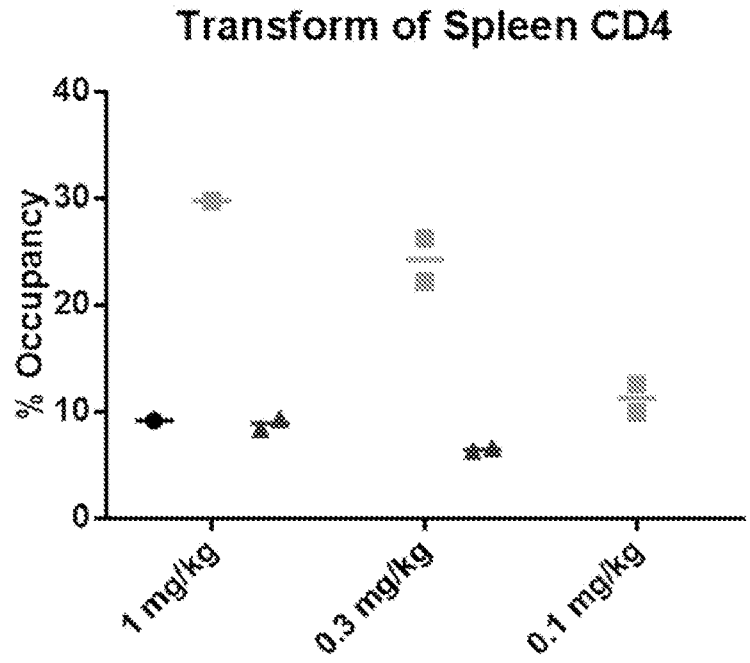


FIGURE 20D

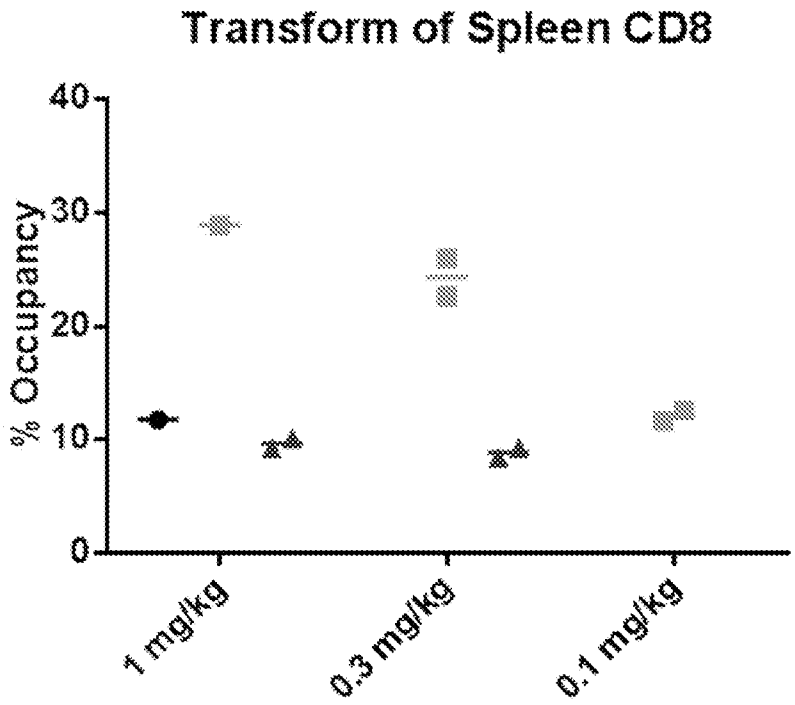


FIGURE 21A

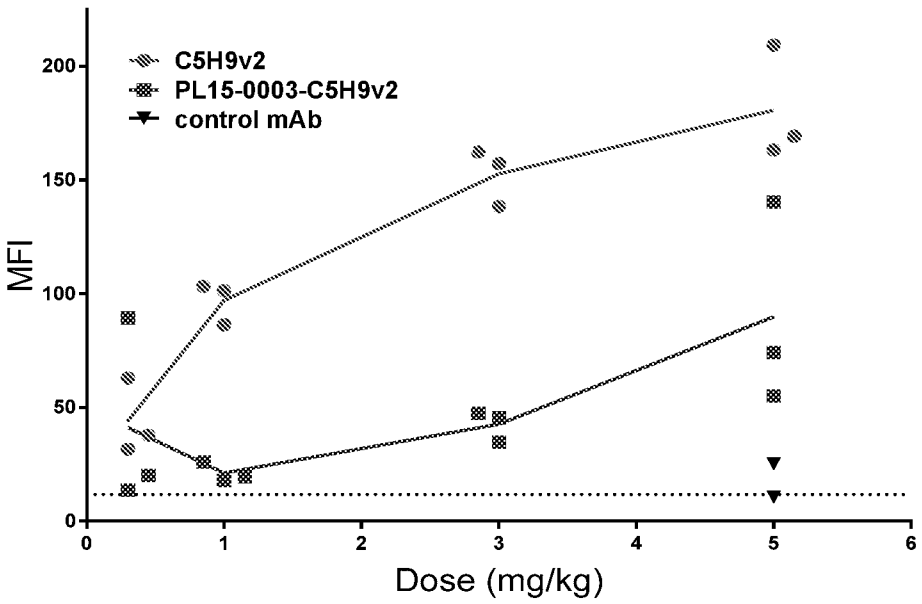


FIGURE 21B

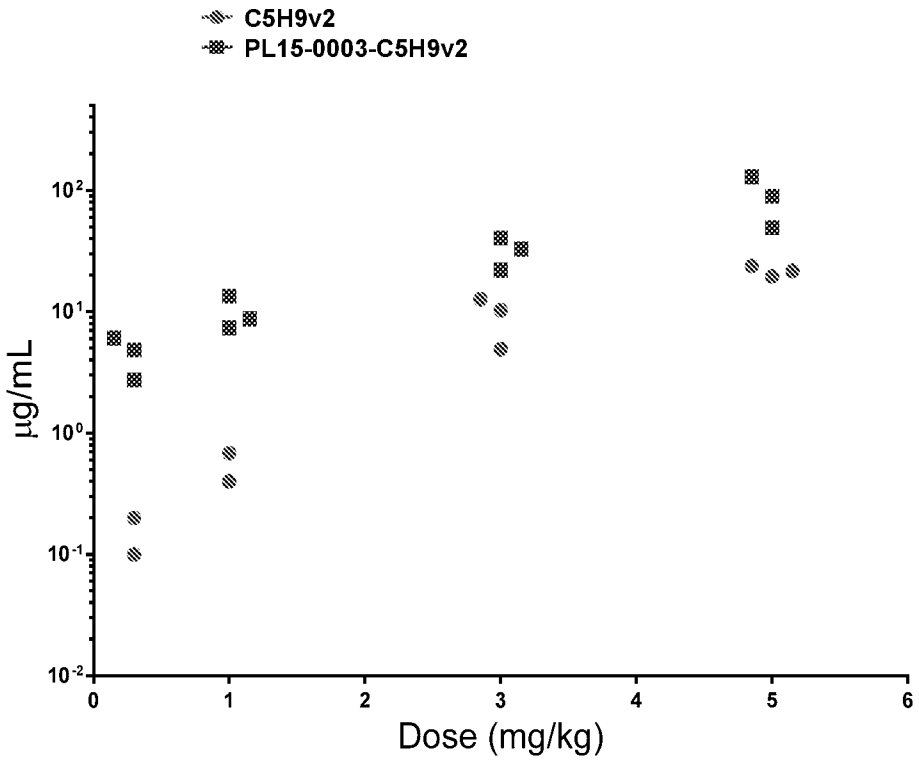


FIGURE 22

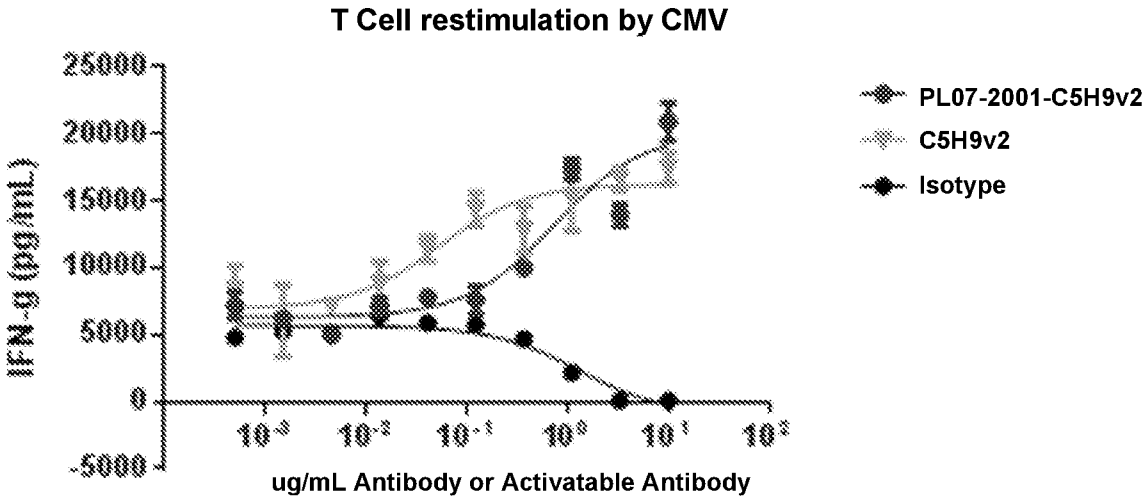


FIGURE 23A

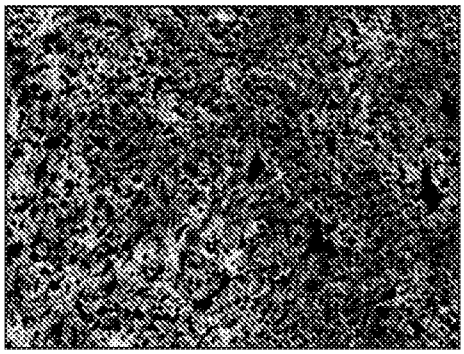


FIGURE 23B

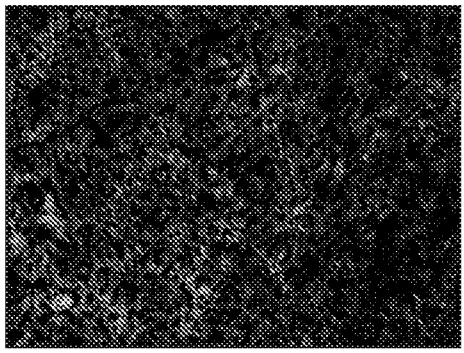


FIGURE 23C

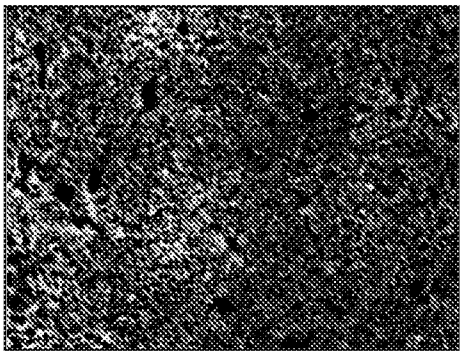


FIGURE 23D

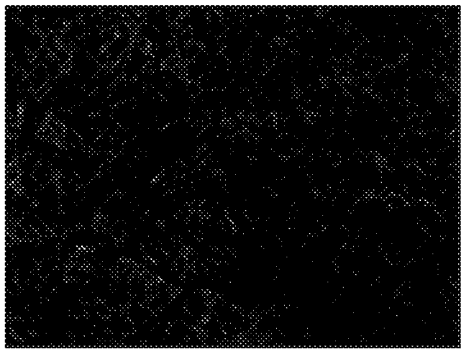


FIGURE 24

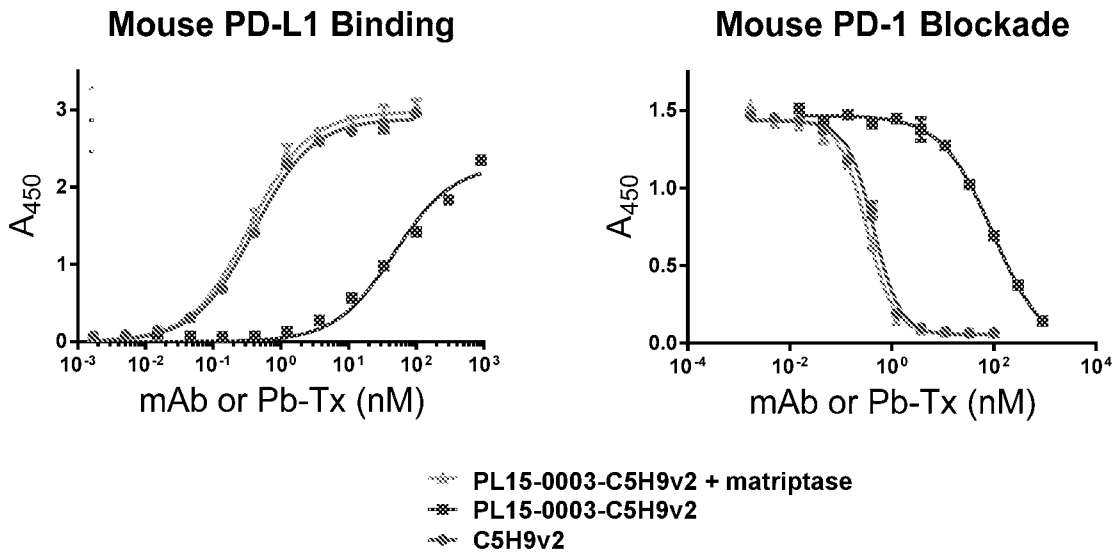
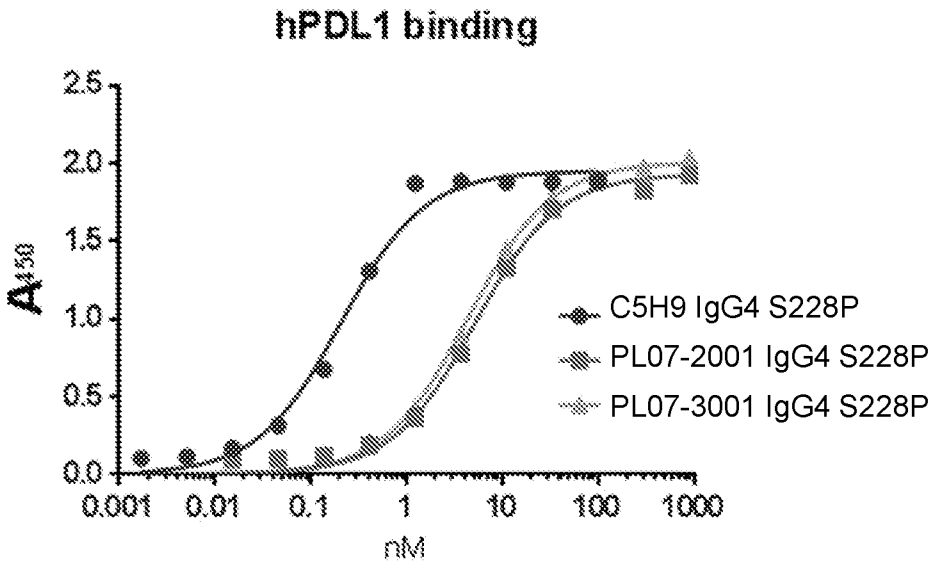
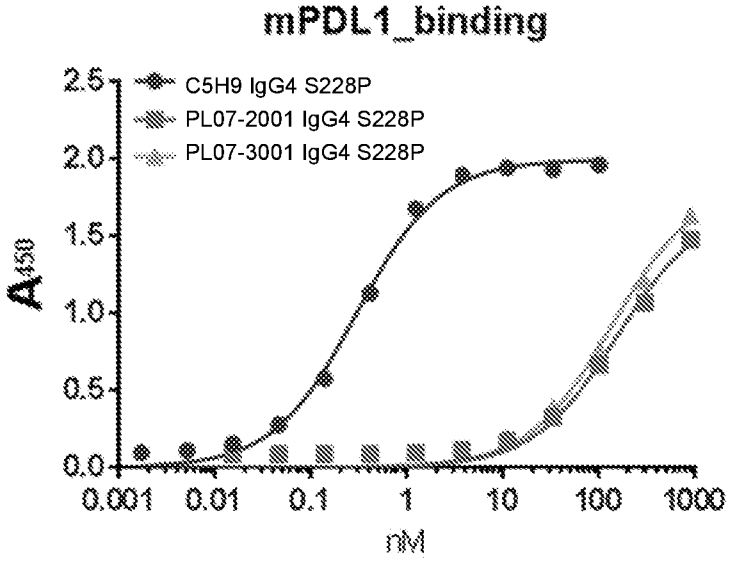


FIGURE 25A



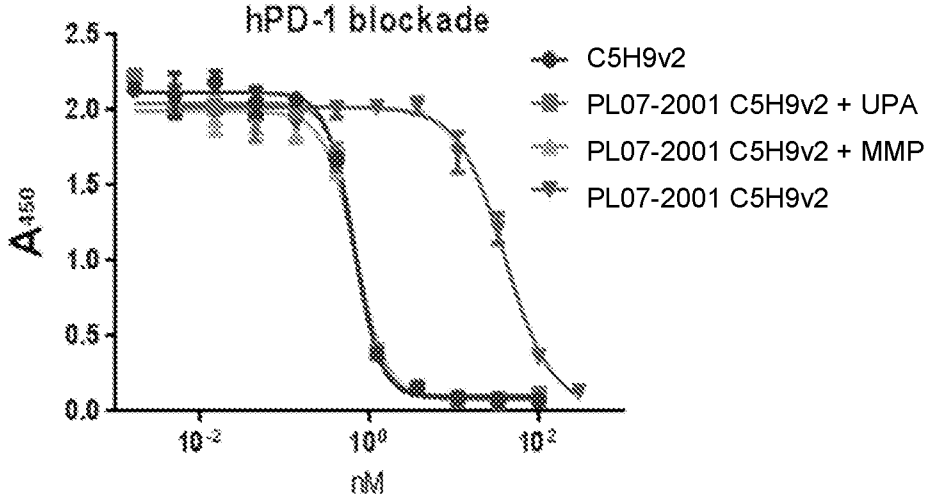
hPDL1	PL-2001	PL-3001
ME	25	21

FIGURE 25B



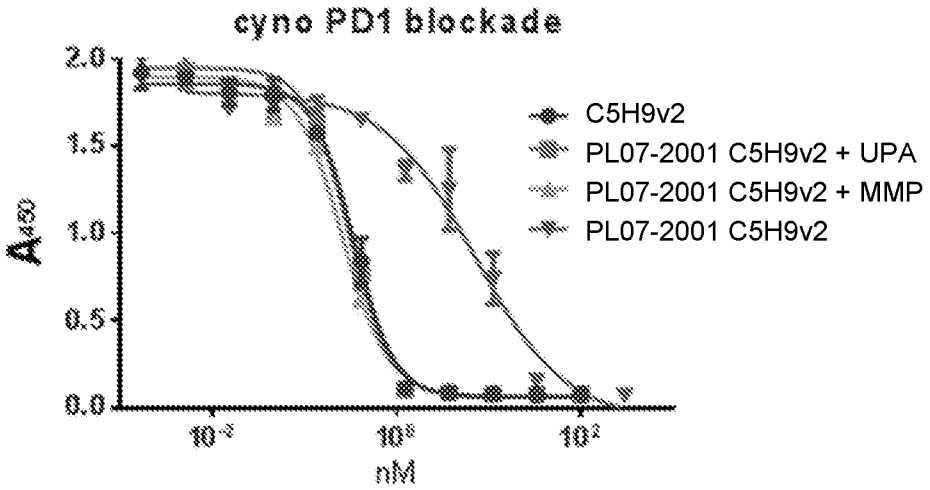
mPDL1	PL-2001	PL-3001
ME	510	450

FIGURE 26A



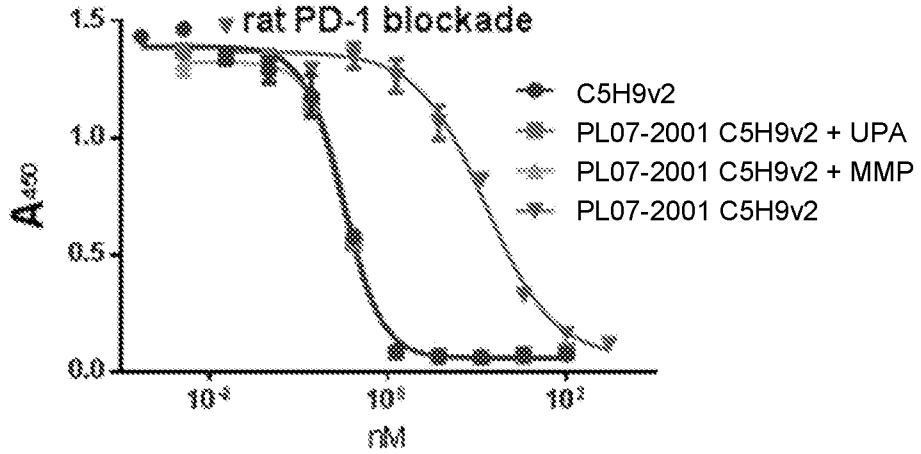
	C5H9v2	PL07-2001 C5H9v2 + UPA	PL07-2001 C5H9v2 + MMP	PL07-2001 C5H9v2
IC50 (nM)	0.7	0.7	0.7	39.8
ME	1	1	1	57

FIGURE 26B



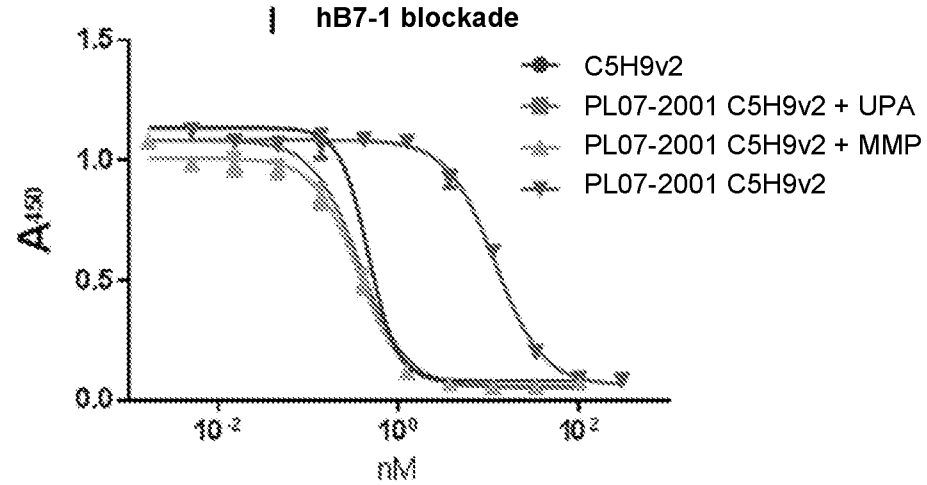
	C5H9v2	PL07-2001 C5H9v2 + UPA	PL07-2001 C5H9v2 + MMP	PL07-2001 C5H9v2
IC50 (nM)	0.3	0.3	0.3	7
ME	1	1	1	23

FIGURE 26C



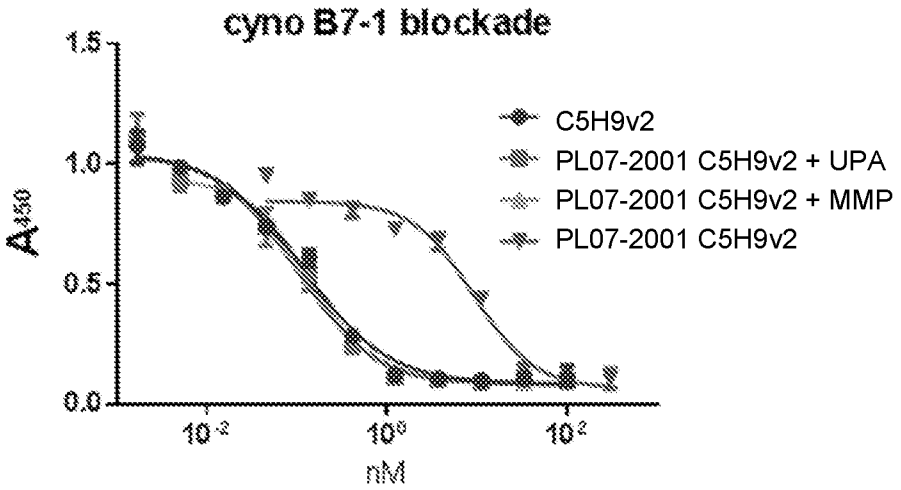
	C5H9v2	PL07-2001 C5H9v2 + UPA	PL07-2001 C5H9v2 + MMP	PL07-2001 C5H9v2
IC50 (nM)	0.3	0.3	0.3	11.9
ME	1	1	1	40

FIGURE 27A



	C5H9v2	PL07-2001 C5H9v2 + UPA	PL07-2001 C5H9v2 + MMP	PL07-2001 C5H9v2
IC50 (nM)	0.5	0.5	0.4	11.7
ME	1	1	1	29

FIGURE 27B



	C5H9v2	PL07-2001 C5H9v2 + UPA	PL07-2001 C5H9v2 + MMP	PL07-2001 C5H9v2
IC50 (nM)	0.1	0.1	0.1	9.6
ME	1	1	1	96

FIGURE 28

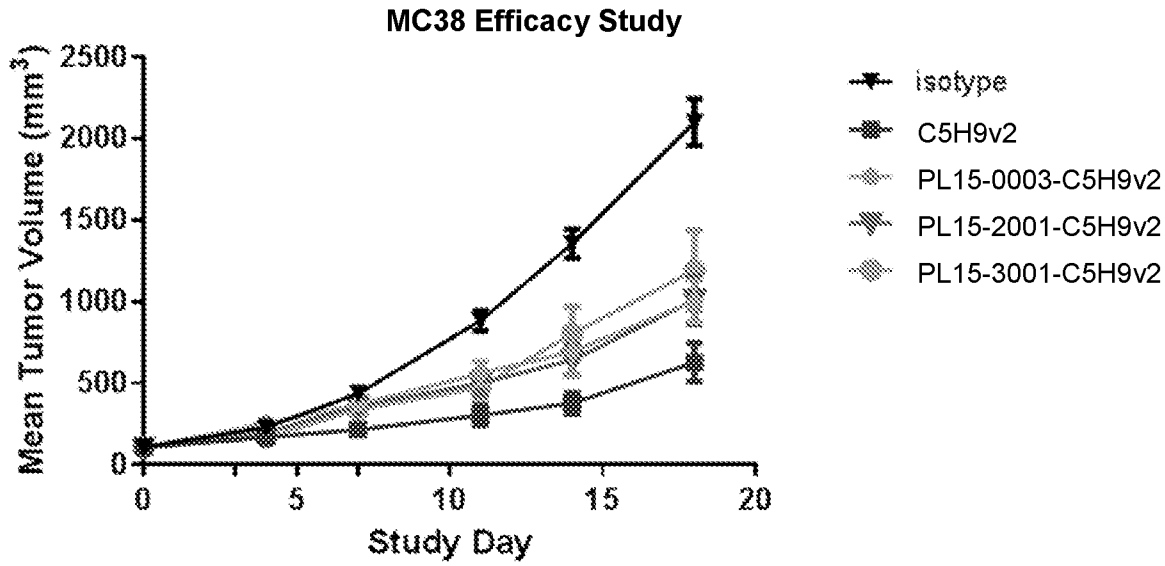


FIGURE 29A

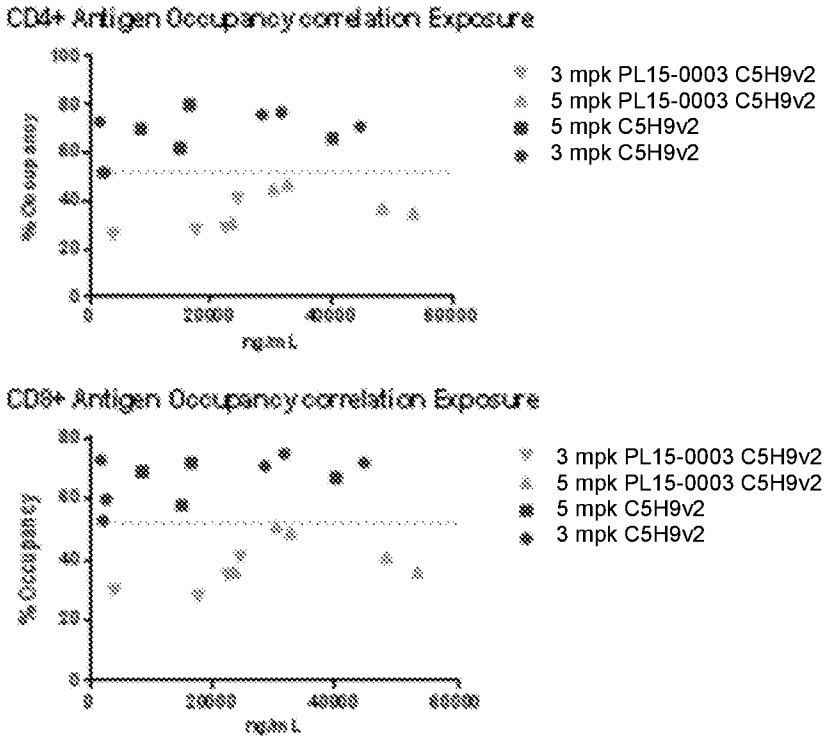


FIGURE 29B

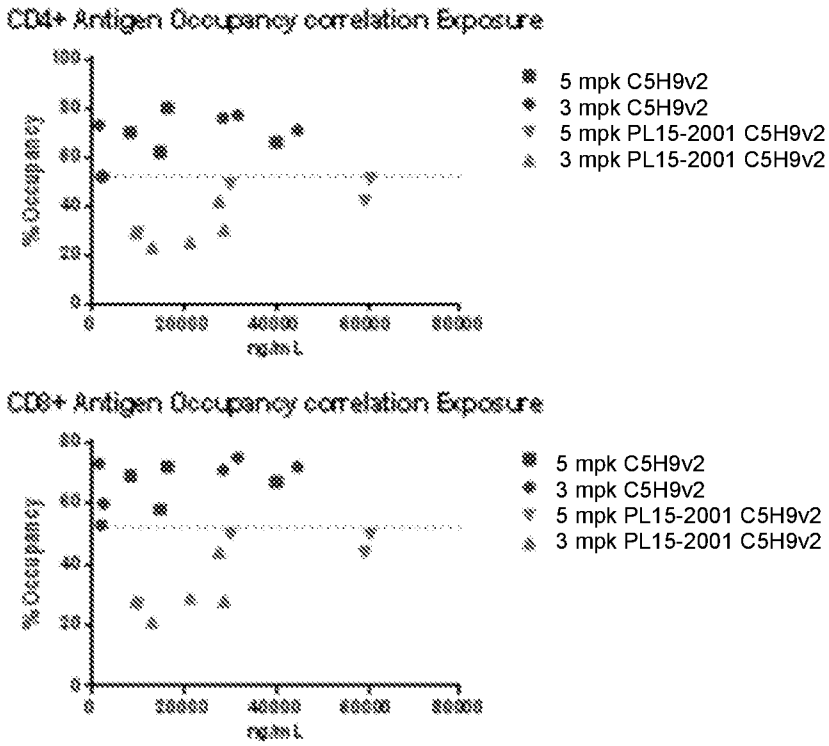


FIGURE 29C

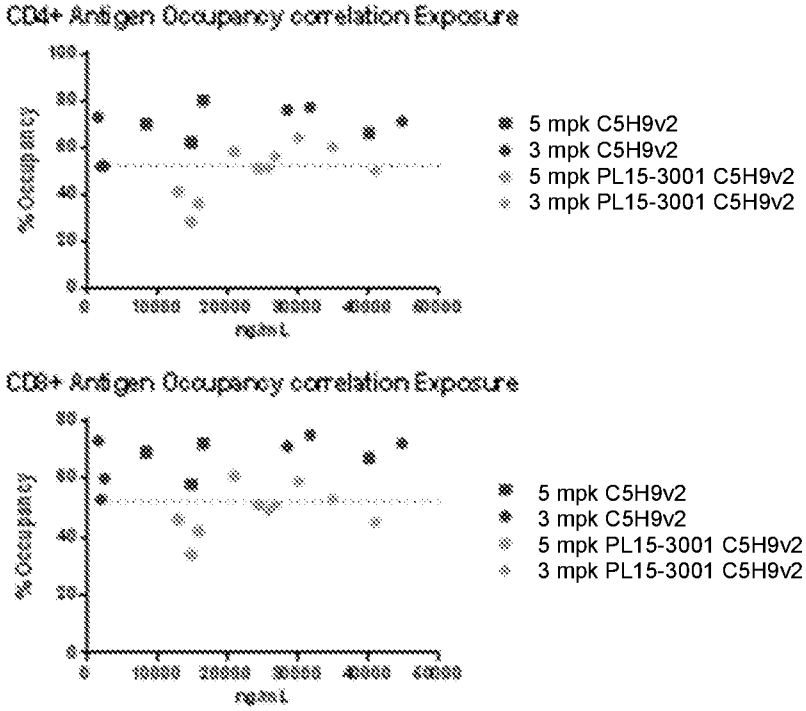
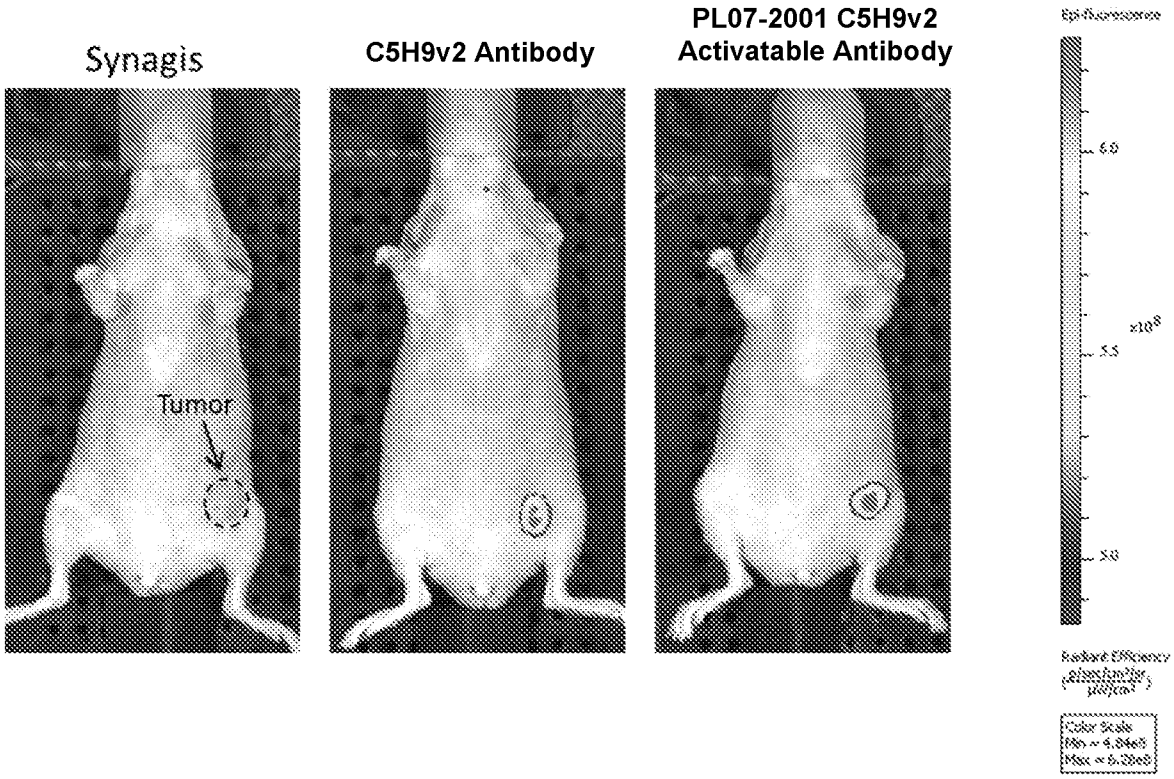


