

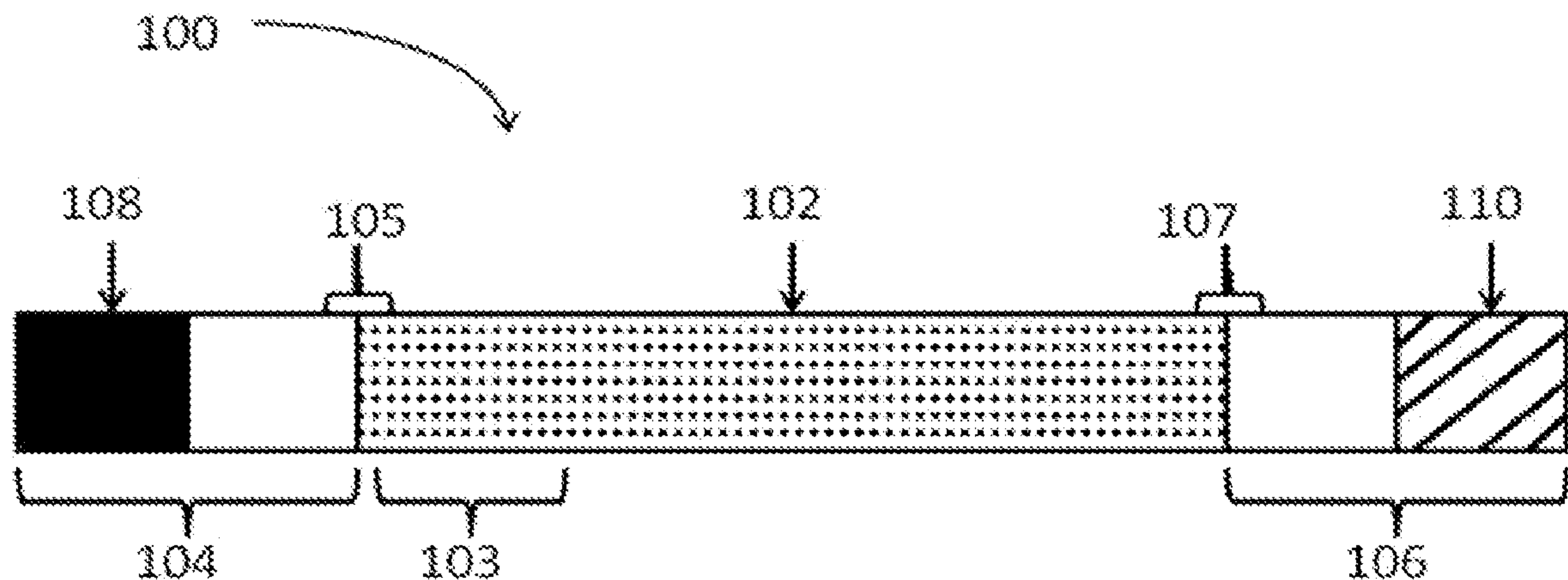


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(54) **Titre : POLYNUCLEOTIDES MODIFIES DESTINES A LA PRODUCTION DE PROTEINES NUCLEAIRES**
 (54) **Title: MODIFIED POLYNUCLEOTIDES FOR THE PRODUCTION OF NUCLEAR PROTEINS**

FIGURE 1



(57) **Abrégé/Abstract:**

The invention relates to compositions and methods for the preparation, manufacture and therapeutic use of polynucleotides, primary transcripts and mmRNA molecules.

- (30) **Priorités(suite)/Priorities(continued):** 2012/04/02 (US61/618,961); 2012/05/17 (US61/648,244);
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WO 2013/151670 A3



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CECI EST LE TOME 1 DE 3
CONTENANT LES PAGES 1 À 462

NOTE : Pour les tomes additionels, veuillez contacter le Bureau canadien des brevets

JUMBO APPLICATIONS/PATENTS

THIS SECTION OF THE APPLICATION/PATENT CONTAINS MORE THAN ONE VOLUME

THIS IS VOLUME 1 OF 3
CONTAINING PAGES 1 TO 462

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MODIFIED POLYNUCLEOTIDES FOR THE PRODUCTION OF NUCLEAR PROTEINS

REFERENCE TO SEQUENCE LISTING

[0001] The present application is being filed along with a Sequence Listing in electronic format. The Sequence Listing file entitled M308_PCTSQLST.txt, was created on March 9, 2013 and is 67,238,216 bytes in size. The information in electronic format of the Sequence Listing is incorporated herein by reference in its entirety.

CROSS REFERENCE TO RELATED APPLICATIONS

[0002] This application claims priority to U.S. Provisional Patent Application No 61/681,742, filed, August 10, 2012, entitled Modified Polynucleotides for the Production of Oncology-Related Proteins and Peptides, U.S. Provisional Patent Application No 61/737,224, filed December 14, 2012, entitled Terminally Optimized Modified RNAs, International Application No PCT/US2012/069610, filed December 14, 2012, entitled Modified Nucleoside, Nucleotide, and Nucleic Acid Compositions, U.S. Provisional Patent Application No 61/618,862, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Biologics, U.S. Provisional Patent Application No 61/681,645, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Biologics, U.S. Provisional Patent Application No 61/737,130, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Biologics, U.S. Provisional Patent Application No 61/618,866, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Antibodies, U.S. Provisional Patent Application No 61/681,647, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Antibodies, U.S. Provisional Patent Application No 61/737,134, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Antibodies, U.S. Provisional Patent Application No 61/618,868, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Vaccines, U.S. Provisional Patent Application No 61/681,648, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Vaccines, U.S. Provisional Patent Application No 61/737,135, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Vaccines, U.S. Provisional Patent Application No 61/618,870, filed April 2, 2012, entitled Modified Polynucleotides for the

Production of Therapeutic Proteins and Peptides, U.S. Provisional Patent Application No 61/681,649, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Therapeutic Proteins and Peptides, U.S. Provisional Patent Application No 61/737,139, filed December 14, 2012, Modified Polynucleotides for the Production of Therapeutic Proteins and Peptides, U.S. Provisional Patent Application No 61/618,873, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Secreted Proteins, U.S. Provisional Patent Application No 61/681,650, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Secreted Proteins, U.S. Provisional Patent Application No 61/737,147, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Secreted Proteins, U.S. Provisional Patent Application No 61/618,878, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Plasma Membrane Proteins, U.S. Provisional Patent Application No 61/681,654, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Plasma Membrane Proteins, U.S. Provisional Patent Application No 61/737,152, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Plasma Membrane Proteins, U.S. Provisional Patent Application No 61/618,885, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Cytoplasmic and Cytoskeletal Proteins, U.S. Provisional Patent Application No 61/681,658, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Cytoplasmic and Cytoskeletal Proteins, U.S. Provisional Patent Application No 61/737,155, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Cytoplasmic and Cytoskeletal Proteins, U.S. Provisional Patent Application No 61/618,896, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Intracellular Membrane Bound Proteins, U.S. Provisional Patent Application No 61/668,157, filed July 5, 2012, entitled Modified Polynucleotides for the Production of Intracellular Membrane Bound Proteins, U.S. Provisional Patent Application No 61/681,661, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Intracellular Membrane Bound Proteins, U.S. Provisional Patent Application No 61/737,160, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Intracellular Membrane Bound Proteins, U.S. Provisional Patent Application No 61/618,911, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Nuclear Proteins, U.S. Provisional Patent

Application No 61/681,667, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Nuclear Proteins, U.S. Provisional Patent Application No 61/737,168, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Nuclear Proteins, U.S. Provisional Patent Application No 61/618,922, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Proteins, U.S. Provisional Patent Application No 61/681,675, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Proteins, U.S. Provisional Patent Application No 61/737,174, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Proteins, U.S. Provisional Patent Application No 61/618,935, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/681,687, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/737,184, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/618,945, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/681,696, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/737,191, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/618,953, filed April 2, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/681,704, filed August 10, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/737,203, filed December 14, 2012, entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease, U.S. Provisional Patent Application No 61/618,961, filed April 2, 2012, entitled Dosing Methods for Modified mRNA, U.S. Provisional Patent Application No 61/648,286, filed May 17, 2012, entitled Dosing Methods for Modified mRNA, the contents of each of which are herein incorporated by reference in its entirety.

[0003] This application is also related to International Publication No. PCT/US2012/58519, filed October 3, 2012, entitled Modified Nucleosides, Nucleotides, and Nucleic Acids, and Uses Thereof and International Publication No. PCT/US2012/69610, filed December 14, 2012, entitled Modified Nucleoside, Nucleotide, and Nucleic Acid Compositions.

[0004] The instant application is also related to co-pending applications, each filed concurrently herewith on March 9, 2013 and having Attorney Docket Number M300.20, (PCT/US13/XXXXX) entitled Modified Polynucleotides for the Production of Biologics and Proteins Associated with Human Disease; Attorney Docket Number M304.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Secreted Proteins; Attorney Docket Number M305.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Membrane Proteins; Attorney Docket Number M306.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Cytoplasmic and Cytoskeletal Proteins; Attorney Docket Number M301.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Proteins; Attorney Docket Number M309.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Proteins; Attorney Docket Number M310.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Proteins Associated with Human Disease; Attorney Docket Number MNC1.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Cosmetic Proteins and Peptides and Attorney Docket Number MNC2.20 (PCT/US13/XXXXX), entitled Modified Polynucleotides for the Production of Oncology-Related Proteins and Peptides, the contents of each of which are herein incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0005] The invention relates to compositions, methods, processes, kits and devices for the design, preparation, manufacture and/or formulation of polynucleotides, primary constructs and modified mRNA molecules (mmRNA).

BACKGROUND OF THE INVENTION

[0006] There are multiple problems with prior methodologies of effecting protein expression. For example, introduced DNA can integrate into host cell genomic DNA at

some frequency, resulting in alterations and/or damage to the host cell genomic DNA. Alternatively, the heterologous deoxyribonucleic acid (DNA) introduced into a cell can be inherited by daughter cells (whether or not the heterologous DNA has integrated into the chromosome) or by offspring.

[0007] In addition, assuming proper delivery and no damage or integration into the host genome, there are multiple steps which must occur before the encoded protein is made. Once inside the cell, DNA must be transported into the nucleus where it is transcribed into RNA. The RNA transcribed from DNA must then enter the cytoplasm where it is translated into protein. Not only do the multiple processing steps from administered DNA to protein create lag times before the generation of the functional protein, each step represents an opportunity for error and damage to the cell. Further, it is known to be difficult to obtain DNA expression in cells as DNA frequently enters a cell but is not expressed or not expressed at reasonable rates or concentrations. This can be a particular problem when DNA is introduced into primary cells or modified cell lines.

[0008] In the early 1990's Bloom and colleagues successfully rescued vasopressin-deficient rats by injecting in vitro-transcribed vasopressin mRNA into the hypothalamus (Science 255: 996-998; 1992). However, the low levels of translation and the immunogenicity of the molecules hampered the development of mRNA as a therapeutic and efforts have since focused on alternative applications that could instead exploit these pitfalls, i.e. immunization with mRNAs coding for cancer antigens.

[0009] Others have investigated the use of mRNA to deliver a polypeptide of interest and shown that certain chemical modifications of mRNA molecules, particularly pseudouridine and 5-methyl-cytosine, have reduced immunostimulatory effect.

[0010] These studies are disclosed in, for example, Ribostem Limited in United Kingdom patent application serial number 0316089.2 filed on July 9, 2003 now abandoned, PCT application number PCT/GB2004/002981 filed on July 9, 2004 published as WO2005005622, United States patent application national phase entry serial number 10/563,897 filed on June 8, 2006 published as US20060247195 now abandoned, and European patent application national phase entry serial number EP2004743322 filed on July 9, 2004 published as EP1646714 now withdrawn; Novozymes, Inc. in PCT application number PCT/US2007/88060 filed on December 19, 2007 published as

WO2008140615, United States patent application national phase entry serial number 12/520,072 filed on July 2, 2009 published as US20100028943 and European patent application national phase entry serial number EP2007874376 filed on July 7, 2009 published as EP2104739; University of Rochester in PCT application number PCT/US2006/46120 filed on December 4, 2006 published as WO2007064952 and United States patent application serial number 11/606,995 filed on December 1, 2006 published as US20070141030; BioNTech AG in European patent application serial number EP2007024312 filed December 14, 2007 now abandoned, PCT application number PCT/EP2008/01059 filed on December 12, 2008 published as WO2009077134, European patent application national phase entry serial number EP2008861423 filed on June 2, 2010 published as EP2240572, United States patent application national phase entry serial number 12/735,060 filed November 24, 2010 published as US20110065103, German patent application serial number DE 10 2005 046 490 filed September 28, 2005, PCT application PCT/EP2006/0448 filed September 28, 2006 published as WO2007036366, national phase European patent EP1934345 published March, 21, 2012 and national phase US patent application serial number 11/992,638 filed August 14, 2009 published as 20100129877; Immune Disease Institute Inc. in United States patent application serial number 13/088,009 filed April 15, 2011 published as US20120046346 and PCT application PCT/US2011/32679 filed April 15, 2011 published as WO20110130624; Shire Human Genetic Therapeutics in United States patent application serial number 12/957,340 filed on November 20, 2010 published as US20110244026; Sequitur Inc. in PCT application PCT/US1998/019492 filed on September 18, 1998 published as WO1999014346; The Scripps Research Institute in PCT application number PCT/US2010/00567 filed on February 24, 2010 published as WO2010098861, and United States patent application national phase entry serial number 13/203,229 filed November 3, 2011 published as US20120053333; Ludwig-Maximilians University in PCT application number PCT/EP2010/004681 filed on July 30, 2010 published as WO2011012316; Cellscript Inc. in United States patent number 8,039,214 filed June 30, 2008 and granted October 18, 2011, United States patent application serial numbers 12/962,498 filed on December 7, 2010 published as US20110143436, 12/962,468 filed on December 7, 2010 published as US20110143397, 13/237,451 filed on September 20,

2011 published as US20120009649, and PCT applications PCT/US2010/59305 filed December 7, 2010 published as WO2011071931 and PCT/US2010/59317 filed on December 7, 2010 published as WO2011071936; The Trustees of the University of Pennsylvania in PCT application number PCT/US2006/32372 filed on August 21, 2006 published as WO2007024708, and United States patent application national phase entry serial number 11/990,646 filed on March 27, 2009 published as US20090286852; Curevac GMBH in German patent application serial numbers DE10 2001 027 283.9 filed June 5, 2001, DE10 2001 062 480.8 filed December 19, 2001, and DE 20 2006 051 516 filed October 31, 2006 all abandoned, European patent numbers EP1392341 granted March 30, 2005 and EP1458410 granted January 2, 2008, PCT application numbers PCT/EP2002/06180 filed June 5, 2002 published as WO2002098443, PCT/EP2002/14577 filed on December 19, 2002 published as WO2003051401, PCT/EP2007/09469 filed on December 31, 2007 published as WO2008052770, PCT/EP2008/03033 filed on April 16, 2008 published as WO2009127230, PCT/EP2006/004784 filed on May 19, 2005 published as WO2006122828, PCT/EP2008/00081 filed on January 9, 2007 published as WO2008083949, and United States patent application serial numbers 10/729,830 filed on December 5, 2003 published as US20050032730, 10/870,110 filed on June 18, 2004 published as US20050059624, 11/914,945 filed on July 7, 2008 published as US20080267873, 12/446,912 filed on October 27, 2009 published as US2010047261 now abandoned, 12/522,214 filed on January 4, 2010 published as US20100189729, 12/787,566 filed on May 26, 2010 published as US20110077287, 12/787,755 filed on May 26, 2010 published as US20100239608, 13/185,119 filed on July 18, 2011 published as US20110269950, and 13/106,548 filed on May 12, 2011 published as US20110311472 all of which are herein incorporated by reference in their entirety.

[00011] Notwithstanding these reports which are limited to a selection of chemical modifications including pseudouridine and 5-methyl-cytosine, there remains a need in the art for therapeutic modalities to address the myriad of barriers surrounding the efficacious modulation of intracellular translation and processing of nucleic acids encoding polypeptides or fragments thereof.

[00012] To this end, the inventors have shown that certain modified mRNA sequences have the potential as therapeutics with benefits beyond just evading, avoiding or diminishing the immune response. Such studies are detailed in published co-pending applications International Application PCT/US2011/046861 filed August 5, 2011 and PCT/US2011/054636 filed October 3, 2011, International Application number PCT/US2011/054617 filed October 3, 2011, the contents of which are incorporated herein by reference in their entirety.

[00013] The present invention addresses this need by providing nucleic acid based compounds or polynucleotides which encode a polypeptide of interest (e.g., modified mRNA or mmRNA) and which have structural and/or chemical features that avoid one or more of the problems in the art, for example, features which are useful for optimizing formulation and delivery of nucleic acid-based therapeutics while retaining structural and functional integrity, overcoming the threshold of expression, improving expression rates, half life and/or protein concentrations, optimizing protein localization, and avoiding deleterious bio-responses such as the immune response and/or degradation pathways.

SUMMARY OF THE INVENTION

[00014] Described herein are compositions, methods, processes, kits and devices for the design, preparation, manufacture and/or formulation of modified mRNA (mmRNA) molecules.

[00015] The details of various embodiments of the invention are set forth in the description below. Other features, objects, and advantages of the invention will be apparent from the description and the drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[00016] The foregoing and other objects, features and advantages will be apparent from the following description of particular embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of various embodiments of the invention.

[00017] FIG. 1 is a schematic of a primary construct of the present invention.

[00018] FIG. 2 illustrates lipid structures in the prior art useful in the present invention. Shown are the structures for 98N12-5 (TETA5-LAP), DLin-DMA, DLin-K-DMA (2,2-Dilinoleyl-4-dimethylaminomethyl-[1,3]-dioxolane), DLin-KC2-DMA, DLin-MC3-DMA and C12-200.

[00019] FIG. 3 is a representative plasmid useful in the IVT reactions taught herein. The plasmid contains Insert 64818, designed by the instant inventors.

[00020] FIG. 4 is a gel profile of modified mRNA encapsulated in PLGA microspheres.

[00021] FIG. 5 is a histogram of Factor IX protein production PLGA formulation Factor IX modified mRNA.