FIGURE 30



2016233495 14 Aug 2018

SEQUENCE LISTING

<110> CYTOMX THERAPEUTICS, INC.
WEST, JAMES WILLIAM
MEI, LI
MOORE, STEPHEN JAMES
NGUYEN, MARGARET
HOSTETTER, DANIEL
VASILJEVA, OLGA
SAGERT, JASON
TERRETT, JONATHAN

<120> ANTI-PDL1 ANTIBODIES, ACTIVATABLE ANTI-PDL1 ANTIBODIES, AND METHODS OF USE THEREOF

<130> CYTM-038/N02CA 322001-2378

<140> CA 2978942
<141> 2017-09-06

<150> PCT/US2016/022345
<151> 2016-03-14

<150> US 62/218,883
<151> 2015-09-15

<150> US 62/139,596
<151> 2015-03-27

<150> US 62/133,231
<151> 2015-03-13

<160> 1203

2016233495 14 Aug 2018

<170> PatentIn version 3.5

<210> 1

<211> 720

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcagat attactgcgt cgggttagag gacaacgtac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gagatcgaag 300

attgcttttg actactgggg ccagggaacc ctggtcaccg tctcgagcgg tggaggcggt 360

tcaggcggag gtggcagcgg cggtggcggg tcgacggaca tccagatgac ccagtctcca 420

tcctccctgt ctgcatctgt aggagacaga gtcaccatca cttgccgggc aagtcagagc 480

attagcagct atttaaattg gtatcagcag aaaccaggga aagcccctaa gctcctgatc 540

tataaggcat cccgtttgca aagtggggtc ccatcaaggt tcagtggcag tggatctggg 600

acagatttca ctctcaccat cagcagtctg caacctgaag attttgcaac ttactactgt 660

caacagcgtg cgcttaagcc tgtgacgttc ggccaaggga ccaaggtgga aatcaaacgg 720

<210> 2

<211> 240

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 2

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Asp Ile Thr Ala Ser Gly Gln Arg Thr Thr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Ser Lys Ile Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
115 120 125

Gly Gly Ser Thr Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
130 135 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser
145 150 155 160

Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
165 170 175

Lys Leu Leu Ile Tyr Lys Ala Ser Arg Leu Gln Ser Gly Val Pro Ser
180 185 190

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
195 200 205

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Arg Ala
210 215 220

Leu Lys Pro Val Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
225 230 235 240

<210> 3
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 3
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagacta 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt attaataagg atggtcatta tacaagttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaaaatctt 300

gatgagtttg actactgggg ccagggaacc ctggtcaccg tctcgagcgg tggaggcggt 360

tcaggcggag gtggcagcgg cggtggcggg tcgacggaca tccagatgac ccagtctcca 420

tcctccctgt ctgcatctgt aggagacaga gtcaccatca cttgccgggc aagtcagagc 480

attagcagct atttaaattg gtatcagcag aaaccaggga aagcccctaa gctcctgatc 540

tatgctgcat ccagtttgca aagtggggtc ccatcaaggt tcagtggcag tggatctggg 600

acagatttca ctctcaccat cagcagtctg caacctgaag attttgcaac ttactactgt 660

caacagagtt acagtacccc taatacgttc ggccaaggga ccaaggtgga aatcaaacgg 720

<210> 4

<211> 240

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 4

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Asn Lys Asp Gly His Tyr Thr Ser Tyr Ala Asp Ser Val
50 55 60

```
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Lys Asn Leu Asp Glu Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
        115                 120                 125

Gly Gly Ser Thr Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
    130                 135                 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser
145                 150                 155                 160

Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
                165                 170                 175

Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser
            180                 185                 190
```

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
195 200 205

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr
210 215 220

Ser Thr Pro Asn Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
225 230 235 240

<210> 5
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 5
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatct attatggcta ctggtgctgg tacattgtac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaagatggt 300

gcggggtttg actactgggg ccagggaacc ctggtcaccg tctcgagcgg tggaggcggt 360

tcaggcggag gtggcagcgg cggtggcggg tcgacggaca tccagatgac ccagtctcca 420

tcctccctgt ctgcatctgt aggagacaga gtcaccatca cttgccgggc aagtcagagc 480

attagcagct atttaaattg gtatcagcag aaaccaggga aagcccctaa gctcctgatc 540

tattctgcat cccagttgca aagtggggtc ccatcaaggt tcagtggcag tggatctggg 600

acagatttca ctctcaccat cagcagtctg caacctgaag attttgcaac ttactactgt 660

caacaggcga attcgcggcc ttctacgttc ggccaaggga ccaaggtgga aatcaaacgg 720

<210> 6

<211> 240

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 6

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

```
        35                  40                  45

Ser Ser Ile Met Ala Thr Gly Ala Gly Thr Leu Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Lys Asp Gly Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
        115                 120                 125

Gly Gly Ser Thr Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
    130                 135                 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser
145                 150                 155                 160

Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
                165                 170                 175
```

14 Aug 2018 2016233495

Lys Leu Leu Ile Tyr Ser Ala Ser Gln Leu Gln Ser Gly Val Pro Ser
180 185 190

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
195 200 205

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ala Asn
210 215 220

Ser Arg Pro Ser Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
225 230 235 240

<210> 7
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 7
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctgtagtg ggtctcaact attacttctt ctggtgctgc tacatattac 180

2016233495 14 Aug 2018

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaaaattat 300

actggttttg actactgggg ccagggaacc ctggtcaccg tctcgagcgg tggaggcggt 360

tcaggcggag gtggcagcgg cggtggcggg tcgacggaca tccagatgac ccagtctcca 420

tcctccctgt ctgcatctgt aggagacaga gtcaccatca cttgccgggc aagtcagagc 480

attagcagct atttaaattg gtatcagcag aaaccaggga aagcccctaa gctcctgatc 540

tataatgcat cctccttgca aagtggggtc ccatcaaggt tcagtggcag tggatctggg 600

acagatttca ctctcaccat cagcagtctg caacctgaag attttgcaac ttactactgt 660

caacagtata cttatggtcc tggtacgttc ggccaaggga ccaaggtgga aatcaaacgg 720

<210> 8

<211> 240

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 8

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

1 5 10 15

```
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Gln Trp Val
        35                  40                  45

Ser Thr Ile Thr Ser Ser Gly Ala Ala Thr Tyr Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Lys Asn Tyr Thr Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
        115                 120                 125

Gly Gly Ser Thr Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
    130                 135                 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser
```

145 150 155 160

Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
165 170 175

Lys Leu Leu Ile Tyr Asn Ala Ser Ser Leu Gln Ser Gly Val Pro Ser
180 185 190

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
195 200 205

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Thr
210 215 220

Tyr Gly Pro Gly Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
225 230 235 240

<210> 9
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 9
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

2016233495 14 Aug 2018

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatcttct 300

gctggttttg actactgggg ccagggaacc ctggtcaccg tctcgagcgg tggaggcggt 360

tcaggcggag gtggcagcgg cggtggcggg tcgacggaca tccagatgac ccagtctcca 420

tcctccctgt ctgcatctgt aggagacaga gtcaccatca cttgccgggc aagtcagagc 480

attagcagct atttaaattg gtatcagcag aaaccaggga aagcccctaa gctcctgatc 540

tattatgcat ccactttgca aagtggggtc ccatcaaggt tcagtggcag tggatctggg 600

acagatttca ctctcaccat cagcagtctg caacctgaag attttgcaac ttactactgt 660

caacaggata atggttatcc ttctacgttc ggccaaggga ccaaggtgga aatcaaacgg 720

<210> 10

<211> 240

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 10

```
Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly
        115                 120                 125
```

2016233495 14 Aug 2018

```
Gly Gly Ser Thr Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
    130                 135                 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser
145                 150                 155                 160

Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro
                165                 170                 175

Lys Leu Leu Ile Tyr Tyr Ala Ser Thr Leu Gln Ser Gly Val Pro Ser
            180                 185                 190

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
        195                 200                 205

Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn
    210                 215                 220

Gly Tyr Pro Ser Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
225                 230                 235                 240
```

<210> 11

<211> 324

<212> DNA

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 11

gacatccaga tgacccagtc tccatcctcc ctgtctgcat ctgtaggaga cagagtcacc 60

atcacttgcc gggcaagtca gagcattagc agctatttaa attggtatca gcagaaacca 120

gggaaagccc ctaagctcct gatctattat gcatccactt tgcaaagtgg ggtcccatca 180

aggttcagtg gcagtggatc tgggacagat ttcactctca ccatcagcag tctgcaacct 240

gaagattttg caacttacta ctgtcaacag gataatggtt atccttctac gttcggccaa 300

gggaccaagg tggaaatcaa acgg 324

<210> 12

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 12

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Tyr Ala Ser Thr Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 13
<211> 360
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 13
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatcttct 300

gctggtagtc ggccgggttt tgactactgg ggccagggaa ccctggtcac cgtctcgagc 360

<210> 14

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 14

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Ser Ser Ala Gly Gln Ser Arg Pro Gly Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 15
<211> 360
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 15
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

2016233495 14 Aug 2018

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatcttct 300

gctggttcgt ggccgggttt tgactactgg ggccagggaa ccctggtcac cgtctcgagc 360

<210> 16

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 16

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

14 Aug 2018 2016233495

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Ser Ser Ala Gly Gln Ser Trp Pro Gly Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 17
<211> 363
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 17
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatcttct 300

gctggtcagt cgtttccggg ttttgactac tggggccagg gaaccctggt caccgtctcg 360

agc 363

<210> 18

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 18

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

14 Aug 2018 2016233495

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Ser Ser Ala Gly Gln Ser Phe Pro Gly Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 19
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 19
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctgcttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 20

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 20

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 21
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 21
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctgcttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 22

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 22

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

14 Aug 2018 2016233495

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Gly Tyr Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 23
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 23
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttattcta ctggtggtgc tacagcttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

aagggttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 24

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 24

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

2016233495 14 Aug 2018

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Lys Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 25
<211> 352
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 25
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggaagt agggtattgt gacagtgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

2016233495 14 Aug 2018

<210> 26

<211> 113

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 26

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Lys Gln Gly Ile Val Thr Val Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val

<210> 27
<211> 352
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 27
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagttagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 28

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 28

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

2016233495 14 Aug 2018

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 29
<211> 352
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 29
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcagat atttggaagt agggtatggt tacagtgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 30
<211> 115
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 30

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Asp Ile Trp Lys Gln Gly Met Val Thr Val Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 31
<211> 352
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 31
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatcg atttggaggt agggtctggc gacagcgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 32
<211> 115
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 32

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Gln Gly Leu Ala Thr Ala Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

2016233495 14 Aug 2018

Val Ser Ser
115

<210> 33
<211> 352
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 33
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcagag attgtggcta ctggtatttt gacaagtagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 34
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 34

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Glu Ile Val Ala Thr Gly Ile Leu Thr Ser Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

2016233495 14 Aug 2018

<210> 35

<211> 352

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 35

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatcg attggtcggt agggtttgat tacagttagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 36

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 36

2016233495 14 Aug 2018

```
Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ser Ser Ile Gly Arg Gln Gly Leu Ile Thr Val Tyr Asp Ser Val Lys
    50                  55                  60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65                  70                  75                  80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
                85                  90                  95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
            100                 105                 110

Val Ser Ser
        115
```

2016233495 14 Aug 2018

<210> 37

<211> 352

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 37

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatct atttggtatt agggtctggt gacagttagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 38

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 38

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 39
<211> 352

2016233495 14 Aug 2018

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 39

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcagat atttggaagt agggttttgc tacagcgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 40

<211> 114

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 40

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

1 5 10 15

2016233495 14 Aug 2018

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Asp Ile Trp Lys Gln Gly Phe Ala Thr Ala Asp Ser Val Lys Gly
50 55 60

Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
65 70 75 80

Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Lys
85 90 95

Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val
100 105 110

Ser Ser

<210> 41
<211> 352
<212> DNA
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 41

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggaagt agggtattgt gacagtgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 42

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 42

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr

20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Lys Gln Gly Ile Val Thr Val Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 43
<211> 352
<212> DNA
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 43

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggGtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatcg atttggaggt agggtctggc gacagcgagc 180

ttacgcagac tccgtgaagg gccggttcac catctccaga gacaattcca agaacacgct 240

gtatctgcaa atgaacagcc tgagagccga ggacacggcc gtatattact gtgcgaaatc 300

ttctgctggt tttgactact ggggccaggg aaccctggtc accgtctcga gc 352

<210> 44

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 44

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

2016233495 14 Aug 2018

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Gln Gly Leu Ala Thr Ala Tyr Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys Ser Ser Ala Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 45
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 45

gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctgcttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 46

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 46

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 47
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 47
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctggttatg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 48

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 48

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Gly Tyr Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 49
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 49
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

aagggttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 50

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 50

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val

2016233495 14 Aug 2018

50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Lys Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 51
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 51
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcatct atttggtatc agggtctggt gacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctgcttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 52

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 52

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Glu Thr Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu
35 40 45

Trp Val Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Ala Asp
50 55 60

2016233495 14 Aug 2018

Ser Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr
65 70 75 80

Leu Tyr Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr
85 90 95

Tyr Cys Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 53
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 53
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

gctggttatg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 54

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 54

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr

65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Gly Tyr Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 55
<211> 348
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 55
gaggtgcagc tgttggagtc tgggggaggc ttggtacagc ctgggggtc cctgagactc 60

tcctgtgcag cctctggatt cacctttagc agctatgcca tgagctgggt ccgccaggct 120

ccagggaagg ggctggagtg ggtctcaagt atttggcgga atggtattgt tacagtttac 180

gcagactccg tgaagggccg gttcaccatc tccagagaca attccaagaa cacgctgtat 240

ctgcaaatga acagcctgag agccgaggac acggccgtat attactgtgc gaaatggtct 300

aagggttttg actactgggg ccagggaacc ctggtcaccg tctcgagc 348

<210> 56

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 56

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

2016233495 14 Aug 2018

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Lys Gly Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 57
<211> 324
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 57
gatattcaga tgacccagag cccgagcagc ctgagcgcga gcgtgggcga tcgcgtgacc 60

attacctgcc gcgcgagcca gagcattagc agctatctga actggtatca gcagaaaccg 120

ggcaaagcgc cgaaactgct gatttatgcg gcgagcagcc tgcagagcgg cgtgccgagc 180

cgctttagcg gcagcggcag cggcaccgat tttaccctga ccattagcag cctgcagccg 240

gaagattttg cgacctatta ttgccagcag gataacggct atccgagcac ctttggcggc 300

ggcaccaaag tggaaattaa acgc 324

<210> 58

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 58

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser

85 90 95

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 59
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 59

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly
1 5 10 15

<210> 60
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 60

Ile Ala Cys Arg His Phe Met Glu Gln Leu Pro Phe Cys His His
1 5 10 15

<210> 61

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 61

Phe Gly Pro Arg Cys Gly Glu Ala Ser Thr Cys Val Pro Tyr Glu
1 5 10 15

<210> 62

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 62

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro
1 5 10 15

<210> 63

<211> 15

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 63

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr
1 5 10 15

<210> 64

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 64

Asp Gly Pro Arg Cys Phe Val Ser Gly Glu Cys Ser Pro Ile Gly
1 5 10 15

<210> 65

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 65

Leu Cys Tyr Lys Leu Asp Tyr Asp Asp Arg Ser Tyr Cys His Ile
1 5 10 15

<210> 66
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 66

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 67
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 67

Pro Cys Tyr Trp His Pro Phe Phe Ala Tyr Arg Tyr Cys Asn Thr
1 5 10 15

14 Aug 2018 2016233495

<210> 68

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 68

Val Cys Tyr Tyr Met Asp Trp Leu Gly Arg Asn Trp Cys Ser Ser
1 5 10 15

<210> 69

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 69

Leu Cys Asp Leu Phe Lys Leu Arg Glu Phe Pro Tyr Cys Met Gly
1 5 10 15

<210> 70

<211> 15

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 70

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys
1 5 10 15

<210> 71

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 71

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr
1 5 10 15

<210> 72

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 72

Ala Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 73
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 73

Pro Cys His Pro Ala Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 74
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 74

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

2016233495 14 Aug 2018

<210> 75

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 75

Pro Cys His Pro His Pro Ala Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 76

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 76

Pro Cys His Pro His Pro Tyr Ala Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 77

<211> 15

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 77

Pro Cys His Pro His Pro Tyr Asp Ala Ala Pro Tyr Cys Asn Val
1 5 10 15

<210> 78

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 78

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Ala Cys Asn Val
1 5 10 15

<210> 79

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 79

2016233495 14 Aug 2018

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Ala Val
1 5 10 15

<210> 80
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 80

Pro Cys His Ala His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val
1 5 10 15

<210> 81
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 81

Pro Cys His Pro His Pro Tyr Asp Ala Arg Ala Tyr Cys Asn Val
1 5 10 15

<210> 82

2016233495 14 Aug 2018

<211> 534

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 82

caaggtcagt ctggatccta ttgcgaggtt agtgagctgt ttgttcttcc ttggtgcatg 60

ggtggaggtg gctcgagcgg tggcagcggt ggctctggtg gtactagcac ctctggtcgt 120

tccgctaacc cacgtggcgg cggttctgac atccagatga cccagagccc cagcagcctg 180

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 240

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 300

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 360

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 420

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 480

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 534

<210> 83

<211> 157

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 83

Gln Gly Gln Ser Gly Ser Tyr Cys Glu Val Ser Glu Leu Phe Val Leu
1 5 10 15

Pro Trp Cys Met Gly Gly Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser
20 25 30

Gly Gly Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly
35 40 45

Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val
50 55 60

Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser
65 70 75 80

Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu
85 90 95

Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser
100 105 110

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln

2016233495 14 Aug 2018

115 120 125

Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro
130 135 140

Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 84
<211> 534
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 84
caaggtcagt ctggatcctc ttgccttatg catccgcatt atgctcatga ttattgctat 60

gttggaggtg gctcgagcgg tggcagcggt ggctctggtg gtactagcac ctctggtcgt 120

tccgctaacc cacgtggcgg cggttctgac atccagatga cccagagccc cagcagcctg 180

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 240

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 300

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 360

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 420

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 480

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 534

<210> 85

<211> 157

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 85

Gln Gly Gln Ser Gly Ser Ser Cys Leu Met His Pro His Tyr Ala His
1 5 10 15

Asp Tyr Cys Tyr Val Gly Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser
20 25 30

Gly Gly Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly
35 40 45

Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val
50 55 60

Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser

2016233495 14 Aug 2018

65 70 75 80

Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu
85 90 95

Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser
100 105 110

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln
115 120 125

Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro
130 135 140

Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 86
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 86
ttgtgcgagg ttttgatgtt gttgcagcat ccgtggtgca tgggggggagg tggctcgagc 60

2016233495 14 Aug 2018

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 87

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 87

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser

```
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140

Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 88

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 88

attgcgtgcc ggcattttat ggagcagttg ccgttttgcc atcatggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 89

<211> 151

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 89

Ile Ala Cys Arg His Phe Met Glu Gln Leu Pro Phe Cys His His Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

14 Aug 2018 2016233495

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 90
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 90
tttggtccta ggtgcggtga ggcttctact tgcgttccgt atgagggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 91

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 91

Phe Gly Pro Arg Cys Gly Glu Ala Ser Thr Cys Val Pro Tyr Glu Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

2016233495 14 Aug 2018

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 92
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 92

attctttatt gcgatagttg gggggcgggg tgcttgacgc ggccgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 93

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 93

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140
```

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 94
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 94
gggattgcgt tgtgcccgtc tcatttttgc cagctgcctc agactggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 95

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 95

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 96
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 96
gatgggccgc gttgctttgt gtcgggggag tgctctccga ttggtggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 97

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 97

Asp Gly Pro Arg Cys Phe Val Ser Gly Glu Cys Ser Pro Ile Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

2016233495 14 Aug 2018

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 98
<211> 516
<212> DNA
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 98

ttgtgctata agctggatta tgatgatagg tcttattgcc atattggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 99

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 99

2016233495 14 Aug 2018

```
Leu Cys Tyr Lys Leu Asp Tyr Asp Asp Arg Ser Tyr Cys His Ile Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125
```

2016233495 14 Aug 2018

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 100
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 100
ccgtgccatc cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 101

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 101

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

2016233495 14 Aug 2018

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 102
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 102
ccttgctatt ggcatccttt ttttgcgtat aggtattgca atactggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

14 Aug 2018 2016233495

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 103

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 103

Pro Cys Tyr Trp His Pro Phe Phe Ala Tyr Arg Tyr Cys Asn Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

2016233495 14 Aug 2018

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 104

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 104

gtttgctatt atatggattg gttggggcgg aattggtgct cttcgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 105

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 105

Val Cys Tyr Tyr Met Asp Trp Leu Gly Arg Asn Trp Cys Ser Ser Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr

2016233495 14 Aug 2018

115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 106
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 106
ctgtgcgatc tgtttaagtt gcgtgagttt ccttattgca tgggggggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 107

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 107

Leu Cys Asp Leu Phe Lys Leu Arg Glu Phe Pro Tyr Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln

65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 108
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 108
tatcttccgt gccattttgt tccgattggg gcttgcaata ataagggagg tggctcgagc 60

2016233495 14 Aug 2018

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 109

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 109

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser

```
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140

Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 110

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 110

atttttgcc atatgggtgt tgtggttcct cagtgcgcga attatggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 111

<211> 151

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 111

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

14 Aug 2018 2016233495

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 112
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 112
gcgtgccatc cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

2016233495 14 Aug 2018

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 113

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 113

Ala Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

2016233495 14 Aug 2018

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 114
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 114

ccgtgccatc cggctcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 115

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 115

Pro Cys His Pro Ala Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140
```

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 116
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 116
ccgtgccatc cgcatgctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

2016233495 14 Aug 2018

<210> 117

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 117

```
Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95
```

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 118
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 118
ccgtgccatc cgcatcctgc tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

2016233495 14 Aug 2018

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 119

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 119

Pro Cys His Pro His Pro Ala Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

2016233495 14 Aug 2018

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 120
<211> 516
<212> DNA
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 120

ccgtgccatc cgcatcctta tgctgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 121

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 121

2016233495 14 Aug 2018

```
Pro Cys His Pro His Pro Tyr Ala Ala Arg Pro Tyr Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125
```

2016233495 14 Aug 2018

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 122
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 122
ccgtgccatc cgcatcctta tgatgctgct ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

2016233495 14 Aug 2018

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 123

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 123

Pro Cys His Pro His Pro Tyr Asp Ala Ala Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

2016233495 14 Aug 2018

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 124
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 124
ccgtgccatc cgcatcctta tgatgctcgt cctgcttgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

2016233495 14 Aug 2018

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 125

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 125

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Ala Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

2016233495 14 Aug 2018

```
Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140

Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 126

2016233495 14 Aug 2018

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 126

ccgtgccatc cgcatcctta tgatgctcgt ccttattgcg ctgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 127

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 127

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Ala Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr

115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 128
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 128
ccgtgccatg cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

14 Aug 2018 2016233495

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 129

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 129

Pro Cys His Ala His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln

2016233495 14 Aug 2018

65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 130
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 130
ccgtgccatc cgcatcctta tgatgctcgt gcttattgca atgtgggagg tggctcgagc 60

2016233495 14 Aug 2018

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 131

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 131

Pro Cys His Pro His Pro Tyr Asp Ala Arg Ala Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser

2016233495 14 Aug 2018

20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

2016233495 14 Aug 2018

<210> 132

<211> 474

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 132

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 133

<211> 152

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 133

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 134
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 134
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 135

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 135

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

2016233495 14 Aug 2018

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 136
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 136
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 137

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 137

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

```
Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 138

<211> 474

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 138

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 139

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 139

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

2016233495 14 Aug 2018

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 140
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 140
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 141

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 141

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser

85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 142
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 142
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

2016233495 14 Aug 2018

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 143

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 143

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 144
<211> 474
<212> DNA
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 144

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 145

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 145

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly

1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

14 Aug 2018 2016233495

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 146
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 146
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 147

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 147

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

2016233495 14 Aug 2018

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 148
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 148
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 149

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 149

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

2016233495 14 Aug 2018

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 150
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 150

ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 151

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 151

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly

1 5 10 15

2016233495 14 Aug 2018

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg

2016233495 14 Aug 2018

145 150

<210> 152

<211> 477

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 152

ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 153

<211> 153

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 153

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 154
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 154
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 155

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 155

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp

2016233495 14 Aug 2018

65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 156
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 156
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 157

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 157

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

2016233495 14 Aug 2018

```
Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
        35                  40                  45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
    50                  55                  60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65                  70                  75                  80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
                85                  90                  95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
            100                 105                 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
        115                 120                 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
    130                 135                 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

2016233495 14 Aug 2018

<210> 158

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 158

Ser Tyr Ala Met Ser
1 5

<210> 159

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 159

Ala Ile Ser Gly Ser Gly Gly Ser Thr Tyr Tyr
1 5 10

<210> 160

<211> 11

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 160

Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr
1 5 10

<210> 161

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (3)..(5)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (7)..(8)

<223> Xaa can be any naturally occurring amino acid

14 Aug 2018 2016233495

<220>

<221> misc_feature

<222> (10)..(10)

<223> Xaa can be any naturally occurring amino acid

<400> 161

Xaa Ile Xaa Xaa Xaa Gly Xaa Xaa Thr Xaa Tyr
1 5 10

<210> 162

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 162

Ser Ser Ala Gly Phe Asp Tyr
1 5

<210> 163

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (1)..(2)

<223> Xaa can be any naturally occurring amino acid

<400> 163

Xaa Xaa Ala Gly Phe Asp Tyr
1 5

<210> 164

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (2)..(3)

<223> Xaa can be any naturally occurring amino acid

<400> 164

Ser Xaa Xaa Gly Phe Asp Tyr
1 5

<210> 165

2016233495 14 Aug 2018

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (3)..(4)

<223> Xaa can be any naturally occurring amino acid

<400> 165

Ser Ser Xaa Xaa Phe Asp Tyr
1 5

<210> 166

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa can be any naturally occurring amino acid

<400> 166

Xaa Ser Xaa Gly Phe Asp Tyr
1 5

<210> 167

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa can be any naturally occurring amino acid

<400> 167

Xaa Ser Ala Xaa Phe Asp Tyr

2016233495 14 Aug 2018

1 5

<210> 168

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa can be any naturally occurring amino acid

<400> 168

Ser Xaa Ala Xaa Phe Asp Tyr

1 5

<210> 169

<211> 7

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa can be any naturally occurring amino acid

<400> 169

Xaa Ser Ala Gly Xaa Asp Tyr
1 5

<210> 170

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa can be any naturally occurring amino acid

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa can be any naturally occurring amino acid

<400> 170

Ser Xaa Ala Gly Xaa Asp Tyr

1 5

<210> 171

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa can be any naturally occurring amino acid

<400> 171

2016233495 14 Aug 2018

Ser Ser Xaa Gly Xaa Asp Tyr
1 5

<210> 172
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (4)..(5)
<223> Xaa can be any naturally occurring amino acid

<400> 172

Ser Ser Ala Xaa Xaa Asp Tyr
1 5

<210> 173
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (2)..(5)

<223> Xaa can be any naturally occurring amino acid

<400> 173

Thr Xaa Xaa Xaa Xaa Phe
1 5

<210> 174

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 174

Gln Ser Ile Ser Ser Tyr
1 5

<210> 175

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018
2016233495

<400> 175

Ala Ala Ser Ser
1

<210> 176
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 176

Tyr Ala Ser Thr
1

<210> 177
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 177

Cys Gln Gln Ser Tyr Ser Thr Pro Pro
1 5

14 Aug 2018 2016233495

<210> 178

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 178

Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr
1 5 10

<210> 179

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa can be any naturally occurring amino acid

2016233495 14 Aug 2018

<400> 179

Xaa Ala Ser Xaa
1

<210> 180
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (1)..(2)
<223> Xaa can be any naturally occurring amino acid

<400> 180

Xaa Xaa Gly Tyr Pro Ser Thr
1 5

<210> 181
<211> 7
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<220>
<221> misc_feature
<222> (2)..(3)
<223> Xaa can be any naturally occurring amino acid

<400> 181

Asp Xaa Xaa Tyr Pro Ser Thr
1 5

<210> 182
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (3)..(4)
<223> Xaa can be any naturally occurring amino acid

<400> 182

Asp Asn Xaa Xaa Pro Ser Thr
1 5

14 Aug 2018
2016233495

<210> 183

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa can be any naturally occurring amino acid

<400> 183

Asp Asn Gly Xaa Pro Xaa Thr
1 5

<210> 184

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (6)..(7)

<223> Xaa can be any naturally occurring amino acid

<400> 184

Asp Asn Gly Tyr Pro Xaa Xaa

1 5

<210> 185

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa can be any naturally occurring amino acid

<400> 185

2016233495 14 Aug 2018

Xaa Asn Xaa Tyr Pro Ser Thr
1 5

<210> 186
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (1)..(1)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (4)..(4)
<223> Xaa can be any naturally occurring amino acid

<400> 186

Xaa Asn Gly Xaa Pro Ser Thr
1 5

<210> 187
<211> 7
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa can be any naturally occurring amino acid

<400> 187

Xaa Asn Gly Tyr Pro Xaa Thr
1 5

<210> 188

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

2016233495 14 Aug 2018

<222> (2)..(2)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa can be any naturally occurring amino acid

<400> 188

Asp Xaa Gly Xaa Pro Ser Thr
1 5

<210> 189

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa can be any naturally occurring amino acid

14 Aug 2018
2016233495

<400> 189

Asp Xaa Gly Tyr Pro Xaa Thr
1 5

<210> 190
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (3)..(3)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (6)..(6)
<223> Xaa can be any naturally occurring amino acid

<400> 190

Asp Asn Xaa Tyr Pro Xaa Thr
1 5

<210> 191
<211> 5

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 191

Gly Ser Gly Gly Ser
1 5

<210> 192

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 192

Gly Gly Gly Ser
1

<210> 193

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 193

Gly Gly Ser Gly
1

<210> 194
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 194

Gly Gly Ser Gly Gly
1 5

<210> 195
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 195

Gly Ser Gly Ser Gly
1 5

2016233495 14 Aug 2018

<210> 196

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 196

Gly Ser Gly Gly Gly

1 5

<210> 197

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 197

Gly Gly Gly Ser Gly

1 5

<210> 198

<211> 5

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 198

Gly Ser Ser Ser Gly
1 5

<210> 199

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 199

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly
1 5 10

<210> 200

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 200

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly
1 5 10

<210> 201
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 201

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser
1 5 10

<210> 202
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 202

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Gly Ser
1 5 10 15

14 Aug 2018 2016233495

<210> 203

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 203

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly
1 5 10

<210> 204

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 204

Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Ser
1 5 10

<210> 205

<211> 4

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 205

Gly Gly Gly Ser
1

<210> 206

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 206

Gly Ser Ser Gly Thr
1 5

<210> 207

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 207

2016233495 14 Aug 2018

Gly Ser Ser Gly
1

<210> 208
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 208

Tyr Cys Glu Val Ser Glu Leu Phe Val Leu Pro Trp Cys Met Gly
1 5 10 15

<210> 209
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 209

Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn
1 5 10

2016233495 14 Aug 2018

<210> 210

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 210

Lys Ala Ser Arg Leu Gln Ser
1 5

<210> 211

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 211

Arg Ala Leu Lys Pro Val Thr
1 5

<210> 212

<211> 5

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 212

Ser Tyr Ala Met Ser
1 5

<210> 213

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 213

Asp Ile Thr Ala Ser Gly Gln Arg Thr Thr Tyr Ala Asp Ser
1 5 10

<210> 214

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 214

2016233495 14 Aug 2018

Ser Lys Ala Ile Phe Asp Tyr
1 5

<210> 215
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 215

Ala Ala Ser Ser Leu Gln Ser
1 5

<210> 216
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 216

Ser Tyr Ser Thr Pro Asn Thr
1 5

<210> 217

2016233495 14 Aug 2018

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 217

Ser Ile Asn Lys Asp Gly His Tyr Thr Ser Tyr Ala Asp Ser
1 5 10

<210> 218

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 218

Asn Leu Asp Glu Phe Asp Tyr
1 5

<210> 219

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 219

Ser Ala Ser Gln Leu Gln Ser
1 5

<210> 220
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 220

Ala Asn Ser Arg Pro Ser Thr
1 5

<210> 221
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 221

Ser Ile Met Ala Thr Gly Ala Gly Thr Leu Tyr Ala Asp Ser

2016233495 14 Aug 2018

1 5 10

<210> 222

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 222

Asp Gly Ala Gly Phe Asp Tyr

1 5

<210> 223

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 223

Asn Ala Ser Ser Leu Gln Ser

1 5

<210> 224

<211> 6

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 224

Tyr Pro Tyr Gly Pro Gly
1 5

<210> 225

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 225

Thr Ile Thr Ser Ser Gly Ala Ala Thr Tyr Tyr Ala Asp Ser
1 5 10

<210> 226

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 226

Asn Tyr Thr Gly Phe Asp Tyr
1 5

<210> 227
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 227

Tyr Ala Ser Thr Leu Gln Ser
1 5

<210> 228
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 228

Asp Asn Gly Tyr Pro Ser Thr
1 5

<210> 229

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 229

Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser
1 5 10

<210> 230

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 230

Ser Ser Ala Gly Phe Asp Tyr
1 5

<210> 231

<211> 15

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 231

Ser Ser Ile Tyr Ser Thr Gly Gly Ala Thr Ala Tyr Ala Asp Ser
1 5 10 15

<210> 232

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 232

Ser Ser Ala Gly Gln Ser Arg Pro Gly Phe Asp Tyr
1 5 10

<210> 233

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 233

Ser Ser Ala Gly Gln Ser Trp Pro Gly Phe Asp Tyr
1 5 10

<210> 234
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 234

Ser Ser Ala Gly Gln Ser Phe Pro Gly Phe Asp Tyr
1 5 10

<210> 235
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 235

Trp Ser Ala Ala Phe Asp Tyr
1 5

2016233495 14 Aug 2018

<210> 236

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 236

Trp Ser Ala Gly Tyr Asp Tyr

1 5

<210> 237

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 237

Trp Ser Lys Gly Phe Asp Tyr

1 5

<210> 238

<211> 14

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 238

Ser Ser Ile Trp Lys Gln Gly Ile Val Thr Val Tyr Asp Ser
1 5 10

<210> 239

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 239

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Asp Ser
1 5 10

<210> 240

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 240

2016233495 14 Aug 2018

Ser Asp Ile Trp Lys Gln Gly Met Val Thr Val Tyr Asp Ser
1 5 10

<210> 241
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 241

Ser Ser Ile Trp Arg Gln Gly Leu Ala Thr Ala Tyr Asp Ser
1 5 10

<210> 242
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 242

Ser Glu Ile Val Ala Thr Gly Ile Leu Thr Ser Tyr Asp Ser
1 5 10

2016233495 14 Aug 2018

<210> 243

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 243

Ser Ser Ile Gly Arg Gln Gly Leu Ile Thr Val Tyr Asp Ser
1 5 10

<210> 244

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 244

Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Asp Ser
1 5 10

<210> 245

<211> 13

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 245

Ser Asp Ile Trp Lys Gln Gly Phe Ala Thr Ala Asp Ser
1 5 10

<210> 246

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 246

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser
1 5 10 15

<210> 247

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 247

2016233495 14 Aug 2018

Ser Ser Ile Trp Tyr Gln Gly Leu Val Thr Val Tyr Ala Asp Ser
1 5 10 15

<210> 248
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 248

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 Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Gly Phe Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Trp Ile Thr Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Leu
50 55 60

Gln Gly Arg Val Thr Met Thr Thr Asp Thr Ser Thr Ser Thr Val Tyr
65 70 75 80

2016233495 14 Aug 2018

Met Glu Leu Arg Ser Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Tyr Phe Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr
100 105 110

Val Thr Val Ser Ser
115

<210> 249
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 249

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Thr Ser Gly Asp Thr Phe Ser Thr Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

14 Aug 2018 2016233495

Gly Gly Ile Ile Pro Ile Phe Gly Lys Ala His Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Phe Cys
85 90 95

Ala Arg Lys Phe His Phe Val Ser Gly Ser Pro Phe Gly Met Asp Val
100 105 110

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 250
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 250

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala

2016233495 14 Aug 2018

1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Asp Val His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Met
35 40 45

Gly Trp Leu His Ala Asp Thr Gly Ile Thr Lys Phe Ser Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Arg 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 Glu Arg Ile Gln Leu Trp Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

<210> 251
<211> 120
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 251

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Val Ser Gly Gly Ile Phe Ser Thr Tyr
            20                  25                  30

Ala Ile Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn His Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Asp Gln Gly Ile Ala Ala Ala Leu Phe Asp Tyr Trp Gly Gln
            100                 105                 110

Gly Thr Leu Val Thr Val Ser Ser
```

2016233495 14 Aug 2018

115 120

<210> 252

<211> 110

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 252

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Val Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Val Val His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Asn Ser Gly Asn Ile Gly Tyr Ala Asp Ser Val Lys Gly Arg
50 55 60

Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu Gln Met
65 70 75 80

2016233495 14 Aug 2018

Asn Ser Leu Arg Ala Glu Asp Thr Ala Leu Tyr Tyr Cys Ala Val Pro
85 90 95

Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
100 105 110

<210> 253
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 253

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Thr Ser Gly Asp Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Arg Ala His Tyr Ala Gln Lys Phe
50 55 60

2016233495 14 Aug 2018

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Phe Cys
85 90 95

Ala Arg Lys Phe His Phe Val Ser Gly Ser Pro Phe Gly Met Asp Val
100 105 110

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 254
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 254

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Thr Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

14 Aug 2018 2016233495

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Lys Ala His Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Thr 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 Lys Tyr Asp Tyr Val Ser Gly Ser Pro Phe Gly Met Asp Val
100 105 110

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 255
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 255

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Ser Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Asp Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Ala 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 Asp Ser Ser Gly Trp Ser Arg Tyr Tyr Met Asp Val Trp Gly
100 105 110

Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

2016233495 14 Aug 2018

<210> 256

<211> 123

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 256

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Glu Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Asn Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Leu Phe Gly Ile Ala His Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Asn Thr Ala Tyr
65 70 75 80

Met Asp Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys

14 Aug 2018 2016233495

85 90 95

Ala Arg Lys Tyr Ser Tyr Val Ser Gly Ser Pro Phe Gly Met Asp Val
100 105 110

Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 257
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 257

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Ile Thr Phe Asp Asp Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

Ser Gly Ile Ser Trp Asn Arg Gly Arg Ile Glu Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Lys Gly Arg Phe Arg Tyr Phe Asp Trp Phe Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 258
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 258

Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
1 5 10 15

2016233495 14 Aug 2018

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Ser Tyr
20 25 30

Leu Val Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
35 40 45

Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Ser Asn Trp Pro Arg
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 259
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 259

Glu 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 Ser Tyr
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
35 40 45

Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Ser Asn Trp Pro Thr
85 90 95

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 260
<211> 107
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 260

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 261

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 261

Glu Ile Val Leu Thr Gln Ser Pro Gly 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 Ser Ser
20 25 30

Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu
35 40 45

Ile Tyr Gly Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu
65 70 75 80

Pro Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Gly Ser Ser Pro

85 90 95

Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 262
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 262

Glu Ile Val Leu Thr Gln Ser Pro Gly 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 Ser Ser
20 25 30

Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu
35 40 45

Ile Tyr Gly Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser
50 55 60

2016233495 14 Aug 2018

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu
65 70 75 80

Pro Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Gly Ser Ser Pro
85 90 95

Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
100 105

<210> 263
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 263

Glu 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 Ser Tyr
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
35 40 45

2016233495 14 Aug 2018

Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Ser Asn Trp Pro Thr
85 90 95

Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 264
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 264

Ala Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Ala
20 25 30

14 Aug 2018 2016233495

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Asp Ala Ser Ser Leu Glu Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Phe Asn Ser Tyr Pro Phe
85 90 95

Thr Phe Gly Pro Gly Thr Lys Val Asp Ile Lys
100 105

<210> 265
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 265

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

2016233495 14 Aug 2018

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Arg Tyr
20 25 30

Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Asn Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Gly Gly Trp Phe Gly Glu Leu Ala Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 266

<211> 108

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 266

Glu Ile Val Leu Thr Gln Ser Pro Gly Thr Leu Ser Leu Ser Pro Gly
1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Arg Val Ser Ser Ser
20 25 30

Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu
35 40 45

Ile Tyr Asp Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu
65 70 75 80

Pro Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Gly Ser Leu Pro
85 90 95

Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys

2016233495 14 Aug 2018

100 105

<210> 267

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 267

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Ser
20 25 30

Trp Ile His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Trp Ile Ser Pro Tyr Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Ala Asp Thr Ser Lys Asn Thr Ala Tyr
65 70 75 80

2016233495 14 Aug 2018

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Arg His Trp Pro Gly Gly Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ala
115

<210> 268
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 268

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

2016233495 14 Aug 2018

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Leu Tyr His Pro Ala
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 269
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 269

Asp Tyr Phe Tyr Gly Met Asp Val
1 5

<210> 270
<211> 14

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 270

Lys Phe His Phe Val Ser Gly Ser Pro Phe Gly Met Asp Val
1 5 10

<210> 271

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 271

Glu Arg Ile Gln Leu Trp Phe Asp Tyr
1 5

<210> 272

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 272

Asp Gln Gly Ile Ala Ala Ala Leu Phe Asp Tyr
1 5 10

<210> 273
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 273

Pro Phe Asp Tyr
1

<210> 274
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 274

Lys Tyr Asp Tyr Val Ser Gly Ser Pro Phe Gly Met Asp Val
1 5 10

2016233495 14 Aug 2018

<210> 275

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 275

Asp Ser Ser Gly Trp Ser Arg Tyr Tyr Met Asp Val
1 5 10

<210> 276

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 276

Lys Tyr Ser Tyr Val Ser Gly Ser Pro Phe Gly Met Asp Val
1 5 10

<210> 277

<211> 12

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 277

Gly Arg Phe Arg Tyr Phe Asp Trp Phe Leu Asp Tyr
1 5 10

<210> 278

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 278

Gln Gln Arg Ser Asn Trp Pro Arg Thr
1 5

<210> 279

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018
2016233495

<400> 279

Gln Gln Arg Ser Asn Trp Pro Thr
1 5

<210> 280
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 280

Gln Gln Tyr Asn Ser Tyr Pro Tyr Thr
1 5

<210> 281
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 281

Gln Gln Tyr Gly Ser Ser Pro Trp Thr
1 5

14 Aug 2018 2016233495

<210> 282

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 282

Gln Gln Tyr Gly Ser Ser Pro
1 5

<210> 283

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 283

Gln Gln Phe Asn Ser Tyr Pro Phe Thr
1 5

<210> 284

<211> 17

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 284

Trp Ile Thr Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Leu Gln
1 5 10 15

Gly

<210> 285

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 285

Gly Ile Ile Pro Ile Phe Gly Lys Ala His Tyr Ala Gln Lys Phe Gln
1 5 10 15

Gly

<210> 286

2016233495 14 Aug 2018

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 286

Trp Leu His Ala Asp Thr Gly Ile Thr Lys Phe Ser Gln Lys Phe Gln
1 5 10 15

Gly

<210> 287

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 287

Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn His Ala Gln Lys Phe Gln
1 5 10 15

Gly

2016233495 14 Aug 2018

<210> 288

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 288

Gly Ile Ser Gly Asn Ser Gly Asn Ile Gly Tyr Ala Asp Ser Val Lys
1 5 10 15

Gly

<210> 289

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 289

Gly Ile Ile Pro Ile Phe Gly Arg Ala His Tyr Ala Gln Lys Phe Gln
1 5 10 15

2016233495 14 Aug 2018

Gly

<210> 290
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 290

Gly Ile Ile Pro Ile Phe Gly Ser Ala Asn Tyr Ala Gln Lys Phe Gln
1 5 10 15

Asp

<210> 291
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 291

2016233495 14 Aug 2018

Gly Ile Ile Pro Leu Phe Gly Ile Ala His Tyr Ala Gln Lys Phe Gln
1 5 10 15

Gly

<210> 292
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 292

Gly Ile Ser Trp Asn Arg Gly Arg Ile Glu Tyr Ala Asp Ser Val Lys
1 5 10 15

Gly

<210> 293
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 293

Asp Ala Ser Asn Arg Ala Thr
1 5

<210> 294
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 294

Gly Ala Ser Ser Arg Ala Thr
1 5

<210> 295
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 295

Asp Ala Ser Ser Leu Glu Ser
1 5

2016233495 14 Aug 2018

<210> 296

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 296

Asp Tyr Gly Phe Ser
1 5

<210> 297

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 297

Thr Tyr Ala Ile Ser
1 5

<210> 298

<211> 5

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 298

Ser Tyr Asp Val His
1 5

<210> 299

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 299

Thr Tyr Ala Ile Asn
1 5

<210> 300

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018
2016233495

<400> 300

Asp Tyr Val Val His
1 5

<210> 301
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 301

Ser Tyr Ala Ile Ser
1 5

<210> 302
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 302

Ser Tyr Ala Ile Asn
1 5

2016233495 14 Aug 2018

<210> 303

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 303

Asp Tyr Gly Met His
1 5

<210> 304

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 304

Arg Ala Ser Gln Ser Val Ser Ser Tyr Leu Val
1 5 10

<210> 305

<211> 11

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 305

Arg Ala Ser Gln Ser Val Ser Ser Tyr Leu Ala
1 5 10

<210> 306

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 306

Arg Ala Ser Gln Gly Ile Ser Ser Trp Leu Ala
1 5 10

<210> 307

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 307

2016233495 14 Aug 2018

Arg Ala Ser Gln Ser Val Ser Ser Ser Tyr Leu Ala
1 5 10

<210> 308
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 308

Arg Ala Ser Gln Gly Ile Ser Ser Ala Leu Ala
1 5 10

<210> 309
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 309

Thr Tyr Ser Met Asn
1 5

2016233495 14 Aug 2018

<210> 310

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 310

Ser Ile Ser Ser Ser Gly Asp Tyr Ile Tyr Tyr Ala Asp Ser Val Lys
1 5 10 15

<210> 311

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 311

Asp Leu Val Thr Ser Met Val Ala Phe Asp Tyr
1 5 10

<210> 312

<211> 11

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 312

Ser Gly Asp Ala Leu Pro Gln Lys Tyr Val Phe
1 5 10

<210> 313

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 313

Glu Asp Ser Lys Arg Pro Ser
1 5

<210> 314

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 314

2016233495 14 Aug 2018

Tyr Ser Thr Asp Arg Ser Gly Asn His Arg Val
1 5 10

<210> 315
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 315

Arg Tyr Trp Met Ser
1 5

<210> 316
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 316

Asn Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val Lys
1 5 10 15

Gly

2016233495 14 Aug 2018

<210> 317

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 317

Glu Gly Gly Trp Phe Gly Glu Leu Ala Phe Asp Tyr
1 5 10

<210> 318

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 318

Arg Ala Ser Gln Arg Val Ser Ser Ser Tyr Leu Ala
1 5 10

<210> 319

<211> 7

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 319

Asp Ala Ser Ser Arg Ala Thr
1 5

<210> 320

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 320

Gln Gln Tyr Gly Ser Leu Pro Trp Thr
1 5

<210> 321

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 321

Ser Tyr Trp Met Ser
1 5

<210> 322
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 322

Asn Ile Lys Gln Asp Gly Gly Glu Gln Tyr Tyr Val Asp Ser Val Lys
1 5 10 15

<210> 323
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 323

Asp Trp Asn Tyr Gly Tyr Tyr Asp Met Asp Val
1 5 10

2016233495 14 Aug 2018

<210> 324

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 324

Arg Ala Ser Gln Ser Val Ser Ser Asn Tyr Leu Ala
1 5 10

<210> 325

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 325

Gly Thr Ser Ser Arg Ala Thr
1 5

<210> 326

<211> 9

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 326

Gln Gln Tyr Gly Ser Ser Ile Phe Thr
1 5

<210> 327

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Asp or Val

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Val or Ile

<220>

<221> misc_feature

<222> (7)..(7)

2016233495 14 Aug 2018

<223> Xaa is Ser or Asn

<220>
<221> misc_feature
<222> (9)..(9)
<223> Xaa is Ala or Phe

<220>
<221> misc_feature
<222> (10)..(10)
<223> Xaa is Val or Leu

<400> 327

Arg Ala Ser Gln Xaa Xaa Xaa Thr Xaa Xaa Ala
1 5 10

<210> 328
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (4)..(4)
<223> Xaa is Phe or Thr

<220>

14 Aug 2018 2016233495

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Tyr or Ala

<400> 328

Ser Ala Ser Xaa Leu Xaa Ser

1 5

<210> 329

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Tyr, Gly, Phe, or Ser

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Leu, Tyr, Phe, or Trp

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Tyr, Asn, Ala, Thr, Gly, Phe, or Ile

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is His, Val, Pro, Thr, or Ile

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Ala, Trp, Arg, Pro, or Thr

<400> 329

Gln Gln Xaa Xaa Xaa Xaa Pro Xaa Thr
1 5

<210> 330

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Asp or Gly

<400> 330

2016233495 14 Aug 2018

Gly Phe Thr Phe Ser Xaa Ser Trp Ile His
1 5 10

<210> 331
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (4)..(4)
<223> Xaa is Ser or Leu

<220>
<221> misc_feature
<222> (10)..(10)
<223> Xaa is Thr or Ser

<400> 331

Ala Trp Ile Xaa Pro Tyr Gly Gly Ser Xaa Tyr Tyr Ala Asp Ser Val
1 5 10 15

Lys Gly

2016233495 14 Aug 2018

<210> 332

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 332

Arg His Trp Pro Gly Gly Phe Asp Tyr
1 5

<210> 333

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 333

Arg Ala Ser Gln Asp Val Ser Thr Ala Val Ala
1 5 10

<210> 334

<211> 7

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 334

Ser Ala Ser Phe Leu Tyr Ser
1 5

<210> 335

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 335

Gln Gln Tyr Leu Tyr His Pro Ala Thr
1 5

<210> 336

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 336

2016233495 14 Aug 2018

Gly Phe Thr Phe Ser Asp Ser Trp Ile His
1 5 10

<210> 337
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 337

Ala Trp Ile Ser Pro Tyr Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
1 5 10 15

Lys Gly

<210> 338
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 338

Thr Gly Arg Gly Pro Ser Trp Val

2016233495 14 Aug 2018

1 5

<210> 339

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 339

Ser Ala Arg Gly Pro Ser Arg Trp

1 5

<210> 340

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 340

Thr Ala Arg Gly Pro Ser Phe Lys

1 5

<210> 341

<211> 8

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 341

Leu Ser Gly Arg Ser Asp Asn His
1 5

<210> 342

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 342

Gly Gly Trp His Thr Gly Arg Asn
1 5

<210> 343

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 343

His Thr Gly Arg Ser Gly Ala Leu
1 5

<210> 344
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 344

Pro Leu Thr Gly Arg Ser Gly Gly
1 5

<210> 345
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 345

Ala Ala Arg Gly Pro Ala Ile His
1 5

2016233495 14 Aug 2018

<210> 346

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 346

Arg Gly Pro Ala Phe Asn Pro Met
1 5

<210> 347

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 347

Ser Ser Arg Gly Pro Ala Tyr Leu
1 5

<210> 348

<211> 8

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 348

Arg Gly Pro Ala Thr Pro Ile Met
1 5

<210> 349

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 349

Arg Gly Pro Ala
1

<210> 350

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018
2016233495

<400> 350

Gly Gly Gln Pro Ser Gly Met Trp Gly Trp
1 5 10

<210> 351
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 351

Phe Pro Arg Pro Leu Gly Ile Thr Gly Leu
1 5 10

<210> 352
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 352

Val His Met Pro Leu Gly Phe Leu Gly Pro
1 5 10

2016233495 14 Aug 2018

<210> 353

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 353

Ser Pro Leu Thr Gly Arg Ser Gly
1 5

<210> 354

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 354

Ser Ala Gly Phe Ser Leu Pro Ala
1 5

<210> 355

<211> 9

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 355

Leu Ala Pro Leu Gly Leu Gln Arg Arg
1 5

<210> 356

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 356

Ser Gly Gly Pro Leu Gly Val Arg
1 5

<210> 357

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 357

2016233495 14 Aug 2018

Pro Leu Gly Leu
1

<210> 358
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 358

Ile Ser Ser Gly Leu Ser Ser
1 5

<210> 359
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 359

Gln Asn Gln Ala Leu Arg Met Ala
1 5

2016233495 14 Aug 2018

<210> 360

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 360

Ala Gln Asn Leu Leu Gly Met Val
1 5

<210> 361

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 361

Ser Thr Phe Pro Phe Gly Met Phe
1 5

<210> 362

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 362

Pro Val Gly Tyr Thr Ser Ser Leu
1 5

<210> 363

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 363

Asp Trp Leu Tyr Trp Pro Gly Ile
1 5

<210> 364

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 364

2016233495 14 Aug 2018

Ile Ser Ser Gly Leu Leu Ser Ser
1 5

<210> 365
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 365

Leu Lys Ala Ala Pro Arg Trp Ala
1 5

<210> 366
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 366

Gly Pro Ser His Leu Val Leu Thr
1 5

<210> 367

2016233495 14 Aug 2018

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 367

Leu Pro Gly Gly Leu Ser Pro Trp
1 5

<210> 368

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 368

Met Gly Leu Phe Ser Glu Ala Gly
1 5

<210> 369

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 369

Ser Pro Leu Pro Leu Arg Val Pro
1 5

<210> 370
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 370

Arg Met His Leu Arg Ser Leu Gly
1 5

<210> 371
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 371

Leu Ala Ala Pro Leu Gly Leu Leu

2016233495 14 Aug 2018

1 5

<210> 372

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 372

Ala Val Gly Leu Leu Ala Pro Pro

1 5

<210> 373

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 373

Leu Leu Ala Pro Ser His Arg Ala

1 5

<210> 374

<211> 8

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 374

Pro Ala Gly Leu Trp Leu Asp Pro
1 5

<210> 375

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 375

Gly Pro Arg Ser Phe Gly Leu
1 5

<210> 376

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 376

Gly Pro Arg Ser Phe Gly
1 5

<210> 377
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 377

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Asn His
1 5 10

<210> 378
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 378

Ile Ser Ser Gly Leu Leu Ser Ser Gly Gly Ser Gly Gly Ser Leu Ser
1 5 10 15

2016233495 14 Aug 2018

Gly Arg Ser Asp Asn His
20

<210> 379
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 379

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Thr Ser Thr Ser Gly Arg
1 5 10 15

Ser Ala Asn Pro Arg Gly
20

<210> 380
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 380

2016233495 14 Aug 2018

Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ala Val
1 5 10 15

Gly Leu Leu Ala Pro Pro
20

<210> 381
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 381

Val His Met Pro Leu Gly Phe Leu Gly Pro Gly Gly Thr Ser Thr Ser
1 5 10 15

Gly Arg Ser Ala Asn Pro Arg Gly
20

<210> 382
<211> 24
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 382

Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Val His
1 5 10 15

Met Pro Leu Gly Phe Leu Gly Pro
20

<210> 383
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 383

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Asn His

<210> 384
<211> 18
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 384

Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ala Val Gly Leu Leu Ala
1 5 10 15

Pro Pro

<210> 385

<211> 20

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 385

Val His Met Pro Leu Gly Phe Leu Gly Pro Gly Gly Leu Ser Gly Arg
1 5 10 15

Ser Asp Asn His
20

2016233495 14 Aug 2018

<210> 386

<211> 20

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 386

Leu Ser Gly Arg Ser Asp Asn His Gly Gly Val His Met Pro Leu Gly
1 5 10 15

Phe Leu Gly Pro
20

<210> 387

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 387

Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Gly Gly Ser Ile Ser
1 5 10 15

Ser Gly Leu Leu Ser Ser

2016233495 14 Aug 2018

20

<210> 388

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 388

Leu Ser Gly Arg Ser Gly Asn His Gly Gly Ser Gly Gly Ser Ile Ser
1 5 10 15

Ser Gly Leu Leu Ser Ser
20

<210> 389

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 389

Ile Ser Ser Gly Leu Leu Ser Ser Gly Gly Ser Gly Gly Ser Leu Ser
1 5 10 15

2016233495 14 Aug 2018

Gly Arg Ser Gly Asn His
20

<210> 390
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 390

Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Gly Gly Ser Gln Asn
1 5 10 15

Gln Ala Leu Arg Met Ala
20

<210> 391
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 391

2016233495 14 Aug 2018

Gln Asn Gln Ala Leu Arg Met Ala Gly Gly Ser Gly Gly Ser Leu Ser
1 5 10 15

Gly Arg Ser Asp Asn His
20

<210> 392
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 392

Leu Ser Gly Arg Ser Gly Asn His Gly Gly Ser Gly Gly Ser Gln Asn
1 5 10 15

Gln Ala Leu Arg Met Ala
20

<210> 393
<211> 22
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 393

Gln Asn Gln Ala Leu Arg Met Ala Gly Gly Ser Gly Gly Ser Leu Ser
1 5 10 15

Gly Arg Ser Gly Asn His
20

<210> 394
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 394

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Gly Asn His
1 5 10

<210> 395
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 395

Gly Gln Ser Gly Gln Gly
1 5

<210> 396
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 396

Pro Arg Phe Lys Ile Ile Gly Gly
1 5

<210> 397
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 397

Pro Arg Phe Arg Ile Ile Gly Gly
1 5

2016233495 14 Aug 2018

<210> 398

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 398

Ser Ser Arg His Arg Arg Ala Leu Asp
1 5

<210> 399

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 399

Arg Lys Ser Ser Ile Ile Ile Arg Met Arg Asp Val Val Leu
1 5 10

<210> 400

<211> 15

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 400

Ser Ser Ser Phe Asp Lys Gly Lys Tyr Lys Lys Gly Asp Asp Ala
1 5 10 15

<210> 401

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 401

Ser Ser Ser Phe Asp Lys Gly Lys Tyr Lys Arg Gly Asp Asp Ala
1 5 10 15

<210> 402

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 402

Ile Glu Gly Arg
1

<210> 403
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 403

Ile Asp Gly Arg
1

<210> 404
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 404

Gly Gly Ser Ile Asp Gly Arg
1 5

2016233495 14 Aug 2018

<210> 405

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 405

Pro Leu Gly Leu Trp Ala
1 5

<210> 406

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 406

Gly Pro Gln Gly Ile Ala Gly Gln
1 5

<210> 407

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 407

Gly Pro Gln Gly Leu Leu Gly Ala
1 5

<210> 408

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 408

Gly Ile Ala Gly Gln
1 5

<210> 409

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 409

2016233495 14 Aug 2018

Gly Pro Leu Gly Ile Ala Gly Ile
1 5

<210> 410
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 410

Gly Pro Glu Gly Leu Arg Val Gly
1 5

<210> 411
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 411

Tyr Gly Ala Gly Leu Gly Val Val
1 5

2016233495 14 Aug 2018

<210> 412

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 412

Ala Gly Leu Gly Val Val Glu Arg
1 5

<210> 413

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 413

Ala Gly Leu Gly Ile Ser Ser Thr
1 5

<210> 414

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 414

Glu Pro Gln Ala Leu Ala Met Ser
1 5

<210> 415

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 415

Gln Ala Leu Ala Met Ser Ala Ile
1 5

<210> 416

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 416

2016233495 14 Aug 2018

Ala Ala Tyr His Leu Val Ser Gln
1 5

<210> 417
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 417

Met Asp Ala Phe Leu Glu Ser Ser
1 5

<210> 418
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 418

Glu Ser Leu Pro Val Val Ala Val
1 5

<210> 419

2016233495 14 Aug 2018

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 419

Ser Ala Pro Ala Val Glu Ser Glu
1 5

<210> 420

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 420

Asp Val Ala Gln Phe Val Leu Thr
1 5

<210> 421

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 421

Val Ala Gln Phe Val Leu Thr Glu
1 5

<210> 422
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 422

Ala Gln Phe Val Leu Thr Glu Gly
1 5

<210> 423
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 423

Pro Val Gln Pro Ile Gly Pro Gln

2016233495 14 Aug 2018

1 5

<210> 424

<211> 273

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 424

Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Ser Gly Gly Gly Ser Gly
1 5 10 15

Gly Gly Gly Ser Gly Gly Gly Glu Ile Val Leu Thr Gln Ser Pro Gly
20 25 30

Thr Leu Ser Leu Ser Pro Gly Glu Arg Ala Thr Leu Ser Cys Arg Ala
35 40 45

Ser Gln Ser Val Ser Ser Ser Tyr Leu Ala Trp Tyr Gln Gln Lys Pro
50 55 60

Gly Gln Ala Pro Arg Leu Leu Ile Tyr Gly Ala Ser Ser Arg Ala Thr
65 70 75 80

2016233495 14 Aug 2018

Gly Ile Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr
85 90 95

Leu Thr Ile Ser Arg Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys
100 105 110

Gln Gln Tyr Gly Ser Ser Pro Leu Thr Phe Gly Gly Gly Thr Lys Val
115 120 125

Glu Ile Lys Arg Ser Gly Gly Ser Thr Ile Thr Ser Tyr Asn Val Tyr
130 135 140

Tyr Thr Lys Leu Ser Ser Ser Gly Thr Gln Val Gln Leu Val Gln Thr
145 150 155 160

Gly Gly Gly Val Val Gln Pro Gly Arg Ser Leu Arg Leu Ser Cys Ala
165 170 175

Ala Ser Gly Ser Thr Phe Ser Ser Tyr Ala Met Ser Trp Val Arg Gln
180 185 190

Ala Pro Gly Lys Gly Leu Glu Trp Val Ser Ala Ile Ser Gly Ser Gly
195 200 205

Gly Ser Thr Tyr Tyr Ala Asp Ser Val Lys Gly Arg Phe Thr Ile Ser

2016233495 14 Aug 2018

210 215 220

Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln Met Asn Ser Leu Arg
225 230 235 240

Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Thr Asn Ser Leu Tyr Trp
245 250 255

Tyr Phe Asp Leu Trp Gly Arg Gly Thr Leu Val Thr Val Ser Ser Ala
260 265 270

Ser

<210> 425
<211> 264
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 425

Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Ser Gly Gly Gly Ser Gly
1 5 10 15

2016233495 14 Aug 2018

Gly Gly Gly Ser Gly Gly Gly Gln Val Gln Leu Gln Gln Ser Gly Ala
20 25 30

Glu Leu Ala Arg Pro Gly Ala Ser Val Lys Met Ser Cys Lys Ala Ser
35 40 45

Gly Tyr Thr Phe Thr Arg Tyr Thr Met His Trp Val Lys Gln Arg Pro
50 55 60

Gly Gln Gly Leu Glu Trp Ile Gly Tyr Ile Asn Pro Ser Arg Gly Tyr
65 70 75 80

Thr Asn Tyr Asn Gln Lys Phe Lys Asp Lys Ala Thr Leu Thr Thr Asp
85 90 95

Lys Ser Ser Ser Thr Ala Tyr Met Gln Leu Ser Ser Leu Thr Ser Glu
100 105 110

Asp Ser Ala Val Tyr Tyr Cys Ala Arg Tyr Tyr Asp Asp His Tyr Cys
115 120 125

Leu Asp Tyr Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser Gly Gly
130 135 140

Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gln Ile Val

2016233495 14 Aug 2018

145 150 155 160

Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly Glu Lys Val
165 170 175

Thr Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met Asn Trp Tyr
180 185 190

Gln Gln Lys Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr Asp Thr Ser
195 200 205

Lys Leu Ala Ser Gly Val Pro Ala His Phe Arg Gly Ser Gly Ser Gly
210 215 220

Thr Ser Tyr Ser Leu Thr Ile Ser Gly Met Glu Ala Glu Asp Ala Ala
225 230 235 240

Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Phe Thr Phe Gly Ser
245 250 255

Gly Thr Lys Leu Glu Ile Asn Arg
260

<210> 426

<211> 15

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 426

Ser Cys Leu Met His Pro His Tyr Ala His Asp Tyr Cys Tyr Val
1 5 10 15

<210> 427

<211> 804

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 427

cagggccagt ccggctcata tctgccctgc cacttcgtgc caatcggggc ctgtaacaat 60

aagggcggtg gatctagtgg tggctcaggc gggtctggcg gcatttccag tggactcttg 120

tcaggacgat ccgataatca tggcgggtcc gacatccaga tgacacagag cccttcttcc 180

ctctccgcaa gcgttggcga cagggtcacc attacctgta gggcttctca gagcatctca 240

agctatctga actggtacca gcagaaacct ggaaaggctc caaaactgct gatttacgct 300

gcctccagtc ttcagtcagg cgtcccctcc agatttagcg gatcaggtag tggaactgat 360

14 Aug 2018 2016233495

tttacccttа caatatcttc tctgcagcca gaggacttcg ccacatacta ttgtcagcaa 420

gacaatggtt accccagtac atttggcgga gggacaaagg tcgagatcaa aaggaccgta 480

gcagcaccaa gcgtctttat tttccccccc agtgacgaac agctgaagag cggaacagct 540

tcagtggtgt gtctcctgaa taacttctat ccacgcgagg caaaggtgca gtggaaggtg 600

gacaatgcac tgcagtctgg taattcccaa gaaagtgtta ctgagcagga ttccaaggat 660

tcaacttact ctctgtctag caccctgact ctttctaaag cagattatga gaagcataag 720

gtctacgctt gcgaggtgac ccaccagggg ctttcctctc cagttaccaa gtcattcaac 780

cggggtgagt gttgatgaga attc 804

<210> 428

<211> 264

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 428

Gln Gly Gln Ser Gly Ser Gly Ile Ala Leu Cys Pro Ser His Phe Cys
1 5 10 15

Gln Leu Pro Gln Thr Gly Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser
20 25 30

```
Gly Gly Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Asn His Gly
        35                  40                  45

Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser
    50                  55                  60

Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser
65                  70                  75                  80

Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu
                85                  90                  95

Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe
            100                 105                 110

Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu
        115                 120                 125

Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr
    130                 135                 140

Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg Thr Val
145                 150                 155                 160
```

2016233495 14 Aug 2018

Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys
165 170 175

Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg
180 185 190

Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn
195 200 205

Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser
210 215 220

Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys
225 230 235 240

Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr
245 250 255

Lys Ser Phe Asn Arg Gly Glu Cys
260

<210> 429
<211> 1371
<212> DNA
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 429

gaagtgcagc tgctcgaaag cggcggaggc ttggtgcagc caggagggag cctgcgactg 60

tcttgcgcag ccagcggatt cactttctct tcctatgcca tgagctgggt tcgacaggca 120

cccggcaaag gtctcgagtg ggtgtctagc atctggcgaa acggaatagt tacagtgtat 180

gccgatagcg tgaagggtcg ctttactatt tcacgggata attctaagaa caccctctac 240

ctgcaaatga atagccttag ggcagaagat accgccgtgt actactgtgc caaatggtcc 300

gcagcctttg actactgggg ccaggggaca ctggtgaccg tgtcctctgc atcaaccaag 360

gggccatcag tgttcccact cgccccatct tccaagagta cttccggcgg aaccgcagcc 420

cttggctgcc ttgttaagga ctatttccca gaacccgtga ccgtaagttg gaactctggc 480

gcccttactt ctggggtgca caccttccca gcagtgttgc agtccagtgg cctttactct 540

ctgtctagtg tagtgactgt gccttcctct agtctcggta cccagaccta tatttgtaat 600

gttaaccata agcccagcaa tacaaaggtt gataagaaag tggaacccaa gagctgcgat 660

aagacacata cctgcccacc ttgtccagct cccgagctgc tgggcggacc ctcagtcttt 720

ctcttcccac ctaaacccaa ggataccctt atgatctcca ggactcctga ggtgacctgc 780

gttgtggtcg acgtgtcaca tgaggaccct gaggtaaagt ttaactggta cgtggacggt 840

2016233495 14 Aug 2018

gtggaggtac ataacgctaa gactaagcca cgagaggagc aatacgcttc cacttacagg 900

gtggtcagcg tcctgaccgt tctccatcag gactggctga acgggaagga atataagtgt 960

aaggttagca acaaagctct ccctgcacca atcgagaaga caatcagcaa ggcaaaaggg 1020

cagcctcggg aacctcaggt ctacaccctc cctcctagca gggaagagat gacaaagaac 1080

caggtctctc tcacctgcct ggtgaaaggc ttctatccat ctgacattgc tgtggagtgg 1140

gaatccaacg gccagcctga aaataattat aagaccacac cccccgtcct tgattccgat 1200

ggatctttct tcctgtacag taaactcacc gtcgacaaat cacggtggca gcaaggtaac 1260

gtgttcagct gttctgtcat gcatgaggct ctgcataacc attacacaca aaagtctttg 1320

tcattgtctc caggatgatg agaattcatt gatcataatc agccatacca c 1371

<210> 430

<211> 445

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 430

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

1 5 10 15

2016233495 14 Aug 2018

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala
115 120 125

Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly Cys Leu
130 135 140

Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly

2016233495 14 Aug 2018

145 150 155 160

Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser
165 170 175

Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu
180 185 190

Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser Asn Thr
195 200 205

Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys Asp Lys Thr His Thr
210 215 220

Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe
225 230 235 240

Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro
245 250 255

Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu Val
260 265 270

Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr
275 280 285

2016233495 14 Aug 2018

```
Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val
    290                 295                 300

Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys
305                 310                 315                 320

Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser
                325                 330                 335

Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro
            340                 345                 350

Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val
        355                 360                 365

Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly
    370                 375                 380

Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp
385                 390                 395                 400

Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp
                405                 410                 415
```

2016233495 14 Aug 2018

Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His
420 425 430

Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly
435 440 445

<210> 431
<211> 1362
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 431
gaagtgcagc tgctcgaaag cggcggaggc ttggtgcagc caggagggag cctgcgactg 60

tcttgcgcag ccagcggatt cactttctct tcctatgcca tgagctgggt tcgacaggca 120

cccggcaaag gtctcgagtg ggtgtctagc atctggcgaa acggaatagt tacagtgtat 180

gccgatagcg tgaagggtcg ctttactatt tcacgggata attctaagaa caccctctac 240

ctgcaaatga atagccttag ggcagaagat accgccgtgt actactgtgc caaatggtcc 300

gcagcctttg actactgggg ccaggggaca ctggtgaccg tgtcctctgc atcaaccaag 360

gggccatcag tgttcccact cgccccatgt agcagatcaa catctgaatc caccgcagcc 420

cttggctgcc ttgttaagga ctatttccca gaacccgtga ccgtaagttg gaactctggc 480

2016233495 14 Aug 2018

gcccttactt ctggggtgca caccttccca gcagtgttgc agtccagtgg cctttactct 540

ctgtctagtg tagtgactgt gccttcctct agtctcggta ccaagaccta tacctgcaac 600

gtagatcata agcccagcaa tacaaaggtt gataagagag tagagtcaaa gtacggccca 660

ccctgcccac cttgtccagc tcccgagttc ctgggcggac cctcagtctt tctcttccca 720

cctaaaccca aggataccct tatgatctcc aggactcctg aggtgacctg cgttgtggtc 780

gacgtgtcac aagaggaccc tgaggtacag tttaactggt acgtggacgg tgtggaggta 840

cataacgcta agactaagcc acgagaggag caatttaact ccacttacag ggtggtcagc 900

gtcctgaccg ttctccatca ggactggctg aacgggaagg aatataagtg taaggttagc 960

aacaaaggtc tgcccagttc tatcgagaag acaatcagca aggcaaaagg gcagcctcgg 1020

gaacctcagg tctacaccct ccctcctagc caggaagaga tgacaaagaa ccaggtctct 1080

ctcacctgcc tggtgaaagg cttctatcca tctgacattg ctgtggagtg ggaatccaac 1140

ggccagcctg aaaataatta taagaccaca ccccccgtcc ttgattccga tggatctttc 1200

ttcctgtaca gtcgcctcac cgtcgacaaa tcacggtggc aggaaggtaa cgtgttcagc 1260

tgttctgtca tgcatgaggc tctgcataac cattacacac aaaagtcttt gtcattgtct 1320

ctcggatgat gagaattcat tgatcataat cagccatacc ac 1362

<210> 432

2016233495 14 Aug 2018

<211> 442

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 432

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

2016233495 14 Aug 2018

```
Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala
        115                 120                 125

Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu
    130                 135                 140

Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly
145                 150                 155                 160

Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser
                165                 170                 175

Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu
            180                 185                 190

Gly Thr Lys Thr Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr
        195                 200                 205

Lys Val Asp Lys Arg Val Glu Ser Lys Tyr Gly Pro Pro Cys Pro Pro
    210                 215                 220

Cys Pro Ala Pro Glu Phe Leu Gly Gly Pro Ser Val Phe Leu Phe Pro
```