[00022] FIG. 6 is a histogram showing VEGF protein production in human keratinocyte cells after transfection of modified mRNA at a range of doses. Figure 6A shows protein production after transfection of modified mRNA comprising natural nucleoside triphosphate (NTP). Figure 6B shows protein production after transfection of modified mRNA fully modified with pseudouridine (Pseudo-U) and 5-methylcytosine (5mC). Figure 6C shows protein production after transfection of modified mRNA fully modified with N1-methyl-pseudouridine (N1-methyl-Pseudo-U) and 5-methylcytosine (5mC).

[00023] FIG. 7 is a histogram of VEGF protein production in HEK293 cells.

[00024] FIG. 8 is a histogram of VEGF expression and IFN-alpha induction after transfection of VEGF modified mRNA in peripheral blood mononuclear cells (PBMC). Figure 8A shows VEGF expression. Figure 8B shows IFN-alpha induction.

[00025] FIG. 9 is a histogram of VEGF protein production in HeLa cells from VEGF modified mRNA.

[00026] FIG. 10 is a histogram of VEGF protein production from lipoplexed VEGF modified mRNA in mice.

[00027] FIG. 11 is a histogram of G-CSF protein production in HeLa cells from G-CSF modified mRNA.

[00028] FIG. 12 is a histogram of Factor IX protein production in HeLa cell supernatant from Factor IX modified mRNA.

DETAILED DESCRIPTION

[00029] It is of great interest in the fields of therapeutics, diagnostics, reagents and for biological assays to be able to deliver a nucleic acid, e.g., a ribonucleic acid (RNA) inside a cell, whether *in vitro*, *in vivo*, *in situ* or *ex vivo*, such as to cause intracellular translation of the nucleic acid and production of an encoded polypeptide of interest. Of particular importance is the delivery and function of a non-integrative polynucleotide.

[00030] Described herein are compositions (including pharmaceutical compositions) and methods for the design, preparation, manufacture and/or formulation of polynucleotides encoding one or more polypeptides of interest. Also provided are systems, processes, devices and kits for the selection, design and/or utilization of the polynucleotides encoding the polypeptides of interest described herein.

[00031] According to the present invention, these polynucleotides are preferably modified as to avoid the deficiencies of other polypeptide-encoding molecules of the art. Hence these polynucleotides are referred to as modified mRNA or mmRNA.

[00032] The use of modified polynucleotides in the fields of antibodies, viruses, veterinary applications and a variety of *in vivo* settings has been explored by the inventors and these studies are disclosed in for example, co-pending and co-owned United States provisional patent application serial numbers 61/470,451 filed March 31, 2011 teaching *in vivo* applications of mmRNA; 61/517,784 filed on April 26, 2011 teaching engineered nucleic acids for the production of antibody polypeptides; 61/519,158 filed May 17, 2011 teaching veterinary applications of mmRNA technology; 61/533,537 filed on September 12, 2011 teaching antimicrobial applications of mmRNA technology; 61/533,554 filed on September 12, 2011 teaching viral applications of mmRNA technology, 61/542,533 filed on October 3, 2011 teaching various chemical modifications for use in mmRNA technology; 61/570,690 filed on December 14, 2011 teaching mobile devices for use in making or using mmRNA technology; 61/570,708 filed on December 14, 2011 teaching the use of mmRNA in acute care situations; 61/576,651 filed on December 16, 2011 teaching terminal modification architecture for mmRNA; 61/576,705 filed on December 16, 2011 teaching delivery methods using lipidoids for mmRNA; 61/578,271 filed on December 21, 2011 teaching methods to increase the viability of organs or tissues using mmRNA; 61/581,322 filed on December 29, 2011 teaching mmRNA encoding cell penetrating peptides; 61/581,352 filed on

December 29, 2011 teaching the incorporation of cytotoxic nucleosides in mmRNA and 61/631,729 filed on January 10, 2012 teaching methods of using mmRNA for crossing the blood brain barrier; all of which are herein incorporated by reference in their entirety.

[00033] Provided herein, in part, are polynucleotides, primary constructs and/or mmRNA encoding polypeptides of interest which have been designed to improve one or more of the stability and/or clearance in tissues, receptor uptake and/or kinetics, cellular access by the compositions, engagement with translational machinery, mRNA half-life, translation efficiency, immune evasion, protein production capacity, secretion efficiency (when applicable), accessibility to circulation, protein half-life and/or modulation of a cell's status, function and/or activity.

I. Compositions of the Invention (mmRNA)

[00034] The present invention provides nucleic acid molecules, specifically polynucleotides, primary constructs and/or mmRNA which encode one or more polypeptides of interest. The term "nucleic acid," in its broadest sense, includes any compound and/or substance that comprise a polymer of nucleotides. These polymers are often referred to as polynucleotides. Exemplary nucleic acids or polynucleotides of the invention include, but are not limited to, ribonucleic acids (RNAs), deoxyribonucleic acids (DNAs), threose nucleic acids (TNAs), glycol nucleic acids (GNAs), peptide nucleic acids (PNAs), locked nucleic acids (LNAs, including LNA having a β -D-ribo configuration, α -LNA having an α -L-ribo configuration (a diastereomer of LNA), 2'-amino-LNA having a 2'-amino functionalization, and 2'-amino- α -LNA having a 2'-amino functionalization) or hybrids thereof.

[00035] In preferred embodiments, the nucleic acid molecule is a messenger RNA (mRNA). As used herein, the term "messenger RNA" (mRNA) refers to any polynucleotide which encodes a polypeptide of interest and which is capable of being translated to produce the encoded polypeptide of interest *in vitro*, *in vivo*, *in situ* or *ex vivo*.

[00036] Traditionally, the basic components of an mRNA molecule include at least a coding region, a 5'UTR, a 3'UTR, a 5' cap and a poly-A tail. Building on this wild type modular structure, the present invention expands the scope of functionality of traditional mRNA molecules by providing polynucleotides or primary RNA constructs which

maintain a modular organization, but which comprise one or more structural and/or chemical modifications or alterations which impart useful properties to the polynucleotide including, in some embodiments, the lack of a substantial induction of the innate immune response of a cell into which the polynucleotide is introduced. As such, modified mRNA molecules of the present invention are termed “mmRNA.” As used herein, a “structural” feature or modification is one in which two or more linked nucleotides are inserted, deleted, duplicated, inverted or randomized in a polynucleotide, primary construct or mmRNA without significant chemical modification to the nucleotides themselves. Because chemical bonds will necessarily be broken and reformed to effect a structural modification, structural modifications are of a chemical nature and hence are chemical modifications. However, structural modifications will result in a different sequence of nucleotides. For example, the polynucleotide “ATCG” may be chemically modified to “AT-5meC-G”. The same polynucleotide may be structurally modified from “ATCG” to “ATCCCG”. Here, the dinucleotide “CC” has been inserted, resulting in a structural modification to the polynucleotide.

mmRNA Architecture

[00037] The mmRNA of the present invention are distinguished from wild type mRNA in their functional and/or structural design features which serve to, as evidenced herein, overcome existing problems of effective polypeptide production using nucleic acid-based therapeutics.

[00038] Figure 1 shows a representative polynucleotide primary construct **100** of the present invention. As used herein, the term “primary construct” or “primary mRNA construct” refers to a polynucleotide transcript which encodes one or more polypeptides of interest and which retains sufficient structural and/or chemical features to allow the polypeptide of interest encoded therein to be translated. Primary constructs may be polynucleotides of the invention. When structurally or chemically modified, the primary construct may be referred to as an mmRNA.

[00039] Returning to FIG. 1, the primary construct **100** here contains a first region of linked nucleotides **102** that is flanked by a first flanking region **104** and a second flanking region **106**. As used herein, the “first region” may be referred to as a “coding region” or “region encoding” or simply the “first region.” This first region may include, but is not

limited to, the encoded polypeptide of interest. The polypeptide of interest may comprise at its 5' terminus one or more signal sequences encoded by a signal sequence region **103**. The flanking region **104** may comprise a region of linked nucleotides comprising one or more complete or incomplete 5' UTRs sequences. The flanking region **104** may also comprise a 5' terminal cap **108**. The second flanking region **106** may comprise a region of linked nucleotides comprising one or more complete or incomplete 3' UTRs. The flanking region **106** may also comprise a 3' tailing sequence **110**.

[00040] Bridging the 5' terminus of the first region **102** and the first flanking region **104** is a first operational region **105**. Traditionally this operational region comprises a Start codon. The operational region may alternatively comprise any translation initiation sequence or signal including a Start codon.

[00041] Bridging the 3' terminus of the first region **102** and the second flanking region **106** is a second operational region **107**. Traditionally this operational region comprises a Stop codon. The operational region may alternatively comprise any translation initiation sequence or signal including a Stop codon. According to the present invention, multiple serial stop codons may also be used.

[00042] Generally, the shortest length of the first region of the primary construct of the present invention can be the length of a nucleic acid sequence that is sufficient to encode for a dipeptide, a tripeptide, a tetrapeptide, a pentapeptide, a hexapeptide, a heptapeptide, an octapeptide, a nonapeptide, or a decapeptide. In another embodiment, the length may be sufficient to encode a peptide of 2-30 amino acids, e.g. 5-30, 10-30, 2-25, 5-25, 10-25, or 10-20 amino acids. The length may be sufficient to encode for a peptide of at least 11, 12, 13, 14, 15, 17, 20, 25 or 30 amino acids, or a peptide that is no longer than 40 amino acids, e.g. no longer than 35, 30, 25, 20, 17, 15, 14, 13, 12, 11 or 10 amino acids. Examples of dipeptides that the polynucleotide sequences can encode or include, but are not limited to, carnosine and anserine.

[00043] Generally, the length of the first region encoding the polypeptide of interest of the present invention is greater than about 30 nucleotides in length (e.g., at least or greater than about 35, 40, 45, 50, 55, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,100, 1,200, 1,300, 1,400, 1,500, 1,600, 1,700, 1,800, 1,900, 2,000, 2,500, and 3,000, 4,000, 5,000, 6,000, 7,000, 8,000,

9,000, 10,000, 20,000, 30,000, 40,000, 50,000, 60,000, 70,000, 80,000, 90,000 or up to and including 100,000 nucleotides). As used herein, the “first region” may be referred to as a “coding region” or “region encoding” or simply the “first region.”

[00044] In some embodiments, the polynucleotide, primary construct, or mRNA includes from about 30 to about 100,000 nucleotides (e.g., from 30 to 50, from 30 to 100, from 30 to 250, from 30 to 500, from 30 to 1,000, from 30 to 1,500, from 30 to 3,000, from 30 to 5,000, from 30 to 7,000, from 30 to 10,000, from 30 to 25,000, from 30 to 50,000, from 30 to 70,000, from 100 to 250, from 100 to 500, from 100 to 1,000, from 100 to 1,500, from 100 to 3,000, from 100 to 5,000, from 100 to 7,000, from 100 to 10,000, from 100 to 25,000, from 100 to 50,000, from 100 to 70,000, from 100 to 100,000, from 500 to 1,000, from 500 to 1,500, from 500 to 2,000, from 500 to 3,000, from 500 to 5,000, from 500 to 7,000, from 500 to 10,000, from 500 to 25,000, from 500 to 50,000, from 500 to 70,000, from 500 to 100,000, from 1,000 to 1,500, from 1,000 to 2,000, from 1,000 to 3,000, from 1,000 to 5,000, from 1,000 to 7,000, from 1,000 to 10,000, from 1,000 to 25,000, from 1,000 to 50,000, from 1,000 to 70,000, from 1,000 to 100,000, from 1,500 to 3,000, from 1,500 to 5,000, from 1,500 to 7,000, from 1,500 to 10,000, from 1,500 to 25,000, from 1,500 to 50,000, from 1,500 to 70,000, from 1,500 to 100,000, from 2,000 to 3,000, from 2,000 to 5,000, from 2,000 to 7,000, from 2,000 to 10,000, from 2,000 to 25,000, from 2,000 to 50,000, from 2,000 to 70,000, and from 2,000 to 100,000).

[00045] According to the present invention, the first and second flanking regions may range independently from 15-1,000 nucleotides in length (e.g., greater than 30, 40, 45, 50, 55, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, and 900 nucleotides or at least 30, 40, 45, 50, 55, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, and 1,000 nucleotides).

[00046] According to the present invention, the tailing sequence may range from absent to 500 nucleotides in length (e.g., at least 60, 70, 80, 90, 120, 140, 160, 180, 200, 250, 300, 350, 400, 450, or 500 nucleotides). Where the tailing region is a polyA tail, the length may be determined in units of or as a function of polyA Binding Protein binding. In this embodiment, the polyA tail is long enough to bind at least 4 monomers of PolyA Binding Protein. PolyA Binding Protein monomers bind to stretches of approximately 38

nucleotides. As such, it has been observed that polyA tails of about 80 nucleotides and 160 nucleotides are functional.

[00047] According to the present invention, the capping region may comprise a single cap or a series of nucleotides forming the cap. In this embodiment the capping region may be from 1 to 10, e.g. 2-9, 3-8, 4-7, 1-5, 5-10, or at least 2, or 10 or fewer nucleotides in length. In some embodiments, the cap is absent.

[00048] According to the present invention, the first and second operational regions may range from 3 to 40, e.g., 5-30, 10-20, 15, or at least 4, or 30 or fewer nucleotides in length and may comprise, in addition to a Start and/or Stop codon, one or more signal and/or restriction sequences.

Cyclic mmRNA

[00049] According to the present invention, a primary construct or mmRNA may be cyclized, or concatemerized, to generate a translation competent molecule to assist interactions between poly-A binding proteins and 5'-end binding proteins. The mechanism of cyclization or concatemerization may occur through at least 3 different routes: 1) chemical, 2) enzymatic, and 3) ribozyme catalyzed. The newly formed 5'-/3'-linkage may be intramolecular or intermolecular.

[00050] In the first route, the 5'-end and the 3'-end of the nucleic acid contain chemically reactive groups that, when close together, form a new covalent linkage between the 5'-end and the 3'-end of the molecule. The 5'-end may contain an NHS-ester reactive group and the 3'-end may contain a 3'-amino-terminated nucleotide such that in an organic solvent the 3'-amino-terminated nucleotide on the 3'-end of a synthetic mRNA molecule will undergo a nucleophilic attack on the 5'-NHS-ester moiety forming a new 5'-/3'-amide bond.

[00051] In the second route, T4 RNA ligase may be used to enzymatically link a 5'-phosphorylated nucleic acid molecule to the 3'-hydroxyl group of a nucleic acid forming a new phosphodiester linkage. In an example reaction, 1 μ g of a nucleic acid molecule is incubated at 37°C for 1 hour with 1-10 units of T4 RNA ligase (New England Biolabs, Ipswich, MA) according to the manufacturer's protocol. The ligation reaction may occur in the presence of a split oligonucleotide capable of base-pairing with both the 5'- and 3'-region in juxtaposition to assist the enzymatic ligation reaction.

[00052] In the third route, either the 5'-or 3'-end of the cDNA template encodes a ligase ribozyme sequence such that during *in vitro* transcription, the resultant nucleic acid molecule can contain an active ribozyme sequence capable of ligating the 5'-end of a nucleic acid molecule to the 3'-end of a nucleic acid molecule. The ligase ribozyme may be derived from the Group I Intron, Group I Intron, Hepatitis Delta Virus, Hairpin ribozyme or may be selected by SELEX (systematic evolution of ligands by exponential enrichment). The ribozyme ligase reaction may take 1 to 24 hours at temperatures between 0 and 37°C.

mmRNA Multimers

[00053] According to the present invention, multiple distinct polynucleotides, primary constructs or mmRNA may be linked together through the 3'-end using nucleotides which are modified at the 3'-terminus. Chemical conjugation may be used to control the stoichiometry of delivery into cells. For example, the glyoxylate cycle enzymes, isocitrate lyase and malate synthase, may be supplied into HepG2 cells at a 1:1 ratio to alter cellular fatty acid metabolism. This ratio may be controlled by chemically linking polynucleotides, primary constructs or mmRNA using a 3'-azido terminated nucleotide on one polynucleotide, primary construct or mmRNA species and a C5-ethynyl or alkynyl-containing nucleotide on the opposite polynucleotide, primary construct or mmRNA species. The modified nucleotide is added post-transcriptionally using terminal transferase (New England Biolabs, Ipswich, MA) according to the manufacturer's protocol. After the addition of the 3'-modified nucleotide, the two polynucleotide, primary construct or mmRNA species may be combined in an aqueous solution, in the presence or absence of copper, to form a new covalent linkage via a click chemistry mechanism as described in the literature.

[00054] In another example, more than two polynucleotides may be linked together using a functionalized linker molecule. For example, a functionalized saccharide molecule may be chemically modified to contain multiple chemical reactive groups (SH-, NH₂-, N₃, etc...) to react with the cognate moiety on a 3'-functionalized mRNA molecule (i.e., a 3'-maleimide ester, 3'-NHS-ester, alkynyl). The number of reactive groups on the modified saccharide can be controlled in a stoichiometric fashion to directly control the stoichiometric ratio of conjugated polynucleotide, primary construct or mmRNA.

mmRNA Conjugates and Combinations

[00055] In order to further enhance protein production, primary constructs or mmRNA of the present invention can be designed to be conjugated to other polynucleotides, dyes, intercalating agents (*e.g.* acridines), cross-linkers (*e.g.* psoralene, mitomycin C), porphyrins (TPPC4, texaphyrin, Sapphyrin), polycyclic aromatic hydrocarbons (*e.g.*, phenazine, dihydrophenazine), artificial endonucleases (*e.g.* EDTA), alkylating agents, phosphate, amino, mercapto, PEG (*e.g.*, PEG-40K), MPEG, [MPEG]₂, polyamino, alkyl, substituted alkyl, radiolabeled markers, enzymes, haptens (*e.g.* biotin), transport/absorption facilitators (*e.g.*, aspirin, vitamin E, folic acid), synthetic ribonucleases, proteins, *e.g.*, glycoproteins, or peptides, *e.g.*, molecules having a specific affinity for a co-ligand, or antibodies *e.g.*, an antibody, that binds to a specified cell type such as a cancer cell, endothelial cell, or bone cell, hormones and hormone receptors, non-peptidic species, such as lipids, lectins, carbohydrates, vitamins, cofactors, or a drug.

[00056] Conjugation may result in increased stability and/or half life and may be particularly useful in targeting the polynucleotides, primary constructs or mmRNA to specific sites in the cell, tissue or organism.