225 230 235 240

Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr
245 250 255

Cys Val Val Val Asp Val Ser Gln Glu Asp Pro Glu Val Gln Phe Asn
260 265 270

Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg
275 280 285

Glu Glu Gln Phe Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val
290 295 300

Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser
305 310 315 320

Asn Lys Gly Leu Pro Ser Ser Ile Glu Lys Thr Ile Ser Lys Ala Lys
325 330 335

Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln Glu
340 345 350

Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe
355 360 365

14 Aug 2018 2016233495

Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu
370 375 380

Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe
385 390 395 400

Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu Gly
405 410 415

Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr
420 425 430

Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly
435 440

<210> 433
<211> 1371
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 433
gaagtgcagc tgctcgaaag cggcggaggc ttggtgcagc caggagggag cctgcgactg 60

2016233495 14 Aug 2018

tcttgcgcag ccagcggatt cactttctct tcctatgcca tgagctgggt tcgacaggca 120

cccggcaaag gtctcgagtg ggtgtctagc atctggcgaa acggaatagt tacagtgtat 180

gccgatagcg tgaagggtcg ctttactatt tcacgggata attctaagaa caccctctac 240

ctgcaaatga atagccttag ggcagaagat accgccgtgt actactgtgc caaatggtcc 300

gcagcctttg actactgggg ccaggggaca ctggtgaccg tgtcctctgc atcaaccaag 360

gggccatcag tgttcccact cgccccatct tccaagagta cttccggcgg aaccgcagcc 420

cttggctgcc ttgttaagga ctatttccca gaacccgtga ccgtaagttg gaactctggc 480

gcccttactt ctggggtgca caccttccca gcagtgttgc agtccagtgg cctttactct 540

ctgtctagtg tagtgactgt gccttcctct agtctcggta cccagaccta tatttgtaat 600

gttaaccata agcccagcaa tacaaaggtt gataagaaag tggaacccaa gagctgcgat 660

aagacacata cctgcccacc ttgtccagct cccgagctgc tgggcggacc ctcagtcttt 720

ctcttcccac ctaaacccaa ggataccctt atgatctcca ggactcctga ggtgacctgc 780

gttgtggtcg acgtgtcaca tgaggaccct gaggtaaagt ttaactggta cgtggacggt 840

gtggaggtac ataacgctaa gactaagcca cgagaggagc aatacgcttc cacttacagg 900

gtggtcagcg tcctgaccgt tctccatcag gactggctga acgggaagga atataagtgt 960

aaggttagca acaaagctct ccctgcacca atcgagaaga caatcagcaa ggcaaaaggg 1020

cagcctcggg aacctcaggt ctacaccctc cctcctagca gggaagagat gacaaagaac 1080

2016233495 14 Aug 2018

caggtctctc tcacctgcct ggtgaaaggc ttctatccat ctgacattgc tgtggagtgg 1140

gaatccaacg gccagcctga aaataattat aagaccacac cccccgtcct tgattccgat 1200

ggatctttct tcctgtacag taaactcacc gtcgacaaat cacggtggca gcaaggtaac 1260

gtgttcagct gttctgtcat gcatgaggct ctgcataacc attacacaca aaagtctttg 1320

tcattgtctc caggatgatg agaattcatt gatcataatc agccatacca c 1371

<210> 434

<211> 445

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 434

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

```
Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val
            100                 105                 110

Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala
        115                 120                 125

Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly Cys Leu
    130                 135                 140

Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly
145                 150                 155                 160

Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser
                165                 170                 175
```

2016233495 14 Aug 2018

```
Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu
            180                 185                 190

Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser Asn Thr
        195                 200                 205

Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys Asp Lys Thr His Thr
    210                 215                 220

Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe
225                 230                 235                 240

Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro
                245                 250                 255

Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu Val
            260                 265                 270

Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr
        275                 280                 285

Lys Pro Arg Glu Glu Gln Tyr Ala Ser Thr Tyr Arg Val Val Ser Val
    290                 295                 300

Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys
```

2016233495 14 Aug 2018

```
305                 310                 315                 320

Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser
                325                 330                 335

Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro
            340                 345                 350

Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val
        355                 360                 365

Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly
    370                 375                 380

Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp
385                 390                 395                 400

Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp
                405                 410                 415

Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His
            420                 425                 430

Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly
        435                 440                 445
```

2016233495 14 Aug 2018

<210> 435

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 435

Asn Thr Leu Ser Gly Arg Ser Glu Asn His Ser Gly
1 5 10

<210> 436

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 436

Asn Thr Leu Ser Gly Arg Ser Gly Asn His Gly Ser
1 5 10

<210> 437

<211> 12

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 437

Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly
1 5 10

<210> 438

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 438

Thr Ser Gly Arg Ser Ala Asn Pro
1 5

<210> 439

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 439

Val Ala Gly Arg Ser Met Arg Pro
1 5

<210> 440
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 440

Val Val Pro Glu Gly Arg Arg Ser
1 5

<210> 441
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 441

Ile Leu Pro Arg Ser Pro Ala Phe
1 5

2016233495 14 Aug 2018

<210> 442

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 442

Met Val Leu Gly Arg Ser Leu Leu

1 5

<210> 443

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 443

Gln Gly Arg Ala Ile Thr Phe Ile

1 5

<210> 444

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 444

Ser Pro Arg Ser Ile Met Leu Ala
1 5

<210> 445

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 445

Ser Met Leu Arg Ser Met Pro Leu
1 5

<210> 446

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 446

2016233495 14 Aug 2018

Asp Tyr Phe Trp Ser Gly Phe Ser Ala Phe Asp Ile
1 5 10

<210> 447
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 447

Lys Ala Ser Thr Leu Glu Ser
1 5

<210> 448
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 448

Gln Gln Ser Tyr Ser Thr Pro Trp Thr
1 5

<210> 449

<211> 120

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 449

Gln Met Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Asn Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

2016233495 14 Aug 2018

Ala Arg Asp Tyr Phe Trp Ser Gly Phe Ser Ala Phe Asp Ile Trp Gly
100 105 110

Lys Gly Thr Leu Val Thr Val Ser
115 120

<210> 450
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 450

Asp Ile Val Met Thr Gln Ser Pro Ser Thr Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Arg Ala Pro Lys Val Leu Ile
35 40 45

Tyr Lys Ala Ser Thr Leu Glu Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

14 Aug 2018 2016233495

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Trp
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 451
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 451

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Gly Ser
20 25 30

Trp Ile His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

2016233495 14 Aug 2018

35 40 45

Ala Trp Ile Leu Pro Tyr Gly Gly Ser Ser Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Ala Asp Thr Ser Lys Asn Thr Ala Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Arg His Trp Pro Gly Gly Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ala
115

<210> 452
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 452

2016233495 14 Aug 2018

```
Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
            20                  25                  30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Tyr Asn Val Pro Trp
                85                  90                  95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
            100                 105
```

<210> 453

<211> 108

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 453

```
Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
            20                  25                  30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Tyr Ala Pro Pro Trp
                85                  90                  95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
            100                 105
```

2016233495 14 Aug 2018

<210> 454

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 454

```
Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
            20                  25                  30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Tyr Thr Val Pro Trp
                85                  90                  95
```

2016233495 14 Aug 2018

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 455
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 455

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Val Ile Asn Thr Phe
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Thr Leu Ala Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

14 Aug 2018 2016233495

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Tyr Thr Val Pro Arg
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 456
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 456

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly

14 Aug 2018 2016233495

50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Gly Tyr Gly Val Pro Arg
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 457
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 457

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

2016233495 14 Aug 2018

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Leu Phe Thr Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 458
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 458

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

2016233495 14 Aug 2018

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Phe Ile Thr Pro Thr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 459
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 459

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Tyr Tyr Thr Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 460
<211> 108
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 460

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Phe Phe Tyr Thr Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

2016233495 14 Aug 2018

<210> 461

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 461

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Leu Phe Thr Pro Pro

2016233495 14 Aug 2018

85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 462
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 462

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

2016233495 14 Aug 2018

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Leu Tyr Thr Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 463
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 463

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

2016233495 14 Aug 2018

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Trp Tyr His Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 464
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 464

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

14 Aug 2018 2016233495

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Phe Tyr Ile Pro Pro
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 465
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 465

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly

14 Aug 2018 2016233495

1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Trp Tyr Thr Pro Thr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 466
<211> 108
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 466

```
Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
            20                  25                  30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Phe Ile Pro Pro
                85                  90                  95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
            100                 105
```

<210> 467

2016233495 14 Aug 2018

<211> 141

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 467

Met Glu Thr Gly Leu Arg Trp Leu Leu Leu Val Ala Val Leu Lys Gly
1 5 10 15

Val Gln Cys Leu Ser Val Glu Glu Ser Gly Gly Arg Leu Val Thr Pro
20 25 30

Gly Thr Pro Leu Thr Leu Thr Cys Thr Ala Ser Gly Phe Thr Ile Thr
35 40 45

Asn Tyr His Met Phe Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu
50 55 60

Trp Ile Gly Val Ile Thr Ser Ser Gly Ile Gly Ser Ser Ser Thr Thr
65 70 75 80

Tyr Tyr Ala Thr Trp Ala Lys Gly Arg Phe Thr Ile Ser Lys Thr Ser
85 90 95

2016233495 14 Aug 2018

Thr Thr Val Asn Leu Arg Ile Thr Ser Pro Thr Thr Glu Asp Thr Ala
100 105 110

Thr Tyr Phe Cys Ala Arg Asp Tyr Phe Thr Asn Thr Tyr Tyr Ala Leu
115 120 125

Asp Ile Trp Gly Pro Gly Thr Leu Val Thr Val Ser Ser
130 135 140

<210> 468
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 468

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 Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Asp Val His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Met
35 40 45

2016233495 14 Aug 2018

Gly Trp Leu His Ala Asp Thr Gly Ile Thr Lys Phe Ser Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Arg 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 Glu Arg Ile Gln Leu Trp Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 469
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 469

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

14 Aug 2018 2016233495

Ser Leu Arg Leu Ser Cys Ala Val Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Val Val His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Ser Gly Asn Ser Gly Asn Ile Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Val Pro Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser
100 105 110

Ser

<210> 470
<211> 116
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 470

Met Asp Thr Arg Ala Pro Thr Gln Leu Leu Gly Leu Leu Leu Leu Trp
1 5 10 15

Leu Pro Gly Ala Arg Cys Ala Leu Val Met Thr Gln Thr Pro Ser Ser
20 25 30

Thr Ser Thr Ala Val Gly Gly Thr Val Thr Ile Lys Cys Gln Ala Ser
35 40 45

Gln Ser Ile Ser Val Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
50 55 60

Pro Pro Lys Leu Leu Ile Tyr Ser Ala Ser Thr Leu Ala Ser Gly Val
65 70 75 80

Pro Ser Arg Phe Lys Gly Ser Arg Ser Gly Thr Glu Tyr Thr Leu Thr
85 90 95

Ile Ser Gly Val Gln Arg Glu Asp Ala Ala Thr Tyr Tyr Cys Leu Gly
100 105 110

Ser Ala Gly Ser
115

<210> 471
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 471

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ile Met Met Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Tyr Pro Ser Gly Gly Ile Thr Phe Tyr Ala Asp Thr Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr

2016233495 14 Aug 2018

65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Ile Lys Leu Gly Thr Val Thr Thr Val Asp Tyr Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 472
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 472

Gln Ser Ala Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

2016233495 14 Aug 2018

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Ser Thr Arg Val Phe Gly Thr Gly Thr Lys Val Thr Val Leu
100 105 110

<210> 473
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 473

Glu Val Lys Leu Gln Glu Ser Gly Pro Ser Leu Val Lys Pro Ser Gln
1 5 10 15

2016233495 14 Aug 2018

Thr Leu Ser Leu Thr Cys Ser Val Thr Gly Tyr Ser Ile Thr Ser Asp
20 25 30

Tyr Trp Asn Trp Ile Arg Lys Phe Pro Gly Asn Lys Leu Glu Tyr Val
35 40 45

Gly Tyr Ile Ser Tyr Thr Gly Ser Thr Tyr Tyr Asn Pro Ser Leu Lys
50 55 60

Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Tyr Tyr Leu
65 70 75 80

Gln Leu Asn Ser Val Thr Ser Glu Asp Thr Ala Thr Tyr Tyr Cys Ala
85 90 95

Arg Tyr Gly Gly Trp Leu Ser Pro Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Leu Thr Val Ser Ser
115

<210> 474
<211> 120
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 474

```
Glu Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Ala Pro Ser Gln
1               5                  10                  15

Ser Leu Ser Ile Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Thr Tyr
            20                  25                  30

Ser Ile Asn Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
        35                  40                  45

Gly Val Met Trp Ala Gly Gly Gly Thr Asn Ser Asn Ser Val Leu Lys
    50                  55                  60

Ser Arg Leu Ile Ile Ser Lys Asp Asn Ser Lys Ser Gln Val Phe Leu
65                  70                  75                  80

Lys Met Asn Ser Leu Gln Thr Asp Asp Thr Ala Arg Tyr Tyr Cys Ala
                85                  90                  95

Arg Tyr Tyr Gly Asn Ser Pro Tyr Tyr Ala Ile Asp Tyr Trp Gly Gln
            100                 105                 110
```

2016233495 14 Aug 2018

Gly Thr Ser Val Thr Val Ser Ser
115 120

<210> 475
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 475

Glu Val Lys Leu Gln Glu Ser Gly Pro Ser Leu Val Lys Pro Ser Gln
1 5 10 15

Thr Leu Ser Leu Thr Cys Ser Val Thr Gly Tyr Ser Ile Ile Ser Asp
20 25 30

Tyr Trp Asn Trp Ile Arg Lys Phe Pro Gly Asn Lys Leu Glu Tyr Leu
35 40 45

Gly Tyr Ile Ser Tyr Thr Gly Ser Thr Tyr Tyr Asn Pro Ser Leu Lys
50 55 60

Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Tyr Tyr Leu
65 70 75 80

14 Aug 2018 2016233495

Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Ala Thr Tyr Tyr Cys Ala
85 90 95

Arg Arg Gly Gly Trp Leu Leu Pro Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Leu Thr Val Ser Ser
115

<210> 476
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 476

Glu Val Lys Leu Gln Glu Ser Gly Pro Ser Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Asp Ile Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile

2016233495 14 Aug 2018

35 40 45

Gly Trp Ile Phe Pro Arg Asp Asn Asn Thr Lys Tyr Asn Glu Asn Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Thr Thr Ala Tyr
65 70 75 80

Met Glu Leu His Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Phe Cys
85 90 95

Thr Lys Glu Asn Trp Val Gly Asp Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Leu Thr Leu Ser Ser
115

<210> 477
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 477

2016233495 14 Aug 2018

```
Glu Val Gln Leu Gln Gln Ser Gly Pro Asp Leu Val Thr Pro Gly Ala
1               5                  10                  15

Ser Val Arg Ile Ser Cys Gln Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
            20                  25                  30

Tyr Met Asn Trp Val Lys Gln Ser His Gly Lys Ser Leu Glu Trp Ile
        35                  40                  45

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Thr Tyr Asn Gln Lys Phe
    50                  55                  60

Lys Gly Lys Ala Ile Leu Thr Val Asp Arg Ser Ser Ser Thr Ala Tyr
65                  70                  75                  80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Ser Leu Thr Val
            100                 105                 110

Ser Ser
```

<210> 478

2016233495 14 Aug 2018

<211> 106

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 478

Glu 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 Ser Ser Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Gln Ser Pro Arg Pro Leu Ile Tyr
35 40 45

Ala Ala Phe Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser Leu Glu Pro Glu
65 70 75 80

Asp Phe Ala Val Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

2016233495 14 Aug 2018

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 479
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 479

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 Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65 70 75 80

2016233495 14 Aug 2018

Met Glu Leu Ser Arg Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Met Val Thr Val
100 105 110

Ser Ser

<210> 480
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 480

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 Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Gln Ser Leu Glu Trp Met
35 40 45

14 Aug 2018 2016233495

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Asn Tyr Asn Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Arg Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Met Val Thr Val
100 105 110

Ser Ser

<210> 481
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 481

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala

2016233495 14 Aug 2018

1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Gln Ser Leu Glu Trp Met
35 40 45

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Asn Tyr Asn Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Val Asp Arg Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Arg Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Met Val Thr Val
100 105 110

Ser Ser

<210> 482

<211> 114

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 482

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Thr Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
            20                  25                  30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Thr Tyr Ala Ala Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Val Asp Arg Ser Lys Ser Ile Ala Tyr
65                  70                  75                  80

Leu Gln Met Ser Ser Leu Lys Thr Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Thr Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Met Val Thr Val
```

100 105 110

Ser Ser

<210> 483

<211> 114

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 483

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Thr Ala Ser Gly Tyr Thr Phe Pro Asp Tyr
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Gly Asp Ile Asp Pro Asn Tyr Gly Gly Thr Thr Tyr Asn Ala Ser Val
50 55 60

2016233495 14 Aug 2018

Lys Gly Arg Phe Thr Ile Ser Val Asp Arg Ser Lys Ser Ile Ala Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ala Leu Thr Asp Trp Gly Gln Gly Thr Met Val Thr Val
100 105 110

Ser Ser

<210> 484
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 484

Asp Ile Val Met Thr Gln Ser His Lys Leu Met Ser Thr Ser Val Gly
1 5 10 15

Asp Arg Val Ser Ile Thr Cys Lys Ala Ser Gln Asp Val Gly Thr Ala
20 25 30

2016233495 14 Aug 2018

Val Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ser Pro Lys Leu Leu Ile
35 40 45

Tyr Trp Ala Ser Thr Arg His Thr Gly Val Pro Asp Arg Phe Thr Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Asn Val Gln Ser
65 70 75 80

Glu Asp Leu Ala Asp Tyr Phe Cys Gln Gln Asp Ser Ser Tyr Pro Leu
85 90 95

Thr Phe Gly Ala Gly Thr Lys Val Glu Leu Lys
100 105

<210> 485
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 485

Asp Ile Val Thr Thr Gln Ser His Lys Leu Met Ser Thr Ser Val Gly
1 5 10 15

2016233495 14 Aug 2018

Asp Arg Val Ser Ile Thr Cys Lys Ala Ser Gln Asp Val Gly Thr Ala
20 25 30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ser Pro Lys Leu Leu Ile
35 40 45

Tyr Trp Ala Ser Thr Arg His Thr Gly Val Pro Asp Arg Phe Thr Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Asn Val Gln Ser
65 70 75 80

Glu Asp Leu Ala Asp Tyr Phe Cys Gln Gln Asp Ser Ser Tyr Pro Leu
85 90 95

Thr Phe Gly Ala Gly Thr Lys Val Glu Leu Lys
100 105

<210> 486
<211> 113
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 486

Asp Ile Val Met Thr Gln Ser Pro Ser Ser Leu Ala Val Ser Val Gly
1 5 10 15

Glu Lys Val Ser Met Gly Cys Lys Ser Ser Gln Ser Leu Leu Tyr Ser
20 25 30

Ser Asn Gln Lys Asn Ser Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Ser Pro Lys Leu Leu Ile Asp 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 Lys Ala Glu Asp Leu Ala Val Tyr Tyr Cys Gln Gln
85 90 95

Tyr Tyr Gly Tyr Pro Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu
100 105 110

Lys

<210> 487

<211> 106

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 487

```
Asp Ile Val Met Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1               5                  10                  15

Glu Lys Val Thr Met Thr Cys Ser Ala Ser Ser Ser Ile Arg Tyr Met
            20                  25                  30

His Trp Tyr Gln Gln Lys Pro Gly Thr Ser Pro Lys Arg Trp Ile Ser
        35                  40                  45

Asp Thr Ser Lys Leu Thr Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
    50                  55                  60

Gly Ser Gly Thr Ser Tyr Ala Leu Thr Ile Ser Ser Met Glu Ala Glu
65                  70                  75                  80

Asp Ala Ala Thr Tyr Tyr Cys His Gln Arg Ser Ser Tyr Pro Trp Thr
```

2016233495 14 Aug 2018

85 90 95

Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 488
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 488

Gln Ile Val Leu Ser Gln Ser Pro Ala Ile Leu Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Met Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Ser Ser Pro Lys Pro Trp Ile Tyr
35 40 45

Ala Thr Phe Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
50 55 60

2016233495 14 Aug 2018

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Val Glu Thr Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys
100 105

<210> 489
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 489

Glu 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 Ser Ser Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
35 40 45

2016233495 14 Aug 2018

Ala Ala Phe Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser Leu Glu Pro Glu
65 70 75 80

Asp Phe Ala Val Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 490
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 490

Gln 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 Ser Ser Val Ser Tyr Ile
20 25 30

14 Aug 2018 2016233495

Tyr Trp Phe Gln Gln Lys Pro Gly Gln Ser Pro Arg Pro Leu Ile Tyr
35 40 45

Ala Thr Phe Asn Leu Ala Ser Gly Ile Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Thr Leu Thr Ile Ser Arg Leu Glu Pro Glu
65 70 75 80

Asp Phe Ala Val Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 491
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 491

Asp Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly

2016233495 14 Aug 2018

1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Gly Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr
35 40 45

Ala Ala Phe Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Glu Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
65 70 75 80

Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 492
<211> 106
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 492

Asp Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Gly Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr
35 40 45

Ala Ala Phe Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Glu Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
65 70 75 80

Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 493

2016233495 14 Aug 2018

<211> 106

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 493

Asp Ile Gln Leu Thr Gln Ser Pro Ser Ile Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Ile
20 25 30

Tyr Trp Phe Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr
35 40 45

Ala Thr Phe Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
65 70 75 80

Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Asn Asn Pro Leu Thr
85 90 95

2016233495 14 Aug 2018

Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 494
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 494

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 Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Gly Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Trp Ile Ser Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Leu
50 55 60

Gln Gly Arg Val Thr Met Thr Thr Asp Thr Ser Thr Ser Thr Ala Tyr
65 70 75 80

2016233495 14 Aug 2018

Met Glu Leu Arg Ser Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Ala Leu Pro Ser Gly Thr Ile Leu Val Gly Gly Trp Phe Asp
100 105 110

Pro Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 495
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 495

Glu Val Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Leu Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

14 Aug 2018 2016233495

Ser Ala Ile Ser Gly Gly Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Asp Val Phe Pro Glu Thr Phe Ser Met Asn Tyr Gly Met Asp
100 105 110

Val Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 496
<211> 128
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 496

Gln Val Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Gly

2016233495 14 Aug 2018

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Leu Ile Ser Gly Asp Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Lys Val Leu Leu Pro Cys Ser Ser Thr Ser Cys Tyr Gly Ser Val
100 105 110

Gly Ala Phe Asp Ile Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

<210> 497

<211> 117

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 497

```
Gln Val Gln Leu Val Gln Ser Gly Gly Ser Val Val Arg Pro Gly Glu
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Val Ala Ser Gly Phe Ile Phe Asp Asn Tyr
            20                  25                  30

Asp Met Ser Trp Val Arg Gln Val Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ser Arg Val Asn Trp Asn Gly Gly Ser Thr Thr Tyr Ala Asp Ala Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Thr Lys Asn Ser Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Asn Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Val Arg Glu Phe Val Gly Ala Tyr Asp Leu Trp Gly Gln Gly Thr Thr
```

2016233495 14 Aug 2018

100 105 110

Val Thr Val Ser Ser
115

<210> 498
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 498

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1 5 10 15

Thr Val Lys Val Ser Cys Lys Val Phe Gly Asp Thr Phe Arg Gly Leu
20 25 30

Tyr Ile His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

2016233495 14 Aug 2018

Gln Gly Arg Val Thr Ile Thr Thr Asp Glu Ser Thr 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 Ser Gly Leu Arg Trp Gly Ile Trp Gly Trp Phe Asp Pro Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 499
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 499

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Leu Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Phe Gly Gly Thr Phe Ser Asp Asn
20 25 30

2016233495 14 Aug 2018

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Pro Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Lys Pro Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Thr Ala Tyr
65 70 75 80

Met Val Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Thr Met Val Arg Gly Phe Leu Gly Val Met Asp Val Trp Gly
100 105 110

Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 500
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 500

Gln Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ala Ile Ser Gly Ser Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Asp Gln Phe Val Thr Ile Phe Gly Val Pro Arg Tyr Gly Met
100 105 110

Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

2016233495 14 Aug 2018

<210> 501

<211> 120

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 501

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr 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

14 Aug 2018 2016233495

Ala Arg Gly Arg Gln Met Phe Gly Ala Gly Ile Asp Phe Trp Gly Pro
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 502
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 502

Glu Val Gln Leu Val Glu Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Val Ser Gly Gly Thr Phe Gly Thr Tyr
20 25 30

Ala Leu Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Arg Ile Val Pro Leu Ile Gly Leu Val Asn Tyr Ala His Asn Phe

2016233495 14 Aug 2018

50 55 60

Glu Gly Arg Ile Ser Ile Thr Ala Asp Lys Ser Thr Gly Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Asn Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Val Tyr Gly Gly Asn Ser Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 503
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 503

Gln Val Gln Leu Val Gln Ser Gly Gly Glu Val Lys Lys Pro Gly Ala
1 5 10 15

2016233495 14 Aug 2018

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Thr Leu Ser Ser His
20 25 30

Gly Ile Thr Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Trp Ile Ser Ala His Asn Gly His Ala Ser Asn Ala Gln Lys Val
50 55 60

Glu Asp Arg Val Thr Met Thr Thr Asp Thr Ser Thr Asn Thr Ala Tyr
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ala Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Val His Ala Ala Leu Tyr Tyr Gly Met Asp Val Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 504
<211> 121
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 504

```
Gln Val Gln Leu Gln Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ser Ala Ser Gly Phe Thr Phe Ser Arg His
            20                  25                  30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Ser His Asp Gly Ser Val Lys Tyr Tyr Ala Asp Ser Met
    50                  55                  60

Lys Gly Arg Phe Ser Ile Ser Arg Asp Asn Ser Asn Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asp Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Gly Leu Ser Tyr Gln Val Ser Gly Trp Phe Asp Pro Trp Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 505
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 505

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Glu Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly Ser Ile Ala Ser Asn
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ser Pro Thr Thr Val
35 40 45

Ile Tyr Glu Asp Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

Gly Ser Ile Asp Thr Ser Ser Asn Ser Ala Ser Leu Thr Ile Ser Gly
65 70 75 80

2016233495 14 Aug 2018

Leu Lys Thr Lys Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr Asp Gly
85 90 95

Ile Thr Val Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 506
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 506

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Gly Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Leu Pro Cys Thr Arg Ser Ser Gly Ser Ile Ala Ser His
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ala Pro Thr Thr Val
35 40 45

Ile Tyr Glu Asp Asn Lys Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

14 Aug 2018 2016233495

Gly Ser Ile Asp Ser Ser Ser Asn Ser Ala Ser Leu Ser Ile Ser Gly
65 70 75 80

Leu Lys Thr Glu Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr Asp Ser
85 90 95

Ser Asn Arg Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 507
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 507

Leu Pro Val Leu Thr Gln Pro Ala Ser Leu Ser Ala Ser Pro Gly Ala
1 5 10 15

Ser Ala Ser Leu Thr Cys Thr Leu Arg Ser Gly Leu Asn Val Gly Ser
20 25 30

Tyr Arg Ile Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Arg Pro Gln Tyr

2016233495 14 Aug 2018

35 40 45

Leu Leu Asn Tyr Lys Ser Asp Ser Asn Lys Gln Gln Ala Ser Gly Val
50 55 60

Pro Ser Arg Phe Ser Gly Ser Lys Asp Ala Ser Ala Asn Ala Gly Ile
65 70 75 80

Leu Leu Ile Ser Gly Leu Gln Ser Glu Asp Glu Ala Asp Tyr Tyr Cys
85 90 95

Met Ile Trp Tyr Ser Ser Ala Val Val Phe Gly Gly Gly Thr Lys Leu
100 105 110

Thr Val Leu
115

<210> 508
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 508

2016233495 14 Aug 2018

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Glu Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly Asn Ile Ala Ser Asn
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ala Pro Thr Thr Val
35 40 45

Ile Tyr Glu Asp Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

Gly Ser Ile Asp Ser Ser Ser Asn Ser Ala Ser Leu Thr Ile Ser Gly
65 70 75 80

Leu Lys Thr Glu Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr Asp Ser
85 90 95

Ser Asn Leu Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 509
<211> 108
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 509

Ser Ser Glu Leu Thr Gln Asp Pro Ala Val Ser Val Ala Leu Gly Gln
1 5 10 15

Thr Val Arg Ile Thr Cys Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Ala
20 25 30

Ser Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Gly Lys Asn Asn Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser
50 55 60

Ser Ser Gly Asn Thr Ala Ser Leu Thr Ile Thr Gly Ala Gln Ala Glu
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Asn Ser Arg Asp Ser Ser Gly Asn His
85 90 95

Tyr Val Phe Gly Thr Gly Thr Lys Val Thr Val Leu
100 105

<210> 510

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 510

Leu Pro Val Leu Thr Gln Ala Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Arg Ile Thr Cys Gly Gly Ser Asp Ile Gly Arg Lys Ser Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Ala Leu Val Ile Tyr
35 40 45

Ser Asp Arg Asp Arg Pro Ser Gly Ile Ser Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Asn Asn Ser Asp His
85 90 95

2016233495 14 Aug 2018

Tyr Val Phe Gly Ala Gly Thr Glu Leu Ile Val Leu
100 105

<210> 511
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 511

Gln Ser Ala Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

2016233495 14 Aug 2018

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Thr Leu Pro Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 512
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 512

Glu 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 Ile Gly Asn Ser
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Met
35 40 45

Tyr Gly Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser Gly

2016233495 14 Aug 2018

50 55 60

Ser Gly Ala Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln His Thr Ile Pro Thr Phe
85 90 95

Ser Phe Gly Pro Gly Thr Lys Val Glu Val Lys
100 105

<210> 513
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 513

Asp Ile Val Met Thr Gln Thr Pro Ser Phe Leu Ser Ala Ser Ile Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Gly Ser Tyr
20 25 30

2016233495 14 Aug 2018

Leu Ala Trp Tyr Gln Gln Arg Pro Gly Glu Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Thr Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Asn Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Leu Asn Asn Tyr Pro Ile
85 90 95

Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 514
<211> 105
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 514

Gln Ser Ala Leu Thr Gln Pro Pro Ser Val Ser Val Ser Pro Gly Gln
1 5 10 15

2016233495 14 Aug 2018

Thr Ala Asn Ile Pro Cys Ser Gly Asp Lys Leu Gly Asn Lys Tyr Ala
20 25 30

Tyr Trp Tyr Gln Gln Lys Pro Gly Gln Ser Pro Val Leu Leu Ile Tyr
35 40 45

Gln Asp Ile Lys Arg Pro Ser Arg Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Ala Asp Thr Ala Thr Leu Thr Ile Ser Gly Thr Gln Ala Met
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Thr Trp Asp Asn Ser Val Val Phe
85 90 95

Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 515
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 515

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Glu Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly Ser Ile Asp Ser Asn
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ala Pro Thr Thr Val
35 40 45

Ile Tyr Glu Asp Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

Gly Ser Ile Asp Ser Ser Ser Asn Ser Ala Ser Leu Thr Ile Ser Gly
65 70 75 80

Leu Lys Thr Glu Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr Asp Ser
85 90 95

Asn Asn Arg His Val Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 516
<211> 110
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 516

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Glu Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly Asn Ile Gly Thr Asn
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ala Pro Val Ala Leu
35 40 45

Ile Tyr Glu Asp Tyr Arg Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

Gly Ser Ile Asp Ser Ser Ser Asn Ser Ala Ser Leu Ile Ile Ser Gly
65 70 75 80

Leu Lys Pro Glu Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr His Ser
85 90 95

Ser Gly Trp Glu Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 517

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 517

Gln Ser Val Leu Thr Gln Pro Pro Ser Val Ser Val Ala Pro Gly Gln
1 5 10 15

Thr Ala Arg Ile Thr Cys Gly Gly Asn Asn Ile Gly Ser Lys Gly Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Val Tyr
35 40 45

Asp Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His

85 90 95

Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 518
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 518

Asn Phe Met Leu Thr Gln Pro His Ser Val Ser Glu Ser Pro Gly Lys
1 5 10 15

Thr Val Thr Ile Ser Cys Thr Arg Ser Ser Gly Ser Ile Ala Ser Asn
20 25 30

Tyr Val Gln Trp Tyr Gln Gln Arg Pro Gly Ser Ala Pro Thr Thr Val
35 40 45

Ile Tyr Glu Asp Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

2016233495 14 Aug 2018

Gly Ser Ile Asp Ser Ser Ser Asn Ser Ala Ser Leu Thr Ile Ser Gly
65 70 75 80

Leu Lys Thr Glu Asp Glu Ala Asp Tyr Tyr Cys Gln Ser Tyr Asp Ser
85 90 95

Thr Thr Pro Ser Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 519
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 519

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 Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Gly Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

2016233495 14 Aug 2018

Gly Trp Thr Ser Pro His Asn Gly Leu Thr Ala Phe Ala Gln Ile Leu
50 55 60

Glu Gly Arg Val Thr Met Thr Thr Asp Thr Ser Thr Asn Thr Ala Tyr
65 70 75 80

Met Glu Leu Arg Asn Leu Thr Phe Asp Asp Thr Ala Val Tyr Phe Cys
85 90 95

Ala Lys Val His Pro Val Phe Ser Tyr Ala Leu Asp Val Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 520
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 520

Glu Val Gln Leu Val Glu Ser Gly Ala Glu Val Met Asn Pro Gly Ser
1 5 10 15

14 Aug 2018 2016233495

Ser Val Arg Val Ser Cys Arg Gly Ser Gly Gly Asp Phe Ser Thr Tyr
20 25 30

Ala Phe Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Arg Ile Ile Pro Ile Leu Gly Ile Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Gly Tyr Gly Ser Asp Pro Val Leu Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 521
<211> 118
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 521

Glu 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 Asn Tyr
20 25 30

Gly Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Trp Ile Ser Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Val
50 55 60

Gln Gly Arg Val Thr Met Thr Thr Asp Thr Ser Thr Ser Thr Gly Tyr
65 70 75 80

Met Glu Leu Arg Ser Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Asp Phe Arg Lys Pro Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 522
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 522

Glu Val Gln Leu Val Gln Ser Gly Pro Glu Leu Lys Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Val Met His Trp Val Lys Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
35 40 45

Gly Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe
50 55 60

Lys Gly Arg Ala Thr Leu Thr Ser Asp Lys Ser Thr Ser Thr Ala Tyr

14 Aug 2018 2016233495

65 70 75 80

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gln Ala Trp Gly Tyr Pro Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 523
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 523

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

2016233495 14 Aug 2018

```
Val Met His Trp Val Lys Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
        35                  40                  45

Gly Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe
    50                  55                  60

Lys Gly Arg Ala Thr Leu Thr Ser Asp Lys Ser Thr 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 Gln Ala Trp Gly Tyr Pro Trp Gly Gln Gly Thr Leu Val Thr
            100                 105                 110

Val Ser Ser
        115
```

<210> 524

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 524

2016233495 14 Aug 2018

```
Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                  10                  15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
            20                  25                  30

Val Met His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
        35                  40                  45

Gly Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe
    50                  55                  60

Lys Gly Arg Ala Thr Leu Thr Ser Asp Lys Ser Thr 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 Gln Ala Trp Gly Tyr Pro Trp Gly Gln Gly Thr Leu Val Thr
            100                 105                 110

Val Ser Ser
        115
```

2016233495 14 Aug 2018

<210> 525

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 525

```
Glu 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 Ser Tyr
            20                  25                  30

Val Met His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
        35                  40                  45

Gly Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe
    50                  55                  60

Lys Gly Arg Ala Thr Leu Thr Ser Asp Lys Ser Thr 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
```

2016233495 14 Aug 2018

Ala Arg Gln Ala Trp Gly Tyr Pro Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 526
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 526

Glu 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 Ser Tyr
20 25 30

Val Met His Trp Val Arg Gln Ala Pro Gly Gln Arg Leu Glu Trp Ile
35 40 45

Gly Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe
50 55 60

14 Aug 2018 2016233495

Lys Gly Arg Ala Thr Ile Thr Ser Asp Lys Ser Thr 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 Gln Ala Trp Gly Tyr Pro Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 527
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 527

Asp Ile Val Leu Thr Gln Ser Pro Ala Ser Leu Ala Leu Ser Pro Gly
1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Thr Glu Ser Val Glu Tyr Tyr

20 25 30

Gly Thr Ser Leu Val Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Ala Ala Ser Ser Val Asp Ser Gly Val Pro Ser
50 55 60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65 70 75 80

Ser Leu Glu Glu Glu Asp Ala Ala Met Tyr Phe Cys Gln Gln Ser Arg
85 90 95

Arg Val Pro Tyr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

<210> 528
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 528

2016233495 14 Aug 2018

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 Thr Glu Ser Val Glu Tyr Tyr
20 25 30

Gly Thr Ser Leu Val Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Ala Ala Ser Ser Val Asp Ser Gly Val Pro Ser
50 55 60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65 70 75 80

Ser Leu Glu Ala Glu Asp Ala Ala Met Tyr Phe Cys Gln Gln Ser Arg
85 90 95

Arg Val Pro Tyr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

<210> 529
<211> 111
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 529

```
Glu 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 Thr Glu Ser Val Glu Tyr Tyr
            20                  25                  30

Gly Thr Ser Leu Val Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35                  40                  45

Lys Leu Leu Ile Tyr Ala Ala Ser Ser Val Asp Ser Gly Val Pro Ser
    50                  55                  60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65                  70                  75                  80

Ser Leu Glu Ala Glu Asp Ala Ala Met Tyr Phe Cys Gln Gln Ser Arg
                85                  90                  95

Arg Val Pro Tyr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
            100                 105                 110
```

<210> 530

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 530

```
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 Thr Glu Ser Val Glu Tyr Tyr
            20                  25                  30

Gly Thr Ser Leu Val Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
        35                  40                  45

Lys Leu Leu Ile Tyr Ala Ala Ser Ser Val Asp Ser Gly Val Pro Ser
    50                  55                  60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65                  70                  75                  80

Ser Leu Glu Ala Glu Asp Ala Ala Thr Tyr Phe Cys Gln Gln Ser Arg
                85                  90                  95
```

2016233495 14 Aug 2018

Arg Val Pro Tyr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

<210> 531
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 531

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr Ser Thr Ala Tyr
65 70 75 80

14 Aug 2018 2016233495

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Gly Thr Ile Tyr Asp Ser Ser Gly Tyr Ser Phe Asp Tyr
100 105 110

Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 532
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 532

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met

2016233495 14 Aug 2018

35 40 45

Gly Ile Ile Asn Pro Ser Gly Gly Ser Thr Ser Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Ser Met Thr Arg Asp Thr Ser Thr Ser Thr Val Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Leu Phe Pro His Ile Tyr Gly Asn Tyr Tyr Gly Met Asp
100 105 110

Ile Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 533
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 533

2016233495 14 Aug 2018

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr 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 Leu Ala Val Pro Gly Ala Phe Asp Ile Trp Gly Gln Gly Thr
            100                 105                 110

Met Val Thr Val Ser Ser
        115
```

<210> 534

2016233495 14 Aug 2018

<211> 116

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 534

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Ala Val Ile
        35                  40                  45

Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val Lys Gly Arg
    50                  55                  60

Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln Met
65                  70                  75                  80

Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Arg Gly
                85                  90                  95
```

2016233495 14 Aug 2018

Gln Trp Leu Val Thr Glu Leu Asp Tyr Trp Gly Gln Gly Thr Leu Val
100 105 110

Thr Val Ser Ser
115

<210> 535
<211> 122
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 535

Glu Val Gln Leu Val Glu Ser Gly Ser Glu Val Glu Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Asp Ser
20 25 30

Gly Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Met Phe Ala Thr Pro Tyr Tyr Ala Gln Lys Phe
50 55 60

2016233495 14 Aug 2018

Gln Asp Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Thr Val Tyr
65 70 75 80

Met Glu Leu Ser Gly Leu Arg Ser Asp Asp Thr Ala Val Phe Tyr Cys
85 90 95

Ala Arg Asp Arg Gly Arg Gly His Leu Pro Trp Tyr Phe Asp Leu Trp
100 105 110

Gly Arg Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 536
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 536

Glu Val Gln Leu Val Glu Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

2016233495 14 Aug 2018

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Ala Pro Tyr Tyr Tyr Tyr Tyr Met Asp Val Trp Gly Gln Gly
100 105 110

Thr Thr Val Thr Val Ser Ser
115

<210> 537
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 537

Glu Val Gln Leu Leu Glu Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Leu Ser Arg Tyr
20 25 30

Ala Leu Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Pro Glu Trp Val
35 40 45

Gly Ala Ile Ile Pro Ile Phe Gly Thr Pro His Tyr Ser Lys Lys Phe
50 55 60

Gln Asp Arg Val Ile Ile Thr Val Asp Thr Ser Thr Asn Thr Ala Phe
65 70 75 80

Met Glu Leu Ser Ser Leu Arg Phe Glu Asp Thr Ala Leu Tyr Phe Cys
85 90 95

Ala Arg Gly His Asp Glu Tyr Asp Ile Ser Gly Tyr His Arg Leu Asp
100 105 110

Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 538

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 538

Gln Val Gln Leu Val Gln Ser Gly Ser Glu Leu Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Ser Phe Ser Gly Tyr
20 25 30

Tyr Ile His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Trp Ile Asp Pro Asn Ser Gly Val Thr Asn Tyr Val Arg Arg Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Leu Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Gly Leu Thr Ala Asp Asp Thr Ala Val Tyr Tyr Cys

85 90 95

Ala Arg Asp Glu Asn Leu Trp Gln Phe Gly Tyr Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 539
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 539

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Arg Tyr
20 25 30

Gly Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

2016233495 14 Aug 2018

Gly Arg Leu Ile Pro Ile Val Ser Met Thr Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Asp Arg Val Ser Ile Thr Thr Asp Lys Ser Thr Gly Thr Ala Tyr
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Ser Val Gly Gln Gln Leu Pro Trp Val Phe Phe Ala Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 540
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 540

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

2016233495 14 Aug 2018

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 541
<211> 118
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 541

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
    50                  55                  60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110
```

2016233495 14 Aug 2018

Leu Val Thr Val Ser Ser
115

<210> 542
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 542

Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Gly Met His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
35 40 45

Ala Val Ile Ser Tyr Asp Gly Ser Tyr Lys Ile His Ala Asp Ser Val
50 55 60

Gln Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Val Phe
65 70 75 80

14 Aug 2018 2016233495

Leu Gln Met Asn Ser Leu Lys Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Thr Thr Asp Arg Lys Trp Leu Ala Trp His Gly Met Asp Val Trp Gly
100 105 110

Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 543
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 543

Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met

2016233495 14 Aug 2018

35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Asp Gly Ile Val Ala Asp Phe Gln His Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 544
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 544

2016233495 14 Aug 2018

```
Glu Val Gln Leu Val Glu Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Asp Thr Phe Ser Arg Tyr
            20                  25                  30

Gly Ile Thr Trp Val Arg Gln Ala Pro Gly Arg Gly Leu Glu Trp Met
        35                  40                  45

Gly Asn Ile Val Pro Phe Phe Gly Ala Thr Asn Tyr Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Leu Thr Ile Thr Ala Asp Lys Ser Ser Tyr Thr Ser Tyr
65                  70                  75                  80

Met Asp Leu Ser Ser Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Asp His Phe Tyr Gly Ser Gly Gly Tyr Phe Asp Tyr Trp Gly
            100                 105                 110

Gln Gly Thr Leu Val Thr Val Ser Ser
        115                 120
```

<210> 545

2016233495 14 Aug 2018

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 545

```
Glu Val Gln Leu Leu Glu 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 Asn Ser Tyr
            20                  25                  30

Asp Ile Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Gly Ile Ile Pro Val Phe Gly Thr Ala Asn Tyr Ala Glu Ser Phe
    50                  55                  60

Gln Gly Arg Val Thr Met Thr Ala Asp His Ser Thr Ser Thr Ala Tyr
65                  70                  75                  80

Met Glu Leu Asn Asn Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95
```

2016233495 14 Aug 2018

Ala Arg Asp Arg Trp His Tyr Glu Ser Arg Pro Met Asp Val Trp Gly
100 105 110

Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 546
<211> 119
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 546

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Arg Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ala Cys Ala Ala Ser Gly Phe Ser Phe Ser Asp Tyr
20 25 30

Tyr Met Thr Trp Ile Arg Gln Ala Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Ala Tyr Ile Ser Asp Ser Gly Gln Thr Val His Tyr Ala Asp Ser Val
50 55 60

2016233495 14 Aug 2018

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Thr Lys Asn Ser Leu Phe
65 70 75 80

Leu Gln Val Asn Thr Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Asp Leu Leu Gly Tyr Tyr Leu Gln Ser Trp Gly Gln Gly
100 105 110

Thr Leu Val Thr Val Ser Ser
115

<210> 547
<211> 131
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 547

Gln Val Gln Leu Gln Gln Ser Gly Pro Gly Leu Val Lys Pro Ser Gln
1 5 10 15

Thr Leu Ser Leu Thr Cys Ala Ile Ser Gly Asp Ser Val Ser Ser Asn
20 25 30

2016233495 14 Aug 2018

Ser Ala Ala Trp Asn Trp Ile Arg Gln Ser Pro Ser Arg Gly Leu Glu
35 40 45

Trp Leu Gly Arg Thr Tyr Tyr Arg Ser Lys Trp Tyr Asn Asp Tyr Ala
50 55 60

Val Ser Val Lys Ser Arg Ile Thr Ile Asn Pro Asp Thr Ser Lys Asn
65 70 75 80

Gln Phe Ser Leu Gln Leu Asn Ser Val Thr Pro Glu Asp Thr Ala Val
85 90 95

Tyr Tyr Cys Ala Arg Asp Glu Pro Arg Ala Val Ala Gly Ser Gln Ala
100 105 110

Tyr Tyr Tyr Tyr Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr
115 120 125

Val Ser Ser
130

<210> 548
<211> 124
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 548

Glu 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 Ser Tyr
20 25 30

Tyr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Ile Ile Asn Pro Ser Asp Gly Ser Thr Ser Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Thr Ser Thr Val His
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 Asp Leu Phe Pro His Ile Tyr Gly Asn Tyr Tyr Gly Met Asp
100 105 110

Ile Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 549
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 549

Gln Met Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr

2016233495 14 Aug 2018

65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 550
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 550

Gln Val Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

2016233495 14 Aug 2018

```
Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
    50                  55                  60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110

Leu Val Thr Val Ser Ser
        115
```

<210> 551

<211> 110

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 551

2016233495 14 Aug 2018

```
Gln Ser Val Leu Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1               5                  10                  15

Lys Val Thr Ile Ser Cys Ser Gly Asn Asn Ser Asn Ile Ala Asn Asn
            20                  25                  30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
        35                  40                  45

Ile Tyr Asp Asn Asn Tyr Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
    50                  55                  60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Asp Ile Thr Gly Leu Gln
65                  70                  75                  80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Val Trp Asp Gly Ser Leu
                85                  90                  95

Thr Thr Gly Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
            100                 105                 110
```

<210> 552

<211> 107

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 552

```
Ala Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Asn Tyr
            20                  25                  30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Lys Val Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ala Ala Ser Thr Leu Glu Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Leu Ala Thr Tyr Tyr Cys Gln Gln Leu His Thr Phe Pro Leu
                85                  90                  95

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
            100                 105
```

2016233495 14 Aug 2018

<210> 553

<211> 111

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 553

Gln Pro Val Leu Thr Gln Pro Pro Ser Ala Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Val Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Ala Tyr
20 25 30

Asn Phe Val Ser Trp Tyr Arg Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Glu Val Asn Lys Arg Pro Ser Gly Val Pro Asp Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Val Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Ala Gly Thr
85 90 95

Asn Ser Leu Gly Ile Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 554
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 554

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asp Ile Gly Asn His
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Gln Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Ala Ile Thr Gly Leu Gln

2016233495 14 Aug 2018

65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Asn Ser Leu
85 90 95

Ser Pro His Leu Leu Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 555
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 555

Gln Ser Val Leu Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Met Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Lys Gln Val Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

2016233495 14 Aug 2018

Ile Tyr Glu Asn Asp Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Asn Ser Leu
85 90 95

Ser Gly Phe Val Phe Ala Ser Gly Thr Lys Val Thr Val Leu
100 105 110

<210> 556
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 556

Gln Ser Ala Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Leu Gly Gln
1 5 10 15

Ser Val Thr Ile Ser Cys Thr Gly Ser Ser Ser Asp Val Gly Ser Tyr
20 25 30

2016233495 14 Aug 2018

Asn Leu Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Asn Leu
35 40 45

Met Ile Tyr Asp Val Ser Lys Arg Ser Gly Val Ser Asn Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu Gln
65 70 75 80

Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Gly Ile Ser
85 90 95

Thr Val Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 557
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 557

Gln Ser Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

2016233495 14 Aug 2018

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Ser Tyr
20 25 30

Asn Leu Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Glu Val Ser Lys Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Gly Gly Phe
85 90 95

Asn Asn Leu Leu Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 558
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 558

Asp Ile Val Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Ile Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Arg Ile Ser Ala Tyr
20 25 30

Val Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Val Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Arg Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Thr Tyr Ser Ser Pro Trp
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 559
<211> 112

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 559

```
Gln Ser Val Leu Thr Gln Pro Pro Ser Ala Ser Gly Ser Pro Gly Gln
1               5                  10                  15

Ser Val Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Ile Gly Gly Tyr
            20                  25                  30

Asp Ser Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
        35                  40                  45

Met Ile Tyr Asp Val Ser Lys Arg Pro Ser Gly Val Ser Asn Arg Phe
    50                  55                  60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65                  70                  75                  80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
                85                  90                  95

Ser Ile Phe Phe Tyr Val Phe Gly Thr Gly Thr Lys Val Thr Val Leu
```

2016233495 14 Aug 2018

100 105 110

<210> 560
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 560

Leu Pro Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Thr Ser Asp Ile Gly Gly Tyr
20 25 30

Asp Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Lys Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

2016233495 14 Aug 2018

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Ser Thr His Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 561
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 561

Gln Ser Ala Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

2016233495 14 Aug 2018

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Arg Ser Ser
85 90 95

Thr Leu Gly Pro Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 562
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 562

Gln Ala Gly Leu Thr Gln Pro Pro Ser Val Ser Glu Ala Pro Arg Gln
1 5 10 15

Arg Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Ala Val Asn Trp Tyr Gln Gln Leu Pro Gly Lys Ala Pro Lys Leu Leu
35 40 45

2016233495 14 Aug 2018

Ile Tyr Tyr Asp Asp Leu Leu Pro Ser Gly Val Ser Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Ser Leu Ala Ile Ser Gly Leu Gln
65 70 75 80

Ser Glu Asp Glu Ala Asp Tyr Tyr Cys Ala Ala Trp Asp Asp Ser Leu
85 90 95

Asn Gly Tyr Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 563
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 563

Gln Ser Ala Leu Thr Gln Pro Arg Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Val Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr

20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Lys Arg Pro Ser Gly Val Pro Asp Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Thr Thr His Val Phe Gly Thr Gly Thr Lys Val Thr Val Leu
100 105 110

<210> 564
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 564

2016233495 14 Aug 2018

```
Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1               5                  10                  15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
            20                  25                  30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
        35                  40                  45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
    50                  55                  60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65                  70                  75                  80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
                85                  90                  95

Ser Val Trp Val Phe Gly Gly Gly Thr Gln Leu Thr Val Leu
            100                 105                 110
```

<210> 565

<211> 112

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 565

```
Gln Ser Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1               5                  10                  15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
            20                  25                  30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Arg Ala Pro Arg Leu
        35                  40                  45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe
    50                  55                  60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65                  70                  75                  80

Gln Ala Glu Asp Glu Gly Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Gly
                85                  90                  95

Gly Thr Leu Gly Pro Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
            100                 105                 110
```

<210> 566

<211> 110

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 566

```
Gln Ala Gly Leu Thr Gln Pro Pro Ser Ala Ser Gly Thr Pro Gly Gln
1               5                  10                  15

Arg Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Ser Asn
            20                  25                  30

Thr Val Asn Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
        35                  40                  45

Ile Tyr Ser Asn Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
    50                  55                  60

Gly Ser Lys Ser Gly Thr Ser Ala Ser Leu Ala Ile Ser Gly Leu Gln
65                  70                  75                  80

Ser Glu Asp Glu Ala Asp Tyr Tyr Cys Ala Ala Trp Asp Asp Ser Leu
                85                  90                  95
```

Asn Gly Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 567
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 567

Ala Ile Arg Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Asn Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Arg Pro Gly Lys Ala Pro Asn Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Thr Tyr Ser Thr Pro Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 568
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 568

Gln Ser Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Arg Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Tyr Arg Pro Ser Gly Val Ser Asn Arg Phe

2016233495 14 Aug 2018

50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Asp Ser
85 90 95

Ser Thr Arg Tyr Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 569
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 569

Gln Pro Val Leu Thr Gln Pro Pro Ser Ala Ser Gly Thr Pro Gly Gln
1 5 10 15

Arg Val Ala Ile Ser Cys Ser Gly Ser Arg Ser Asn Ile Glu Ile Asn
20 25 30

2016233495 14 Aug 2018

Ser Val Asn Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Ser Trp Asp Ser Ser Leu
85 90 95

Ser Ala Asp Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 570
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 570

Gln Ser Val Leu Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Lys
1 5 10 15

2016233495 14 Aug 2018

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Arg Asn Asn Gln Arg Pro Ser Gly Val Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Ser Leu Ala Ile Ser Gly Leu Gln
65 70 75 80

Ser Glu Asp Glu Ala Asp Tyr Tyr Cys Ala Thr Trp Asp Asp Ser Leu
85 90 95

Asn Gly Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 571
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 571

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Gly Ala Pro Gly Gln
1 5 10 15

Arg Val Thr Ile Ser Cys Thr Gly Ser Ser Ser Asn Ile Gly Ala Gly
20 25 30

Tyr Asp Val His Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu
35 40 45

Leu Ile Tyr Gly Asn Asn Asn Arg His Ser Gly Val Pro Asp Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Thr Ser Ala Ser Leu Ala Ile Thr Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Glu Phe Phe Cys Gly Thr Trp Asp Ser Arg
85 90 95

Leu Thr Thr Tyr Val Phe Gly Ser Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 572
<211> 110
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 572

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Ala Val Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 573

<211> 103

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 573

Val Ile Trp Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Ala Ala Ser Ser Leu Gln Ser Trp Tyr
20 25 30

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Glu Ala Ser
35 40 45

Thr Leu Glu Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
50 55 60

Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
65 70 75 80

Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Tyr Thr Phe Gly Gln

2016233495 14 Aug 2018

85 90 95

Gly Thr Lys Leu Glu Ile Lys
100

<210> 574
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 574

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Val Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

2016233495 14 Aug 2018

Gly Ser Asn Ser Asp Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Ala Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 575
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 575

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

2016233495 14 Aug 2018

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Ala Gly Ser Val Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 576
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 576

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

2016233495 14 Aug 2018

```
His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
        35                  40                  45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
    50                  55                  60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65                  70                  75                  80

Asp Glu Ala Asp Tyr Tyr Cys Leu Val Trp Asp Ser Ser Ser Asp His
                85                  90                  95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
            100                 105
```

<210> 577

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 577

```
Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
```

2016233495 14 Aug 2018

1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 578
<211> 108
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 578

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 579

2016233495 14 Aug 2018

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 579

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

2016233495 14 Aug 2018

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 580
<211> 447
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 580

Gln Val Gln Leu Val Gln Ser Gly Val 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 Asn Tyr
20 25 30

Tyr Met Tyr Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Asn Pro Ser Asn Gly Gly Thr Asn Phe Asn Glu Lys Phe
50 55 60

Lys Asn Arg Val Thr Leu Thr Thr Asp Ser Ser Thr Thr Thr Ala Tyr
65 70 75 80

2016233495 14 Aug 2018

```
Met Glu Leu Lys Ser Leu Gln Phe Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Arg Asp Tyr Arg Phe Asp Met Gly Phe Asp Tyr Trp Gly Gln
            100                 105                 110

Gly Thr Thr Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val
        115                 120                 125

Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala
    130                 135                 140

Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser
145                 150                 155                 160

Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val
                165                 170                 175

Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro
            180                 185                 190

Ser Ser Ser Leu Gly Thr Lys Thr Tyr Thr Cys Asn Val Asp His Lys
        195                 200                 205
```

2016233495 14 Aug 2018

Pro Ser Asn Thr Lys Val Asp Lys Arg Val Glu Ser Lys Tyr Gly Pro
210 215 220

Pro Cys Pro Pro Cys Pro Ala Pro Glu Phe Leu Gly Gly Pro Ser Val
225 230 235 240

Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr
245 250 255

Pro Glu Val Thr Cys Val Val Val Asp Val Ser Gln Glu Asp Pro Glu
260 265 270

Val Gln Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys
275 280 285

Thr Lys Pro Arg Glu Glu Gln Phe Asn Ser Thr Tyr Arg Val Val Ser
290 295 300

Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys
305 310 315 320

Cys Lys Val Ser Asn Lys Gly Leu Pro Ser Ser Ile Glu Lys Thr Ile
325 330 335

Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro

340 345 350

Pro Ser Gln Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu
355 360 365

Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn
370 375 380

Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser
385 390 395 400

Asp Gly Ser Phe Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys Ser Arg
405 410 415

Trp Gln Glu Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
420 425 430

His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly Lys
435 440 445

<210> 581

<211> 440

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 581

```
Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Asp Cys Lys Ala Ser Gly Ile Thr Phe Ser Asn Ser
            20                  25                  30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Trp Tyr Asp Gly Ser Lys Arg Tyr Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Thr Asn Asp Asp Tyr Trp Gly Gln Gly Thr Leu Val Thr Val Ser
            100                 105                 110

Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser
```

2016233495 14 Aug 2018

```
        115                 120                 125

Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp
    130                 135                 140

Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr
145                 150                 155                 160

Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr
                165                 170                 175

Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu Gly Thr Lys
            180                 185                 190

Thr Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn Thr Lys Val Asp
        195                 200                 205

Lys Arg Val Glu Ser Lys Tyr Gly Pro Pro Cys Pro Pro Cys Pro Ala
    210                 215                 220

Pro Glu Phe Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro
225                 230                 235                 240

Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val
                245                 250                 255
```

2016233495 14 Aug 2018

```
Val Asp Val Ser Gln Glu Asp Pro Glu Val Gln Phe Asn Trp Tyr Val
            260                 265                 270

Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln
        275                 280                 285

Phe Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val Leu His Gln
    290                 295                 300

Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Gly
305                 310                 315                 320

Leu Pro Ser Ser Ile Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro
                325                 330                 335

Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln Glu Glu Met Thr
            340                 345                 350

Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser
        355                 360                 365

Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr
    370                 375                 380
```

2016233495 14 Aug 2018

Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr
385 390 395 400

Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu Gly Asn Val Phe
405 410 415

Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys
420 425 430

Ser Leu Ser Leu Ser Leu Gly Lys
435 440

<210> 582
<211> 218
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 582

Glu 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 Lys Gly Val Ser Thr Ser
20 25 30

2016233495 14 Aug 2018

```
Gly Tyr Ser Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro
        35                  40                  45

Arg Leu Leu Ile Tyr Leu Ala Ser Tyr Leu Glu Ser Gly Val Pro Ala
    50                  55                  60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser
65                  70                  75                  80

Ser Leu Glu Pro Glu Asp Phe Ala Val Tyr Tyr Cys Gln His Ser Arg
                85                  90                  95

Asp Leu Pro Leu Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
            100                 105                 110

Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln
        115                 120                 125

Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr
    130                 135                 140

Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser
145                 150                 155                 160
```

2016233495 14 Aug 2018

Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr
165 170 175

Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys
180 185 190

His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro
195 200 205

Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
210 215

<210> 583
<211> 214
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 583

Glu 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 Ser Tyr
20 25 30

2016233495 14 Aug 2018

```
Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
        35                  40                  45

Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65                  70                  75                  80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Ser Ser Asn Trp Pro Arg
                85                  90                  95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala
            100                 105                 110

Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
        115                 120                 125

Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
    130                 135                 140

Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
145                 150                 155                 160
```

2016233495 14 Aug 2018

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser
165 170 175

Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
180 185 190

Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
195 200 205

Phe Asn Arg Gly Glu Cys
210

<210> 584
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (8)..(8)
<223> Xaa is His or Asn

<220>
<221> misc_feature

2016233495 14 Aug 2018

<222> (9)..(9)

<223> Xaa is Ser or Thr

<220>

<221> misc_feature

<222> (10)..(10)

<223> Xaa is Arg or Ser

<400> 584

Lys Ser Ser Gln Ser Leu Leu Xaa Xaa Xaa Thr Arg Lys Asn Tyr Leu
1 5 10 15

Ala

<210> 585

<211> 290

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 585

Met Arg Ile Phe Ala Val Phe Ile Phe Met Thr Tyr Trp His Leu Leu
1 5 10 15

Asn Ala Phe Thr Val Thr Val Pro Lys Asp Leu Tyr Val Val Glu Tyr

```
            20                  25                  30

Gly Ser Asn Met Thr Ile Glu Cys Lys Phe Pro Val Glu Lys Gln Leu
        35                  40                  45

Asp Leu Ala Ala Leu Ile Val Tyr Trp Glu Met Glu Asp Lys Asn Ile
    50                  55                  60

Ile Gln Phe Val His Gly Glu Glu Asp Leu Lys Val Gln His Ser Ser
65                  70                  75                  80

Tyr Arg Gln Arg Ala Arg Leu Leu Lys Asp Gln Leu Ser Leu Gly Asn
                85                  90                  95

Ala Ala Leu Gln Ile Thr Asp Val Lys Leu Gln Asp Ala Gly Val Tyr
            100                 105                 110

Arg Cys Met Ile Ser Tyr Gly Gly Ala Asp Tyr Lys Arg Ile Thr Val
        115                 120                 125

Lys Val Asn Ala Pro Tyr Asn Lys Ile Asn Gln Arg Ile Leu Val Val
    130                 135                 140

Asp Pro Val Thr Ser Glu His Glu Leu Thr Cys Gln Ala Glu Gly Tyr
145                 150                 155                 160
```

2016233495 14 Aug 2018

```
Pro Lys Ala Glu Val Ile Trp Thr Ser Ser Asp His Gln Val Leu Ser
                165                 170                 175

Gly Lys Thr Thr Thr Thr Asn Ser Lys Arg Glu Glu Lys Leu Phe Asn
            180                 185                 190

Val Thr Ser Thr Leu Arg Ile Asn Thr Thr Thr Asn Glu Ile Phe Tyr
        195                 200                 205

Cys Thr Phe Arg Arg Leu Asp Pro Glu Glu Asn His Thr Ala Glu Leu
    210                 215                 220

Val Ile Pro Glu Leu Pro Leu Ala His Pro Pro Asn Glu Arg Thr His
225                 230                 235                 240

Leu Val Ile Leu Gly Ala Ile Leu Leu Cys Leu Gly Val Ala Leu Thr
                245                 250                 255

Phe Ile Phe Arg Leu Arg Lys Gly Arg Met Met Asp Val Lys Lys Cys
            260                 265                 270

Gly Ile Gln Asp Thr Asn Ser Lys Lys Gln Ser Asp Thr His Leu Glu
        275                 280                 285
```

2016233495 14 Aug 2018

Glu Thr
290

<210> 586
<211> 290
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 586

Met Arg Ile Phe Ala Gly Ile Ile Phe Thr Ala Cys Cys His Leu Leu
1 5 10 15

Arg Ala Phe Thr Ile Thr Ala Pro Lys Asp Leu Tyr Val Val Glu Tyr
20 25 30

Gly Ser Asn Val Thr Met Glu Cys Arg Phe Pro Val Glu Arg Glu Leu
35 40 45

Asp Leu Leu Ala Leu Val Val Tyr Trp Glu Lys Glu Asp Glu Gln Val
50 55 60

Ile Gln Phe Val Ala Gly Glu Glu Asp Leu Lys Pro Gln His Ser Asn
65 70 75 80

2016233495 14 Aug 2018

```
Phe Arg Gly Arg Ala Ser Leu Pro Lys Asp Gln Leu Leu Lys Gly Asn
                85                  90                  95

Ala Ala Leu Gln Ile Thr Asp Val Lys Leu Gln Asp Ala Gly Val Tyr
            100                 105                 110

Cys Cys Ile Ile Ser Tyr Gly Gly Ala Asp Tyr Lys Arg Ile Thr Leu
        115                 120                 125

Lys Val Asn Ala Pro Tyr Arg Lys Ile Asn Gln Arg Ile Ser Val Asp
    130                 135                 140

Pro Ala Thr Ser Glu His Glu Leu Ile Cys Gln Ala Glu Gly Tyr Pro
145                 150                 155                 160

Glu Ala Glu Val Ile Trp Thr Asn Ser Asp His Gln Pro Val Ser Gly
                165                 170                 175

Lys Arg Ser Val Thr Thr Ser Arg Thr Glu Gly Met Leu Leu Asn Val
            180                 185                 190

Thr Ser Ser Leu Arg Val Asn Ala Thr Ala Asn Asp Val Phe Tyr Cys
        195                 200                 205
```

2016233495 14 Aug 2018

Thr Phe Trp Arg Ser Gln Pro Gly Gln Asn His Thr Ala Glu Leu Ile
210 215 220

Ile Pro Glu Leu Pro Ala Thr His Pro Pro Gln Asn Arg Thr His Trp
225 230 235 240

Val Leu Leu Gly Ser Ile Leu Leu Phe Leu Ile Val Val Ser Thr Val
245 250 255

Leu Leu Phe Leu Arg Lys Gln Val Arg Met Leu Asp Val Glu Lys Cys
260 265 270

Gly Val Glu Asp Thr Ser Ser Lys Asn Arg Asn Asp Thr Gln Phe Glu
275 280 285

Glu Thr
290

<210> 587
<211> 288
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 587

Met Arg Ile Phe Ala Val Phe Ile Phe Met Thr Tyr Trp His Leu Leu
1 5 10 15

Asn Ala Phe Thr Val Thr Val Pro Lys Asp Leu Tyr Val Val Glu Tyr
20 25 30

Gly Ser Asn Met Thr Ile Glu Cys Lys Phe Pro Val Glu Lys Gln Leu
35 40 45

Asp Leu Ala Ala Leu Ile Val Tyr Trp Glu Met Glu Asp Lys Asn Ile
50 55 60

Ile Gln Phe Val His Gly Glu Glu Asp Leu Lys Val Gln His Ser Ser
65 70 75 80

Tyr Arg Gln Arg Ala Arg Leu Leu Lys Asp Gln Leu Ser Leu Gly Asn
85 90 95

Ala Ala Leu Gln Ile Thr Asp Val Lys Leu Gln Asp Ala Gly Val Tyr
100 105 110

Arg Cys Met Ile Ser Tyr Gly Gly Ala Asp Tyr Lys Arg Ile Thr Val
115 120 125

2016233495 14 Aug 2018

```
Lys Val Asn Ala Pro Tyr Asn Lys Ile Asn Gln Arg Ile Leu Val Val
    130                 135                 140

Asp Pro Val Thr Ser Glu His Glu Leu Thr Cys Gln Ala Glu Gly Tyr
145                 150                 155                 160

Pro Lys Ala Glu Val Ile Trp Thr Ser Ser Asp His Gln Val Leu Ser
                165                 170                 175

Gly Lys Thr Thr Thr Thr Asn Ser Lys Arg Glu Glu Lys Leu Phe Asn
            180                 185                 190

Val Thr Ser Thr Leu Arg Ile Asn Thr Thr Thr Asn Glu Ile Phe Tyr
        195                 200                 205

Cys Thr Phe Arg Arg Leu Asp Pro Glu Glu Asn His Thr Ala Glu Leu
    210                 215                 220

Val Ile Pro Glu Leu Pro Leu Ala His Pro Pro Asn Glu Arg Thr His
225                 230                 235                 240

Leu Val Ile Leu Gly Ala Ile Leu Leu Cys Leu Gly Val Ala Leu Thr
                245                 250                 255
```

2016233495 14 Aug 2018

Phe Ile Phe Arg Leu Arg Lys Gly Arg Met Met Asp Val Lys Cys Gly
260 265 270

Ile Gln Asp Thr Asn Ser Lys Gln Ser Asp Thr His Leu Glu Glu Thr
275 280 285

<210> 588
<211> 221
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 588

Phe Thr Val Thr Val Pro Lys Asp Leu Tyr Val Val Glu Tyr Gly Ser
1 5 10 15

Asn Met Thr Ile Glu Cys Lys Phe Pro Val Glu Lys Gln Leu Asp Leu
20 25 30

Ala Ala Leu Ile Val Tyr Trp Glu Met Glu Asp Lys Asn Ile Ile Gln
35 40 45

Phe Val His Gly Glu Glu Asp Leu Lys Val Gln His Ser Ser Tyr Arg
50 55 60

2016233495 14 Aug 2018

```
Gln Arg Ala Arg Leu Leu Lys Asp Gln Leu Ser Leu Gly Asn Ala Ala
65                  70                  75                  80

Leu Gln Ile Thr Asp Val Lys Leu Gln Asp Ala Gly Val Tyr Arg Cys
                85                  90                  95

Met Ile Ser Tyr Gly Gly Ala Asp Tyr Lys Arg Ile Thr Val Lys Val
            100                 105                 110

Asn Ala Pro Tyr Asn Lys Ile Asn Gln Arg Ile Leu Val Val Asp Pro
        115                 120                 125

Val Thr Ser Glu His Glu Leu Thr Cys Gln Ala Glu Gly Tyr Pro Lys
    130                 135                 140

Ala Glu Val Ile Trp Thr Ser Ser Asp His Gln Val Leu Ser Gly Lys
145                 150                 155                 160

Thr Thr Thr Thr Asn Ser Lys Arg Glu Glu Lys Leu Phe Asn Val Thr
                165                 170                 175