[00057] According to the present invention, the mmRNA or primary constructs may be administered with, or further encode one or more of RNAi agents, siRNAs, shRNAs, miRNAs, miRNA binding sites, antisense RNAs, ribozymes, catalytic DNA, tRNA, RNAs that induce triple helix formation, aptamers or vectors, and the like.

Bifunctional mmRNA

[00058] In one embodiment of the invention are bifunctional polynucleotides (*e.g.*, bifunctional primary constructs or bifunctional mmRNA). As the name implies, bifunctional polynucleotides are those having or capable of at least two functions. These molecules may also by convention be referred to as multi-functional.

[00059] The multiple functionalities of bifunctional polynucleotides may be encoded by the RNA (the function may not manifest until the encoded product is translated) or may be a property of the polynucleotide itself. It may be structural or chemical. Bifunctional modified polynucleotides may comprise a function that is covalently or electrostatically associated with the polynucleotides. Further, the two functions may be provided in the context of a complex of a mmRNA and another molecule.

[00060] Bifunctional polynucleotides may encode peptides which are anti-proliferative. These peptides may be linear, cyclic, constrained or random coil. They may function as aptamers, signaling molecules, ligands or mimics or mimetics thereof. Anti-proliferative peptides may, as translated, be from 3 to 50 amino acids in length. They may be 5-40, 10-30, or approximately 15 amino acids long. They may be single chain, multichain or branched and may form complexes, aggregates or any multi-unit structure once translated.

Noncoding polynucleotides and primary constructs

[00061] As described herein, provided are polynucleotides and primary constructs having sequences that are partially or substantially not translatable, e.g., having a noncoding region. Such noncoding region may be the “first region” of the primary construct. Alternatively, the noncoding region may be a region other than the first region. Such molecules are generally not translated, but can exert an effect on protein production by one or more of binding to and sequestering one or more translational machinery components such as a ribosomal protein or a transfer RNA (tRNA), thereby effectively reducing protein expression in the cell or modulating one or more pathways or cascades in a cell which in turn alters protein levels. The polynucleotide or primary construct may contain or encode one or more long noncoding RNA (lncRNA, or lincRNA) or portion thereof, a small nucleolar RNA (sno-RNA), micro RNA (miRNA), small interfering RNA (siRNA) or Piwi-interacting RNA (piRNA).

Polypeptides of interest

[00062] According to the present invention, the primary construct is designed to encode one or more polypeptides of interest or fragments thereof. A polypeptide of interest may include, but is not limited to, whole polypeptides, a plurality of polypeptides or fragments of polypeptides, which independently may be encoded by one or more nucleic acids, a plurality of nucleic acids, fragments of nucleic acids or variants of any of the aforementioned. As used herein, the term “polypeptides of interest” refer to any polypeptide which is selected to be encoded in the primary construct of the present invention. As used herein, “polypeptide” means a polymer of amino acid residues (natural or unnatural) linked together most often by peptide bonds. The term, as used herein, refers to proteins, polypeptides, and peptides of any size, structure, or function. In

some instances the polypeptide encoded is smaller than about 50 amino acids and the polypeptide is then termed a peptide. If the polypeptide is a peptide, it will be at least about 2, 3, 4, or at least 5 amino acid residues long. Thus, polypeptides include gene products, naturally occurring polypeptides, synthetic polypeptides, homologs, orthologs, paralogs, fragments and other equivalents, variants, and analogs of the foregoing. A polypeptide may be a single molecule or may be a multi-molecular complex such as a dimer, trimer or tetramer. They may also comprise single chain or multichain polypeptides such as antibodies or insulin and may be associated or linked. Most commonly disulfide linkages are found in multichain polypeptides. The term polypeptide may also apply to amino acid polymers in which one or more amino acid residues are an artificial chemical analogue of a corresponding naturally occurring amino acid.

[00063] The term “polypeptide variant” refers to molecules which differ in their amino acid sequence from a native or reference sequence. The amino acid sequence variants may possess substitutions, deletions, and/or insertions at certain positions within the amino acid sequence, as compared to a native or reference sequence. Ordinarily, variants will possess at least about 50% identity (homology) to a native or reference sequence, and preferably, they will be at least about 80%, more preferably at least about 90% identical (homologous) to a native or reference sequence.

[00064] In some embodiments “variant mimics” are provided. As used herein, the term “variant mimic” is one which contains one or more amino acids which would mimic an activated sequence. For example, glutamate may serve as a mimic for phospho-threonine and/or phospho-serine. Alternatively, variant mimics may result in deactivation or in an inactivated product containing the mimic, e.g., phenylalanine may act as an inactivating substitution for tyrosine; or alanine may act as an inactivating substitution for serine.

[00065] “Homology” as it applies to amino acid sequences is defined as the percentage of residues in the candidate amino acid sequence that are identical with the residues in the amino acid sequence of a second sequence after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent homology. Methods and computer programs for the alignment are well known in the art. It is understood that homology

depends on a calculation of percent identity but may differ in value due to gaps and penalties introduced in the calculation.

[00066] By “homologs” as it applies to polypeptide sequences means the corresponding sequence of other species having substantial identity to a second sequence of a second species.

[00067] “Analog” is meant to include polypeptide variants which differ by one or more amino acid alterations, e.g., substitutions, additions or deletions of amino acid residues that still maintain one or more of the properties of the parent or starting polypeptide.

[00068] The present invention contemplates several types of compositions which are polypeptide based including variants and derivatives. These include substitutional, insertional, deletion and covalent variants and derivatives. The term “derivative” is used synonymously with the term “variant” but generally refers to a molecule that has been modified and/or changed in any way relative to a reference molecule or starting molecule.

[00069] As such, mmRNA encoding polypeptides containing substitutions, insertions and/or additions, deletions and covalent modifications with respect to reference sequences, in particular the polypeptide sequences disclosed herein, are included within the scope of this invention. For example, sequence tags or amino acids, such as one or more lysines, can be added to the peptide sequences of the invention (e.g., at the N-terminal or C-terminal ends). Sequence tags can be used for peptide purification or localization. Lysines can be used to increase peptide solubility or to allow for biotinylation. Alternatively, amino acid residues located at the carboxy and amino terminal regions of the amino acid sequence of a peptide or protein may optionally be deleted providing for truncated sequences. Certain amino acids (e.g., C-terminal or N-terminal residues) may alternatively be deleted depending on the use of the sequence, as for example, expression of the sequence as part of a larger sequence which is soluble, or linked to a solid support.

[00070] “Substitutional variants” when referring to polypeptides are those that have at least one amino acid residue in a native or starting sequence removed and a different amino acid inserted in its place at the same position. The substitutions may be single,

where only one amino acid in the molecule has been substituted, or they may be multiple, where two or more amino acids have been substituted in the same molecule.

[00071] As used herein the term “conservative amino acid substitution” refers to the substitution of an amino acid that is normally present in the sequence with a different amino acid of similar size, charge, or polarity. Examples of conservative substitutions include the substitution of a non-polar (hydrophobic) residue such as isoleucine, valine and leucine for another non-polar residue. Likewise, examples of conservative substitutions include the substitution of one polar (hydrophilic) residue for another such as between arginine and lysine, between glutamine and asparagine, and between glycine and serine. Additionally, the substitution of a basic residue such as lysine, arginine or histidine for another, or the substitution of one acidic residue such as aspartic acid or glutamic acid for another acidic residue are additional examples of conservative substitutions. Examples of non-conservative substitutions include the substitution of a non-polar (hydrophobic) amino acid residue such as isoleucine, valine, leucine, alanine, methionine for a polar (hydrophilic) residue such as cysteine, glutamine, glutamic acid or lysine and/or a polar residue for a non-polar residue.

[00072] “Insertional variants” when referring to polypeptides are those with one or more amino acids inserted immediately adjacent to an amino acid at a particular position in a native or starting sequence. “Immediately adjacent” to an amino acid means connected to either the alpha-carboxy or alpha-amino functional group of the amino acid.

[00073] “Deletional variants” when referring to polypeptides are those with one or more amino acids in the native or starting amino acid sequence removed. Ordinarily, deletional variants will have one or more amino acids deleted in a particular region of the molecule.

[00074] “Covalent derivatives” when referring to polypeptides include modifications of a native or starting protein with an organic proteinaceous or non-proteinaceous derivatizing agent, and/or post-translational modifications. Covalent modifications are traditionally introduced by reacting targeted amino acid residues of the protein with an organic derivatizing agent that is capable of reacting with selected side-chains or terminal residues, or by harnessing mechanisms of post-translational modifications that function in selected recombinant host cells. The resultant covalent derivatives are useful in programs

directed at identifying residues important for biological activity, for immunoassays, or for the preparation of anti-protein antibodies for immunoaffinity purification of the recombinant glycoprotein. Such modifications are within the ordinary skill in the art and are performed without undue experimentation.

[00075] Certain post-translational modifications are the result of the action of recombinant host cells on the expressed polypeptide. Glutaminyl and asparaginyl residues are frequently post-translationally deamidated to the corresponding glutamyl and aspartyl residues. Alternatively, these residues are deamidated under mildly acidic conditions. Either form of these residues may be present in the polypeptides produced in accordance with the present invention.

[00076] Other post-translational modifications include hydroxylation of proline and lysine, phosphorylation of hydroxyl groups of seryl or threonyl residues, methylation of the alpha-amino groups of lysine, arginine, and histidine side chains (T. E. Creighton, *Proteins: Structure and Molecular Properties*, W.H. Freeman & Co., San Francisco, pp. 79-86 (1983)).

[00077] “Features” when referring to polypeptides are defined as distinct amino acid sequence-based components of a molecule. Features of the polypeptides encoded by the mmRNA of the present invention include surface manifestations, local conformational shape, folds, loops, half-loops, domains, half-domains, sites, termini or any combination thereof.

[00078] As used herein when referring to polypeptides the term “surface manifestation” refers to a polypeptide based component of a protein appearing on an outermost surface.

[00079] As used herein when referring to polypeptides the term “local conformational shape” means a polypeptide based structural manifestation of a protein which is located within a definable space of the protein.

[00080] As used herein when referring to polypeptides the term “fold” refers to the resultant conformation of an amino acid sequence upon energy minimization. A fold may occur at the secondary or tertiary level of the folding process. Examples of secondary level folds include beta sheets and alpha helices. Examples of tertiary folds include

domains and regions formed due to aggregation or separation of energetic forces.

Regions formed in this way include hydrophobic and hydrophilic pockets, and the like.

[00081] As used herein the term “turn” as it relates to protein conformation means a bend which alters the direction of the backbone of a peptide or polypeptide and may involve one, two, three or more amino acid residues.

[00082] As used herein when referring to polypeptides the term “loop” refers to a structural feature of a polypeptide which may serve to reverse the direction of the backbone of a peptide or polypeptide. Where the loop is found in a polypeptide and only alters the direction of the backbone, it may comprise four or more amino acid residues. Oliva et al. have identified at least 5 classes of protein loops (J. Mol Biol 266 (4): 814-830; 1997). Loops may be open or closed. Closed loops or “cyclic” loops may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10 or more amino acids between the bridging moieties. Such bridging moieties may comprise a cysteine-cysteine bridge (Cys-Cys) typical in polypeptides having disulfide bridges or alternatively bridging moieties may be non-protein based such as the dibromozylyl agents used herein.

[00083] As used herein when referring to polypeptides the term “half-loop” refers to a portion of an identified loop having at least half the number of amino acid residues as the loop from which it is derived. It is understood that loops may not always contain an even number of amino acid residues. Therefore, in those cases where a loop contains or is identified to comprise an odd number of amino acids, a half-loop of the odd-numbered loop will comprise the whole number portion or next whole number portion of the loop (number of amino acids of the loop/2+/-0.5 amino acids). For example, a loop identified as a 7 amino acid loop could produce half-loops of 3 amino acids or 4 amino acids ($7/2=3.5\pm 0.5$ being 3 or 4).

[00084] As used herein when referring to polypeptides the term “domain” refers to a motif of a polypeptide having one or more identifiable structural or functional characteristics or properties (e.g., binding capacity, serving as a site for protein-protein interactions).

[00085] As used herein when referring to polypeptides the term “half-domain” means a portion of an identified domain having at least half the number of amino acid residues as the domain from which it is derived. It is understood that domains may not always

contain an even number of amino acid residues. Therefore, in those cases where a domain contains or is identified to comprise an odd number of amino acids, a half-domain of the odd-numbered domain will comprise the whole number portion or next whole number portion of the domain (number of amino acids of the domain/2 \pm 0.5 amino acids). For example, a domain identified as a 7 amino acid domain could produce half-domains of 3 amino acids or 4 amino acids (7/2=3.5 \pm 0.5 being 3 or 4). It is also understood that sub-domains may be identified within domains or half-domains, these subdomains possessing less than all of the structural or functional properties identified in the domains or half domains from which they were derived. It is also understood that the amino acids that comprise any of the domain types herein need not be contiguous along the backbone of the polypeptide (i.e., nonadjacent amino acids may fold structurally to produce a domain, half-domain or subdomain).

[00086] As used herein when referring to polypeptides the terms “site” as it pertains to amino acid based embodiments is used synonymously with “amino acid residue” and “amino acid side chain.” A site represents a position within a peptide or polypeptide that may be modified, manipulated, altered, derivatized or varied within the polypeptide based molecules of the present invention.

[00087] As used herein the terms “termini” or “terminus” when referring to polypeptides refers to an extremity of a peptide or polypeptide. Such extremity is not limited only to the first or final site of the peptide or polypeptide but may include additional amino acids in the terminal regions. The polypeptide based molecules of the present invention may be characterized as having both an N-terminus (terminated by an amino acid with a free amino group (NH₂)) and a C-terminus (terminated by an amino acid with a free carboxyl group (COOH)). Proteins of the invention are in some cases made up of multiple polypeptide chains brought together by disulfide bonds or by non-covalent forces (multimers, oligomers). These sorts of proteins will have multiple N- and C-termini. Alternatively, the termini of the polypeptides may be modified such that they begin or end, as the case may be, with a non-polypeptide based moiety such as an organic conjugate.

[00088] Once any of the features have been identified or defined as a desired component of a polypeptide to be encoded by the primary construct or mmRNA of the

invention, any of several manipulations and/or modifications of these features may be performed by moving, swapping, inverting, deleting, randomizing or duplicating. Furthermore, it is understood that manipulation of features may result in the same outcome as a modification to the molecules of the invention. For example, a manipulation which involved deleting a domain would result in the alteration of the length of a molecule just as modification of a nucleic acid to encode less than a full length molecule would.

[00089] Modifications and manipulations can be accomplished by methods known in the art such as, but not limited to, site directed mutagenesis. The resulting modified molecules may then be tested for activity using *in vitro* or *in vivo* assays such as those described herein or any other suitable screening assay known in the art.

[00090] According to the present invention, the polypeptides may comprise a consensus sequence which is discovered through rounds of experimentation. As used herein a “consensus” sequence is a single sequence which represents a collective population of sequences allowing for variability at one or more sites.

[00091] As recognized by those skilled in the art, protein fragments, functional protein domains, and homologous proteins are also considered to be within the scope of polypeptides of interest of this invention. For example, provided herein is any protein fragment (meaning a polypeptide sequence at least one amino acid residue shorter than a reference polypeptide sequence but otherwise identical) of a reference protein 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 or greater than 100 amino acids in length. In another example, any protein that includes a stretch of about 20, about 30, about 40, about 50, or about 100 amino acids which are about 40%, about 50%, about 60%, about 70%, about 80%, about 90%, about 95%, or about 100% identical to any of the sequences described herein can be utilized in accordance with the invention. In certain embodiments, a polypeptide to be utilized in accordance with the invention includes 2, 3, 4, 5, 6, 7, 8, 9, 10, or more mutations as shown in any of the sequences provided or referenced herein.

Encoded Polypeptides

[00092] The primary constructs or mmRNA of the present invention may be designed to encode polypeptides of interest selected from any of several target categories including, but not limited to, biologics, antibodies, vaccines, therapeutic proteins or

peptides, cell penetrating peptides, secreted proteins, plasma membrane proteins, cytoplasmic or cytoskeletal proteins, intracellular membrane bound proteins, nuclear proteins, proteins associated with human disease, targeting moieties or those proteins encoded by the human genome for which no therapeutic indication has been identified but which nonetheless have utility in areas of research and discovery.

[00093] In one embodiment primary constructs or mmRNA may encode variant polypeptides which have a certain identity with a reference polypeptide sequence. As used herein, a “reference polypeptide sequence” refers to a starting polypeptide sequence. Reference sequences may be wild type sequences or any sequence to which reference is made in the design of another sequence. A “reference polypeptide sequence” may, e.g., be any one of SEQ ID NOs: 3858-7559 as disclosed herein, e.g., any of SEQ ID NOs 3858, 3859, 3860, 3861, 3862, 3863, 3864, 3865, 3866, 3867, 3868, 3869, 3870, 3871, 3872, 3873, 3874, 3875, 3876, 3877, 3878, 3879, 3880, 3881, 3882, 3883, 3884, 3885, 3886, 3887, 3888, 3889, 3890, 3891, 3892, 3893, 3894, 3895, 3896, 3897, 3898, 3899, 3900, 3901, 3902, 3903, 3904, 3905, 3906, 3907, 3908, 3909, 3910, 3911, 3912, 3913, 3914, 3915, 3916, 3917, 3918, 3919, 3920, 3921, 3922, 3923, 3924, 3925, 3926, 3927, 3928, 3929, 3930, 3931, 3932, 3933, 3934, 3935, 3936, 3937, 3938, 3939, 3940, 3941, 3942, 3943, 3944, 3945, 3946, 3947, 3948, 3949, 3950, 3951, 3952, 3953, 3954, 3955, 3956, 3957, 3958, 3959, 3960, 3961, 3962, 3963, 3964, 3965, 3966, 3967, 3968, 3969, 3970, 3971, 3972, 3973, 3974, 3975, 3976, 3977, 3978, 3979, 3980, 3981, 3982, 3983, 3984, 3985, 3986, 3987, 3988, 3989, 3990, 3991, 3992, 3993, 3994, 3995, 3996, 3997, 3998, 3999, 4000, 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, 4009, 4010, 4011, 4012, 4013, 4014, 4015, 4016, 4017, 4018, 4019, 4020, 4021, 4022, 4023, 4024, 4025, 4026, 4027, 4028, 4029, 4030, 4031, 4032, 4033, 4034, 4035, 4036, 4037, 4038, 4039, 4040, 4041, 4042, 4043, 4044, 4045, 4046, 4047, 4048, 4049, 4050, 4051, 4052, 4053, 4054, 4055, 4056, 4057, 4058, 4059, 4060, 4061, 4062, 4063, 4064, 4065, 4066, 4067, 4068, 4069, 4070, 4071, 4072, 4073, 4074, 4075, 4076, 4077, 4078, 4079, 4080, 4081, 4082, 4083, 4084, 4085, 4086, 4087, 4088, 4089, 4090, 4091, 4092, 4093, 4094, 4095, 4096, 4097, 4098, 4099, 4100, 4101, 4102, 4103, 4104, 4105, 4106, 4107, 4108, 4109, 4110, 4111, 4112, 4113, 4114, 4115, 4116, 4117, 4118, 4119, 4120, 4121, 4122, 4123, 4124, 4125, 4126, 4127, 4128, 4129, 4130, 4131, 4132, 4133, 4134, 4135, 4136, 4137,

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[00094] The term “identity” as known in the art, refers to a relationship between the sequences of two or more peptides, as determined by comparing the sequences. In the art, identity also means the degree of sequence relatedness between peptides, as determined

by the number of matches between strings of two or more amino acid residues. Identity measures the percent of identical matches between the smaller of two or more sequences with gap alignments (if any) addressed by a particular mathematical model or computer program (i.e., “algorithms”). Identity of related peptides can be readily calculated by known methods. Such methods include, but are not limited to, those described in Computational Molecular Biology, Lesk, A. M., ed., Oxford University Press, New York, 1988; Biocomputing: Informatics and Genome Projects, Smith, D. W., ed., Academic Press, New York, 1993; Computer Analysis of Sequence Data, Part 1, Griffin, A. M., and Griffin, H. G., eds., Humana Press, New Jersey, 1994; Sequence Analysis in Molecular Biology, von Heinje, G., Academic Press, 1987; Sequence Analysis Primer, Gribskov, M. and Devereux, J., eds., M. Stockton Press, New York, 1991; and Carillo et al., SIAM J. Applied Math. 48, 1073 (1988).