Ser Thr Leu Arg Ile Asn Thr Thr Thr Asn Glu Ile Phe Tyr Cys Thr
            180                 185                 190
```

2016233495 14 Aug 2018

Phe Arg Arg Leu Asp Pro Glu Glu Asn His Thr Ala Glu Leu Val Ile
195 200 205

Pro Glu Leu Pro Leu Ala His Pro Pro Asn Glu Arg Thr
210 215 220

<210> 589
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 589

Trp Ala Ser Thr Arg Glu Ser
1 5

<210> 590
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature

2016233495 14 Aug 2018

<222> (1)..(1)

<223> Xaa is Gln or Lys

<400> 590

Xaa Gln Ser Tyr Asp Val Val Thr
1 5

<210> 591

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Ile or Met

<400> 591

Ser Tyr Trp Xaa His
1 5

<210> 592

<211> 17

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (7)..(7)

<223> Xaa is Asp or Gly

<220>

<221> misc_feature

<222> (9)..(9)

<223> Xaa is His or Asn

<220>

<221> misc_feature

<222> (12)..(12)

<223> Xaa is Ser or Asn

<220>

<221> misc_feature

<222> (13)..(13)

<223> Xaa is Glu or Gln

<220>

<221> misc_feature

<222> (16)..(16)

<223> Xaa is Ile or Met

<400> 592

Tyr Ile Asn Pro Ser Ser Xaa Tyr Xaa Glu Tyr Xaa Xaa Lys Phe Xaa

14 Aug 2018 2016233495

1 5 10 15

Asp

<210> 593
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (5)..(5)
<223> Xaa is Ile or Val

<220>
<221> misc_feature
<222> (13)..(13)
<223> Xaa is Phe or Tyr

<400> 593

Ser Gly Trp Leu Xaa His Gly Asp Tyr Tyr Phe Asp Xaa
1 5 10

<210> 594

2016233495 14 Aug 2018

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 594

Lys Ser Ser Gln Ser Leu Leu Asn Ser Arg Thr Arg Lys Asn Tyr Leu
1 5 10 15

Ala

<210> 595

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 595

Gln Gln Ser Tyr Asp Val Val Thr
1 5

<210> 596

<211> 5

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 596

Ser Tyr Trp Met His
1 5

<210> 597

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 597

Tyr Ile Asn Pro Ser Ser Asp Tyr Asn Glu Tyr Ser Glu Lys Phe Met
1 5 10 15

Asp

<210> 598

<211> 13

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 598

Ser Gly Trp Leu Val His Gly Asp Tyr Tyr Phe Asp Tyr
1 5 10

<210> 599

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 599

Lys Ser Ser Gln Ser Leu Leu His Thr Ser Thr Arg Lys Asn Tyr Leu
1 5 10 15

Ala

<210> 600

<211> 8

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 600

Lys Gln Ser Tyr Asp Val Val Thr
1 5

<210> 601

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 601

Gly Tyr Ile Phe Thr Ser Tyr Trp Met His
1 5 10

<210> 602

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 602

2016233495 14 Aug 2018

Tyr Ile Asn Pro Ser Ser Gly Tyr His Glu Tyr Asn Gln Lys Phe Ile
1 5 10 15

Asp

<210> 603
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 603

Ser Gly Trp Leu Ile His Gly Asp Tyr Tyr Phe Asp Phe
1 5 10

<210> 604
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 604

2016233495 14 Aug 2018

Ser Tyr Trp Ile His
1 5

<210> 605
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 605

Gly Thr Thr Phe Thr Ser Tyr Trp Ile His
1 5 10

<210> 606
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (4)..(4)
<223> Xaa is Asn or Ser

<220>

2016233495 14 Aug 2018

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Thr, Arg or Ser

<220>

<221> misc_feature

<222> (9)..(9)

<223> Xaa is Ala or Gly

<400> 606

Thr Gly Thr Xaa Xaa Asp Val Gly Xaa Tyr Asn Tyr Val Ser
1 5 10

<210> 607

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa is Glu or Asp

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Ile, Asn or Asp

14 Aug 2018 2016233495

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Asp, His or Asn

<400> 607

Xaa Val Xaa Xaa Arg Pro Ser

1 5

<210> 608

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Phe or Tyr

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Asn or Ser

<220>

<221> misc_feature

2016233495 14 Aug 2018

<222> (6)..(6)

<223> Xaa is Arg, Thr or Ser

<220>

<221> misc_feature

<222> (7)..(7)

<223> Xaa is Gly or Ser

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Ile or Thr

<400> 608

Ser Ser Xaa Thr Xaa Xaa Xaa Xaa Arg Val
1 5 10

<210> 609

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa is Lys, Arg, Thr, Gln, Gly, Ala, Trp,
Met, Ile or Ser

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Val, Arg, Lys, Leu, Met or Ile

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is His, Thr, Asn, Gln, Ala, Val, Tyr,
Trp, Phe or Met

<400> 609

Xaa Tyr Xaa Met Xaa
1 5

<210> 610

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Phe or Ile

<220>

14 Aug 2018
2016233495

<221> misc_feature

<222> (14)..(14)

<223> Xaa is Ser or Thr

<400> 610

Ser Ile Tyr Pro Ser Gly Gly Xaa Thr Phe Tyr Ala Asp Xaa Val Lys
1 5 10 15

Gly

<210> 611

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (10)..(10)

<223> Xaa is Glu or Asp

<400> 611

Ile Lys Leu Gly Thr Val Thr Thr Val Xaa Tyr
1 5 10

14 Aug 2018 2016233495

<210> 612

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 612

Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr Asn Tyr Val Ser
1 5 10

<210> 613

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 613

Asp Val Ser Asn Arg Pro Ser
1 5

<210> 614

<211> 10

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 614

Ser Ser Tyr Thr Ser Ser Ser Thr Arg Val
1 5 10

<210> 615

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 615

Ser Tyr Ile Met Met
1 5

<210> 616

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 616

2016233495 14 Aug 2018

Ser Gly Gln
1

<210> 617
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 617

Ser Ile Tyr Pro Ser Gly Gly Ile Thr Phe Tyr Ala Asp Thr Val Lys
1 5 10 15

Gly

<210> 618
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 618

2016233495 14 Aug 2018

Ile Lys Leu Gly Thr Val Thr Thr Val Asp Tyr
1 5 10

<210> 619
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 619

Met Tyr Met Met Met
1 5

<210> 620
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 620

Ser Ile Tyr Pro Ser Gly Gly Ile Thr Phe Tyr Ala Asp Ser Val Lys
1 5 10 15

Gly

<210> 621

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 621

Thr Gly Thr Ser Ser Asp Val Gly Ala Tyr Asn Tyr Val Ser
1 5 10

<210> 622

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa is Arg, Ser or Lys

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa is Ala or Ser

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Arg, Asn, Asp, Gln, Glu, His, Lys, Met or Ser

<220>

<221> misc_feature

<222> (5)..(10)

<223> May be absent

<220>

<221> misc_feature

<222> (11)..(11)

<223> Xaa is Asn, Asp or Absent

<220>

<221> misc_feature

<222> (12)..(12)

<223> Xaa is Ala, Gln, Glu, Leu, Lys, Met, Pro, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (13)..(13)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (14)..(14)

<223> Xaa is Arg, Asn, Ser or Thr

<220>

<221> misc_feature

<222> (15)..(15)

<223> Xaa is Ala, Arg, Asn, Cys, Gln, Glu, His, Ile, Leu, Lys, Met, Phe, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (16)..(16)

<223> Xaa is Ile, Leu, Met or Val

<220>

<221> misc_feature

<222> (17)..(17)

<223> Xaa is Ala, Arg, Asn, Gln, Glu, His, Ile, Lys, Met, Phe, Ser, Thr or Tyr

<400> 622

Xaa Xaa Ser Xaa Ser Leu Leu Tyr Ser Ser Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa

<210> 623

<211> 6

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa is Ala, Cys, Gly, Ser, Thr or Val

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Ala, Cys, His, Ile, Leu, Met, Phe, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Arg, Asn, Asp, Gln, Glu, Lys, Ser or Thr

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Ala, Arg, Asn, Asp, Gln, Glu, Gly, His, Lys, Met, Phe, Pro, Ser, Thr or Tyr

<220>

<221> misc_feature

2016233495 14 Aug 2018

<222> (6)..(6)

<223> Xaa is Ala, Asn, Ser or Thr

<400> 623

Xaa Xaa Xaa Xaa Xaa Xaa
1 5

<210> 624

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa is Arg, Asn, Gln, Glu or His

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Ala, Arg, Asn, Cys, Gln, Glu, His, Ile, Leu, Lys, Met, Phe, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Asn, Gly or Ser

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Ile, Leu, Lys, Met, Phe, Arg, Ser, Thr, Trp, Tyr or Val

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Ala, Arg, Asn, Asp, Gln, Glu, Gly, His, Lys, Met, Pro, Ser, Thr or Tyr

<400> 624

Xaa Gln Xaa Xaa Xaa Xaa Pro Xaa Thr
1 5

<210> 625

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (2)..(2)

<223> Xaa is Tyr or Phe

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Thr or Ser

<220>

<221> misc_feature

<222> (4)..(4)

<223> Xaa is Ile, Leu, Met or Phe

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, His, Ile, Leu, Lys, Met, Pro, Ser, Thr, Trp, Tyr or Val

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Asn, Asp, Gln, Glu, Lys, Pro, Ser or Thr

<220>

<221> misc_feature

<222> (7)..(7)

<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Ile, Leu, Lys, Met, Phe, Pro, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Ile, Leu, Lys, Met, Phe, Pro, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (9)..(9)

<223> Xaa is Ala, Arg, Cys, Gln, Glu, His, Ile, Leu, Lys, Met, Phe, Ser, Thr, Trp, Tyr or Val

<400> 625

Gly Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn
1 5 10

<210> 626

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (1)..(1)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

2016233495 14 Aug 2018

<222> (2)..(2)

<223> Xaa is Ile, Leu, Met, Phe or Val

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (4)..(4)

<223> May be absent

<220>

<221> misc_feature

<222> (5)..(5)

<223> Xaa is Ala, Arg, Asn, Gln, Glu, His, Lys, Met, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (6)..(6)

<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Lys, Met, Phe, Pro, Ser, Thr, Tyr or Val

<220>

<221> misc_feature

<222> (7)..(7)

<223> Xaa is Asn, Gly or Ser

<220>

<221> misc_feature

<222> (8)..(8)

2016233495 14 Aug 2018

<223> Xaa is Asn, Gly or Ser

<220>
<221> misc_feature
<222> (10)..(10)
<223> Xaa is Ala, Arg, Asn, Gln, Glu, His, Lys, Met, Ser, Thr or Tyr

<220>
<221> misc_feature
<222> (11)..(11)
<223> Xaa is Ala, Arg, Asn, Cys, Gln, Glu, His, Ile, Leu, Lys, Met, Phe, Ser, Thr, Trp, Tyr or Val

<220>
<221> misc_feature
<222> (13)..(13)
<223> Xaa is Ala, Asp, Gln, Glu, Lys, Pro, Ser or Thr

<220>
<221> misc_feature
<222> (14)..(14)
<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Ile, Leu, Lys, Met, Phe, Pro, Ser, Thr, Tyr or Val

<220>
<221> misc_feature
<222> (15)..(15)
<223> Xaa is Ile, Leu, Met or Phe

<220>
<221> misc_feature
<222> (17)..(17)

2016233495 14 Aug 2018

<223> Xaa is Ala, Gly or Ser

<400> 626

Xaa Xaa Xaa Pro Xaa Xaa Xaa Xaa Thr Xaa Xaa Asn Xaa Xaa Xaa Lys
1 5 10 15

Xaa

<210> 627
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<220>
<221> misc_feature
<222> (1)..(1)
<223> Xaa is Ala, Arg, Asn, Gln, Glu, His, Lys, Met, Ser, Thr or Tyr

<220>
<221> misc_feature
<222> (2)..(2)
<223> Xaa is Ala, Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Lys, Met, Phe, Pro, Ser, Thr, Tyr or Val

2016233495 14 Aug 2018

<220>

<221> misc_feature

<222> (3)..(3)

<223> Xaa is Gln, Gly, His, Thr or Trp

<220>

<221> misc_feature

<222> (4)..(7)

<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature

<222> (8)..(8)

<223> Xaa is Phe or Tyr

<220>

<221> misc_feature

<222> (9)..(10)

<223> May be absent

<400> 627

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Ala Ile
1 5 10

<210> 628

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 628

Arg Ala Ser Ser Ser Val Ser Tyr Ile Tyr
1 5 10

<210> 629
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 629

Ala Thr Phe Asn Leu Ala Ser
1 5

<210> 630
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 630

His Gln Arg Ser Ser Tyr Pro Trp Thr
1 5

2016233495 14 Aug 2018

<210> 631

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 631

Gly Tyr Thr Phe Pro Asp Tyr Tyr Met Asn
1 5 10

<210> 632

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 632

Asp Ile Asp Pro Asn Tyr Gly Gly Thr Thr Tyr Asn Gln Lys Phe Lys
1 5 10 15

Gly

14 Aug 2018 2016233495

<210> 633

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 633

Gly Ala Leu
1

<210> 634

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 634

Ser Ala Ser Ser Ser Ile Arg Tyr Met His
1 5 10

<210> 635

<211> 7

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 635

Asp Thr Ser Lys Leu Thr Ser
1 5

<210> 636

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 636

Gln Gln Asp Ser Ser Tyr Pro Leu Thr
1 5

<210> 637

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 637

2016233495 14 Aug 2018

Gly Tyr Thr Phe Thr Ser Tyr Asp Ile Asn
1 5 10

<210> 638
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 638

Trp Ile Phe Pro Arg Asp Asn Asn Thr Lys Tyr Asn Glu Asn Phe Lys
1 5 10 15

Gly

<210> 639
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 639

2016233495 14 Aug 2018

Glu Asn Trp Val Gly Asp Phe
1 5

<210> 640
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 640

Lys Ala Ser Gln Asp Val Gly Thr Ala Val Ala
1 5 10

<210> 641
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 641

Trp Ala Ser Thr Arg His Thr
1 5

<210> 642

2016233495 14 Aug 2018

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 642

Gln Gln Tyr Tyr Gly Tyr Pro Leu Thr
1 5

<210> 643

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 643

Gly Tyr Ser Ile Thr Ser Asp Tyr Trp Asn
1 5 10

<210> 644

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 644

Tyr Ile Ser Tyr Thr Gly Ser Thr Tyr Tyr Asn Pro Ser Leu Lys Ser
1 5 10 15

<210> 645
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 645

Tyr Gly Gly Trp Leu Ser Pro Phe
1 5

<210> 646
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 646

Lys Ser Ser Gln Ser Leu Leu Tyr Ser Ser Asn Gln Lys Asn Ser Leu

14 Aug 2018 2016233495

1 5 10 15

<210> 647

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 647

Gly Tyr Ser Ile Ile Ser Asp Tyr Trp Asn

1 5 10

<210> 648

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 648

Arg Gly Gly Trp Leu Leu Pro Phe

1 5

<210> 649

<211> 10

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 649

Gly Phe Ser Leu Thr Thr Tyr Ser Ile Asn
1 5 10

<210> 650

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 650

Val Met Trp Ala Gly Gly Gly Thr Asn Ser Asn Ser Val Leu Lys Ser
1 5 10 15

<210> 651

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 651

Tyr Tyr Gly Asn Ser Pro Tyr Tyr Ala Ile
1 5 10

<210> 652
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 652

Thr Arg Ser Ser Gly Ser Ile Gly Ser Asn Tyr Val Gln
1 5 10

<210> 653
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 653

Glu Asp Asn Gln Arg Pro Ser
1 5

2016233495 14 Aug 2018

<210> 654

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 654

Gln Ser Tyr Asp Ser Ser Thr Trp Val
1 5

<210> 655

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 655

Trp Ile Ser Pro Ile Gly Gly Ser Thr Asn Tyr Ala Gln Lys Val Gln
1 5 10 15

Gly

2016233495 14 Aug 2018

<210> 656

<211> 19

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<220>

<221> misc_feature

<222> (3)..(17)

<223> Xaa can be any naturally occurring amino acid

<400> 656

Gly Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

1 5 10 15

Xaa Asp Val

<210> 657

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 657

Thr Arg Ser Ser Gly Asn Ile Ala Ser Asn Tyr Val Gln
1 5 10

<210> 658
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 658

Gly Lys Asn Asn Arg Pro Ser
1 5

<210> 659
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 659

Gln Ser Tyr Asp Ser Ser Asn Leu Trp Val
1 5 10

14 Aug 2018 2016233495

<210> 660

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 660

Ser Tyr Gly Ile Ser
1 5

<210> 661

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 661

Trp Ile Ser Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Leu Glu
1 5 10 15

Asp

2016233495 14 Aug 2018

<210> 662

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 662

Ala Leu Pro Ser Gly Thr Ile Leu Val Gly Gly Trp Phe Asp Pro
1 5 10 15

<210> 663

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 663

Gln Gly Asp Ser Leu Arg Ser Tyr Tyr Ala Ser
1 5 10

<210> 664

<211> 7

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 664

Ser Asp Arg Asp Arg Pro Ser
1 5

<210> 665

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 665

Asn Ser Arg Asp Ser Ser Gly Asn His Tyr Val
1 5 10

<210> 666

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 666

2016233495 14 Aug 2018

Ser Tyr Ala Leu Ser
1 5

<210> 667
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 667

Ala Ile Ser Gly Gly Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val Lys
1 5 10 15

Asp

<210> 668
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 668

Asp Val Phe Pro Glu Thr Phe Ser Met Asn Tyr Gly Met Asp Val

14 Aug 2018 2016233495

1 5 10 15

<210> 669

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 669

Gly Gly Ser Asp Ile Gly Arg Lys Ser Val His

1 5 10

<210> 670

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 670

Gln Val Trp Asp Asn Asn Ser Asp His Tyr Val

1 5 10

<210> 671

<211> 5

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 671

Asp Tyr Ala Met His
1 5

<210> 672

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 672

Leu Ile Ser Gly Asp Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val Lys
1 5 10 15

Asp

<210> 673

<211> 19

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 673

Val Leu Leu Pro Cys Ser Ser Thr Ser Cys Tyr Gly Ser Val Gly Ala
1 5 10 15

Phe Asp Ile

<210> 674

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 674

Ser Ser Tyr Thr Ser Ser Thr Leu Pro
1 5

<210> 675

<211> 5

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 675

Asn Tyr Asp Met Ser
1 5

<210> 676

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 676

Arg Val Asn Trp Asn Gly Gly Ser Thr Thr Tyr Ala Asp Ala Val Lys
1 5 10 15

Asp

<210> 677

<211> 8

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 677

Glu Phe Val Gly Ala Tyr Asp Leu
1 5

<210> 678

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 678

Arg Ala Ser Gln Ser Ile Gly Asn Ser Leu Ala
1 5 10

<210> 679

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 679

2016233495 14 Aug 2018

Ala Ala Ser Thr Leu Gln Ser
1 5

<210> 680
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 680

Gln Gln His Thr Ile Pro Thr Phe Ser
1 5

<210> 681
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 681

Gly Leu Tyr Ile His
1 5

<210> 682

2016233495 14 Aug 2018

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 682

Trp Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe Glu
1 5 10 15

Asp

<210> 683

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 683

Gly Leu Arg Trp Gly Ile Trp Gly Trp Phe Asp Pro
1 5 10

<210> 684

<211> 11

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 684

Arg Ala Ser Gln Gly Ile Gly Ser Tyr Leu Ala
1 5 10

<210> 685

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 685

Gln Asp Ile Lys Arg Pro Ser
1 5

<210> 686

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 686

Gln Gln Leu Asn Asn Tyr Pro Ile Thr
1 5

<210> 687
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 687

Asp Asn Ala Ile Ser
1 5

<210> 688
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 688

Trp Ile Ile Pro Ile Phe Gly Lys Pro Asn Tyr Ala Gln Lys Phe Glu
1 5 10 15

2016233495 14 Aug 2018

Asp

<210> 689

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 689

Thr Met Val Arg Gly Phe Leu Gly Val Met Asp Val
1 5 10

<210> 690

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 690

Ser Gly Asp Lys Leu Gly Asn Lys Tyr Ala Tyr
1 5 10

14 Aug 2018 2016233495

<210> 691

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 691

Glu Asp Tyr Arg Arg Pro Ser
1 5

<210> 692

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 692

Gln Thr Trp Asp Asn Ser Val Val
1 5

<210> 693

<211> 17

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 693

Ala Ile Ser Gly Ser Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val Lys
1 5 10 15

Asp

<210> 694

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 694

Asp Gln Phe Val Thr Ile Phe Gly Val Pro Arg Tyr Gly Met Asp Val
1 5 10 15

<210> 695

<211> 13

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 695

Thr Arg Ser Ser Gly Ser Ile Asp Ser Asn Tyr Val Gln
1 5 10

<210> 696

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 696

Asp Asp Ser Asp Arg Pro Ser
1 5

<210> 697

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 697

2016233495 14 Aug 2018

Gln Ser Tyr Asp Ser Asn Asn Arg His Val Ile
1 5 10

<210> 698
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 698

Thr Tyr Ala Leu Asn
1 5

<210> 699
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 699

Arg Ile Val Pro Leu Ile Gly Leu Val Asn Tyr Ala His Asn Phe Glu
1 5 10 15

Asp

2016233495 14 Aug 2018

<210> 700

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 700

Gly Arg Gln Met Phe Gly Ala Gly Ile Asp Phe
1 5 10

<210> 701

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 701

Thr Arg Ser Ser Gly Asn Ile Gly Thr Asn Tyr Val Gln
1 5 10

<210> 702

<211> 7

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 702

Glu Asp Asn Lys Arg Pro Ser
1 5

<210> 703

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 703

Gln Ser Tyr His Ser Ser Gly Trp Glu
1 5

<210> 704

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 704

Ser His Gly Ile Thr
1 5

<210> 705
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 705

Trp Ile Ser Ala His Asn Gly His Ala Ser Asn Ala Gln Lys Val Glu
1 5 10 15

Asp

<210> 706
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018
2016233495

<400> 706

Glu Val Tyr Gly Gly Asn Ser Asp Tyr
1 5

<210> 707
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 707

Gly Gly Asn Asn Ile Gly Ser Lys Gly Val His
1 5 10

<210> 708
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 708

Tyr Lys Ser Asp Ser Asn Lys Gln Gln Ala Ser
1 5 10

2016233495 14 Aug 2018

<210> 709

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 709

Gln Val Trp Asp Ser Ser Ser Asp His Trp Val
1 5 10

<210> 710

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 710

Arg His Gly Met His
1 5

<210> 711

<211> 17

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 711

Val Ile Ser His Asp Gly Ser Val Lys Tyr Tyr Ala Asp Ser Met Lys
1 5 10 15

Asp

<210> 712

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 712

Val His Ala Ala Leu Tyr Tyr Gly Met Asp Val
1 5 10

<210> 713

<211> 13

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 713

Thr Arg Ser Ser Gly Ser Ile Ala Ser Asn Tyr Val Gln
1 5 10

<210> 714

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 714

Gln Ser Tyr Asp Ser Thr Thr Pro Ser Val
1 5 10

<210> 715

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 715

2016233495 14 Aug 2018

Trp Thr Ser Pro His Asn Gly Leu Thr Ala Phe Ala Gln Ile Leu Glu
1 5 10 15

Asp

<210> 716
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 716

Gly Leu Ser Tyr Gln Val Ser Gly Trp Phe Asp Pro
1 5 10

<210> 717
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 717

Thr Arg Ser Ser Gly Ser Ile Ala Ser His Tyr Val Gln

2016233495 14 Aug 2018

1 5 10

<210> 718

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 718

Gln Ser Tyr Asp Gly Ile Thr Val Ile

1 5

<210> 719

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 719

Arg Ile Ile Pro Ile Leu Gly Ile Ala Asn Tyr Ala Gln Lys Phe Glu

1 5 10 15

Asp

2016233495 14 Aug 2018

<210> 720

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 720

Val His Pro Val Phe Ser Tyr Ala Leu Asp Val
1 5 10

<210> 721

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 721

Thr Leu Arg Ser Gly Leu Asn Val Gly Ser Tyr Arg Ile Tyr
1 5 10

<210> 722

<211> 10

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 722

Gln Ser Tyr Asp Ser Ser Asn Arg Trp Val
1 5 10

<210> 723

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 723

Thr Tyr Ala Phe Ser
1 5

<210> 724

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 724

Trp Ile Ser Ala Tyr Asn Gly Asn Thr Asn Tyr Ala Gln Lys Val Glu
1 5 10 15

Asp

<210> 725
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 725

Asp Gly Tyr Gly Ser Asp Pro Val Leu
1 5

<210> 726
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 726

14 Aug 2018 2016233495

Met Ile Trp Tyr Ser Ser Ala Val Val
1 5

<210> 727
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 727

Asn Tyr Gly Ile Ser
1 5

<210> 728
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 728

Gly Asp Phe Arg Lys Pro Phe Asp Tyr
1 5

2016233495 14 Aug 2018

<210> 729

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 729

Arg Ala Thr Glu Ser Val Glu Tyr Tyr Gly Thr Ser Leu Val Gln
1 5 10 15

<210> 730

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 730

Ala Ala Ser Ser Val Asp Ser
1 5

<210> 731

<211> 9

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 731

Gln Gln Ser Arg Arg Val Pro Tyr Thr
1 5

<210> 732

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 732

Ser Tyr Val Met His
1 5

<210> 733

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 733

2016233495 14 Aug 2018

Tyr Val Asn Pro Phe Asn Asp Gly Thr Lys Tyr Asn Glu Met Phe Lys
1 5 10 15

Gly

<210> 734
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 734

Gln Ala Trp Gly Tyr Pro
1 5

<210> 735
<211> 122
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 735

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly

2016233495 14 Aug 2018

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Ser
20 25 30

Trp Ile His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Trp Ile Ser Pro Tyr Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Ala Asp Thr Ser Lys Asn Thr Ala Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Arg His Trp Pro Gly Gly Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser Ala Ser Thr Lys
115 120

<210> 736

<211> 118

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 736

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Ser
20 25 30

Trp Ile His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Trp Ile Ser Pro Tyr Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Ala Asp Thr Ser Lys Asn Thr Ala Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Arg His Trp Pro Gly Gly Phe Asp Tyr Trp Gly Gln Gly Thr

100 105 110

Leu Val Thr Val Ser Ser
115

<210> 737
<211> 447
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 737

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Ser
20 25 30

Trp Ile His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Trp Ile Ser Pro Tyr Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val
50 55 60

2016233495 14 Aug 2018

```
Lys Gly Arg Phe Thr Ile Ser Ala Asp Thr Ser Lys Asn Thr Ala Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Arg His Trp Pro Gly Gly Phe Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110

Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro
        115                 120                 125

Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly
    130                 135                 140

Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn
145                 150                 155                 160

Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln
                165                 170                 175

Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser
            180                 185                 190

Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser
```

2016233495 14 Aug 2018

195 200 205

Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys Asp Lys Thr
210 215 220

His Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser
225 230 235 240

Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg
245 250 255

Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro
260 265 270

Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala
275 280 285

Lys Thr Lys Pro Arg Glu Glu Gln Tyr Ala Ser Thr Tyr Arg Val Val
290 295 300

Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr
305 310 315 320

Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr
325 330 335

2016233495 14 Aug 2018

Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu
340 345 350

Pro Pro Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys
355 360 365

Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser
370 375 380

Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp
385 390 395 400

Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser
405 410 415

Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala
420 425 430

Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly
435 440 445

<210> 738
<211> 214
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 738

```
Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asp Val Ser Thr Ala
            20                  25                  30

Val Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Ser Ala Ser Phe Leu Tyr Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Leu Tyr His Pro Ala
                85                  90                  95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala
            100                 105                 110
```

2016233495 14 Aug 2018

Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
115 120 125

Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
130 135 140

Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
145 150 155 160

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser
165 170 175

Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
180 185 190

Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
195 200 205

Phe Asn Arg Gly Glu Cys
210

<210> 739
<211> 121
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 739

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Arg Phe
20 25 30

Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Asn Ile Asn Gln Asp Gly Thr Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Gly Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Asn Thr Tyr Tyr Asp Phe Trp Ser Gly His Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 740
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 740

Gln Glu His Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Glu Ala Ser Gly Phe Thr Phe Ser Asn Phe
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Ala Leu Trp Ser Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Val Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr

2016233495 14 Aug 2018

65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Arg Gly Ala Pro Gly Ile Pro Ile Phe Gly Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 741
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 741

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asn Ala
20 25 30

2016233495 14 Aug 2018

Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Gly Arg Ile Lys Arg Lys Thr Asp Gly Gly Thr Thr Asp Tyr Ala Ala
50 55 60

Pro Val Lys Gly Arg Phe Thr Ile Ser Arg Asp Asp Ser Lys Asn Thr
65 70 75 80

Leu His Leu Gln Met Asn Ser Leu Lys Thr Glu Asp Thr Ala Val Tyr
85 90 95

Tyr Cys Thr Thr Asp Asp Ile Val Val Val Pro Ala Val Met Arg Glu
100 105 110

Tyr Tyr Phe Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val
115 120 125

Ser Ser
130

<210> 742
<211> 121
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 742

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ala
1               5                  10                  15

Ser Val Gln Val Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Gly Tyr
            20                  25                  30

Tyr Ile His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Trp Ile Asn Pro Asn Ser Gly Thr Lys Lys Tyr Ala His Lys Phe
    50                  55                  60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Ile Asp Thr Ala Tyr
65                  70                  75                  80

Met Ile Leu Ser Ser Leu Ile Ser Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Asp Glu Asp Trp Asn Phe Gly Ser Trp Phe Asp Ser Trp Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 743
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 743

Gln Val His 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 Gly Tyr
20 25 30

Tyr Ile His Trp Val Arg Gln Ala Pro Gly His Gly Leu Glu Trp Met
35 40 45

Gly Trp Leu Asn Pro Asn Thr Gly Thr Thr Lys Tyr Ile Gln Asn Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

2016233495 14 Aug 2018

Met Glu Leu Thr Arg Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Glu Asp Trp Asn Tyr Gly Ser Trp Phe Asp Thr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 744
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 744

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Arg Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Thr Trp Val Arg Gln Ala Pro Gly Arg Gly Leu Glu Trp Val
35 40 45

14 Aug 2018 2016233495

Ser Gly Ile His Trp His Gly Lys Arg Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Lys Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Lys Gly Glu Asp Thr Ala Leu Tyr His Cys
85 90 95

Val Arg Gly Gly Met Ser Thr Gly Asp Trp Phe Asp Pro Trp Gly Gln
100 105 110

Gly Thr Leu Val Ile Val Ser Ser
115 120

<210> 745
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 745

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Arg Pro Gly Gly

1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Thr Trp Val Arg Gln Val Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile His Trp Ser Gly Arg Ser Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Arg Gly Gly Met Ser Thr Gly Asp Trp Phe Asp Pro Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 746
<211> 115

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 746

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Val Gly Ser Asn
            20                  25                  30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ser Val Ile Tyr Ser Gly Gly Ser Thr Tyr Tyr Ala Asp Ser Val Lys
    50                  55                  60

Gly Arg Phe Thr Ile Ser Arg Leu Thr Ser Lys Asn Thr Leu Tyr Leu
65                  70                  75                  80

Gln Met Ser Ser Leu Arg Pro Glu Asp Thr Ala Val Tyr Tyr Cys Ala
                85                  90                  95

Arg Gly Ile Arg Gly Leu Asp Val Trp Gly Gln Gly Thr Thr Val Thr
```

100 105 110

Val Ser Ser
115

<210> 747
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 747

Glu Glu Arg Leu Val Glu Ser Gly Gly Asp Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Ile Thr Val Gly Thr Asn
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Val Ile Ser Ser Gly Gly Asn Thr His Tyr Ala Asp Ser Val Lys
50 55 60

2016233495 14 Aug 2018

Gly Arg Phe Ile Met Ser Arg Gln Thr Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Glu Thr Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Arg Gly Ile Arg Gly Leu Asp Val Trp Gly Gln Gly Thr Met Val Thr
100 105 110

Val Ser Ser
115

<210> 748
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 748

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Met Pro Gly Ser
1 5 10 15

Ser Val Arg Val Ser Cys Lys Ala Ser Gly Gly Ile Phe Ser Ser Ser
20 25 30

2016233495 14 Aug 2018

Thr Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Glu Ile Ile Pro Val Phe Gly Thr Val Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Asp Arg Val Ile Phe Thr Ala Asp Glu Ser Thr Thr Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Lys Ser Gly Asp Thr Ala Val Tyr Phe Cys
85 90 95

Ala Arg Asn Trp Gly Leu Gly Ser Phe Tyr Ile Trp Gly Gln Gly Thr
100 105 110

Met Val Thr Val Ser Ser
115

<210> 749
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018
2016233495

<400> 749

Glu Val Gln Leu Val Glu Ser Gly Gly Asp Leu Val His Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Pro Phe Asp Glu Tyr
20 25 30

Ala Met His Trp Val Arg Gln Val Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Ser Trp Ser Asn Asn Asn Ile Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Pro Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Lys Ser Gly Ile Phe Asp Ser Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

2016233495 14 Aug 2018

<210> 750

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 750

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Thr Leu Ile Ser Tyr Glu Gly Arg Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Asp Arg Thr Leu Tyr Gly Met Asp Val Trp Gly Gln Gly Thr
100 105 110

Thr Val Thr Val Ser Ser
115

<210> 751
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 751

Gln Val Thr Leu Arg Glu Ser Gly Pro Ala Leu Val Lys Thr Thr Gln
1 5 10 15

Thr Leu Thr Leu Thr Cys Thr Phe Ser Gly Phe Ser Leu Ser Thr Asn
20 25 30

Arg Met Cys Val Thr Trp Ile Arg Gln Pro Pro Gly Lys Ala Leu Glu
35 40 45

Trp Leu Ala Arg Ile Asp Trp Asp Gly Val Lys Tyr Tyr Asn Thr Ser

2016233495 14 Aug 2018

50 55 60

Leu Lys Thr Arg Leu Thr Ile Ser Lys Asp Thr Ser Lys Asn Gln Val
65 70 75 80

Val Leu Thr Met Thr Asn Met Asp Pro Val Asp Thr Ala Thr Phe Tyr
85 90 95

Cys Ala Arg Ser Thr Ser Leu Thr Phe Tyr Tyr Phe Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 752
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 752

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

2016233495 14 Aug 2018

Ser Leu Arg Leu Ser Cys Ala Ala Ser Glu Phe Thr Val Gly Thr Asn
20 25 30

His Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Val Ile Tyr Ser Gly Gly Asn Thr Phe Tyr Ala Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg His Thr Ser Lys Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Thr Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Arg Gly Leu Gly Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr
100 105 110

Val Ser Ser
115

<210> 753
<211> 120
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 753

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Arg Gly Glu
1               5                  10                  15

Ser Leu Arg Leu Tyr Cys Ala Ala Ser Gly Phe Thr Phe Ser Lys Tyr
            20                  25                  30

Trp Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Asn Ile Lys Gly Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Asp Tyr Trp Gly Ser Gly Tyr Tyr Phe Asp Phe Trp Gly Gln
            100                 105                 110
```

2016233495 14 Aug 2018

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 754
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 754

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Ser Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Asn Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

2016233495 14 Aug 2018

Leu Gln Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Asp Ile Val Val Val Pro Ala Pro Met Gly Tyr Tyr Tyr
100 105 110

Tyr Tyr Phe Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val
115 120 125

Ser Ser
130

<210> 755
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 755

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Phe
20 25 30

14 Aug 2018 2016233495

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Ser Trp Thr Gly Gly Asn Met Asp Tyr Ala Asn Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Glu Asp Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Ala Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Val Lys Asp Ile Arg Gly Ile Val Ala Thr Gly Gly Ala Phe Asp Ile
100 105 110

Trp Gly Arg Gly Thr Met Val Thr Val Ser Ser
115 120

<210> 756
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 756

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Val Gly Thr Asn
            20                  25                  30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Ile
        35                  40                  45

Ser Val Ile Tyr Ser Gly Gly Ser Thr Phe Tyr Ala Asp Ser Val Lys
    50                  55                  60

Gly Arg Phe Thr Ile Ser Arg Gln Thr Ser Gln Asn Thr Leu Tyr Leu
65                  70                  75                  80

Gln Met Asn Ser Leu Arg Pro Glu Asp Thr Ala Val Tyr Tyr Cys Ala
                85                  90                  95

Arg Gly Ile Arg Gly Phe Asp Ile Trp Gly Gln Gly Thr Met Val Thr
            100                 105                 110

Val Ser Ser
        115
```

<210> 757

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 757

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ile Ser Thr Asn
20 25 30

Tyr Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Tyr Ser Ser Gly Ser Thr Tyr Tyr Ile Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Leu Thr Ser Lys Asn Thr Val Tyr Leu
65 70 75 80

Gln Met Ser Ser Leu Asn Ser Glu Asp Thr Ala Val Tyr Tyr Cys Ala

85 90 95

Arg Gly Ile Arg Gly Phe Asp Ile Trp Gly Gln Gly Thr Met Val Thr
100 105 110

Val Ser Ser
115

<210> 758
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 758

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ile Asp Asp Ser
20 25 30

Ala Met His Trp Val Arg Gln Thr Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

Ser Gly Ile Ser Trp Lys Ser Gly Ser Ile Gly Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Val Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Val Lys Asp Ile Arg Gly Asn Trp Asn Tyr Gly Gly Asn Trp Phe Asp
100 105 110

Pro Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 759
<211> 115
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 759

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

2016233495 14 Aug 2018

Ser Leu Arg Leu Ser Cys Glu Ala Ser Gly Phe Thr Val Gly Val Asn
20 25 30

His Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Val Ile Phe Ser Ser Gly Arg Thr Phe Tyr Gly Asp Tyr Val Lys
50 55 60

Gly Arg Leu Thr Ile Phe Arg Gln Thr Ser Gln Asn Thr Val Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Ser Glu Asp Thr Ala Ile Tyr Tyr Cys Ala
85 90 95

Arg Gly Ile Gly Gly Leu Asp Ile Trp Gly Arg Gly Thr Met Val Thr
100 105 110

Val Ser Ser
115

<210> 760
<211> 123
<212> PRT
<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 760

```
Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
            20                  25                  30

Ala Leu His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ser Gly Ile Ser Trp Thr Gly Gly Thr Ile Asp Tyr Ala Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65                  70                  75                  80

Leu Gln Met Ser Ser Leu Arg Thr Glu Asp Thr Ala Ile Tyr Tyr Cys
                85                  90                  95

Thr Arg Asp Ile Arg Gly Asn Trp Lys Tyr Gly Gly Trp Phe Asp Pro
            100                 105                 110
```

2016233495 14 Aug 2018

Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 761
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 761

Gln Val Gln Leu Val Gln Ser Gly Thr 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 Ala Tyr
20 25 30

Tyr Met His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Asp Trp Met
35 40 45

Gly Trp Ile Ser Pro Asn Ser Gly Phe Thr Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Met Thr Arg Asp Thr Ser Ile Asn Thr Phe Tyr
65 70 75 80

14 Aug 2018 2016233495

Met Glu Leu Ser Gly Leu Arg Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Gly Ser Thr His His Asn Ser Phe Asp Pro Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 762
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 762

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Val Gly Thr Asn
20 25 30

Phe Met Asn Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

2016233495 14 Aug 2018

35 40 45

Ser Ala Ile Tyr Ser Gly Gly Thr Ala Asn Tyr Ala Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Thr Ser Arg Asn Thr Leu Tyr Leu
65 70 75 80

Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Arg Gly Gly Gly Met Asp Val Trp Gly Gln Gly Thr Thr Val Thr Val
100 105 110

Ser Ser

<210> 763
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 763

2016233495 14 Aug 2018

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1               5                   10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Asn Thr Tyr
            20                  25                  30

Val Leu Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Glu Ile Ile Pro Ile Leu Gly Ala Ala Asn Tyr Ala Gln Asn Phe
    50                  55                  60

Gln Gly Arg Val Thr Phe Thr Thr Asp Glu Ser Thr Asn Thr Ala Tyr
65                  70                  75                  80

Met Asp Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Asp Arg Thr Ser Gly Gly Phe Asp Pro Trp Gly Gln Gly Thr
            100                 105                 110

Leu Val Thr Val Ser Ser
        115
```

<210> 764

2016233495 14 Aug 2018

<211> 119

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 764

```
Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Glu Lys Pro Gly Ala
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Ile Phe Thr His Tyr
            20                  25                  30

Gly Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Val
        35                  40                  45

Gly Trp Ile Ser Pro Tyr Asn Gly Tyr Thr Asp Tyr Ala Gln Lys Leu
    50                  55                  60

Gln Gly Arg Val Thr Leu Thr Thr Asp Thr Ser Thr Thr Thr Ala Tyr
65                  70                  75                  80

Met Glu Leu Arg Asn Leu Arg Ser Asp Asp Thr Ala Met Tyr Tyr Cys
                85                  90                  95
```

2016233495 14 Aug 2018

Ser Arg Gly Arg Gly Pro Tyr Trp Ser Phe Asp Leu Trp Gly Arg Gly
100 105 110

Thr Leu Val Thr Val Ser Ser
115

<210> 765
<211> 106
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 765

Asp Ile Gln Met Thr Gln Ser Pro Ser Thr Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Asn Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Lys Ala Ser Ser Leu Glu Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

2016233495 14 Aug 2018

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Asp Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr His Ser Tyr Ser Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Glu Ile Lys
100 105

<210> 766
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 766

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Arg Asn Asp
20 25 30

Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

14 Aug 2018
2016233495

Tyr Thr Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Ser Tyr Pro Leu
85 90 95

Thr Phe Gly Gly Gly Thr Lys Val Ala Ile Lys
100 105

<210> 767
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 767

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Thr Ser Gln Gly Ile Arg Asn Asp

14 Aug 2018 2016233495

20 25 30

Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Asn Tyr Pro Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 768
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 768

2016233495 14 Aug 2018

```
Asp Ile Val Met Thr Gln Thr Pro Leu Ser Ser Pro Val Thr Leu Gly
1               5                  10                  15

Gln Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Thr Leu Val His Gly
            20                  25                  30

Asp Gly Asn Thr Tyr Leu Ser Trp Ile Gln Gln Arg Pro Gly Gln Pro
        35                  40                  45

Pro Arg Leu Leu Ile Tyr Lys Val Ser Asn Gln Phe Ser Gly Val Pro
    50                  55                  60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Lys Ile
65                  70                  75                  80

Ser Arg Val Glu Ala Glu Asp Val Gly Leu Tyr Phe Cys Met Gln Ala
                85                  90                  95

Thr His Phe Pro Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
            100                 105                 110
```

<210> 769

<211> 112

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 769

```
Asp Ile Val Met Thr Gln Thr Pro Leu Ser Ser Pro Val Thr Leu Gly
1               5                  10                  15

Gln Pro Ala Ser Ile Ser Cys Arg Ser Ser Pro Ser Leu Val His Ser
            20                  25                  30

Asp Gly Asn Thr Tyr Leu Ser Trp Leu Gln Gln Arg Pro Gly Gln Pro
        35                  40                  45

Pro Arg Leu Leu Ile Tyr Lys Ile Ser Asn Arg Phe Ser Gly Val Pro
    50                  55                  60

Asp Arg Phe Ser Gly Ser Gly Ala Gly Thr Asp Phe Thr Leu Lys Ile
65                  70                  75                  80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Met Gln Ala
                85                  90                  95

Thr His Phe Pro Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Arg
            100                 105                 110
```

<210> 770

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 770

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Leu Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Asn Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Val Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Asn Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Pro
85 90 95

2016233495 14 Aug 2018

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 771
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 771

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Val Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

14 Aug 2018 2016233495

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Pro
85 90 95

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 772
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 772

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Thr Ile Asn Ile Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Arg Ala Pro Arg Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly

2016233495 14 Aug 2018

50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys His Gln Ser Tyr Ser Thr Pro Pro
85 90 95

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 773
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 773

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Met Ser Ser Tyr
20 25 30

2016233495 14 Aug 2018

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Arg Ala Pro Lys Leu Leu Ile
35 40 45

Phe Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Pro
85 90 95

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 774
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 774

Glu Ile Val Leu Thr Gln Ser Pro Gly Thr Leu Ser Leu Ser Pro Gly
1 5 10 15

2016233495 14 Aug 2018

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Phe Asn Phe Asn
20 25 30

Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu
35 40 45

Ile Tyr Gly Ala Ser Ser Arg Ala Thr Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn Arg Leu Glu
65 70 75 80

Pro Glu Asp Phe Gly Val Phe Tyr Cys Gln Gln Tyr Glu Ser Ala Pro
85 90 95

Trp Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 775
<211> 105
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 775

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Leu Leu Ile Tyr Ala Ala
35 40 45

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Gly Gly Ser
50 55 60

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Arg Pro Glu Asp Phe
65 70 75 80

Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Cys Thr Pro Pro Ile Thr Phe
85 90 95

Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 776
<211> 108
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 776

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Pro
85 90 95

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

2016233495 14 Aug 2018

<210> 777

<211> 91

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 777

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Val Ile Ser Asn Tyr
1 5 10 15

Leu Ala Trp Tyr Gln Gln Lys Pro Gly Lys Val Pro Arg Leu Leu Ile
20 25 30

Tyr Ala Ala Ser Thr Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
35 40 45

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
50 55 60

Glu Asp Val Ala Thr Tyr Tyr Cys Gln Lys Tyr Asn Ser Ala Pro Arg
65 70 75 80

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys

2016233495 14 Aug 2018

85 90

<210> 778

<211> 107

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 778

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Asn Ile Asn Asn Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Phe Gln Asn Ala Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

2016233495 14 Aug 2018

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Asn Thr Pro Leu
85 90 95

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
100 105

<210> 779
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 779

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Arg Asn Asp
20 25 30

Leu Gly Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Arg Leu Ile
35 40 45

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

14 Aug 2018 2016233495

Ser Gly Ser Gly Thr Glu Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Leu Gln His Asn Ser Tyr Pro Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 780
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 780

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
35 40 45

14 Aug 2018 2016233495

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Thr Pro Pro
85 90 95

Ile Thr Phe Gly Gln Gly Thr Arg Leu Glu Ile Lys
100 105

<210> 781
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 781

Gln Ser Ile Ser Asn Trp
1 5

<210> 782

2016233495 14 Aug 2018

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 782

Lys Ala Ser
1

<210> 783

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 783

Gln Gln Tyr His Ser Tyr Ser Tyr Thr
1 5

<210> 784

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 784

Gly Phe Thr Phe Ser Arg Phe Trp
1 5

<210> 785
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 785

Ile Asn Gln Asp Gly Thr Glu Lys
1 5

<210> 786
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 786

Ala Asn Thr Tyr Tyr Asp Phe Trp Ser Gly His Phe Asp Tyr

2016233495 14 Aug 2018

1 5 10

<210> 787

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 787

Gln Gly Ile Arg Asn Asp

1 5

<210> 788

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 788

Thr Ala Ser

1

<210> 789

<211> 9

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 789

Leu Gln His Asn Ser Tyr Pro Leu Thr
1 5

<210> 790

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 790

Gly Phe Thr Phe Ser Asn Phe Gly
1 5

<210> 791

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 791

Leu Trp Ser Asp Gly Ser Asn Lys
1 5

<210> 792
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 792

Ala Arg Gly Arg Gly Ala Pro Gly Ile Pro Ile Phe Gly Tyr
1 5 10

<210> 793
<211> 3
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 793

Ala Ala Ser
1

2016233495 14 Aug 2018

<210> 794

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 794

Leu Gln His Asn Asn Tyr Pro Tyr Thr
1 5

<210> 795

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 795

Gly Phe Thr Phe Ser Asn Ala Trp
1 5

<210> 796

<211> 10

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 796

Ile Lys Arg Lys Thr Asp Gly Gly Thr Thr
1 5 10

<210> 797

<211> 21

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 797

Thr Thr Asp Asp Ile Val Val Val Pro Ala Val Met Arg Glu Tyr Tyr
1 5 10 15

Phe Gly Met Asp Val
20

<210> 798

<211> 11

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 798

Gln Thr Leu Val His Gly Asp Gly Asn Thr Tyr
1 5 10

<210> 799

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 799

Lys Val Ser
1

<210> 800

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 800

2016233495 14 Aug 2018

Met Gln Ala Thr His Phe Pro Ile Thr
1 5

<210> 801
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 801

Gly Tyr Ser Phe Thr Gly Tyr Tyr
1 5

<210> 802
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 802

Ile Asn Pro Asn Ser Gly Thr Lys
1 5

2016233495 14 Aug 2018

<210> 803

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 803

Ala Arg Asp Glu Asp Trp Asn Phe Gly Ser Trp Phe Asp Ser
1 5 10

<210> 804

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 804

Pro Ser Leu Val His Ser Asp Gly Asn Thr Tyr
1 5 10

<210> 805

<211> 3

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 805

Lys Ile Ser
1

<210> 806
<211> 8
<212> PRT
<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 806

Gly Tyr Thr Phe Thr Gly Tyr Tyr
1 5

<210> 807
<211> 8
<212> PRT
<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 807

2016233495 14 Aug 2018

Leu Asn Pro Asn Thr Gly Thr Thr
1 5

<210> 808
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 808

Ala Arg Asp Glu Asp Trp Asn Tyr Gly Ser Trp Phe Asp Thr
1 5 10

<210> 809
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 809

Gln Ser Ile Asn Ser Tyr
1 5

<210> 810

2016233495 14 Aug 2018

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 810

Val Ala Ser
1

<210> 811

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 811

Gln Gln Ser Tyr Ser Thr Pro Pro Ile Thr
1 5 10

<210> 812

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 812

Gly Phe Thr Phe Asp Asp Tyr Gly
1 5

<210> 813
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 813

Ile His Trp His Gly Lys Arg Thr
1 5

<210> 814
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 814

Val Arg Gly Gly Met Ser Thr Gly Asp Trp Phe Asp Pro

2016233495 14 Aug 2018

1 5 10

<210> 815

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 815

Gln Ser Ile Ser Ser Tyr

1 5

<210> 816

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 816

Ile His Trp Ser Gly Arg Ser Thr

1 5

<210> 817

<211> 13

14 Aug 2018
2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 817

Ala Arg Gly Gly Met Ser Thr Gly Asp Trp Phe Asp Pro
1 5 10

<210> 818

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 818

Gln Thr Ile Asn Ile Tyr
1 5

<210> 819

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 819

His Gln Ser Tyr Ser Thr Pro Pro Ile Thr
1 5 10

<210> 820
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 820

Gly Phe Thr Val Gly Ser Asn Tyr
1 5

<210> 821
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 821

Ile Tyr Ser Gly Gly Ser Thr
1 5

2016233495 14 Aug 2018

<210> 822

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 822

Ala Arg Gly Ile Arg Gly Leu Asp Val
1 5

<210> 823

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 823

Gln Ser Phe Asn Phe Asn Tyr
1 5

<210> 824

<211> 3

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 824

Gly Ala Ser
1

<210> 825

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 825

Gln Gln Tyr Glu Ser Ala Pro Trp Thr
1 5

<210> 826

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 826

Gly Gly Ile Phe Ser Ser Ser Thr
1 5

<210> 827
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 827

Ile Ile Pro Val Phe Gly Thr Val
1 5

<210> 828
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 828

Ala Arg Asn Trp Gly Leu Gly Ser Phe Tyr Ile
1 5 10

14 Aug 2018 2016233495

<210> 829

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 829

Gln Gln Ser Tyr Cys Thr Pro Pro Ile Thr
1 5 10

<210> 830

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 830

Gly Phe Pro Phe Asp Glu Tyr Ala
1 5

<210> 831

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 831

Ile Ser Trp Ser Asn Asn Asn Ile
1 5

<210> 832

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 832

Ala Lys Ser Gly Ile Phe Asp Ser
1 5

<210> 833

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 833

2016233495 14 Aug 2018

Gly Phe Thr Phe Ser Ser Tyr Gly
1 5

<210> 834
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 834

Ile Ser Tyr Glu Gly Arg Asn Lys
1 5

<210> 835
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 835

Ala Lys Asp Arg Thr Leu Tyr Gly Met Asp Val
1 5 10

2016233495 14 Aug 2018

<210> 836

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 836

Gln Val Ile Ser Asn Tyr
1 5

<210> 837

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 837

Gln Lys Tyr Asn Ser Ala Pro Arg Thr
1 5

<210> 838

<211> 10

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 838

Gly Phe Ser Leu Ser Thr Asn Arg Met Cys
1 5 10

<210> 839

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 839

Ile Asp Trp Asp Gly Val Lys
1 5

<210> 840

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 840

2016233495 14 Aug 2018

Ala Arg Ser Thr Ser Leu Thr Phe Tyr Tyr Phe Asp Tyr
1 5 10

<210> 841
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 841

Gln Asn Ile Asn Asn Tyr
1 5

<210> 842
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 842

Gln Gln Ser Tyr Asn Thr Pro Leu Thr
1 5

<210> 843

2016233495 14 Aug 2018

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 843

Glu Phe Thr Val Gly Thr Asn His
1 5

<210> 844

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 844

Ile Tyr Ser Gly Gly Asn Thr
1 5

<210> 845

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 845

Ala Arg Gly Leu Gly Gly Met Asp Val
1 5

<210> 846
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 846

Gln Thr Ile Ser Thr Tyr
1 5

<210> 847
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 847

Leu Gln His Asn Ser Tyr Pro Tyr Thr

2016233495 14 Aug 2018

1 5

<210> 848

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 848

Gly Phe Thr Phe Ser Lys Tyr Trp

1 5

<210> 849

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 849

Ile Lys Gly Asp Gly Ser Glu Lys

1 5

<210> 850

<211> 13

14 Aug 2018
2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 850

Ala Arg Asp Tyr Trp Gly Ser Gly Tyr Tyr Phe Asp Phe
1 5 10

<210> 851

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 851

Val Val Ser
1

<210> 852

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018 2016233495

<400> 852

Gln Gln Ser Tyr Ser Thr Pro Phe Thr
1 5

<210> 853
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 853

Gly Phe Thr Phe Ser Ser Tyr Trp
1 5

<210> 854
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 854

Ile Lys Gln Asp Gly Ser Glu Lys
1 5

2016233495 14 Aug 2018

<210> 855

<211> 23

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 855

Ala Arg Asp Asp Ile Val Val Val Pro Ala Pro Met Gly Tyr Tyr Tyr
1 5 10 15

Tyr Tyr Phe Gly Met Asp Val
20

<210> 856

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 856

Gly Phe Thr Phe Asp Asp Phe Ala
1 5

14 Aug 2018
2016233495

<210> 857

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 857

Ile Ser Trp Thr Gly Gly Asn Met
1 5

<210> 858

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 858

Val Lys Asp Ile Arg Gly Ile Val Ala Thr Gly Gly Ala Phe Asp Ile
1 5 10 15

<210> 859

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 859

Gly Phe Thr Val Gly Thr Asn Tyr
1 5

<210> 860

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 860

Ala Arg Gly Ile Arg Gly Phe Asp Ile
1 5

<210> 861

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 861

2016233495 14 Aug 2018

Gly Phe Thr Ile Ser Thr Asn Tyr
1 5

<210> 862
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 862

Ile Tyr Ser Ser Gly Ser Thr
1 5

<210> 863
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 863

Gly Phe Thr Ile Asp Asp Ser Ala
1 5

2016233495 14 Aug 2018

<210> 864

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 864

Ile Ser Trp Lys Ser Gly Ser Ile
1 5

<210> 865

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 865

Val Lys Asp Ile Arg Gly Asn Trp Asn Tyr Gly Gly Asn Trp Phe Asp
1 5 10 15

Pro

<210> 866

2016233495 14 Aug 2018

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 866

Gly Phe Thr Val Gly Val Asn His
1 5

<210> 867

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 867

Ile Phe Ser Ser Gly Arg Thr
1 5

<210> 868

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 868

Ala Arg Gly Ile Gly Gly Leu Asp Ile
1 5

<210> 869
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 869

Gly Phe Thr Phe Asp Asp Tyr Ala
1 5

<210> 870
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 870

Ile Ser Trp Thr Gly Gly Thr Ile

2016233495 14 Aug 2018

1 5

<210> 871

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 871

Thr Arg Asp Ile Arg Gly Asn Trp Lys Tyr Gly Gly Trp Phe Asp Pro
1 5 10 15

<210> 872

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 872

Gly Tyr Thr Phe Thr Ala Tyr Tyr
1 5

<210> 873

<211> 8

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 873

Ile Ser Pro Asn Ser Gly Phe Thr
1 5

<210> 874

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 874

Ala Arg Glu Gly Ser Thr His His Asn Ser Phe Asp Pro
1 5 10

<210> 875

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 875

Gly Phe Thr Val Gly Thr Asn Phe
1 5

<210> 876
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 876

Ile Ile Pro Ile Leu Gly Ala Ala
1 5

<210> 877
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 877

Ala Arg Gly Gly Gly Met Asp Val
1 5

2016233495 14 Aug 2018

<210> 878

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 878

Gly Gly Thr Phe Asn Thr Tyr Val
1 5

<210> 879

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 879

Ile Ser Pro Tyr Asn Gly Tyr Thr
1 5

<210> 880

<211> 11

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 880

Ala Arg Asp Arg Thr Ser Gly Gly Phe Asp Pro
1 5 10

<210> 881

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 881

Gly Tyr Ile Phe Thr His Tyr Gly
1 5

<210> 882

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 882

Ser Arg Gly Arg Gly Pro Tyr Trp Ser Phe Asp Leu
1 5 10

<210> 883
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 883

Leu Ser Gly Arg Ser Gly Asn His
1 5

<210> 884
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 884

Ser Gly Arg Ser Ala Asn Pro Arg Gly
1 5

14 Aug 2018 2016233495

<210> 885

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 885

Leu Ser Gly Arg Ser Asp Asp His
1 5

<210> 886

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 886

Leu Ser Gly Arg Ser Asp Ile His
1 5

<210> 887

<211> 8

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 887

Leu Ser Gly Arg Ser Asp Gln His
1 5

<210> 888

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 888

Leu Ser Gly Arg Ser Asp Thr His
1 5

<210> 889

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 889

2016233495 14 Aug 2018

Leu Ser Gly Arg Ser Asp Tyr His
1 5

<210> 890
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 890

Leu Ser Gly Arg Ser Asp Asn Pro
1 5

<210> 891
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 891

Leu Ser Gly Arg Ser Ala Asn Pro
1 5

2016233495 14 Aug 2018

<210> 892

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 892

Leu Ser Gly Arg Ser Ala Asn Ile
1 5

<210> 893

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 893

Leu Ser Gly Arg Ser Asp Asn Ile
1 5

<210> 894

<211> 8

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 894

Met Ile Ala Pro Val Ala Tyr Arg
1 5

<210> 895

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 895

Arg Pro Ser Pro Met Trp Ala Tyr
1 5

<210> 896

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 896

2016233495 14 Aug 2018

Trp Ala Thr Pro Arg Pro Met Arg
1 5

<210> 897
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 897

Phe Arg Leu Leu Asp Trp Gln Trp
1 5

<210> 898
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 898

Ile Ser Ser Gly Leu
1 5

<210> 899

2016233495 14 Aug 2018

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 899

Ile Ser Ser Gly Leu Leu Ser
1 5

<210> 900

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 900

Ile Ser Ser Gly Leu Leu
1 5

<210> 901

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 901

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Ala Asn Pro Arg Gly
1 5 10 15

<210> 902
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 902

Ala Val Gly Leu Leu Ala Pro Pro Thr Ser Gly Arg Ser Ala Asn Pro
1 5 10 15

Arg Gly

<210> 903
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 903

Ala Val Gly Leu Leu Ala Pro Pro Ser Gly Arg Ser Ala Asn Pro Arg
1 5 10 15

Gly

<210> 904
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 904

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Asp His
1 5 10

<210> 905
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 905

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Ile His
1 5 10

<210> 906
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 906

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Gln His
1 5 10

<210> 907
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 907

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Thr His
1 5 10

14 Aug 2018 2016233495

<210> 908

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 908

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Tyr His
1 5 10

<210> 909

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 909

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Asn Pro
1 5 10

<210> 910

<211> 13

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 910

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Ala Asn Pro
1 5 10

<210> 911

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 911

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Ala Asn Ile
1 5 10

<210> 912

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 912

2016233495 14 Aug 2018

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Asp His

<210> 913
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 913

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Ile His

<210> 914
<211> 18
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 914

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Gln His

<210> 915
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 915

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Thr His

<210> 916
<211> 18
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 916

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Tyr His

<210> 917

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 917

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Asn Pro

2016233495 14 Aug 2018

<210> 918

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 918

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Ala
1 5 10 15

Asn Pro

<210> 919

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 919

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Ala
1 5 10 15

Asn Ile

2016233495 14 Aug 2018

<210> 920

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 920

Ile Ser Ser Gly Leu Leu Ser Gly Arg Ser Asp Asn Ile
1 5 10

<210> 921

<211> 18

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 921

Ala Val Gly Leu Leu Ala Pro Pro Gly Gly Leu Ser Gly Arg Ser Asp
1 5 10 15

Asn Ile

2016233495 14 Aug 2018

<210> 922

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 922

Gly Gly Ser Gly Gly Ser
1 5

<210> 923

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 923

Gln Gly Gln Ser Gly Ser
1 5

<210> 924

<211> 7

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 924

Gln Gly Gln Ser Gly Gln Gly
1 5

<210> 925

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 925

Gln Ser Gly Gln Gly
1 5

<210> 926

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

14 Aug 2018
2016233495

<400> 926

Ser Gly Gln Gly
1

<210> 927
<211> 3
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 927

Gly Gln Gly
1

<210> 928
<211> 2
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 928

Gln Gly
1

14 Aug 2018
2016233495

<210> 929

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 929

caaggtcagt ctggatcc 18

<210> 930

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 930

tattgcgagg ttagtgagct gtttgttctt ccttggtgca tgggtggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 931

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 931

Tyr Cys Glu Val Ser Glu Leu Phe Val Leu Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

2016233495 14 Aug 2018

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 932
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 932

tcttgcctta tgcatccgca ttatgctcat gattattgct atgttggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 933

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 933

Ser Cys Leu Met His Pro His Tyr Ala His Asp Tyr Cys Tyr Val Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140
```

14 Aug 2018 2016233495

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 934
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 934
ttgtgcgagg ttttgatgtt gttgcagcat ccgtggtgca tgggggggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 935

2016233495 14 Aug 2018

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 935

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 936
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 936
attgcgtgcc ggcattttat ggagcagttg ccgttttgcc atcatggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

14 Aug 2018
2016233495

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 937

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 937

Ile Ala Cys Arg His Phe Met Glu Gln Leu Pro Phe Cys His His Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

2016233495 14 Aug 2018

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 938
<211> 516
<212> DNA
<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 938

tttggtccta ggtgcggtga ggcttctact tgcgttccgt atgagggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 939

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 939

2016233495 14 Aug 2018

```
Phe Gly Pro Arg Cys Gly Glu Ala Ser Thr Cys Val Pro Tyr Glu Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
```

14 Aug 2018
2016233495

130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 940
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 940
attctttatt gcgatagttg gggggcgggg tgcttgacgc ggccgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 941

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 941

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser

85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 942
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 942
gggattgcgt tgtgcccgtc tcatttttgc cagctgcctc agactggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

2016233495 14 Aug 2018

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 943

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 943

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr

2016233495 14 Aug 2018

35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 944
<211> 516

14 Aug 2018
2016233495

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 944

gatgggccgc gttgctttgt gtcgggggag tgctctccga ttggtggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 945

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 945

Asp Gly Pro Arg Cys Phe Val Ser Gly Glu Cys Ser Pro Ile Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 946
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 946
ttgtgctata agctggatta tgatgatagg tcttattgcc atattggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 947

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 947

Leu Cys Tyr Lys Leu Asp Tyr Asp Asp Arg Ser Tyr Cys His Ile Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 948
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 948
ccgtgccatc cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

14 Aug 2018 2016233495

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 949

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 949

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

```
Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140

Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 950

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 950

ccttgctatt ggcatccttt ttttgcgtat aggtattgca atactggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 951

<211> 151

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 951

```
Pro Cys Tyr Trp His Pro Phe Phe Ala Tyr Arg Tyr Cys Asn Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110
```

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 952
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 952
gtttgctatt atatggattg gttggggcgg aattggtgct cttcgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 953

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 953

Val Cys Tyr Tyr Met Asp Trp Leu Gly Arg Asn Trp Cys Ser Ser Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

2016233495 14 Aug 2018

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 954
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 954

ctgtgcgatc tgtttaagtt gcgtgagttt ccttattgca tgggggggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 955

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 955

Leu Cys Asp Leu Phe Lys Leu Arg Glu Phe Pro Tyr Cys Met Gly Gly

1 5 10 15

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140
```

2016233495 14 Aug 2018

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 956
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 956
tatcttccgt gccattttgt tccgattggg gcttgcaata ataagggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 957

2016233495 14 Aug 2018

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 957

```
Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95
```

2016233495 14 Aug 2018

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 958
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 958
atttttttgcc atatgggtgt tgtggttcct cagtgcgcga attatggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

2016233495 14 Aug 2018

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 959

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 959

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

2016233495 14 Aug 2018

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 960
<211> 516
<212> DNA
<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 960

gcgtgccatc cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 961

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 961

2016233495 14 Aug 2018

```
Ala Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
```

14 Aug 2018
2016233495

130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 962
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 962
ccgtgccatc cggctcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 963

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 963

Pro Cys His Pro Ala Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser

85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 964
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 964
ccgtgccatc cgcatgctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 965

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 965

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr

35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 966
<211> 516

14 Aug 2018
2016233495

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 966

ccgtgccatc cgcatcctgc tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 967

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 967

Pro Cys His Pro His Pro Ala Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 968
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 968
ccgtgccatc cgcatcctta tgctgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 969

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 969

Pro Cys His Pro His Pro Tyr Ala Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 970
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 970
ccgtgccatc cgcatcctta tgatgctgct ccttattgca atgtgggagg tggctcgagc 60

14 Aug 2018 2016233495

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 971

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 971

Pro Cys His Pro His Pro Tyr Asp Ala Ala Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

```
Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140

Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 972

<211> 516

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 972

ccgtgccatc cgcatcctta tgatgctcgt cctgcttgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 973

<211> 151

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 973

```
Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Ala Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110
```

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 974
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 974
ccgtgccatc cgcatcctta tgatgctcgt ccttattgcg ctgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 975

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 975

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Ala Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

2016233495 14 Aug 2018

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 976
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 976

ccgtgccatg cgcatcctta tgatgctcgt ccttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 977

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 977

Pro Cys His Ala His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
            20                  25                  30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
        35                  40                  45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
    50                  55                  60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65                  70                  75                  80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
                85                  90                  95

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
            100                 105                 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
        115                 120                 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
    130                 135                 140
```

2016233495 14 Aug 2018

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 978
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 978
ccgtgccatc cgcatcctta tgatgctcgt gcttattgca atgtgggagg tggctcgagc 60

ggtggcagcg gtggctctgg tggtactagc acctctggtc gttccgctaa cccacgtggc 120

ggcggttctg acatccagat gacccagagc cccagcagcc tgtctgctag cgtgggcgac 180

agagtgacca tcacctgtag agccagccag agcatcagca gctacctgaa ctggtatcag 240

cagaagcccg gcaaggcccc caaactgctg atctacgccg ccagctctct gcagtctggc 300

gtgcccagca gattttccgg cagcggctct ggcaccgact tcaccctgac catcagctcc 360

ctgcagcccg aggacttcgc cacctactac tgccagcagg acaacggcta ccccagcacc 420

tttggcggag gtaccaaggt ggaaatcaag cgttgtgagg ccactcacaa gacatcaact 480

tcacccattg tcaagagctt caacaggaat gagtgt 516

<210> 979

2016233495 14 Aug 2018

<211> 151

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 979

Pro Cys His Pro His Pro Tyr Asp Ala Arg Ala Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Thr Ser Thr Ser
20 25 30

Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile Gln Met Thr
35 40 45

Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile
50 55 60

Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln
65 70 75 80

Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser
85 90 95

2016233495 14 Aug 2018

Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr
100 105 110

Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr
115 120 125

Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly
130 135 140

Thr Lys Val Glu Ile Lys Arg
145 150

<210> 980
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 980
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 981

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 981

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

2016233495 14 Aug 2018

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 982
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 982

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 983

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 983

Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
```

145 150

<210> 984

<211> 474

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 984

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 985

<211> 152

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 985

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 986
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 986
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 987

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 987

Pro Cys His Pro His Pro Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr

2016233495 14 Aug 2018

65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 988
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 988
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 989

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 989

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

```
Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

2016233495 14 Aug 2018

<210> 990

<211> 474

<212> DNA

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 990

ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 991

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 991

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 992
<211> 474
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 992
ggaggtggct cgagcggtgg cagcggtggc tctggtggta ttagcagtgg tctgttaagc 60

ggtcgtagcg ataatcatgg cggttctgac atccagatga cccagagccc cagcagcctg 120

tctgctagcg tgggcgacag agtgaccatc acctgtagag ccagccagag catcagcagc 180

tacctgaact ggtatcagca gaagcccggc aaggccccca aactgctgat ctacgccgcc 240

agctctctgc agtctggcgt gcccagcaga ttttccggca gcggctctgg caccgacttc 300

accctgacca tcagctccct gcagcccgag gacttcgcca cctactactg ccagcaggac 360

aacggctacc ccagcacctt tggcggaggt accaaggtgg aaatcaagcg ttgtgaggcc 420

2016233495 14 Aug 2018

actcacaaga catcaacttc acccattgtc aagagcttca acaggaatga gtgt 474

<210> 993

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 993

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

2016233495 14 Aug 2018

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 994
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 994
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

14 Aug 2018 2016233495

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 995

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 995

Leu Cys Glu Val Leu Met Leu Leu Gln His Pro Trp Cys Met Gly Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

14 Aug 2018 2016233495

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 996
<211> 477
<212> DNA

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 996

ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 997

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 997

2016233495 14 Aug 2018

```
Ile Leu Tyr Cys Asp Ser Trp Gly Ala Gly Cys Leu Thr Arg Pro Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
            20                  25                  30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
        35                  40                  45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
    50                  55                  60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65                  70                  75                  80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
                85                  90                  95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
            100                 105                 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
        115                 120                 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
```

130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 998
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 998
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 999

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 999

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

2016233495 14 Aug 2018

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1000
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1000
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgcgaa 420

gtcacccatc agggcctgag ctcgcccgtc acaaagagct tcaacagggg agagtgt 477

<210> 1001

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1001

Tyr Leu Pro Cys His Phe Val Pro Ile Gly Ala Cys Asn Asn Lys Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val

2016233495 14 Aug 2018

50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1002
<211> 477
<212> DNA
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1002

ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 1003

<211> 153

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1003

Ile Phe Cys His Met Gly Val Val Val Pro Gln Cys Ala Asn Tyr Gly

1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
            20                  25                  30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
        35                  40                  45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
    50                  55                  60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65                  70                  75                  80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
                85                  90                  95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
            100                 105                 110

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
        115                 120                 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
    130                 135                 140
```

2016233495 14 Aug 2018

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1004
<211> 477
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1004
ggaggtggct cgagcggtgg cagcggtgct gtgggtctcc tggctccccc gggcggcctg 60

tccggccgca gcgataatca tggcggttct gacatccaga tgacccagag ccccagcagc 120

ctgtctgcta gcgtgggcga cagagtgacc atcacctgta gagccagcca gagcatcagc 180

agctacctga actggtatca gcagaagccc ggcaaggccc ccaaactgct gatctacgcc 240

gccagctctc tgcagtctgg cgtgcccagc agattttccg gcagcggctc tggcaccgac 300

ttcaccctga ccatcagctc cctgcagccc gaggacttcg ccacctacta ctgccagcag 360

gacaacggct accccagcac ctttggcgga ggtaccaagg tggaaatcaa gcgttgtgag 420

gccactcaca agacatcaac ttcacccatt gtcaagagct tcaacaggaa tgagtgt 477

<210> 1005
<211> 153
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1005

Pro Cys His Pro His Ala Tyr Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Ala Val Gly Leu Leu Ala Pro Pro
20 25 30

Gly Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln
35 40 45

Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val
50 55 60

Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp
65 70 75 80

Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala
85 90 95

Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser
100 105 110

14 Aug 2018 2016233495

Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe
115 120 125

Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly
130 135 140

Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1006
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1006
cagggccagt ccggctca 18

<210> 1007
<211> 786
<212> DNA
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1007

tatctgccct gccacttcgt gccaatcggg gcctgtaaca ataagggcgg tggatctagt 60

ggtggctcag gcgggtctgg cggcatttcc agtggactct tgtcaggacg atccgataat 120

catggcgggt ccgacatcca gatgacacag agcccttctt ccctctccgc aagcgttggc 180

gacagggtca ccattacctg tagggcttct cagagcatct caagctatct gaactggtac 240

cagcagaaac ctggaaaggc tccaaaactg ctgatttacg ctgcctccag tcttcagtca 300

ggcgtcccct ccagatttag cggatcaggt agtggaactg attttaccct tacaatatct 360

tctctgcagc cagaggactt cgccacatac tattgtcagc aagacaatgg ttaccccagt 420

acatttggcg gagggacaaa ggtcgagatc aaaaggaccg tagcagcacc aagcgtcttt 480

attttccccc ccagtgacga acagctgaag agcggaacag cttcagtggt gtgtctcctg 540

aataacttct atccacgcga ggcaaaggtg cagtggaagg tggacaatgc actgcagtct 600

ggtaattccc aagaaagtgt tactgagcag gattccaagg attcaactta ctctctgtct 660

agcaccctga ctctttctaa agcagattat gagaagcata aggtctacgc ttgcgaggtg 720

acccaccagg ggctttcctc tccagttacc aagtcattca accggggtga gtgttgatga 780

gaattc 786

<210> 1008

<211> 258

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1008

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
```

2016233495 14 Aug 2018

```
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala Pro Ser Val Phe
145                 150                 155                 160

Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly Thr Ala Ser Val
                165                 170                 175

Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp
            180                 185                 190

Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln Glu Ser Val Thr
        195                 200                 205

Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr
    210                 215                 220

Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr Ala Cys Glu Val
225                 230                 235                 240
```

2016233495 14 Aug 2018

Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser Phe Asn Arg Gly
245 250 255

Glu Cys

<210> 1009
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1009

Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ala Val Gly Leu Leu
1 5 10 15

Ala Pro Pro

<210> 1010
<211> 21
<212> PRT
<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 1010

Gly Leu Ser Gly Arg Ser Asp Asn His Gly Gly Val His Met Pro Leu
1 5 10 15

Gly Phe Leu Gly Pro
20

<210> 1011

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1011

Gln Ser Met Ser Ser Tyr
1 5

<210> 1012

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1012

Gly Ile Thr Val Gly Thr Asn Tyr
1 5

<210> 1013
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1013

Ile Ser Ser Gly Gly Asn Thr
1 5

<210> 1014
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1014

Gln Ala Ser Glu Ser Val Tyr Ser Asn Asn Tyr Leu Ser

14 Aug 2018 2016233495

1 5 10

<210> 1015

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1015

Leu Ala Ser Thr Leu Ala Ser

1 5

<210> 1016

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1016

Ile Gly Gly Lys Ser Ser Ser Thr Asp Gly Asn Ala

1 5 10

<210> 1017

<211> 5

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1017

Ser Asn Gly Leu Thr
1 5

<210> 1018

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1018

Thr Ile Asn Lys Asp Ala Ser Ala Tyr Tyr Ala Ser Trp Ala Lys Gly
1 5 10 15

<210> 1019

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1019

Ile Ala Phe Lys Thr Gly Thr Ser Ile
1 5

<210> 1020
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1020

Arg Ser Ser Lys Ser Leu Leu His Ser Asn Gly Ile Thr Tyr Leu Tyr
1 5 10 15

<210> 1021
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1021

Gln Met Ser Asn Leu Ala Ser
1 5

2016233495 14 Aug 2018

<210> 1022

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1022

Ala Gln Asn Leu Glu Pro Pro Leu Thr
1 5

<210> 1023

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1023

Asp Tyr Tyr Thr His
1 5

<210> 1024

<211> 17

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1024

Trp Ile Asp Pro Glu Asn Gly Lys Thr Ala Tyr Ala Pro Lys Phe Gln
1 5 10 15

Gly

<210> 1025

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1025

Gly Gly Tyr Asp Val Tyr Phe Leu Asp Tyr
1 5 10

<210> 1026

<211> 11

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 1026

Lys Ala Ser Gln Asp Val Gly Ile Val Val Ala
1 5 10

<210> 1027

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1027

Trp Ala Ser Ile Arg His Thr
1 5

<210> 1028

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1028

2016233495 14 Aug 2018

Gln Gln Tyr Ser Asn Tyr Pro Leu Tyr Thr
1 5 10

<210> 1029
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1029

Gly Phe Ser Leu Thr Ser Tyr Gly Val His
1 5 10

<210> 1030
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1030

Val Ile Trp Ala Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Met Ser
1 5 10 15