[00095] In some embodiments, the polypeptide variant may have the same or a similar activity as the reference polypeptide. Alternatively, the variant may have an altered activity (e.g., increased or decreased) relative to a reference polypeptide. Generally, variants of a particular polynucleotide or polypeptide of the invention will have at least about 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% but less than 100% sequence identity to that particular reference polynucleotide or polypeptide as determined by sequence alignment programs and parameters described herein and known to those skilled in the art. Such tools for alignment include those of the BLAST suite (Stephen F. Altschul, Thomas L. Madden, Alejandro A. Schäffer, Jinghui Zhang, Zheng Zhang, Webb Miller, and David J. Lipman (1997), "Gapped BLAST and PSI-BLAST: a new generation of protein database search programs", Nucleic Acids Res. 25:3389-3402.) Other tools are described herein, specifically in the definition of “Identity.”

[00096] Default parameters in the BLAST algorithm include, for example, an expect threshold of 10, Word size of 28, Match/Mismatch Scores 1, -2, Gap costs Linear. Any filter can be applied as well as a selection for species specific repeats, e.g., Homo sapiens.

Biologics

[00097] The polynucleotides, primary constructs or mmRNA disclosed herein, may encode one or more biologics. As used herein, a “biologic” is a polypeptide-based

molecule produced by the methods provided herein and which may be used to treat, cure, mitigate, prevent, or diagnose a serious or life-threatening disease or medical condition. Biologics, according to the present invention include, but are not limited to, allergenic extracts (e.g. for allergy shots and tests), blood components, gene therapy products, human tissue or cellular products used in transplantation, vaccines, monoclonal antibodies, cytokines, growth factors, enzymes, thrombolytics, and immunomodulators, among others.

[00098] According to the present invention, one or more biologics currently being marketed or in development may be encoded by the polynucleotides, primary constructs or mmRNA of the present invention. While not wishing to be bound by theory, it is believed that incorporation of the encoding polynucleotides of a known biologic into the primary constructs or mmRNA of the invention will result in improved therapeutic efficacy due at least in part to the specificity, purity and/or selectivity of the construct designs.

Antibodies

[00099] The primary constructs or mmRNA disclosed herein, may encode one or more antibodies or fragments thereof. The term “antibody” includes monoclonal antibodies (including full length antibodies which have an immunoglobulin Fc region), antibody compositions with polyepitopic specificity, multispecific antibodies (e.g., bispecific antibodies, diabodies, and single-chain molecules), as well as antibody fragments. The term “immunoglobulin” (Ig) is used interchangeably with “antibody” herein. As used herein, the term “monoclonal antibody” refers to an antibody obtained from a population of substantially homogeneous antibodies, i.e., the individual antibodies comprising the population are identical except for possible naturally occurring mutations and/or post-translation modifications (e.g., isomerizations, amidations) that may be present in minor amounts. Monoclonal antibodies are highly specific, being directed against a single antigenic site.

[000100] The monoclonal antibodies herein specifically include “chimeric” antibodies (immunoglobulins) in which a portion of the heavy and/or light chain is identical with or homologous to corresponding sequences in antibodies derived from a particular species or belonging to a particular antibody class or subclass, while the remainder of the

chain(s) is(are) identical with or homologous to corresponding sequences in antibodies derived from another species or belonging to another antibody class or subclass, as well as fragments of such antibodies, so long as they exhibit the desired biological activity. Chimeric antibodies of interest herein include, but are not limited to, “primatized” antibodies comprising variable domain antigen-binding sequences derived from a non-human primate (e.g., Old World Monkey, Ape etc.) and human constant region sequences.

[000101] An “antibody fragment” comprises a portion of an intact antibody, preferably the antigen binding and/or the variable region of the intact antibody. Examples of antibody fragments include Fab, Fab', F(ab')₂ and Fv fragments; diabodies; linear antibodies; nanobodies; single-chain antibody molecules and multispecific antibodies formed from antibody fragments.

[000102] Any of the five classes of immunoglobulins, IgA, IgD, IgE, IgG and IgM, may be encoded by the mmRNA of the invention, including the heavy chains designated alpha, delta, epsilon, gamma and mu, respectively. Also included are polynucleotide sequences encoding the subclasses, gamma and mu. Hence any of the subclasses of antibodies may be encoded in part or in whole and include the following subclasses: IgG1, IgG2, IgG3, IgG4, IgA1 and IgA2.

[000103] According to the present invention, one or more antibodies or fragments currently being marketed or in development may be encoded by the polynucleotides, primary constructs or mmRNA of the present invention. While not wishing to be bound by theory, it is believed that incorporation into the primary constructs of the invention will result in improved therapeutic efficacy due at least in part to the specificity, purity and selectivity of the mmRNA designs.

[000104] Antibodies encoded in the polynucleotides, primary constructs or mmRNA of the invention may be utilized to treat conditions or diseases in many therapeutic areas such as, but not limited to, blood, cardiovascular, CNS, poisoning (including antivenoms), dermatology, endocrinology, gastrointestinal, medical imaging, musculoskeletal, oncology, immunology, respiratory, sensory and anti-infective.

[000105] In one embodiment, primary constructs or mmRNA disclosed herein may encode monoclonal antibodies and/or variants thereof. Variants of antibodies may also

include, but are not limited to, substitutional variants, conservative amino acid substitution, insertional variants, deletional variants and/or covalent derivatives. In one embodiment, the primary construct and/or mmRNA disclosed herein may encode an immunoglobulin Fc region. In another embodiment, the primary constructs and/or mmRNA may encode a variant immunoglobulin Fc region. As a non-limiting example, the primary constructs and/or mmRNA may encode an antibody having a variant immunoglobulin Fc region as described in U.S. Pat. No. 8,217,147 herein incorporated by reference in its entirety.

Vaccines

[000106] The primary constructs or mmRNA disclosed herein, may encode one or more vaccines. As used herein, a “vaccine” is a biological preparation that improves immunity to a particular disease or infectious agent. According to the present invention, one or more vaccines currently being marketed or in development may be encoded by the polynucleotides, primary constructs or mmRNA of the present invention. While not wishing to be bound by theory, it is believed that incorporation into the primary constructs or mmRNA of the invention will result in improved therapeutic efficacy due at least in part to the specificity, purity and selectivity of the construct designs.

[000107] Vaccines encoded in the polynucleotides, primary constructs or mmRNA of the invention may be utilized to treat conditions or diseases in many therapeutic areas such as, but not limited to, cardiovascular, CNS, dermatology, endocrinology, oncology, immunology, respiratory, and anti-infective.

Therapeutic proteins or peptides

[000108] The primary constructs or mmRNA disclosed herein, may encode one or more validated or “in testing” therapeutic proteins or peptides.

[000109] According to the present invention, one or more therapeutic proteins or peptides currently being marketed or in development may be encoded by the polynucleotides, primary constructs or mmRNA of the present invention. While not wishing to be bound by theory, it is believed that incorporation into the primary constructs or mmRNA of the invention will result in improved therapeutic efficacy due at least in part to the specificity, purity and selectivity of the construct designs.

[000110] Therapeutic proteins and peptides encoded in the polynucleotides, primary constructs or mmRNA of the invention may be utilized to treat conditions or diseases in many therapeutic areas such as, but not limited to, blood, cardiovascular, CNS, poisoning (including antivenoms), dermatology, endocrinology, genetic, genitourinary, gastrointestinal, musculoskeletal, oncology, and immunology, respiratory, sensory and anti-infective.

Cell-Penetrating Polypeptides

[000111] The primary constructs or mmRNA disclosed herein, may encode one or more cell-penetrating polypeptides. As used herein, “cell-penetrating polypeptide” or CPP refers to a polypeptide which may facilitate the cellular uptake of molecules. A cell-penetrating polypeptide of the present invention may contain one or more detectable labels. The polypeptides may be partially labeled or completely labeled throughout. The polynucleotide, primary construct or mmRNA may encode the detectable label completely, partially or not at all. The cell-penetrating peptide may also include a signal sequence. As used herein, a “signal sequence” refers to a sequence of amino acid residues bound at the amino terminus of a nascent protein during protein translation. The signal sequence may be used to signal the secretion of the cell-penetrating polypeptide.

[000112] In one embodiment, the polynucleotides, primary constructs or mmRNA may also encode a fusion protein. The fusion protein may be created by operably linking a charged protein to a therapeutic protein. As used herein, “operably linked” refers to the therapeutic protein and the charged protein being connected in such a way to permit the expression of the complex when introduced into the cell. As used herein, “charged protein” refers to a protein that carries a positive, negative or overall neutral electrical charge. Preferably, the therapeutic protein may be covalently linked to the charged protein in the formation of the fusion protein. The ratio of surface charge to total or surface amino acids may be approximately 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 or 0.9.

[000113] The cell-penetrating polypeptide encoded by the polynucleotides, primary constructs or mmRNA may form a complex after being translated. The complex may comprise a charged protein linked, e.g. covalently linked, to the cell-penetrating polypeptide. “Therapeutic protein” refers to a protein that, when administered to a cell

has a therapeutic, diagnostic, and/or prophylactic effect and/or elicits a desired biological and/or pharmacological effect.

[000114] In one embodiment, the cell-penetrating polypeptide may comprise a first domain and a second domain. The first domain may comprise a supercharged polypeptide. The second domain may comprise a protein-binding partner. As used herein, “protein-binding partner” includes, but is not limited to, antibodies and functional fragments thereof, scaffold proteins, or peptides. The cell-penetrating polypeptide may further comprise an intracellular binding partner for the protein-binding partner. The cell-penetrating polypeptide may be capable of being secreted from a cell where the polynucleotide, primary construct or mmRNA may be introduced. The cell-penetrating polypeptide may also be capable of penetrating the first cell.

[000115] In a further embodiment, the cell-penetrating polypeptide is capable of penetrating a second cell. The second cell may be from the same area as the first cell, or it may be from a different area. The area may include, but is not limited to, tissues and organs. The second cell may also be proximal or distal to the first cell.

[000116] In one embodiment, the polynucleotides, primary constructs or mmRNA may encode a cell-penetrating polypeptide which may comprise a protein-binding partner. The protein binding partner may include, but is not limited to, an antibody, a supercharged antibody or a functional fragment. The polynucleotides, primary constructs or mmRNA may be introduced into the cell where a cell-penetrating polypeptide comprising the protein-binding partner is introduced.

Secreted proteins

[000117] Human and other eukaryotic cells are subdivided by membranes into many functionally distinct compartments. Each membrane-bounded compartment, or organelle, contains different proteins essential for the function of the organelle. The cell uses “sorting signals,” which are amino acid motifs located within the protein, to target proteins to particular cellular organelles.

[000118] One type of sorting signal, called a signal sequence, a signal peptide, or a leader sequence, directs a class of proteins to an organelle called the endoplasmic reticulum (ER).

[000119] Proteins targeted to the ER by a signal sequence can be released into the extracellular space as a secreted protein. Similarly, proteins residing on the cell membrane can also be secreted into the extracellular space by proteolytic cleavage of a “linker” holding the protein to the membrane. While not wishing to be bound by theory, the molecules of the present invention may be used to exploit the cellular trafficking described above. As such, in some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a secreted protein. The secreted proteins may be selected from those described herein or those in US Patent Publication, 20100255574, the contents of which are incorporated herein by reference in their entirety.

[000120] In one embodiment, these may be used in the manufacture of large quantities of valuable human gene products.

Plasma membrane proteins

[000121] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a protein of the plasma membrane.

Cytoplasmic or cytoskeletal proteins

[000122] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a cytoplasmic or cytoskeletal protein.

Intracellular membrane bound proteins

[000123] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express an intracellular membrane bound protein.

Nuclear proteins

[000124] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a nuclear protein.

Proteins associated with human disease

[000125] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a protein associated with human disease.

Miscellaneous proteins

[000126] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a protein with a presently unknown therapeutic function.

Targeting Moieties

[000127] In some embodiments of the invention, polynucleotides, primary constructs or mmRNA are provided to express a targeting moiety. These include a protein-binding partner or a receptor on the surface of the cell, which functions to target the cell to a specific tissue space or to interact with a specific moiety, either *in vivo* or *in vitro*. Suitable protein-binding partners include, but are not limited to, antibodies and functional fragments thereof, scaffold proteins, or peptides. Additionally, polynucleotide, primary construct or mmRNA can be employed to direct the synthesis and extracellular localization of lipids, carbohydrates, or other biological moieties or biomolecules.

Polypeptide Libraries

[000128] In one embodiment, the polynucleotides, primary constructs or mmRNA may be used to produce polypeptide libraries. These libraries may arise from the production of a population of polynucleotides, primary constructs or mmRNA, each containing various structural or chemical modification designs. In this embodiment, a population of polynucleotides, primary constructs or mmRNA may comprise a plurality of encoded polypeptides, including but not limited to, an antibody or antibody fragment, protein binding partner, scaffold protein, and other polypeptides taught herein or known in the art. In a preferred embodiment, the polynucleotides are primary constructs of the present invention, including mmRNA which may be suitable for direct introduction into a target cell or culture which in turn may synthesize the encoded polypeptides.

[000129] In certain embodiments, multiple variants of a protein, each with different amino acid modification(s), may be produced and tested to determine the best variant in terms of pharmacokinetics, stability, biocompatibility, and/or biological activity, or a biophysical property such as expression level. Such a library may contain 10 , 10^2 , 10^3 , 10^4 , 10^5 , 10^6 , 10^7 , 10^8 , 10^9 , or over 10^9 possible variants (including, but not limited to, substitutions, deletions of one or more residues, and insertion of one or more residues).

Anti-Microbial and Anti-viral Polypeptides

[000130] The polynucleotides, primary constructs and mmRNA of the present invention may be designed to encode one or more antimicrobial peptides (AMP) or antiviral peptides (AVP). AMPs and AVPs have been isolated and described from a wide range of animals such as, but not limited to, microorganisms, invertebrates, plants, amphibians, birds, fish, and mammals (Wang *et al.*, *Nucleic Acids Res.* 2009; 37 (Database issue):D933-7). For

example, anti-microbial polypeptides are described in Antimicrobial Peptide Database (<http://aps.unmc.edu/AP/main.php>; Wang *et al.*, *Nucleic Acids Res.* 2009; 37 (Database issue):D933-7), CAMP: Collection of Anti-Microbial Peptides (<http://www.bicnirrh.res.in/antimicrobial/>); Thomas *et al.*, *Nucleic Acids Res.* 2010; 38 (Database issue):D774-80), US 5221732, US 5447914, US 5519115, US 5607914, US 5714577, US 5734015, US 5798336, US 5821224, US 5849490, US 5856127, US 5905187, US 5994308, US 5998374, US 6107460, US 6191254, US 6211148, US 6300489, US 6329504, US 6399370, US 6476189, US 6478825, US 6492328, US 6514701, US 6573361, US 6573361, US 6576755, US 6605698, US 6624140, US 6638531, US 6642203, US 6653280, US 6696238, US 6727066, US 6730659, US 6743598, US 6743769, US 6747007, US 6790833, US 6794490, US 6818407, US 6835536, US 6835713, US 6838435, US 6872705, US 6875907, US 6884776, US 6887847, US 6906035, US 6911524, US 6936432, US 7001924, US 7071293, US 7078380, US 7091185, US 7094759, US 7166769, US 7244710, US 7314858, and US 7582301, the contents of which are incorporated by reference in their entirety.

[000131] The anti-microbial polypeptides described herein may block cell fusion and/or viral entry by one or more enveloped viruses (*e.g.*, HIV, HCV). For example, the anti-microbial polypeptide can comprise or consist of a synthetic peptide corresponding to a region, *e.g.*, a consecutive sequence of at least about 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, or 60 amino acids of the transmembrane subunit of a viral envelope protein, *e.g.*, HIV-1 gp120 or gp41. The amino acid and nucleotide sequences of HIV-1 gp120 or gp41 are described in, *e.g.*, Kuiken *et al.*, (2008). “*HIV Sequence Compendium*,” Los Alamos National Laboratory.

[000132] In some embodiments, the anti-microbial polypeptide may have at least about 75%, 80%, 85%, 90%, 95%, 100% sequence homology to the corresponding viral protein sequence. In some embodiments, the anti-microbial polypeptide may have at least about 75%, 80%, 85%, 90%, 95%, or 100% sequence homology to the corresponding viral protein sequence.