2016233495 14 Aug 2018

<210> 1031

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1031

Ala Lys Pro Tyr Gly Asn Ser Ala Met Asp Tyr
1 5 10

<210> 1032

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1032

Val Ile Trp Ala Gly Gly Ser Thr Asn Tyr Val Asp Ser Val Lys Gly
1 5 10 15

<210> 1033

<211> 11

<212> PRT

<213> Artificial Sequence

14 Aug 2018
2016233495

<220>

<223> chemically synthesized

<400> 1033

Ala Lys Pro Tyr Gly Thr Ser Ala Met Asp Tyr
1 5 10

<210> 1034

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1034

Val Ile Trp Ala Gly Gly Ser Thr Asn Tyr Ala Asp Ser Val Lys Gly
1 5 10 15

<210> 1035

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1035

2016233495 14 Aug 2018

Ala Ser Gln Ser Val Ser Thr Ser Ser Ser Ser Phe Met His
1 5 10

<210> 1036
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1036

Tyr Ala Ser Asn Leu Glu Ser
1 5

<210> 1037
<211> 9
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1037

Gln His Ser Trp Glu Ile Pro Tyr Thr
1 5

<210> 1038

2016233495 14 Aug 2018

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1038

Ser Tyr Gly Met Ser
1 5

<210> 1039

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1039

Ser Ile Ser Ser Gly Gly Ser Thr Tyr Tyr Pro Asp Ser Val Lys Gly
1 5 10 15

<210> 1040

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1040

Gly Tyr Asp Ser Gly Phe Ala Tyr
1 5

<210> 1041
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1041

Arg Ala Ser Gln Ser Val Ser Thr Ser Ser Ser Ser Tyr Met His
1 5 10 15

<210> 1042
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1042

Ser Ile Ser Ser Gly Gly Thr Thr Tyr Tyr Pro Asp Ser Val Lys Gly

14 Aug 2018 2016233495

1 5 10 15

<210> 1043

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1043

Lys Ala Ser Gln Ser Val Ser Asn Asp Val Ala

1 5 10

<210> 1044

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1044

Tyr Ala Ala Asn Arg Tyr Thr

1 5

<210> 1045

<211> 9

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1045

Gln Gln Asp Tyr Thr Ser Pro Tyr Thr
1 5

<210> 1046

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1046

Thr Tyr Gly Val His
1 5

<210> 1047

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1047

Val Ile Trp Arg Gly Val Thr Thr Asp Tyr Asn Ala Ala Phe Met Ala
1 5 10 15

Ser

<210> 1048
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1048

Leu Gly Phe Tyr Ala Met Asp Tyr
1 5

<210> 1049
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 1049

Lys Ala Ser Gln Ser Val Ser Asn Asp Val Gly
1 5 10

<210> 1050
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1050

Tyr Ala Ser Asn Arg Tyr Ser
1 5

<210> 1051
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1051

Ser Tyr Gly Val His
1 5

2016233495 14 Aug 2018

<210> 1052

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1052

Val Ile Trp Ser Gly Gly Val Thr Asp Tyr Asn Ala Ala Phe Ile Ser
1 5 10 15

<210> 1053

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1053

Arg Ser Ser Gln Ile Ile Val His Ser Asn Ala Asn Thr Tyr Leu Glu
1 5 10 15

<210> 1054

<211> 7

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1054

Lys Val Ser Asn Arg Phe Ser
1 5

<210> 1055

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1055

Phe Gln Gly Ser His Val Pro Tyr Thr
1 5

<210> 1056

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1056

2016233495 14 Aug 2018

Thr Tyr Trp Met His
1 5

<210> 1057
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1057

Gln Ile Asn Pro Asp Ser Thr Thr Ile Asn Thr Ala Pro Ser Leu Lys
1 5 10 15

Asp

<210> 1058
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1058

2016233495 14 Aug 2018

Pro Gly Asp Tyr Gly Tyr Asp Phe Asp Cys
1 5 10

<210> 1059
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1059

Ser Ala Ser Ser Ser Val Ser Ser Ser Tyr Leu Tyr
1 5 10

<210> 1060
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1060

Asn Thr Ser Asn Leu Ala Ser
1 5

<210> 1061

2016233495 14 Aug 2018

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1061

His Gln Trp Arg Ser Tyr Pro Pro Thr
1 5

<210> 1062

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1062

Ser Gly Tyr Trp Asn
1 5

<210> 1063

<211> 16

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1063

Tyr Ile Ser Tyr Ser Gly Ser Thr Tyr Tyr Asn Pro Ser Leu Lys Ser
1 5 10 15

<210> 1064
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1064

Ser Leu Leu Trp Phe Ser Thr Gly Phe Ala Tyr
1 5 10

<210> 1065
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1065

Ser Ala Asn Ser Ser Val Ser Tyr Met His

14 Aug 2018 2016233495

1 5 10

<210> 1066

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1066

Asp Thr Ser Lys Leu Ala Ser

1 5

<210> 1067

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1067

Gln Gln Trp Ser Ser Asn Pro Trp Thr

1 5

<210> 1068

<211> 16

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1068

Tyr Ile Trp Ser Gly Gly Ile Thr Asp Tyr Asn Ala Ala Phe Lys Ser
1 5 10 15

<210> 1069

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1069

Arg Ala Ser Gln Ser Val Ser Thr Ser Ser Tyr Ser Tyr Met His
1 5 10 15

<210> 1070

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1070

Gln Asn Ser Trp Glu Ile Pro Tyr Thr
1 5

<210> 1071
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1071

Ser Thr Gly Met Ser
1 5

<210> 1072
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1072

Ser Ile Ser Ser Gly Gly Thr Thr Tyr Tyr Leu Gly Ser Val Gln Gly
1 5 10 15

2016233495 14 Aug 2018

<210> 1073

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1073

Gly Tyr Asp Ala Gly Phe Ala Tyr
1 5

<210> 1074

<211> 17

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1074

Lys Ser Ser Gln Ser Leu Leu Tyr Ser Ser Asn Gln Lys Asn Ser Leu
1 5 10 15

Ala

14 Aug 2018 2016233495

<210> 1075

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1075

Trp Ala Ser Asn Arg Glu Ser
1 5

<210> 1076

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1076

Gln Gln Tyr Tyr Ser Tyr Pro Leu Thr
1 5

<210> 1077

<211> 5

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1077

Ser Gly Tyr Trp Thr
1 5

<210> 1078

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1078

Tyr Ile Tyr Thr Gly Ser Thr Tyr Tyr Asn Pro Ser Leu Lys Ser
1 5 10 15

<210> 1079

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1079

2016233495 14 Aug 2018

Gln Arg Asp Trp Leu Gly Phe Ala Tyr
1 5

<210> 1080
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1080

Arg Ala Ser Gln Ser Val Ser Thr Ser Ser Tyr Ser Tyr Val His
1 5 10 15

<210> 1081
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1081

Ser Ile Ser Ser Gly Gly Ser Ile Tyr Tyr Pro Asp Ser Val Lys Gly
1 5 10 15

2016233495 14 Aug 2018

<210> 1082

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1082

Gly Tyr Asp Ala Gly Phe Ala Phe
1 5

<210> 1083

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1083

Gly Phe Thr Phe Ser Met Tyr Met Met Met
1 5 10

<210> 1084

<211> 10

<212> PRT

<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1084

Gly Phe Thr Phe Ser Ala Tyr Ala Met Ala
1 5 10

<210> 1085

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1085

Gly Phe Thr Phe Ser Ala Tyr Arg Met Phe
1 5 10

<210> 1086

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1086

2016233495 14 Aug 2018

Gly Phe Thr Phe Ser Ala Tyr Leu Met Val
1 5 10

<210> 1087
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1087

Gly Phe Thr Phe Ser Ala Tyr Val Met Phe
1 5 10

<210> 1088
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1088

Gly Phe Thr Phe Ser Ala Tyr Val Met Ser
1 5 10

<210> 1089

2016233495 14 Aug 2018

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1089

Gly Phe Thr Phe Ser Gly Tyr Leu Met Val
1 5 10

<210> 1090

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1090

Gly Phe Thr Phe Ser Gly Tyr Gln Met Leu
1 5 10

<210> 1091

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1091

Gly Phe Thr Phe Ser Gly Tyr Ser Met Phe
1 5 10

<210> 1092
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1092

Gly Phe Thr Phe Ser Gly Tyr Trp Met Ala
1 5 10

<210> 1093
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1093

Gly Phe Thr Phe Ser Gln Tyr Leu Met Tyr

2016233495 14 Aug 2018

1 5 10

<210> 1094

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1094

Gly Phe Thr Phe Ser Gln Tyr Val Met Phe

1 5 10

<210> 1095

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1095

Gly Phe Thr Phe Ser Gln Tyr Tyr Met Tyr

1 5 10

<210> 1096

<211> 10

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1096

Gly Phe Thr Phe Ser Ser Tyr Leu Met Ser
1 5 10

<210> 1097

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1097

Gly Phe Thr Phe Ser Ser Tyr Leu Met Thr
1 5 10

<210> 1098

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1098

Gly Phe Thr Phe Ser Ser Tyr Gln Met Val
1 5 10

<210> 1099
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1099

Gly Phe Thr Phe Ser Ser Tyr Ser Met Ala
1 5 10

<210> 1100
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1100

Gly Phe Thr Phe Ser Ser Tyr Val Met Phe
1 5 10

2016233495 14 Aug 2018

<210> 1101

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1101

Gly Phe Thr Phe Ser Ser Tyr Val Met Ser
1 5 10

<210> 1102

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1102

Gly Phe Thr Phe Ser Ser Tyr Val Met Tyr
1 5 10

<210> 1103

<211> 10

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1103

Gly Phe Thr Phe Ser Ser Tyr Tyr Met Phe
1 5 10

<210> 1104

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1104

Gly Phe Thr Phe Ser Ser Tyr Tyr Met Val
1 5 10

<210> 1105

<211> 10

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1105

Gly Phe Thr Phe Ser Tyr Tyr Ser Met Val
1 5 10

<210> 1106
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1106

Gly Phe Thr Phe Ser Trp Tyr Leu Met Ala
1 5 10

<210> 1107
<211> 10
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1107

Gly Phe Thr Phe Ser Trp Tyr Gln Met Ser
1 5 10

<210> 1108

<211> 115

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1108

Gln Ser Leu Glu Glu Ser Gly Gly Arg Leu Val Lys Pro Asp Glu Thr
1 5 10 15

Leu Thr Ile Thr Cys Thr Val Ser Gly Ile Asp Leu Ser Ser Asn Gly
20 25 30

Leu Thr Trp Val Arg Gln Ala Pro Gly Glu Gly Leu Glu Trp Ile Gly
35 40 45

Thr Ile Asn Lys Asp Ala Ser Ala Tyr Tyr Ala Ser Trp Ala Lys Gly
50 55 60

Arg Leu Thr Ile Ser Lys Pro Ser Ser Thr Lys Val Asp Leu Lys Ile
65 70 75 80

Thr Ser Pro Thr Thr Glu Asp Thr Ala Thr Tyr Phe Cys Gly Arg Ile
85 90 95

Ala Phe Lys Thr Gly Thr Ser Ile Trp Gly Pro Gly Thr Leu Val Thr
100 105 110

Val Ser Ser
115

<210> 1109
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1109

Ala Ile Val Met Thr Gln Thr Pro Ser Pro Val Ser Ala Ala Val Gly
1 5 10 15

Gly Thr Val Thr Ile Asn Cys Gln Ala Ser Glu Ser Val Tyr Ser Asn
20 25 30

Asn Tyr Leu Ser Trp Phe Gln Gln Lys Pro Gly Gln Pro Pro Lys Leu
35 40 45

Leu Ile Tyr Leu Ala Ser Thr Leu Ala Ser Gly Val Pro Ser Arg Phe

2016233495 14 Aug 2018

50 55 60

Lys Gly Ser Gly Ser Gly Thr Gln Phe Thr Leu Thr Ile Ser Gly Val
65 70 75 80

Gln Cys Asp Asp Ala Ala Thr Tyr Tyr Cys Ile Gly Gly Lys Ser Ser
85 90 95

Ser Thr Asp Gly Asn Ala Phe Gly Gly Gly Thr Glu Val Val Val Arg
100 105 110

<210> 1110
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1110

Gln Met Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

2016233495 14 Aug 2018

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Gly Asn Ile Val Ala Thr Ile Thr Pro Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1111
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1111

2016233495 14 Aug 2018

```
Gln Pro Val Leu Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1               5                  10                  15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Ala Asn Asn
            20                  25                  30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
        35                  40                  45

Ile Phe Ala Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
    50                  55                  60

Gly Ser Lys Ser Gly Thr Ser Ala Ala Leu Asp Ile Thr Gly Leu Gln
65                  70                  75                  80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Asp Leu
                85                  90                  95

Arg Ala Gly Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
            100                 105                 110
```

<210> 1112

<211> 123

<212> PRT

<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 1112

```
Glu Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Val Thr Ile Thr Ala Asp Lys Ser Thr 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 Glu Gly Thr Ile Tyr Asp Ser Ser Gly Tyr Ser Phe Asp Tyr
            100                 105                 110
```

2016233495 14 Aug 2018

Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1113
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1113

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

14 Aug 2018 2016233495

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1114
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1114

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

14 Aug 2018 2016233495

35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1115
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1115

2016233495 14 Aug 2018

```
Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
    50                  55                  60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65                  70                  75                  80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
            100                 105                 110

Leu Val Thr Val Ser Ser
        115
```

<210> 1116

2016233495 14 Aug 2018

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1116

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

2016233495 14 Aug 2018

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1117
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1117

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

2016233495 14 Aug 2018

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1118
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1118

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

14 Aug 2018 2016233495

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1119
<211> 120
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1119

Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Arg Tyr
20 25 30

Gly Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Arg Leu Ile Pro Ile Val Ser Met Thr Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Asp Arg Val Ser Ile Thr Thr Asp Lys Ser Thr Gly Thr Ala Tyr
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Thr Ala Leu Tyr Tyr Cys
85 90 95

Ala Ser Val Gly Gln Gln Leu Pro Trp Val Phe Phe Ala Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1120

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1120

Gln Met Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys

85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1121
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1121

Gln Val Gln Leu Val Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

2016233495 14 Aug 2018

Ala Val Ile Ser Phe Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Arg Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Trp Leu Asp Arg Asp Ile Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 1122
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1122

Gln Met Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

2016233495 14 Aug 2018

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Tyr Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ser Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Gly Pro Ile Val Ala Thr Ile Thr Pro Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1123
<211> 121
<212> PRT
<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 1123

```
Gln Met Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1               5                  10                  15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
            20                  25                  30

Ala Tyr Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Gly Gly Ile Ile Pro Ile Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
    50                  55                  60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Gly Pro Ile Val Ala Thr Ile Thr Pro Leu Asp Tyr Trp Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1124
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1124

Gln Met Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Tyr Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Gly Gly Ile Ile Pro Ser Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Ser Thr Ala Tyr
65 70 75 80

14 Aug 2018 2016233495

Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Pro Ile Val Ala Thr Ile Thr Pro Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1125
<211> 121
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1125

Gln Met Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Gly Thr Phe Ser Ser Tyr
20 25 30

Ala Ile Ser Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met

35 40 45

Gly Gly Ile Ile Pro Ala Phe Gly Thr Ala Asn Tyr Ala Gln Lys Phe
50 55 60

Gln Gly Arg Val Thr Ile Thr Ala Asp Glu Ser Thr 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 Gly Pro Ile Val Ala Thr Ile Thr Pro Leu Asp Tyr Trp Gly
100 105 110

Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1126
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1126

2016233495 14 Aug 2018

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 1127
<211> 107
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1127

```
Ala Ile Arg Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1               5                  10                  15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
            20                  25                  30

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
        35                  40                  45

Tyr Thr Thr Ser Ser Leu Lys Ser Gly Val Pro Ser Arg Phe Ser Gly
    50                  55                  60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Gln Pro
65                  70                  75                  80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Ser Tyr Ser Ser Thr Trp
                85                  90                  95

Thr Phe Gly Arg Gly Thr Lys Val Glu Ile Lys
            100                 105
```

<210> 1128

<211> 110

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1128

```
Gln Ser Val Leu Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1               5                  10                  15

Lys Val Thr Ile Ser Cys Ser Gly Asn Asn Ser Asn Ile Ala Asn Asn
            20                  25                  30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
        35                  40                  45

Ile Tyr Asp Asn Asn Tyr Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
    50                  55                  60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Asp Ile Thr Gly Leu Gln
65                  70                  75                  80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Val Trp Asp Gly Ser Leu
                85                  90                  95
```

Thr Thr Gly Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1129
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1129

Leu Pro Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Thr Ser Asp Ile Gly Gly Tyr
20 25 30

Asp Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Lys Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

14 Aug 2018 2016233495

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Ser Thr His Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1130
<211> 111
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1130

Gln Ser Ala Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe

2016233495 14 Aug 2018

50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Arg Ser Ser
85 90 95

Thr Leu Gly Pro Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1131
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1131

Gln Ala Gly Leu Thr Gln Pro Pro Ser Val Ser Glu Ala Pro Arg Gln
1 5 10 15

Arg Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

2016233495 14 Aug 2018

Ala Val Asn Trp Tyr Gln Gln Leu Pro Gly Lys Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Tyr Asp Asp Leu Leu Pro Ser Gly Val Ser Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Ser Leu Ala Ile Ser Gly Leu Gln
65 70 75 80

Ser Glu Asp Glu Ala Asp Tyr Tyr Cys Ala Ala Trp Asp Asp Ser Leu
85 90 95

Asn Gly Tyr Val Phe Gly Thr Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1132
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1132

Gln Ser Ala Leu Thr Gln Pro Arg Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

2016233495 14 Aug 2018

Ser Val Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Lys Ala Pro Lys Leu
35 40 45

Met Ile Tyr Asp Val Ser Lys Arg Pro Ser Gly Val Pro Asp Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Ser
85 90 95

Thr Thr His Val Phe Gly Thr Gly Thr Lys Val Thr Val Leu
100 105 110

<210> 1133
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

2016233495 14 Aug 2018

<400> 1133

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Val Trp Val Phe Gly Gly Gly Thr Gln Leu Thr Val Leu
100 105 110

<210> 1134
<211> 112
<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1134

Gln Ser Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Thr Ser Ser Asp Val Gly Gly Tyr
20 25 30

Asn Tyr Val Ser Trp Tyr Gln Gln His Pro Gly Arg Ala Pro Arg Leu
35 40 45

Met Ile Tyr Asp Val Ser Asn Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Gly Asp Tyr Tyr Cys Ser Ser Tyr Thr Ser Gly
85 90 95

Gly Thr Leu Gly Pro Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1135

<211> 110

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1135

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu

85 90 95

Ser Ala Val Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1136
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1136

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Val Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

2016233495 14 Aug 2018

Gly Ser Asn Ser Asp Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Ala Trp Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1137
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1137

Gln Ser Val Val Thr Gln Pro Pro Ser Val Ser Ala Ala Pro Gly Gln
1 5 10 15

Lys Val Thr Ile Ser Cys Ser Gly Ser Ser Ser Asn Ile Gly Asn Asn
20 25 30

Tyr Val Ser Trp Tyr Gln Gln Leu Pro Gly Thr Ala Pro Lys Leu Leu
35 40 45

2016233495 14 Aug 2018

Ile Tyr Asp Asn Asn Lys Arg Pro Ser Gly Ile Pro Asp Arg Phe Ser
50 55 60

Gly Ser Lys Ser Gly Thr Ser Ala Thr Leu Gly Ile Thr Gly Leu Gln
65 70 75 80

Thr Gly Asp Glu Ala Asp Tyr Tyr Cys Gly Thr Trp Asp Ser Ser Leu
85 90 95

Ser Ala Gly Ser Val Val Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105 110

<210> 1138
<211> 108
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1138

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

2016233495 14 Aug 2018

```
His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
        35                  40                  45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
    50                  55                  60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65                  70                  75                  80

Asp Glu Ala Asp Tyr Tyr Cys Leu Val Trp Asp Ser Ser Ser Asp His
                85                  90                  95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
            100                 105
```

<210> 1139

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1139

```
Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
```

2016233495 14 Aug 2018

1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 1140
<211> 108
<212> PRT
<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1140

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 1141

2016233495 14 Aug 2018

<211> 108

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1141

Ser Tyr Glu Leu Met Gln Pro Pro Ser Val Ser Val Ala Pro Gly Lys
1 5 10 15

Thr Ala Thr Ile Ala Cys Gly Gly Glu Asn Ile Gly Arg Lys Thr Val
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Val Leu Val Ile Tyr
35 40 45

Tyr Asp Ser Asp Arg Pro Ser Gly Ile Pro Glu Arg Phe Ser Gly Ser
50 55 60

Asn Ser Gly Asn Thr Ala Thr Leu Thr Ile Ser Arg Val Glu Ala Gly
65 70 75 80

Asp Glu Ala Asp Tyr Tyr Cys Gln Val Trp Asp Ser Ser Ser Asp His
85 90 95

2016233495 14 Aug 2018

Arg Ile Phe Gly Gly Gly Thr Lys Leu Thr Val Leu
100 105

<210> 1142
<211> 122
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1142

Gln Val Gln Leu Val Gln Ser Gly Ser Glu Val Lys Lys Ser Gly Ser
1 5 10 15

Ser Val Lys Val Ser Cys Lys Thr Ser Gly Gly Thr Phe Ser Ile Thr
20 25 30

Asn Tyr Ala Ile Asn Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu
35 40 45

Trp Met Gly Gly Ile Leu Pro Ile Phe Gly Ala Ala Lys Tyr Ala Gln
50 55 60

Lys Phe Gln Asp Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Asn Thr
65 70 75 80

2016233495 14 Aug 2018

Ala Tyr Leu Glu Leu Ser Ser Leu Thr Ser Glu Asp Thr Ala Met Tyr
85 90 95

Tyr Cys Ala Arg Gly Lys Arg Trp Leu Gln Ser Asp Leu Gln Tyr Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 1143
<211> 110
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1143

Gln Pro Val Leu Thr Gln Pro Ala Ser Val Ser Gly Ser Pro Gly Gln
1 5 10 15

Ser Ile Thr Ile Ser Cys Thr Gly Ser Ser Ser Asp Val Gly Ser Tyr
20 25 30

Asp Leu Val Ser Trp Tyr Gln Gln Ser Pro Gly Lys Val Pro Lys Leu
35 40 45

14 Aug 2018 2016233495

Leu Ile Tyr Glu Gly Val Lys Arg Pro Ser Gly Val Ser Asn Arg Phe
50 55 60

Ser Gly Ser Lys Ser Gly Asn Thr Ala Ser Leu Thr Ile Ser Gly Leu
65 70 75 80

Gln Ala Glu Asp Glu Ala Asp Tyr Tyr Cys Ser Ser Tyr Ala Gly Thr
85 90 95

Arg Asn Phe Val Phe Gly Gly Gly Thr Gln Leu Thr Val Leu
100 105 110

<210> 1144
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1144

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Leu Ser Gly Arg

2016233495 14 Aug 2018

20 25 30

Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1145

<211> 147

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1145

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Leu Ser Gly Arg
20 25 30

Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly

2016233495 14 Aug 2018

85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1146
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1146

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

2016233495 14 Aug 2018

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Leu Ser Gly Arg
20 25 30

Ser Gly Asn His Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg

2016233495 14 Aug 2018

145

<210> 1147

<211> 147

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1147

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Leu Ser Gly Arg
20 25 30

Ser Gly Asn His Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

2016233495 14 Aug 2018

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1148
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1148

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

2016233495 14 Aug 2018

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Ser Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
        35                  40                  45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
    50                  55                  60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65                  70                  75                  80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
                85                  90                  95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
            100                 105                 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
        115                 120                 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
    130                 135                 140
```

2016233495 14 Aug 2018

Ile Lys Arg
145

<210> 1149
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1149

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Ser Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

2016233495 14 Aug 2018

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1150
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1150

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

```
Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Gln Asn Gln Ala
            20                  25                  30

Leu Arg Met Ala Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
        35                  40                  45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
    50                  55                  60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65                  70                  75                  80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
                85                  90                  95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
            100                 105                 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
        115                 120                 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
    130                 135                 140
```

Ile Lys Arg
145

<210> 1151
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1151

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Gln Asn Gln Ala
20 25 30

Leu Arg Met Ala Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

14 Aug 2018 2016233495

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1152
<211> 149
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1152

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly

2016233495 14 Aug 2018

```
1               5                   10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Val His Met Pro
            20                  25                  30

Leu Gly Phe Leu Gly Pro Gly Gly Ser Asp Ile Gln Met Thr Gln Ser
        35                  40                  45

Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys
    50                  55                  60

Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys
65                  70                  75                  80

Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln
                85                  90                  95

Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
            100                 105                 110

Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr
        115                 120                 125

Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys
    130                 135                 140
```

2016233495 14 Aug 2018

Val Glu Ile Lys Arg
145

<210> 1153
<211> 149
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1153

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Val His Met Pro
20 25 30

Leu Gly Phe Leu Gly Pro Gly Gly Ser Asp Ile Gln Met Thr Gln Ser
35 40 45

Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys
50 55 60

Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys

65 70 75 80

Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln
85 90 95

Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe
100 105 110

Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr
115 120 125

Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys
130 135 140

Val Glu Ile Lys Arg
145

<210> 1154
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1154

2016233495 14 Aug 2018

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Gly Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
```

130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1155
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1155

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Gly Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

2016233495 14 Aug 2018

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1156
<211> 154
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1156

2016233495 14 Aug 2018

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile
        35                  40                  45

Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg
    50                  55                  60

Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn
65                  70                  75                  80

Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala
                85                  90                  95

Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly
            100                 105                 110

Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp
        115                 120                 125
```

2016233495 14 Aug 2018

Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe
130 135 140

Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1157
<211> 154
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1157

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser Asp Ile
35 40 45

Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg
50 55 60

2016233495 14 Aug 2018

Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn
65 70 75 80

Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala
85 90 95

Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly
100 105 110

Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp
115 120 125

Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe
130 135 140

Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1158
<211> 157
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

14 Aug 2018 2016233495

<400> 1158

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
            20                  25                  30

Leu Ala Pro Pro Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly
        35                  40                  45

Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val
    50                  55                  60

Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser
65                  70                  75                  80

Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu
                85                  90                  95

Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser
            100                 105                 110

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln
        115                 120                 125
```

14 Aug 2018 2016233495

Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro
130 135 140

Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 1159
<211> 157
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1159

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Thr Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly
35 40 45

Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val
50 55 60

2016233495 14 Aug 2018

Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser
65 70 75 80

Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu
85 90 95

Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser
100 105 110

Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln
115 120 125

Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro
130 135 140

Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 1160
<211> 156
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1160

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser
35 40 45

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
50 55 60

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
65 70 75 80

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
85 90 95

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
100 105 110

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
115 120 125

14 Aug 2018 2016233495

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser
130 135 140

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 1161
<211> 156
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1161

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Ser Gly Arg Ser Ala Asn Pro Arg Gly Gly Gly Ser
35 40 45

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly

14 Aug 2018 2016233495

50 55 60

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr
65 70 75 80

Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile
85 90 95

Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
100 105 110

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
115 120 125

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser
130 135 140

Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg
145 150 155

<210> 1162

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

2016233495 14 Aug 2018

<223> chemically synthesized

<400> 1162

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asp His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
```

2016233495 14 Aug 2018

115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1163
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1163

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asp His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1164
<211> 152
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1164

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Ile His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1165
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1165

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Ile His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1166
<211> 152
<212> PRT
<213> Artificial Sequence

2016233495 14 Aug 2018

<220>

<223> chemically synthesized

<400> 1166

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Gln His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1167
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1167

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Gln His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

```
Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 1168

<211> 152

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1168

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Thr His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1169
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1169

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Thr His Gly Gly Ser Asp Ile Gln Met

2016233495 14 Aug 2018

35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1170

<211> 152

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1170

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Tyr His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
```

2016233495 14 Aug 2018

100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1171
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1171

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

Leu Leu Ser Gly Arg Ser Asp Tyr His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1172

2016233495 14 Aug 2018

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1172

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn Pro Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

2016233495 14 Aug 2018

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1173
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1173

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

```
Leu Leu Ser Gly Arg Ser Asp Asn Pro Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 1174

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1174

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Ala Asn Pro Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95
```

2016233495 14 Aug 2018

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1175
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1175

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

```
Leu Leu Ser Gly Arg Ser Ala Asn Pro Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

2016233495 14 Aug 2018

<210> 1176

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1176

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Ala Asn Ile Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

14 Aug 2018 2016233495

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1177
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1177

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly

```
            20                  25                  30

Leu Leu Ser Gly Arg Ser Ala Asn Ile Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 1178

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1178

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn Ile Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser

85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1179
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1179

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

2016233495 14 Aug 2018

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn Ile Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg

2016233495 14 Aug 2018

145 150

<210> 1180

<211> 161

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1180

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Gly Gly Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro
35 40 45

Arg Gly Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu
50 55 60

Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln
65 70 75 80

2016233495 14 Aug 2018

Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala
85 90 95

Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro
100 105 110

Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile
115 120 125

Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp
130 135 140

Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
145 150 155 160

Arg

<210> 1181
<211> 161
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1181

2016233495 14 Aug 2018

```
Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
            20                  25                  30

Leu Ala Pro Pro Gly Gly Thr Ser Thr Ser Gly Arg Ser Ala Asn Pro
        35                  40                  45

Arg Gly Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu
    50                  55                  60

Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln
65                  70                  75                  80

Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly Lys Ala
                85                  90                  95

Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro
            100                 105                 110

Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile
        115                 120                 125
```

2016233495 14 Aug 2018

Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Asp
130 135 140

Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
145 150 155 160

Arg

<210> 1182
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1182

Ile Ala Cys Arg His Phe Met Glu Gln Leu Pro Phe Cys His His Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1183
<211> 152
<212> PRT
<213> Artificial Sequence

14 Aug 2018 2016233495

<220>

<223> chemically synthesized

<400> 1183

```
Ile Ala Cys Arg His Phe Met Glu Gln Leu Pro Phe Cys His His Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110
```

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1184
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1184

Pro Cys Tyr Trp His Pro Phe Phe Ala Tyr Arg Tyr Cys Asn Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

2016233495 14 Aug 2018

```
Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

<210> 1185

<211> 152

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1185

Pro Cys Tyr Trp His Pro Phe Phe Ala Tyr Arg Tyr Cys Asn Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

2016233495 14 Aug 2018

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1186
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1186

Val Cys Tyr Tyr Met Asp Trp Leu Gly Arg Asn Trp Cys Ser Ser Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met

35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1187

<211> 152

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1187

Val Cys Tyr Tyr Met Asp Trp Leu Gly Arg Asn Trp Cys Ser Ser Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly

2016233495 14 Aug 2018

100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1188
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1188

Pro Cys His Pro His Pro Ala Asp Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

2016233495 14 Aug 2018

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
35 40 45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
50 55 60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65 70 75 80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
85 90 95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1189

2016233495 14 Aug 2018

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1189

```
Pro Cys His Pro His Pro Ala Asp Ala Arg Pro Tyr Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95
```

14 Aug 2018 2016233495

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1190
<211> 152
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1190

Pro Cys His Pro His Pro Tyr Ala Ala Arg Pro Tyr Cys Asn Val Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
20 25 30

```
Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
            100                 105                 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
        115                 120                 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
    130                 135                 140

Gly Thr Lys Val Glu Ile Lys Arg
145                 150
```

2016233495 14 Aug 2018

<210> 1191

<211> 152

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1191

```
Pro Cys His Pro His Pro Tyr Ala Ala Arg Pro Tyr Cys Asn Val Gly
1               5                  10                  15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ile Ser Ser Gly
            20                  25                  30

Leu Leu Ser Gly Arg Ser Asp Asn His Gly Gly Ser Asp Ile Gln Met
        35                  40                  45

Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr
    50                  55                  60

Ile Thr Cys Arg Ala Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr
65                  70                  75                  80

Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser
                85                  90                  95
```

2016233495 14 Aug 2018

Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
100 105 110

Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala
115 120 125

Thr Tyr Tyr Cys Gln Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly
130 135 140

Gly Thr Lys Val Glu Ile Lys Arg
145 150

<210> 1192
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1192

Gly Gln Ser Gly Ser
1 5

<210> 1193
<211> 4

14 Aug 2018 2016233495

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1193

Gln Ser Gly Ser
1

<210> 1194

<211> 3

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1194

Ser Gly Ser
1

<210> 1195

<211> 2

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1195

Gly Ser
1

<210> 1196
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1196

Gln Gly Gln Ser Gly Gln
1 5

<210> 1197
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1197

Gly Gln Ser Gly Gln
1 5

2016233495 14 Aug 2018

<210> 1198

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1198

Gln Ser Gly Gln
1

<210> 1199

<211> 2

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1199

Gly Gln
1

<210> 1200

<211> 147

<212> PRT

2016233495 14 Aug 2018

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1200

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser
35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

2016233495 14 Aug 2018

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1201
<211> 147
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1201

Gly Ile Ala Leu Cys Pro Ser His Phe Cys Gln Leu Pro Gln Thr Gly
1 5 10 15

Gly Gly Ser Ser Gly Gly Ser Gly Gly Ser Gly Gly Ala Val Gly Leu
20 25 30

Leu Ala Pro Pro Gly Gly Ser Asp Ile Gln Met Thr Gln Ser Pro Ser

2016233495 14 Aug 2018

35 40 45

Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala
50 55 60

Ser Gln Ser Ile Ser Ser Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Gly
65 70 75 80

Lys Ala Pro Lys Leu Leu Ile Tyr Ala Ala Ser Ser Leu Gln Ser Gly
85 90 95

Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu
100 105 110

Thr Ile Ser Ser Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln
115 120 125

Gln Asp Asn Gly Tyr Pro Ser Thr Phe Gly Gly Gly Thr Lys Val Glu
130 135 140

Ile Lys Arg
145

<210> 1202
<211> 445

2016233495 14 Aug 2018

<212> PRT

<213> Artificial Sequence

<220>

<223> chemically synthesized

<400> 1202

Glu Val Gln Leu Leu Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Ser Ile Trp Arg Asn Gly Ile Val Thr Val Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Lys Trp Ser Ala Ala Phe Asp Tyr Trp Gly Gln Gly Thr Leu Val

2016233495 14 Aug 2018

```
            100                 105                 110

Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala
        115                 120                 125

Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly Cys Leu
    130                 135                 140

Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly
145                 150                 155                 160

Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser
                165                 170                 175

Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu
            180                 185                 190

Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser Asn Thr
        195                 200                 205

Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys Asp Lys Thr His Thr
    210                 215                 220

Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe
225                 230                 235                 240
```

Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro
245 250 255

Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu Val
260 265 270

Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr
275 280 285

Lys Pro Arg Glu Glu Gln Tyr Gln Ser Thr Tyr Arg Val Val Ser Val
290 295 300

Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys
305 310 315 320

Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser
325 330 335

Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro
340 345 350

Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val
355 360 365

2016233495 14 Aug 2018

Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly
370 375 380

Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp
385 390 395 400

Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp
405 410 415

Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His
420 425 430

Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly
435 440 445

<210> 1203
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> chemically synthesized

<400> 1203

Ser Ser Ala Gly Asn Asn Lys Asn Asn Lys Asn Asn Lys Asn Asn Lys
1 5 10 15

Phe Asp Tyr