[000133] In other embodiments, the anti-microbial polypeptide may comprise or consist of a synthetic peptide corresponding to a region, *e.g.*, a consecutive sequence of at least about 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, or 60 amino acids of the binding domain of

a capsid binding protein. In some embodiments, the anti-microbial polypeptide may have at least about 75%, 80%, 85%, 90%, 95%, or 100% sequence homology to the corresponding sequence of the capsid binding protein.

[000134] The anti-microbial polypeptides described herein may block protease dimerization and inhibit cleavage of viral proproteins (*e.g.*, HIV Gag-pol processing) into functional proteins thereby preventing release of one or more enveloped viruses (*e.g.*, HIV, HCV). In some embodiments, the anti-microbial polypeptide may have at least about 75%, 80%, 85%, 90%, 95%, 100% sequence homology to the corresponding viral protein sequence.

[000135] In other embodiments, the anti-microbial polypeptide can comprise or consist of a synthetic peptide corresponding to a region, *e.g.*, a consecutive sequence of at least about 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, or 60 amino acids of the binding domain of a protease binding protein. In some embodiments, the anti-microbial polypeptide may have at least about 75%, 80%, 85%, 90%, 95%, 100% sequence homology to the corresponding sequence of the protease binding protein.

[000136] The anti-microbial polypeptides described herein can include an *in vitro*-evolved polypeptide directed against a viral pathogen.

Anti-Microbial Polypeptides

[000137] Anti-microbial polypeptides (AMPs) are small peptides of variable length, sequence and structure with broad spectrum activity against a wide range of microorganisms including, but not limited to, bacteria, viruses, fungi, protozoa, parasites, prions, and tumor/cancer cells. (See, *e.g.*, Zaiou, J Mol Med, 2007; 85:317; herein incorporated by reference in its entirety). It has been shown that AMPs have broad-spectrum of rapid onset of killing activities, with potentially low levels of induced resistance and concomitant broad anti-inflammatory effects.

[000138] In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be under 10kDa, *e.g.*, under 8kDa, 6kDa, 4kDa, 2kDa, or 1kDa. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) consists of from about 6 to about 100 amino acids, *e.g.*, from about 6 to about 75 amino acids, about 6 to about 50 amino acids, about 6 to about 25 amino acids, about 25 to about 100 amino acids, about 50 to about 100 amino acids, or about 75 to about 100

amino acids. In certain embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may consist of from about 15 to about 45 amino acids. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) is substantially cationic.

[000139] In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be substantially amphipathic. In certain embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be substantially cationic and amphipathic. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytostatic to a Gram-positive bacterium. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytotoxic to a Gram-positive bacterium. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytostatic and cytotoxic to a Gram-positive bacterium. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytostatic to a Gram-negative bacterium. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytotoxic to a Gram-negative bacterium. In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be cytostatic and cytotoxic to a Gram-positive bacterium. In some embodiments, the anti-microbial polypeptide may be cytostatic to a virus, fungus, protozoan, parasite, prion, or a combination thereof. In some embodiments, the anti-microbial polypeptide may be cytotoxic to a virus, fungus, protozoan, parasite, prion, or a combination thereof. In certain embodiments, the anti-microbial polypeptide may be cytostatic and cytotoxic to a virus, fungus, protozoan, parasite, prion, or a combination thereof. In some embodiments, the anti-microbial polypeptide may be cytotoxic to a tumor or cancer cell (*e.g.*, a human tumor and/or cancer cell). In some embodiments, the anti-microbial polypeptide may be cytostatic to a tumor or cancer cell (*e.g.*, a human tumor and/or cancer cell). In certain embodiments, the anti-microbial polypeptide may be cytotoxic and cytostatic to a tumor or cancer cell (*e.g.*, a human tumor or cancer cell). In some embodiments, the anti-microbial polypeptide (*e.g.*, an anti-bacterial polypeptide) may be a secreted polypeptide.

[000140] In some embodiments, the anti-microbial polypeptide comprises or consists of a defensin. Exemplary defensins include, but are not limited to, α -defensins (*e.g.*,

neutrophil defensin 1, defensin alpha 1, neutrophil defensin 3, neutrophil defensin 4, defensin 5, defensin 6), β -defensins (*e.g.*, beta-defensin 1, beta-defensin 2, beta-defensin 103, beta-defensin 107, beta-defensin 110, beta-defensin 136), and θ -defensins. In other embodiments, the anti-microbial polypeptide comprises or consists of a cathelicidin (*e.g.*, hCAP18).

Anti-Viral Polypeptides

[000141] Anti-viral polypeptides (AVPs) are small peptides of variable length, sequence and structure with broad spectrum activity against a wide range of viruses. See, *e.g.*, Zaiou, J Mol Med, 2007; 85:317. It has been shown that AVPs have a broad-spectrum of rapid onset of killing activities, with potentially low levels of induced resistance and concomitant broad anti-inflammatory effects. In some embodiments, the anti-viral polypeptide is under 10kDa, *e.g.*, under 8kDa, 6kDa, 4kDa, 2kDa, or 1kDa. In some embodiments, the anti-viral polypeptide comprises or consists of from about 6 to about 100 amino acids, *e.g.*, from about 6 to about 75 amino acids, about 6 to about 50 amino acids, about 6 to about 25 amino acids, about 25 to about 100 amino acids, about 50 to about 100 amino acids, or about 75 to about 100 amino acids. In certain embodiments, the anti-viral polypeptide comprises or consists of from about 15 to about 45 amino acids. In some embodiments, the anti-viral polypeptide is substantially cationic. In some embodiments, the anti-viral polypeptide is substantially amphipathic. In certain embodiments, the anti-viral polypeptide is substantially cationic and amphipathic. In some embodiments, the anti-viral polypeptide is cytostatic to a virus. In some embodiments, the anti-viral polypeptide is cytotoxic to a virus. In some embodiments, the anti-viral polypeptide is cytostatic and cytotoxic to a virus. In some embodiments, the anti-viral polypeptide is cytostatic to a bacterium, fungus, protozoan, parasite, prion, or a combination thereof. In some embodiments, the anti-viral polypeptide is cytotoxic to a bacterium, fungus, protozoan, parasite, prion or a combination thereof. In certain embodiments, the anti-viral polypeptide is cytostatic and cytotoxic to a bacterium, fungus, protozoan, parasite, prion, or a combination thereof. In some embodiments, the anti-viral polypeptide is cytotoxic to a tumor or cancer cell (*e.g.*, a human cancer cell). In some embodiments, the anti-viral polypeptide is cytostatic to a tumor or cancer cell (*e.g.*, a human cancer cell). In certain embodiments, the anti-viral

polypeptide is cytotoxic and cytostatic to a tumor or cancer cell (*e.g.*, a human cancer cell). In some embodiments, the anti-viral polypeptide is a secreted polypeptide.

Cytotoxic Nucleosides

[000142] In one embodiment, the polynucleotides, primary constructs or mmRNA of the present invention may incorporate one or more cytotoxic nucleosides. For example, cytotoxic nucleosides may be incorporated into polynucleotides, primary constructs or mmRNA such as bifunctional modified RNAs or mRNAs. Cytotoxic nucleoside anti-cancer agents include, but are not limited to, adenosine arabinoside, cytarabine, cytosine arabinoside, 5-fluorouracil, fludarabine, floxuridine, FTORAFUR® (a combination of tegafur and uracil), tegafur ((RS)-5-fluoro-1-(tetrahydrofuran-2-yl)pyrimidine-2,4(1H,3H)-dione), and 6-mercaptopurine.

[000143] A number of cytotoxic nucleoside analogues are in clinical use, or have been the subject of clinical trials, as anticancer agents. Examples of such analogues include, but are not limited to, cytarabine, gemcitabine, troxacitabine, decitabine, tezacitabine, 2'-deoxy-2'-methylidene cytosine (DMDC), cladribine, clofarabine, 5-azacytidine, 4'-thioaracytidine, cyclopentenylcytosine and 1-(2-C-cyano-2-deoxy-beta-D-arabino-pentofuranosyl)-cytosine. Another example of such a compound is fludarabine phosphate. These compounds may be administered systemically and may have side effects which are typical of cytotoxic agents such as, but not limited to, little or no specificity for tumor cells over proliferating normal cells.

[000144] A number of prodrugs of cytotoxic nucleoside analogues are also reported in the art. Examples include, but are not limited to, N4-behenoyl-1-beta-D-arabinofuranosylcytosine, N4-octadecyl-1-beta-D-arabinofuranosylcytosine, N4-palmitoyl-1-(2-C-cyano-2-deoxy-beta-D-arabino-pentofuranosyl) cytosine, and P-4055 (cytarabine 5'-elaidic acid ester). In general, these prodrugs may be converted into the active drugs mainly in the liver and systemic circulation and display little or no selective release of active drug in the tumor tissue. For example, capecitabine, a prodrug of 5'-deoxy-5-fluorocytidine (and eventually of 5-fluorouracil), is metabolized both in the liver and in the tumor tissue. A series of capecitabine analogues containing "an easily hydrolysable radical under physiological conditions" has been claimed by Fujiu et al. (U.S. Pat. No. 4,966,891) and is herein incorporated by reference. The series described by

Fujiu includes N4 alkyl and aralkyl carbamates of 5'-deoxy-5-fluorocytidine and the implication that these compounds will be activated by hydrolysis under normal physiological conditions to provide 5'-deoxy-5-fluorocytidine.

[000145] A series of cytarabine N4-carbamates has been reported by Fadl et al (Pharmazie. 1995, 50, 382-7, herein incorporated by reference) in which compounds were designed to convert into cytarabine in the liver and plasma. WO 2004/041203, herein incorporated by reference, discloses prodrugs of gemcitabine, where some of the prodrugs are N4-carbamates. These compounds were designed to overcome the gastrointestinal toxicity of gemcitabine and were intended to provide gemcitabine by hydrolytic release in the liver and plasma after absorption of the intact prodrug from the gastrointestinal tract. Nomura et al (Bioorg Med. Chem. 2003, 11, 2453-61, herein incorporated by reference) have described acetal derivatives of 1-(3-C-ethynyl- β -D-ribo-pentofaranosyl) cytosine which, on bioreduction, produced an intermediate that required further hydrolysis under acidic conditions to produce a cytotoxic nucleoside compound.

[000146] Cytotoxic nucleotides which may be chemotherapeutic also include, but are not limited to, pyrazolo [3,4-D]-pyrimidines, allopurinol, azathioprine, capecitabine, cytosine arabinoside, fluorouracil, mercaptopurine, 6-thioguanine, acyclovir, ara-adenosine, ribavirin, 7-deaza-adenosine, 7-deaza-guanosine, 6-aza-uracil, 6-aza-cytidine, thymidine ribonucleotide, 5-bromodeoxyuridine, 2-chloro-purine, and inosine, or combinations thereof.

Flanking Regions: Untranslated Regions (UTRs)

[000147] Untranslated regions (UTRs) of a gene are transcribed but not translated. The 5'UTR starts at the transcription start site and continues to the start codon but does not include the start codon; whereas, the 3'UTR starts immediately following the stop codon and continues until the transcriptional termination signal. There is growing body of evidence about the regulatory roles played by the UTRs in terms of stability of the nucleic acid molecule and translation. The regulatory features of a UTR can be incorporated into the polynucleotides, primary constructs and/or mRNA of the present invention to enhance the stability of the molecule. The specific features can also be incorporated to ensure controlled down-regulation of the transcript in case they are misdirected to undesired organs sites.

5' UTR and Translation Initiation

[000148] Natural 5'UTRs bear features which play roles in for translation initiation. They harbor signatures like Kozak sequences which are commonly known to be involved in the process by which the ribosome initiates translation of many genes. Kozak sequences have the consensus CCR(A/G)CCAUGG, where R is a purine (adenine or guanine) three bases upstream of the start codon (AUG), which is followed by another 'G'. 5'UTR also have been known to form secondary structures which are involved in elongation factor binding.

[000149] By engineering the features typically found in abundantly expressed genes of specific target organs, one can enhance the stability and protein production of the polynucleotides, primary constructs or mmRNA of the invention. For example, introduction of 5' UTR of liver-expressed mRNA, such as albumin, serum amyloid A, Apolipoprotein A/B/E, transferrin, alpha fetoprotein, erythropoietin, or Factor VIII, could be used to enhance expression of a nucleic acid molecule, such as a mmRNA, in hepatic cell lines or liver. Likewise, use of 5' UTR from other tissue-specific mRNA to improve expression in that tissue is possible for muscle (MyoD, Myosin, Myoglobin, Myogenin, Herculin), for endothelial cells (Tie-1, CD36), for myeloid cells (C/EBP, AML1, G-CSF, GM-CSF, CD11b, MSR, Fr-1, i-NOS), for leukocytes (CD45, CD18), for adipose tissue (CD36, GLUT4, ACRP30, adiponectin) and for lung epithelial cells (SP-A/B/C/D).

[000150] Other non-UTR sequences may be incorporated into the 5' (or 3' UTR) UTRs. For example, introns or portions of introns sequences may be incorporated into the flanking regions of the polynucleotides, primary constructs or mmRNA of the invention. Incorporation of intronic sequences may increase protein production as well as mRNA levels.

3' UTR and the AU Rich Elements

[000151] 3' UTRs are known to have stretches of Adenosines and Uridines embedded in them. These AU rich signatures are particularly prevalent in genes with high rates of turnover. Based on their sequence features and functional properties, the AU rich elements (AREs) can be separated into three classes (Chen et al, 1995): Class I AREs contain several dispersed copies of an AUUUA motif within U-rich regions. C-Myc and MyoD contain class I AREs. Class II AREs possess two or more overlapping

UUAUUUA(U/A)(U/A) nonamers. Molecules containing this type of AREs include GM-CSF and TNF- α . Class III AREs are less well defined. These U rich regions do not contain an AUUUA motif. c-Jun and Myogenin are two well-studied examples of this class. Most proteins binding to the AREs are known to destabilize the messenger, whereas members of the ELAV family, most notably HuR, have been documented to increase the stability of mRNA. HuR binds to AREs of all the three classes. Engineering the HuR specific binding sites into the 3' UTR of nucleic acid molecules will lead to HuR binding and thus, stabilization of the message *in vivo*.

[000152] Introduction, removal or modification of 3' UTR AU rich elements (AREs) can be used to modulate the stability of polynucleotides, primary constructs or mmRNA of the invention. When engineering specific polynucleotides, primary constructs or mmRNA, one or more copies of an ARE can be introduced to make polynucleotides, primary constructs or mmRNA of the invention less stable and thereby curtail translation and decrease production of the resultant protein. Likewise, AREs can be identified and removed or mutated to increase the intracellular stability and thus increase translation and production of the resultant protein. Transfection experiments can be conducted in relevant cell lines, using polynucleotides, primary constructs or mmRNA of the invention and protein production can be assayed at various time points post-transfection. For example, cells can be transfected with different ARE-engineering molecules and by using an ELISA kit to the relevant protein and assaying protein produced at 6 hour, 12 hour, 24 hour, 48 hour, and 7 days post-transfection.

Incorporating microRNA Binding Sites

[000153] microRNAs (or miRNA) are 19-25 nucleotide long noncoding RNAs that bind to the 3'UTR of nucleic acid molecules and down-regulate gene expression either by reducing nucleic acid molecule stability or by inhibiting translation. The polynucleotides, primary constructs or mmRNA of the invention may comprise one or more microRNA target sequences, microRNA sequences, or microRNA seeds. Such sequences may correspond to any known microRNA such as those taught in US Publication US2005/0261218 and US Publication US2005/0059005, the contents of which are incorporated herein by reference in their entirety.

[000154] A microRNA sequence comprises a “seed” region, i.e., a sequence in the region of positions 2-8 of the mature microRNA, which sequence has perfect Watson-Crick complementarity to the miRNA target sequence. A microRNA seed may comprise positions 2-8 or 2-7 of the mature microRNA. In some embodiments, a microRNA seed may comprise 7 nucleotides (e.g., nucleotides 2-8 of the mature microRNA), wherein the seed-complementary site in the corresponding miRNA target is flanked by an adenine (A) opposed to microRNA position 1. In some embodiments, a microRNA seed may comprise 6 nucleotides (e.g., nucleotides 2-7 of the mature microRNA), wherein the seed-complementary site in the corresponding miRNA target is flanked by an adenine (A) opposed to microRNA position 1. See for example, Grimson A, Farh KK, Johnston WK, Garrett-Engele P, Lim LP, Bartel DP; *Mol Cell*. 2007 Jul 6;27(1):91-105; each of which is herein incorporated by reference in their entirety. The bases of the microRNA seed have complete complementarity with the target sequence. By engineering microRNA target sequences into the 3'UTR of polynucleotides, primary constructs or mmRNA of the invention one can target the molecule for degradation or reduced translation, provided the microRNA in question is available. This process will reduce the hazard of off target effects upon nucleic acid molecule delivery. Identification of microRNA, microRNA target regions, and their expression patterns and role in biology have been reported (Bonauer et al., *Curr Drug Targets* 2010 11:943-949; Anand and Cheresch *Curr Opin Hematol* 2011 18:171-176; Contreras and Rao *Leukemia* 2012 26:404-413 (2011 Dec 20. doi: 10.1038/leu.2011.356); Bartel *Cell* 2009 136:215-233; Landgraf et al, *Cell*, 2007 129:1401-1414; each of which is herein incorporated by reference in its entirety).

[000155] For example, if the nucleic acid molecule is an mRNA and is not intended to be delivered to the liver but ends up there, then miR-122, a microRNA abundant in liver, can inhibit the expression of the gene of interest if one or multiple target sites of miR-122 are engineered into the 3' UTR of the polynucleotides, primary constructs or mmRNA. Introduction of one or multiple binding sites for different microRNA can be engineered to further decrease the longevity, stability, and protein translation of a polynucleotides, primary constructs or mmRNA.

[000156] As used herein, the term “microRNA site” refers to a microRNA target site or a microRNA recognition site, or any nucleotide sequence to which a microRNA binds or

associates. It should be understood that “binding” may follow traditional Watson-Crick hybridization rules or may reflect any stable association of the microRNA with the target sequence at or adjacent to the microRNA site.

[000157] Conversely, for the purposes of the polynucleotides, primary constructs or mmRNA of the present invention, microRNA binding sites can be engineered out of (i.e. removed from) sequences in which they naturally occur in order to increase protein expression in specific tissues. For example, miR-122 binding sites may be removed to improve protein expression in the liver. Regulation of expression in multiple tissues can be accomplished through introduction or removal of one or several microRNA binding sites.

[000158] Examples of tissues where microRNA are known to regulate mRNA, and thereby protein expression, include, but are not limited to, liver (miR-122), muscle (miR-133, miR-206, miR-208), endothelial cells (miR-17-92, miR-126), myeloid cells (miR-142-3p, miR-142-5p, miR-16, miR-21, miR-223, miR-24, miR-27), adipose tissue (let-7, miR-30c), heart (miR-1d, miR-149), kidney (miR-192, miR-194, miR-204), and lung epithelial cells (let-7, miR-133, miR-126). MicroRNA can also regulate complex biological processes such as angiogenesis (miR-132) (Anand and Cheresch *Curr Opin Hematol* 2011 18:171-176; herein incorporated by reference in its entirety). In the polynucleotides, primary constructs or mmRNA of the present invention, binding sites for microRNAs that are involved in such processes may be removed or introduced, in order to tailor the expression of the polynucleotides, primary constructs or mmRNA expression to biologically relevant cell types or to the context of relevant biological processes. A listing of MicroRNA, miR sequences and miR binding sites is listed in Table 9 of U.S. Provisional Application No. 61/753,661 filed January 17, 2013, in Table 9 of U.S. Provisional Application No. 61/754,159 filed January 18, 2013, and in Table 7 of U.S. Provisional Application No. 61/758,921 filed January 31, 2013, each of which are herein incorporated by reference in their entireties.

[000159] Examples of use of microRNA to drive tissue or disease-specific gene expression are listed (Getner and Naldini, *Tissue Antigens*. 2012, 80:393-403; herein incorporated by reference in its entirety). In addition, microRNA seed sites can be incorporated into mRNA to decrease expression in certain cells which results in a

biological improvement. An example of this is incorporation of miR-142 sites into a UGT1A1-expressing lentiviral vector. The presence of miR-142 seed sites reduced expression in hematopoietic cells, and as a consequence reduced expression in antigen-presenting cells, leading to the absence of an immune response against the virally expressed UGT1A1 (Schmitt et al., *Gastroenterology* 2010; 139:999-1007; Gonzalez-Asequinolaza et al. *Gastroenterology* 2010, 139:726-729; both herein incorporated by reference in its entirety) . Incorporation of miR-142 sites into modified mRNA could not only reduce expression of the encoded protein in hematopoietic cells, but could also reduce or abolish immune responses to the mRNA-encoded protein. Incorporation of miR-142 seed sites (one or multiple) into mRNA would be important in the case of treatment of patients with complete protein deficiencies (UGT1A1 type I, LDLR-deficient patients, CRIM-negative Pompe patients, etc.) .

[000160] Lastly, through an understanding of the expression patterns of microRNA in different cell types, polynucleotides, primary constructs or mmRNA can be engineered for more targeted expression in specific cell types or only under specific biological conditions. Through introduction of tissue-specific microRNA binding sites, polynucleotides, primary constructs or mmRNA could be designed that would be optimal for protein expression in a tissue or in the context of a biological condition.

[000161] Transfection experiments can be conducted in relevant cell lines, using engineered polynucleotides, primary constructs or mmRNA and protein production can be assayed at various time points post-transfection. For example, cells can be transfected with different microRNA binding site-engineering polynucleotides, primary constructs or mmRNA and by using an ELISA kit to the relevant protein and assaying protein produced at 6 hour, 12 hour, 24 hour, 48 hour, 72 hour and 7 days post-transfection. *In vivo* experiments can also be conducted using microRNA-binding site-engineered molecules to examine changes in tissue-specific expression of formulated polynucleotides, primary constructs or mmRNA.

5' Capping

[000162] The 5' cap structure of an mRNA is involved in nuclear export, increasing mRNA stability and binds the mRNA Cap Binding Protein (CBP), which is responsible for mRNA stability in the cell and translation competency through the association of CBP

with poly(A) binding protein to form the mature cyclic mRNA species. The cap further assists the removal of 5' proximal introns removal during mRNA splicing.

[000163] Endogenous mRNA molecules may be 5'-end capped generating a 5'-ppp-5'-triphosphate linkage between a terminal guanosine cap residue and the 5'-terminal transcribed sense nucleotide of the mRNA molecule. This 5'-guanylate cap may then be methylated to generate an N7-methyl-guanylate residue. The ribose sugars of the terminal and/or anteterminal transcribed nucleotides of the 5' end of the mRNA may optionally also be 2'-O-methylated. 5'-decapping through hydrolysis and cleavage of the guanylate cap structure may target a nucleic acid molecule, such as an mRNA molecule, for degradation.

[000164] Modifications to the polynucleotides, primary constructs, and mmRNA of the present invention may generate a non-hydrolyzable cap structure preventing decapping and thus increasing mRNA half-life. Because cap structure hydrolysis requires cleavage of 5'-ppp-5' phosphodiester linkages, modified nucleotides may be used during the capping reaction. For example, a Vaccinia Capping Enzyme from New England Biolabs (Ipswich, MA) may be used with α -thio-guanosine nucleotides according to the manufacturer's instructions to create a phosphorothioate linkage in the 5'-ppp-5' cap. Additional modified guanosine nucleotides may be used such as α -methyl-phosphonate and seleno-phosphate nucleotides.

[000165] Additional modifications include, but are not limited to, 2'-O-methylation of the ribose sugars of 5'-terminal and/or 5'-anteterminal nucleotides of the mRNA (as mentioned above) on the 2'-hydroxyl group of the sugar ring. Multiple distinct 5'-cap structures can be used to generate the 5'-cap of a nucleic acid molecule, such as an mRNA molecule.

[000166] Cap analogs, which herein are also referred to as synthetic cap analogs, chemical caps, chemical cap analogs, or structural or functional cap analogs, differ from natural (i.e. endogenous, wild-type or physiological) 5'-caps in their chemical structure, while retaining cap function. Cap analogs may be chemically (i.e. non-enzymatically) or enzymatically synthesized and/or linked to a nucleic acid molecule.

[000167] For example, the Anti-Reverse Cap Analog (ARCA) cap contains two guanines linked by a 5'-5'-triphosphate group, wherein one guanine contains an N7

methyl group as well as a 3'-O-methyl group (i.e., N7,3'-O-dimethyl-guanosine-5'-triphosphate-5'-guanosine (m^7G -3'mppp-G; which may equivalently be designated 3' O-Me- $m^7G(5')ppp(5')G$). The 3'-O atom of the other, unmodified, guanine becomes linked to the 5'-terminal nucleotide of the capped nucleic acid molecule (e.g. an mRNA or mmRNA). The N7- and 3'-O-methylated guanine provides the terminal moiety of the capped nucleic acid molecule (e.g. mRNA or mmRNA).

[000168] Another exemplary cap is mCAP, which is similar to ARCA but has a 2'-O-methyl group on guanosine (i.e., N7,2'-O-dimethyl-guanosine-5'-triphosphate-5'-guanosine, m^7Gm -ppp-G).

[000169] While cap analogs allow for the concomitant capping of a nucleic acid molecule in an in vitro transcription reaction, up to 20% of transcripts can remain uncapped. This, as well as the structural differences of a cap analog from an endogenous 5'-cap structures of nucleic acids produced by the endogenous, cellular transcription machinery, may lead to reduced translational competency and reduced cellular stability.

[000170] Polynucleotides, primary constructs and mmRNA of the invention may also be capped post-transcriptionally, using enzymes, in order to generate more authentic 5'-cap structures. As used herein, the phrase "more authentic" refers to a feature that closely mirrors or mimics, either structurally or functionally, an endogenous or wild type feature. That is, a "more authentic" feature is better representative of an endogenous, wild-type, natural or physiological cellular function and/or structure as compared to synthetic features or analogs, etc., of the prior art, or which outperforms the corresponding endogenous, wild-type, natural or physiological feature in one or more respects. Non-limiting examples of more authentic 5'cap structures of the present invention are those which, among other things, have enhanced binding of cap binding proteins, increased half life, reduced susceptibility to 5' endonucleases and/or reduced 5'decapping, as compared to synthetic 5'cap structures known in the art (or to a wild-type, natural or physiological 5'cap structure). For example, recombinant Vaccinia Virus Capping Enzyme and recombinant 2'-O-methyltransferase enzyme can create a canonical 5'-5'-triphosphate linkage between the 5'-terminal nucleotide of an mRNA and a guanine cap nucleotide wherein the cap guanine contains an N7 methylation and the 5'-terminal nucleotide of the mRNA contains a 2'-O-methyl. Such a structure is termed the Cap1

structure. This cap results in a higher translational-competency and cellular stability and a reduced activation of cellular pro-inflammatory cytokines, as compared, e.g., to other 5' cap analog structures known in the art. Cap structures include, but are not limited to, 7mG(5')ppp(5')N,pN2p (cap 0), 7mG(5')ppp(5')NlmpNp (cap 1), and 7mG(5')-ppp(5')NlmpN2mp (cap 2).

[000171] Because the polynucleotides, primary constructs or mmRNA may be capped post-transcriptionally, and because this process is more efficient, nearly 100% of the polynucleotides, primary constructs or mmRNA may be capped. This is in contrast to ~80% when a cap analog is linked to an mRNA in the course of an *in vitro* transcription reaction.

[000172] According to the present invention, 5' terminal caps may include endogenous caps or cap analogs. According to the present invention, a 5' terminal cap may comprise a guanine analog. Useful guanine analogs include, but are not limited to, inosine, N1-methyl-guanosine, 2'fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine, LNA-guanosine, and 2-azido-guanosine.

Viral Sequences

[000173] Additional viral sequences such as, but not limited to, the translation enhancer sequence of the barley yellow dwarf virus (BYDV-PAV), the Jaagsiekte sheep retrovirus (JSRV) and/or the Enzootic nasal tumor virus (See e.g., International Pub. No. WO2012129648; herein incorporated by reference in its entirety) can be engineered and inserted in the 3' UTR of the polynucleotides, primary constructs or mmRNA of the invention and can stimulate the translation of the construct *in vitro* and *in vivo*. Transfection experiments can be conducted in relevant cell lines and protein production can be assayed by ELISA at 12hr, 24hr, 48hr, 72 hr and day 7 post-transfection.

IRES Sequences

[000174] Further, provided are polynucleotides, primary constructs or mmRNA which may contain an internal ribosome entry site (IRES). First identified as a feature Picorna virus RNA, IRES plays an important role in initiating protein synthesis in absence of the 5' cap structure. An IRES may act as the sole ribosome binding site, or may serve as one of multiple ribosome binding sites of an mRNA. Polynucleotides, primary constructs or

mmRNA containing more than one functional ribosome binding site may encode several peptides or polypeptides that are translated independently by the ribosomes (“multicistronic nucleic acid molecules”). When polynucleotides, primary constructs or mmRNA are provided with an IRES, further optionally provided is a second translatable region. Examples of IRES sequences that can be used according to the invention include without limitation, those from picornaviruses (e.g. FMDV), pest viruses (CFFV), polio viruses (PV), encephalomyocarditis viruses (ECMV), foot-and-mouth disease viruses (FMDV), hepatitis C viruses (HCV), classical swine fever viruses (CSFV), murine leukemia virus (MLV), simian immune deficiency viruses (SIV) or cricket paralysis viruses (CrPV).

Poly-A tails

[000175] During RNA processing, a long chain of adenine nucleotides (poly-A tail) may be added to a polynucleotide such as an mRNA molecules in order to increase stability. Immediately after transcription, the 3' end of the transcript may be cleaved to free a 3' hydroxyl. Then poly-A polymerase adds a chain of adenine nucleotides to the RNA. The process, called polyadenylation, adds a poly-A tail that can be between, for example, approximately 100 and 250 residues long.

[000176] It has been discovered that unique poly-A tail lengths provide certain advantages to the polynucleotides, primary constructs or mmRNA of the present invention.

[000177] Generally, the length of a poly-A tail of the present invention is greater than 30 nucleotides in length. In another embodiment, the poly-A tail is greater than 35 nucleotides in length (e.g., at least or greater than about 35, 40, 45, 50, 55, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,100, 1,200, 1,300, 1,400, 1,500, 1,600, 1,700, 1,800, 1,900, 2,000, 2,500, and 3,000 nucleotides). In some embodiments, the polynucleotide, primary construct, or mmRNA includes from about 30 to about 3,000 nucleotides (e.g., from 30 to 50, from 30 to 100, from 30 to 250, from 30 to 500, from 30 to 750, from 30 to 1,000, from 30 to 1,500, from 30 to 2,000, from 30 to 2,500, from 50 to 100, from 50 to 250, from 50 to 500, from 50 to 750, from 50 to 1,000, from 50 to 1,500, from 50 to 2,000, from 50 to 2,500, from 50 to 3,000, from 100 to 500, from 100 to 750, from 100 to 1,000, from 100 to 1,500, from 100

to 2,000, from 100 to 2,500, from 100 to 3,000, from 500 to 750, from 500 to 1,000, from 500 to 1,500, from 500 to 2,000, from 500 to 2,500, from 500 to 3,000, from 1,000 to 1,500, from 1,000 to 2,000, from 1,000 to 2,500, from 1,000 to 3,000, from 1,500 to 2,000, from 1,500 to 2,500, from 1,500 to 3,000, from 2,000 to 3,000, from 2,000 to 2,500, and from 2,500 to 3,000).

[000178] In one embodiment, the poly-A tail is designed relative to the length of the overall polynucleotides, primary constructs or mmRNA. This design may be based on the length of the coding region, the length of a particular feature or region (such as the first or flanking regions), or based on the length of the ultimate product expressed from the polynucleotides, primary constructs or mmRNA.

[000179] In this context the poly-A tail may be 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100% greater in length than the polynucleotides, primary constructs or mmRNA or feature thereof. The poly-A tail may also be designed as a fraction of polynucleotides, primary constructs or mmRNA to which it belongs. In this context, the poly-A tail may be 10, 20, 30, 40, 50, 60, 70, 80, or 90% or more of the total length of the construct or the total length of the construct minus the poly-A tail. Further, engineered binding sites and conjugation of polynucleotides, primary constructs or mmRNA for Poly-A binding protein may enhance expression.

[000180] Additionally, multiple distinct polynucleotides, primary constructs or mmRNA may be linked together to the PABP (Poly-A binding protein) through the 3'-end using modified nucleotides at the 3'-terminus of the poly-A tail. Transfection experiments can be conducted in relevant cell lines at and protein production can be assayed by ELISA at 12hr, 24hr, 48hr, 72 hr and day 7 post-transfection.

[000181] In one embodiment, the polynucleotide primary constructs of the present invention are designed to include a polyA-G Quartet. The G-quartet is a cyclic hydrogen bonded array of four guanine nucleotides that can be formed by G-rich sequences in both DNA and RNA. In this embodiment, the G-quartet is incorporated at the end of the poly-A tail. The resultant mmRNA construct is assayed for stability, protein production and other parameters including half-life at various time points. It has been discovered that the polyA-G quartet results in protein production equivalent to at least 75% of that seen using a poly-A tail of 120 nucleotides alone.

Quantification

[000182] In one embodiment, the polynucleotides, primary constructs or mmRNA of the present invention may be quantified in exosomes derived from one or more bodily fluid. As used herein “bodily fluids” include peripheral blood, serum, plasma, ascites, urine, cerebrospinal fluid (CSF), sputum, saliva, bone marrow, synovial fluid, aqueous humor, amniotic fluid, cerumen, breast milk, bronchoalveolar lavage fluid, semen, prostatic fluid, cowper's fluid or pre-ejaculatory fluid, sweat, fecal matter, hair, tears, cyst fluid, pleural and peritoneal fluid, pericardial fluid, lymph, chyme, chyle, bile, interstitial fluid, menses, pus, sebum, vomit, vaginal secretions, mucosal secretion, stool water, pancreatic juice, lavage fluids from sinus cavities, bronchopulmonary aspirates, blastocyl cavity fluid, and umbilical cord blood. Alternatively, exosomes may be retrieved from an organ selected from the group consisting of lung, heart, pancreas, stomach, intestine, bladder, kidney, ovary, testis, skin, colon, breast, prostate, brain, esophagus, liver, and placenta.

[000183] In the quantification method, a sample of not more than 2mL is obtained from the subject and the exosomes isolated by size exclusion chromatography, density gradient centrifugation, differential centrifugation, nanomembrane ultrafiltration, immunoabsorbent capture, affinity purification, microfluidic separation, or combinations thereof. In the analysis, the level or concentration of a polynucleotide, primary construct or mmRNA may be an expression level, presence, absence, truncation or alteration of the administered construct. It is advantageous to correlate the level with one or more clinical phenotypes or with an assay for a human disease biomarker. The assay may be performed using construct specific probes, cytometry, qRT-PCR, real-time PCR, PCR, flow cytometry, electrophoresis, mass spectrometry, or combinations thereof while the exosomes may be isolated using immunohistochemical methods such as enzyme linked immunosorbent assay (ELISA) methods. Exosomes may also be isolated by size exclusion chromatography, density gradient centrifugation, differential centrifugation, nanomembrane ultrafiltration, immunoabsorbent capture, affinity purification, microfluidic separation, or combinations thereof.

[000184] These methods afford the investigator the ability to monitor, in real time, the level of polynucleotides, primary constructs or mmRNA remaining or delivered. This is

possible because the polynucleotides, primary constructs or mmRNA of the present invention differ from the endogenous forms due to the structural or chemical modifications.

II. Design and synthesis of mmRNA

[000185] Polynucleotides, primary constructs or mmRNA for use in accordance with the invention may be prepared according to any available technique including, but not limited to chemical synthesis, enzymatic synthesis, which is generally termed *in vitro* transcription (IVT) or enzymatic or chemical cleavage of a longer precursor, etc.

Methods of synthesizing RNAs are known in the art (see, e.g., Gait, M.J. (ed.)

Oligonucleotide synthesis: a practical approach, Oxford [Oxfordshire], Washington, DC: IRL Press, 1984; and Herdewijn, P. (ed.) *Oligonucleotide synthesis: methods and applications*, Methods in Molecular Biology, v. 288 (Clifton, N.J.) Totowa, N.J.: Humana Press, 2005; both of which are incorporated herein by reference).

[000186] The process of design and synthesis of the primary constructs of the invention generally includes the steps of gene construction, mRNA production (either with or without modifications) and purification. In the enzymatic synthesis method, a target polynucleotide sequence encoding the polypeptide of interest is first selected for incorporation into a vector which will be amplified to produce a cDNA template. Optionally, the target polynucleotide sequence and/or any flanking sequences may be codon optimized. The cDNA template is then used to produce mRNA through *in vitro* transcription (IVT). After production, the mRNA may undergo purification and clean-up processes. The steps of which are provided in more detail below.

Gene Construction

[000187] The step of gene construction may include, but is not limited to gene synthesis, vector amplification, plasmid purification, plasmid linearization and clean-up, and cDNA template synthesis and clean-up.

Gene Synthesis

[000188] Once a polypeptide of interest, or target, is selected for production, a primary construct is designed. Within the primary construct, a first region of linked nucleosides encoding the polypeptide of interest may be constructed using an open reading frame (ORF) of a selected nucleic acid (DNA or RNA) transcript. The ORF may comprise the

wild type ORF, an isoform, variant or a fragment thereof. As used herein, an “open reading frame” or “ORF” is meant to refer to a nucleic acid sequence (DNA or RNA) which is capable of encoding a polypeptide of interest. ORFs often begin with the start codon, ATG and end with a nonsense or termination codon or signal.

[000189] Further, the nucleotide sequence of the first region may be codon optimized. Codon optimization methods are known in the art and may be useful in efforts to achieve one or more of several goals. These goals include to match codon frequencies in target and host organisms to ensure proper folding, bias GC content to increase mRNA stability or reduce secondary structures, minimize tandem repeat codons or base runs that may impair gene construction or expression, customize transcriptional and translational control regions, insert or remove protein trafficking sequences, remove/add post translation modification sites in encoded protein (e.g. glycosylation sites), add, remove or shuffle protein domains, insert or delete restriction sites, modify ribosome binding sites and mRNA degradation sites, to adjust translational rates to allow the various domains of the protein to fold properly, or to reduce or eliminate problem secondary structures within the mRNA. Codon optimization tools, algorithms and services are known in the art, non-limiting examples include services from GeneArt (Life Technologies), DNA2.0 (Menlo Park CA) and/or proprietary methods. In one embodiment, the ORF sequence is optimized using optimization algorithms. Codon options for each amino acid are given in Table 1.

Table 1. Codon Options

Amino Acid	Single Letter Code	Codon Options
Isoleucine	I	ATT, ATC, ATA
Leucine	L	CTT, CTC, CTA, CTG, TTA, TTG
Valine	V	GTT, GTC, GTA, GTG
Phenylalanine	F	TTT, TTC
Methionine	M	ATG
Cysteine	C	TGT, TGC
Alanine	A	GCT, GCC, GCA, GCG
Glycine	G	GGT, GGC, GGA, GGG
Proline	P	CCT, CCC, CCA, CCG
Threonine	T	ACT, ACC, ACA, ACG
Serine	S	TCT, TCC, TCA, TCG, AGT, AGC
Tyrosine	Y	TAT, TAC
Tryptophan	W	TGG
Glutamine	Q	CAA, CAG
Asparagine	N	AAT, AAC

Histidine	H	CAT, CAC
Glutamic acid	E	GAA, GAG
Aspartic acid	D	GAT, GAC
Lysine	K	AAA, AAG
Arginine	R	CGT, CGC, CGA, CGG, AGA, AGG
Selenocysteine	Sec	UGA in mRNA in presence of Selenocystein insertion element (SECIS)
Stop codons	Stop	TAA, TAG, TGA

[000190] Features, which may be considered beneficial in some embodiments of the present invention, may be encoded by the primary construct and may flank the ORF as a first or second flanking region. The flanking regions may be incorporated into the primary construct before and/or after optimization of the ORF. It is not required that a primary construct contain both a 5' and 3' flanking region. Examples of such features include, but are not limited to, untranslated regions (UTRs), Kozak sequences, an oligo(dT) sequence, and detectable tags and may include multiple cloning sites which may have XbaI recognition.

[000191] In some embodiments, a 5' UTR and/or a 3' UTR may be provided as flanking regions. Multiple 5' or 3' UTRs may be included in the flanking regions and may be the same or of different sequences. Any portion of the flanking regions, including none, may be codon optimized and any may independently contain one or more different structural or chemical modifications, before and/or after codon optimization. Combinations of features may be included in the first and second flanking regions and may be contained within other features. For example, the ORF may be flanked by a 5' UTR which may contain a strong Kozak translational initiation signal and/or a 3' UTR which may include an oligo(dT) sequence for templated addition of a poly-A tail. 5'UTR may comprise a first polynucleotide fragment and a second polynucleotide fragment from the same and/or different genes such as the 5'UTRs described in US Patent Application Publication No. 20100293625, herein incorporated by reference in its entirety.

[000192] Tables 2 and 3 provide a listing of exemplary UTRs which may be utilized in the primary construct of the present invention as flanking regions. Shown in Table 2 is a listing of a 5'-untranslated region of the invention. Variants of 5' UTRs may be utilized wherein one or more nucleotides are added or removed to the termini, including A, T, C or G.

Table 2. 5'-Untranslated Regions

5' UTR Identifier	Name/Description	Sequence	SEQ ID NO.
5UTR-001	Upstream UTR	GGGAAATAAGAGAGAAAAGAAGAGTAA GAAGAAATATAAGAGCCACC	1
5UTR-002	Upstream UTR	GGGAGATCAGAGAGAAAAGAAGAGTAA GAAGAAATATAAGAGCCACC	2
5UTR-003	Upstream UTR	GGAATAAAAGTCTCAACACAACATATAC AAAACAAACGAATCTCAAGCAATCAAG CATTCTACTTCTATTGCAGCAATTTAAAT CATTTCTTTTAAAGCAAAAGCAATTTTCT GAAAATTTTCACCATTTACGAACGATAG CAAC	3
5UTR-004	Upstream UTR	GGGAGACAAGCUUGGCAUUCCGGUACU GUUGGUAAAGCCACC	4

[000193] Shown in Table 3 is a representative listing of 3'-untranslated regions of the invention. Variants of 3' UTRs may be utilized wherein one or more nucleotides are added or removed to the termini, including A, T, C or G.

Table 3. 3'-Untranslated Regions

3' UTR Identifier	Name/Description	Sequence	SEQ ID NO.
3UTR-001	Creatine Kinase	GCGCCTGCCCACCTGCCACCGACTGCTG GAACCCAGCCAGTGGGAGGGCCTGGCC CACCAGAGTCCTGCTCCCTCACTCCTCG CCCCGCCCCCTGTCCCAGAGTCCCACCT GGGGGCTCTCTCCACCCTTCTCAGAGTT CCAGTTTCAACCAGAGTTCCAACCAATG GGCTCCATCCTCTGGATTCTGGCCAATG AAATATCTCCCTGGCAGGGTCCTTCTTCT TTTCCCAGAGCTCCACCCCAACCAGGA GCTCTAGTTAATGGAGAGCTCCCAGCA CACTCGGAGCTTGTGCTTTGTCTCCACG CAAAGCGATAAATAAAAGCATTGGTGG CCTTTGGTCTTTGAATAAAGCCTGAGTA GGAAGTCTAGA	5
3UTR-002	Myoglobin	GCCCCTGCCGCTCCCACCCCCACCCATC TGGGCCCCGGGTTCAAGAGAGAGCGGG GTCTGATCTCGTGTAGCCATATAGAGTT TGCTTCTGAGTGTCTGCTTTGTTTAGTA GAGGTGGGCAGGAGGAGCTGAGGGGCT GGGGCTGGGGTGTGAAGTTGGCTTTGC ATGCCAGCGATGCGCCTCCCTGTGGG ATGTCATCACCTGGGAACCGGGAGTG	6

		GCCCTTGGCTCACTGTGTTCTGCATGGT TTGGATCTGAATTAATTGTCCTTTCTTCT AAATCCCAACCGAACTTCTTCCAACCTC CAAAGTGGCTGTAACCCCAAATCCAAG CCATTAACCTACACCTGACAGTAGCAATT GTCTGATTAATCACTGGCCCCTTGAAGA CAGCAGAATGTCCCTTTGCAATGAGGA GGAGATCTGGGCTGGGCGGGCCAGCTG GGGAAGCATTGACTATCTGGAACTTGT GTGTGCCTCCTCAGGTATGGCAGTGACT CACCTGGTTTTAATAAAAACAACCTGCAA CATCTCATGGTCTTTGAATAAAGCCTGA GTAGGAAGTCTAGA	
3UTR-003	α -actin	ACACACTCCACCTCCAGCACGCGACTTC TCAGGACGACGAATCTTCTCAATGGGG GGGCGGCTGAGCTCCAGCCACCCCGCA GTCACCTTTCTTTGTAACAACCTTCCGTTG CTGCCATCGTAAACTGACACAGTGTTTA TAACGTGTACATACATTAACCTATTACC TCATTTTGTTATTTTTTCGAAACAAAGCC CTGTGGAAGAAAATGGAAAACCTGAAG AAGCATTAAAGTCATTCTGTTAAGCTGC GTAAATGGTCTTTGAATAAAGCCTGAGT AGGAAGTCTAGA	7
3UTR-004	Albumin	CATCACATTTAAAAGCATCTCAGCCTAC CATGAGAATAAGAGAAAAGAAAATGAA GATCAAAAAGCTTATTCATCTGTTTTTCT TTTTTCGTTGGTGTAAAGCCAACACCCTG TCTAAAAACATAAATTTCTTTAATCAT TTTGCCTCTTTTCTCTGTGCTTCAATTAA TAAAAAATGGAAAGAATCTAATAGAGT GGTACAGCACTGTTATTTTTCAAAGATG TGTTGCTATCCTGAAAATTCTGTAGGTT CTGTGGAAGTTCAGTGTTCTCTCTTAT TCCACTTCGGTAGAGGATTTCTAGTTTC TTGTGGGCTAATTAATAAATCATTAAAT ACTCTTCTAATGGTCTTTGAATAAAGCC TGAGTAGGAAGTCTAGA	8
3UTR-005	α -globin	GCTGCCTTCTGCGGGGCTTGCCTTCTGG CCATGCCCTTCTTCTCTCCCTTGCACCTG TACCTCTTGGTCTTTGAATAAAGCCTGA GTAGGAAGGCGGCCGCTCGAGCATGCA TCTAGA	9
3UTR-006	G-CSF	GCCAAGCCCTCCCCATCCCATGTATTTA TCTCTATTTAATATTTATGTCTATTTAAG CCTCATATTTAAAGACAGGGAAGAGCA GAACGGAGCCCCAGGCCTCTGTGTCCTT CCCTGCATTTCTGAGTTTCATTCTCCTGC CTGTAGCAGTGAGAAAAAGCTCCTGTC CTCCCATCCCTGGACTGGGAGGTAGAT	10

		<p>AGGTAAATACCAAGTATTTATTACTATG ACTGCTCCCCAGCCCTGGCTCTGCAATG GGCACTGGGATGAGCCGCTGTGAGCCC CTGGTCCTGAGGGTCCCCACCTGGGACC CTTGAGAGTATCAGGTCTCCCACGTGGG AGACAAGAAATCCCTGTTTAATATTTAA ACAGCAGTGTTCCCATCTGGGTCCTTG CACCCCTCACTCTGGCCTCAGCCGACTG CACAGCGGCCCTGCATCCCCTTGGCTG TGAGGCCCTGGACAAGCAGAGGTGGC CAGAGCTGGGAGGCATGGCCCTGGGGT CCCACGAATTTGCTGGGGAATCTCGTTT TTCTTCTTAAGACTTTTGGGACATGGTT TGACTCCCGAACATCACCGACGCGTCTC CTGTTTTTCTGGGTGGCCTCGGGACACC TGCCCTGCCCCACGAGGGTCAGGACT GTGACTCTTTTTAGGGCCAGGCAGGTGC CTGGACATTTGCCTTGCTGGACGGGGAC TGGGGATGTGGGAGGGAGCAGACAGGA GGAATCATGTCAGGCCTGTGTGTGAAA GGAAGCTCCACTGTCACCCTCCACCTCT TCACCCCCACTCACAGTGTCCCCTCC ACTGTCACATTGTA ACTGAACTTCAGGA TAATAAAGTGTTTGCCTCCATGGTCTTT GAATAAAGCCTGAGTAGGAAGGCGGCC GCTCGAGCATGCATCTAGA</p>	
3UTR-007	Colla2; collagen, type I, alpha 2	<p>ACTCAATCTAAATTA AAAAAGAAAGAA ATTTGAAAAACTTTCTCTTTGCCATTT CTTCTTCTTCTTTTTTA ACTGAAAGCTGA ATCCTTCCATTTCTTCTGCACATCTACTT GCTTAAATTGTGGGCAAAAGAGAAAAA GAAGGATTGATCAGAGCATTGTGCAAT ACAGTTTCATTA ACTCCTTCCCCCGCTC CCCCAAAATTTGAATTTTTTTTCAAC ACTCTTACACCTGTTATGGAAAATGTCA ACCTTTGTAAGAAAACCAAATAAAAA TTGAAAAATAAAAACCATAAACATTTG CACC ACTTGTGGCTTTTGAATATCTTCC ACAGAGGGGAAGTTTAAAACCCAACTT CAAAGGTTTAAACTACCTCAAACAC TTTCCCATGAGTGTGATCCACATTGTTA GGTGCTGACCTAGACAGAGATGAACTG AGGTCCTTGTTTTGTTTTGTTTCATAATAC AAAGGTGCTAATTAATAGTATTTTCAGAT ACTTGAAGAATGTTGATGGTGCTAGAA GAATTTGAGAAGAAATACTCCTGTATTG AGTTGTATCGTGTGGTGTATTTTTTAAA AAATTTGATTTAGCATTTCATATTTTCCA TCTTATTCCAATTA AAAAGTATGCAGAT TATTTGCCCAAATCTTCTTCAGATTCAG CATTTGTTCTTTGCCAGTCTCATTTTCAT</p>	11

		CTTCTTCCATGGTTCCACAGAAGCTTTG TTTCTTGGGCAAGCAGAAAAATTAATT GTACCTATTTTGTATATGTGAGATGTTT AAATAAATTGTGAAAAAATGAAATAA AGCATGTTTGGTTTTCCAAAAGAACATA T	
3UTR-008	Col6a2; collagen, type VI, alpha 2	CGCCGCCGCCCGGGCCCCGCAGTCGAG GGTCGTGAGCCCACCCCGTCCATGGTGC TAAGCGGGCCCCGGGTCCCACACGGCCA GCACCGCTGCTCACTCGGACGACGCCCT GGGCCTGCACCTCTCCAGCTCCTCCCAC GGGGTCCCCGTAGCCCCGGCCCCCGCC CAGCCCCAGGTCTCCCCAGGCCCTCCGC AGGCTGCCCGGCCTCCCTCCCCCTGCAG CCATCCCAAGGCTCCTGACCTACCTGGC CCCTGAGCTCTGGAGCAAGCCCTGACC CAATAAAGGCTTTGAACCCAT	12
3UTR-009	RPN1; ribophorin I	GGGGCTAGAGCCCTCTCCGCACAGCGT GGAGACGGGGCAAGGAGGGGGGTTATT AGGATTGGTGGTTTTGTTTTGCTTTGTTT AAAGCCGTGGGAAAATGGCACAACCTT ACCTCTGTGGGAGATGCAACACTGAGA GCCAAGGGGTGGGAGTTGGGATAATTT TTATATAAAAGAAGTTTTTCCACTTTGA ATTGCTAAAAGTGGCATTTTTCCTATGT GCAGTCACTCCTCTCATTTCTAAAATAG GGACGTGGCCAGGCACGGTGGCTCATG CCTGTAATCCCAGCACTTTGGGAGGCCG AGGCAGGCGGCTCACGAGGTCAGGAGA TCGAGACTATCCTGGCTAACACGGTAA AACCTGTCTCTACTAAAAGTACAAAA AATTAGCTGGGCGTGGTGGTGGGCACC TGTAGTCCCAGCTACTCGGGAGGCTGA GGCAGGAGAAAGGCATGAATCCAAGAG GCAGAGCTTGACAGTGAGCTGAGATCAC GCCATTGCACTCCAGCCTGGGCAACAG TGTTAAGACTCTGTCTCAAATATAAATA AATAAATAAATAAATAAATAAATAAAT AAAAATAAAGCGAGATGTTGCCCTCAA A	13
3UTR-010	LRP1; low density lipoprotein receptor- related protein 1	GGCCCTGCCCCGTCCGACTGCCCCCAG AAAGCCTCCTGCCCCCTGCCAGTGAAGT CCTTCAGTGAGCCCCTCCCCAGCCAGCC CTTCCCTGGCCCCGCCGGATGTATAAAT GTAAAAATGAAGGAATTACATTTTATAT GTGAGCGAGCAAGCCGGCAAGCGAGCA CAGTATTATTTCTCCATCCCCCTCCCTGC CTGCTCCTTGGCACCCCCATGCTGCCTT CAGGGAGACAGGCAGGGAGGGCTTGGG GCTGCACCTCCTACCCTCCCACCAGAAC	14

		<p>GCACCCCACTGGGAGAGCTGGTGGTGC AGCCTTCCCCTCCCTGTATAAGACACTT TGCCAAGGCTCTCCCCTCTCGCCCCATC CCTGCTTGCCCGCTCCCACAGCTTCCTG AGGGCTAATTCTGGGAAGGGAGAGTTC TTTGCTGCCCCTGTCTGGAAGACGTGGC TCTGGGTGAGGTAGGCGGGAAAGGATG GAGTGTTTTAGTTCTTGGGGGAGGCCAC CCCAAACCCAGCCCCAACTCCAGGGG CACCTATGAGATGGCCATGCTCAACCCC CCTCCCAGACAGGCCCTCCCTGTCTCCA GGGCCCCACCGAGGTTCCAGGGCTG GAGACTTCTCTGGTAAACATTCCTCCA GCCTCCCCTCCCCTGGGGACGCCAAGG AGGTGGGCCACACCAGGAAGGGAAAG CGGGCAGCCCCGTTTTGGGGACGTGAA CGTTTTAATAATTTTTGCTGAATTCCTTT ACAATAATAACACAGATATTGTTAT AAATAAAATTGT</p>	
3UTR-011	Nnt1; cardiotrophin-like cytokine factor 1	<p>ATATTAAGGATCAAGCTGTTAGCTAATA ATGCCACCTCTGCAGTTTTGGGAACAGG CAAATAAAGTATCAGTATACATGGTGA TGACATCTGTAGCAAAGCTCTTGGAGA AAATGAAGACTGAAGAAAGCAAAGCA AAAAGTATAGAGAGATTTTTCAAAA GCAGTAATCCCTCAATTTTAAAAAAGG ATTGAAAATTCTAAATGTCTTTCTGTGC ATATTTTTTGTGTTAGGAATCAAAGTA TTTTATAAAAGGAGAAAGAACAGCCTC ATTTAGATGTAGTCCTGTTGGATTTTTT ATGCCTCCTCAGTAACCAGAAATGTTTT AAAAAACTAAGTGTTTAGGATTTCAAG ACAACATTATACATGGCTCTGAAATATC TGACACAATGTAAACATTGCAGGCACC TGCATTTTATGTTTTTTTTTCAACAAAT GTGACTAATTTGAAACTTTTATGAACTT CTGAGCTGTCCCCTTGCAATTCAACCGC AGTTTGAATTAATCATATCAAATCAGTT TTAATTTTTTAAATTGTAATTCAGAGTC TATATTTCAAGGGCACATTTTCTCACTA CTATTTAATAACATTAAGGACTAAATA ATCTTTCAGAGATGCTGGAAACAAATC ATTTGCTTTATATGTTTCATTAGAATAC CAATGAAACATACAACTTGAAAATTAG TAATAGTATTTTTGAAGATCCCATTCT AATTGGAGATCTCTTTAATTTTCGATCAA CTTATAATGTGTAGTACTATATTAAGTG CACTTGAGTGGAAATCAACATTTGACTA ATAAAATGAGTTCATCATGTTGGCAAGT GATGTGGCAATTATCTCTGGTGACAAA AGAGTAAAATCAAATATTTCTGCCTGTT</p>	15

		ACAAATATCAAGGAAGACCTGCTACTA TGAAATAGATGACATTAATCTGTCTTCA CTGTTTATAATACGGATGGATTTTTTTT CAAATCAGTGTGTGTTTTGAGGTCTTAT GTAATTGATGACATTTGAGAGAAATGG TGGCTTTTTTTAGCTACCTCTTTGTTTCA TTAAGCACCAGTAAAGATCATGTCTTTT TATAGAAGTGTAGATTTTCTTTGTGACT TTGCTATCGTGCCTAAAGCTCTAAATAT AGGTGAATGTGTGATGAATACTCAGAT TATTTGTCTCTCTATATAATTAGTTTGGT ACTAAGTTTCTCAAAAAATTATTAACAC ATGAAAGACAATCTCTAAACCAGAAAA AGAAGTAGTACAAATTTTGTACTGTAA TGCTCGCGTTTAGTGAGTTTAAAACACA CAGTATCTTTTGGTTTTATAATCAGTTTC TATTTTGCTGTGCCTGAGATTAAGATCT GTGTATGTGTGTGTGTGTGTGTGTGCGT TTGTGTGTTAAAGCAGAAAAGACTTTTT TAAAAGTTTTAAGTGATAAATGCAATTT GTTAATTGATCTTAGATCACTAGTAAAC TCAGGGCTGAATTATACCATGTATATTC TATTAGAAGAAAGTAAACACCATCTTT ATTCCTGCCCTTTTTCTTCTCTCAAAGTA GTTGTAGTTATATCTAGAAAGAAGCAA TTTTGATTTCTTGAAAAGGTAGTTCCTG CACTCAGTTTAAACTAAAAATAATCATA CTTGGATTTTATTTATTTTTGTTCATAGTA AAAATTTTAATTTATATATATTTTTATTT AGTATTATCTTATTCTTTGCTATTTGCCA ATCCTTTGTCATCAATTGTGTTAAATGA ATTGAAAATTCATGCCCTGTTCATTTTA TTTTACTTTATTGGTTAGGATATTTAAA GGATTTTTGTATATATAATTTCTTAAAT TAATATTCCAAAAGGTAGTGGACTTAG ATTATAAATTATGGCAAAAATCTAAAA ACAACAAAAATGATTTTTATAACATTCTA TTTCATTATTCCTCTTTTTCCAATAAGTC ATACAATTGGTAGATATGACTTATTTTA TTTTTGATTATTCACTATATCTTTATGA TATTTAAGTATAAATAATTAAAAAAATT TATTGTACCTTATAGTCTGTCACCAAAA AAAAAAAATTATCTGTAGGTAGTGAAA TGCTAATGTTGATTTGTCTTTAAGGGCT TGTTAACTATCCTTTATTTTCTCATTGT CTTAAATTAGGAGTTTGTGTTTAAATTA CTCATCTAAGCAAAAAATGTATATAAA TCCCATTAAGGGTATATACCCAAAGGA TTATAAATCATGCTGCTATAAAGACACA TGCACACGTATGTTTATTGCAGCACTAT TCACAATAGCAAAGACTTGGAACCAAC	
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		<p>CCAAATGTCCATCAATGATAGACTTGAT TAAGAAAATGTGCACATATACACCATG GAATACTATGCAGCCATAAAAAAGGAT GAGTTCATGTCCTTTGTAGGGACATGGA TAAAGCTGGAAACCATCATTCTGAGCA AACTATTGCAAGGACAGAAAACCAAAC ACTGCATGTTCTCACTCATAGGTGGGAA TTGAACAATGAGAACAACACTTGGACACAA GGTGGGGAACACCACACACCAGGGCCT GTCATGGGGTGGGGGGAGTGGGGAGGG ATAGCATTAGGAGATATACCTAATGTA AATGATGAGTTAATGGGTGCAGCACAC CAACATGGCACATGTATACATATGTAG CAAACCTGCACGTTGTGCACATGTACCC TAGAACTTAAAGTATAATTAAAAAAAAA AAAGAAAACAGAAGCTATTTATAAAGA AGTTATTTGCTGAAATAAATGTGATCTT TCCCATTAATAAATAAAGAAATTTTG GGGTAAAAAACACAATATATTGTATT CTTGAAAAATTCTAAGAGAGTGGATGT GAAGTGTTCACCACAAAAGTGATAA CTAATTGAGGTAATGCACATATTAATTA GAAAGATTTTGTTCATTCCACAATGTATA TATACTTAAAAATATGTTATACACAATA AATACATACATTAATAAATAAGTAAAT GTA</p>	
3UTR-012	Col6a1; collagen, type VI, alpha 1	<p>CCCACCCTGCACGCCGGCACCAAACCC TGTCCTCCCACCCCTCCCCACTCATCAC TAAACAGAGTAAAATGTGATGCGAATT TTCCCGACCAACCTGATTCGCTAGATTT TTTTTAAGGAAAAGCTTGGAAAGCCAG GACACAACGCTGCTGCCTGCTTTGTGCA GGGTCCTCCGGGGCTCAGCCCTGAGTTG GCATCACCTGCGCAGGGCCCTCTGGGG CTCAGCCCTGAGCTAGTGTACCTGCAC AGGGCCCTCTGAGGCTCAGCCCTGAGC TGGCGTCACCTGTGCAGGGCCCTCTGGG GCTCAGCCCTGAGCTGGCCTCACCTGGG TTCCCACCCCGGGCTCTCCTGCCCTGC CCTCCTGCCCGCCCTCCCTCCTGCCTGC GCAGCTCCTTCCCTAGGCACCTCTGTGC TGCATCCCACCAGCCTGAGCAAGACGC CCTCTCGGGGCTGTGCCGCACTAGCCT CCCTCTCCTCTGTCCCCATAGCTGGTTTT TCCCACCAATCCTCACCTAACAGTTACT TTACAATTAACCTCAAAGCAAGCTCTTC TCCTCAGCTTGGGGCAGCCATTGGCCTC TGTCTCGTTTTGGGAAACCAAGGTCAGG AGGCCGTTGCAGACATAAATCTCGGCG ACTCGGCCCGTCTCCTGAGGGTCCTGC TGGTGACCGGCCTGGACCTTGGCCCTAC</p>	16

		<p>AGCCCTGGAGGCCGCTGCTGACCAGCA CTGACCCCGACCTCAGAGAGTACTCGC AGGGGCGCTGGCTGCACTCAAGACCCT CGAGATTAACGGTGCTAACCCCGTCTGC TCCTCCCTCCCGCAGAGACTGGGGCCTG GACTGGACATGAGAGCCCCTTGGTGCC ACAGAGGGCTGTGTCTTACTAGAAACA ACGCAAACCTCTCCTTCCTCAGAATAGT GATGTGTTTCGACGTTTTATCAAAGGCC CCTTTCTATGTTTCATGTTAGTTTTGCTCC TTCTGTGTTTTTTTTCTGAACCATATCCAT GTTGCTGACTTTTTCCAAATAAAGGTTTT CACTCCTCTC</p>	
3UTR-013	Calr; calreticulin	<p>AGAGGCCTGCCTCCAGGGCTGGACTGA GGCCTGAGCGCTCCTGCCGCAGAGCTG GCCGCGCAAATAATGTCTCTGTGAGA CTCGAGAACTTTCATTTTTTTCCAGGCT GGTTCGGATTTGGGGTGGATTTTGGTTT TGTTCCCTCCTCCACTCTCCCCACCC CCTCCCCGCCCTTTTTTTTTTTTTTTTA AACTGGTATTTTATCTTTGATTCTCCTTC AGCCCTCACCCCTGGTTCTCATCTTTCTT GATCAACATCTTTTCTTGCCTCTGTCCC CTTCTCTCATCTCTTAGCTCCCCTCCAAC CTGGGGGGCAGTGGTGTGGAGAAGCCA CAGGCCTGAGATTTTCATCTGCTCTCCTT CCTGGAGCCCAGAGGAGGGCAGCAGAA GGGGGTGGTGTCTCCAACCCCCCAGCA CTGAGGAAGAACGGGGCTCTTCTCATT CACCCCTCCCTTTCTCCCCTGCCCCAG GACTGGGCCACTTCTGGGTGGGGCAGT GGGTCCCAGATTGGCTCACACTGAGAA TGTAAGAACTACAAACAAAATTTCTATT AAATTAATTTTGTGTCTCC</p>	17
3UTR-014	Coll1a1; collagen, type I, alpha 1	<p>CTCCCTCCATCCCAACCTGGCTCCCTCC CACCCAACCAACTTTCCCCCAACCCGG AAACAGACAAGCAACCCAAACTGAACC CCCTCAAAGCCAAAAAATGGGAGACA ATTCACATGGACTTTGGAAAATATTTT TTTCCTTTGCATTCATCTCTCAAACCTAG TTTTTATCTTTGACCAACCGAACATGAC CAAAAACCAAAAAGTGCATTCAACCTTA CCAAAAAAGAAAAAAGGAATA AATAAATAACTTTTTAAAAAAGGAAGC TTGGTCCACTTGCTTGAAGACCCATGCG GGGGTAAGTCCCTTTCTGCCCGTTGGGC TTATGAAACCCCAATGCTGCCCTTTCTG CTCCTTTCTCCACACCCCTTGGGGCC TCCCCTCCACTCCTTCCCAAATCTGTCT CCCCAGAAGACACAGGAAACAATGTAT TGTCTGCCAGCAATCAAAGGCAATGC</p>	18

	TCAAACACCCAAGTGGCCCCCACCCTC AGCCCGCTCCTGCCCCGCCAGCACCCCC AGGCCCTGGGGGACCTGGGGTTCTCAG ACTGCCAAAGAAGCCTTGCCATCTGGC GCTCCCATGGCTCTTGCAACATCTCCCC TTCGTTTTTTGAGGGGGTTCATGCCGGGGG AGCCACCAGCCCCTCACTGGGTTTCGGA GGAGAGTCAGGAAGGGGCCACGACAAA GCAGAAACATCGGATTTGGGGAACGCG TGTCAATCCCTTGTGCCGCAGGGCTGGG CGGGAGAGACTGTTCTGTTCTTGTGTA ACTGTGTTGCTGAAAGACTACCTCGTTC TTGTCTTGATGTGTCACCGGGGCAACTG CCTGGGGGCGGGGATGGGGGCAGGGTG GAAGCGGCTCCCCATTTTATAACCAAAG GTGCTACATCTATGTGATGGGTGGGGTG GGGAGGGAATCACTGGTGCTATAGAAA TTGAGATGCCCCCCCAGGCCAGCAAAT GTTCCTTTTTTGTTCAAAGTCTATTTTTAT TCCTTGATATTTTTCTTTTTTTTTTTTTT TTTTGTGGATGGGGACTTGTGAATTTTT CTAAAGGTGCTATTTAACATGGGAGGA GAGCGTGTGCGGCTCCAGCCCAGCCCG CTGCTCACTTTCCACCCTCTCTCCACCT GCCTCTGGCTTCTCAGGCCTCTGCTCTC CGACCTCTCTCCTCTGAAACCCTCCTCC ACAGCTGCAGCCCATCCTCCCGGCTCCC TCCTAGTCTGTCCCTGCGTCCTCTGTCCC CGGGTTTCAGAGACA ACTTCCCAAAGC ACAAAGCAGTTTTTCCCCCTAGGGGTGG GAGGAAGCAAAGACTCTGTACCTATT TTGTATGTGTATAATAATTTGAGATGTT TTTAATTATTTTGATTGCTGGAATAAAG CATGTGGAAATGACCCAAACATAATCC GCAGTGGCCTCCTAATTTCTTCTTTGG AGTTGGGGGAGGGGTAGACATGGGGAA GGGGCTTTGGGGTGATGGGCTTGCCTTC CATTCTGCCCTTTCCCTCCCCACTATTC TCTTCTAGATCCCTCCATAACCCCACTC CCCTTTCTCTACCCTTCTTATAACCGCA AACCTTTCTACTTCCTCTTTCATTTTCTA TTCTTGCAATTTCTTGCACCTTTTCCAA ATCCTCTTCTCCCCTGCAATACCATACA GGCAATCCACGTGCACAACACACACAC ACACTCTTACATCTGGGGTTGTCCAAA CCTCATACCCACTCCCCTTCAAGCCCAT CCTACTCTCCACCCCCTGGATGCCCTGCA CTTGGTGGCGGTGGGATGCTCATGGAT ACTGGGAGGGTGAGGGGAGTGGAACCC GTGAGGAGGACCTGGGGGCCTCTCCTT GAACTGACATGAAGGGTTCATCTGGCCT	
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		<p>CTGCTCCCTTCTCACCCACGCTGACCTC CTGCCGAAGGAGCAACGCAACAGGAGA GGGGTCTGCTGAGCCTGGCGAGGGTCT GGGAGGGACCAGGAGGAAGGCGTGCTC CCTGCTCGCTGTCCTGGCCCTGGGGGAG TGAGGGAGACAGACACCTGGGAGAGCT GTGGGGAAGGCACTCGCACCGTGCTCT TGGGAAGGAAGGAGACCTGGCCCTGCT CACCACGGACTGGGTGCCTCGACCTCCT GAATCCCCAGAACAACCCCCCTGGG CTGGGGTGGTCTGGGGAACCATCGTGC CCCCGCCTCCCGCCTACTCCTTTTAAAG CTT</p>	
3UTR-015	Plod1; procollagen- lysine, 2-oxoglutarate 5-dioxygenase 1	<p>TTGGCCAGGCCTGACCCTCTTGGACCTT TCTTCTTTGCCGACAACCACTGCCCAGC AGCCTCTGGGACCTCGGGGTCCCAGGG AACCCAGTCCAGCCTCCTGGCTGTTGAC TTCCCATGCTCTTGGAGCCACCAATCA AAGAGATTCAAAGAGATTCTGCAGGC CAGAGGCGGAACACACCTTTATGGCTG GGGCTCTCCGTGGTGTCTGGACCCAGC CCCTGGAGACACCATTCACTTTTACTGC TTTGTAGTGACTCGTGCTCTCCAACCTG TCTTCCTGAAAACCAAGGCCCCCTTCC CCCACCTCTTCCATGGGGTGAGACTTGA GCAGAACAGGGGCTTCCCCAAGTTGCC CAGAAAGACTGTCTGGGTGAGAAGCCA TGGCCAGAGCTTCTCCCAGGCACAGGT GTTGCACCAGGGACTTCTGCTTCAAGTT TTGGGGTAAAGACACCTGGATCAGACT CCAAGGGCTGCCCTGAGTCTGGGACTTC TGCCTCCATGGCTGGTCATGAGAGCAA ACCGTAGTCCCCTGGAGACAGCGACTC CAGAGAACCTCTTGGGAGACAGAAGAG GCATCTGTGCACAGCTCGATCTTCTACT TGCCTGTGGGGAGGGGAGTGACAGGTC CACACACCACACTGGGTCACCCTGTCCT GGATGCCTCTGAAGAGAGGGACAGACC GTCAGAAACTGGAGAGTTTCTATTA AA GGTCATTAAACCA</p>	19
3UTR-016	Nucb1; nucleobindin 1	<p>TCCTCCGGGACCCCAGCCCTCAGGATTC CTGATGCTCCAAGGCGACTGATGGGCG CTGGATGAAGTGGCACAGTCAGCTTCC CTGGGGGCTGGTGTTCATGTTGGGCTCCT GGGGCGGGGGCACGGCCTGGCATTTC CGCATTGCTGCCACCCAGGTCCACCTG TCTCCACTTTCACAGCCTCCAAGTCTGT GGCTCTTCCCTTCTGTCTCCGAGGGGC TTGCCTTCTCTCGTGTCCAGTGAGGTGC TCAGTGATCGGCTTAACTTAGAGAAGC CCGCCCCCTCCCCTTCTCCGTCTGTCCC</p>	20

		AAGAGGGTCTGCTCTGAGCCTGCGTTCC TAGGTGGCTCGGCCTCAGCTGCCTGGGT TGTGGCCGCCCTAGCATCCTGTATGCC ACAGCTACTGGAATCCCCGCTGCTGCTC CGGGCCAAGCTTCTGGTTGATTAATGAG GGCATGGGGTGGTCCCTCAAGACCTTCC CCTACCTTTTGTGGAACCAGTGATGCCT CAAAGACAGTGTCCCCTCCACAGCTGG GTGCCAGGGGCAGGGGATCCTCAGTAT AGCCGGTGAACCCTGATACCAGGAGCC TGGGCCTCCCTGAACCCCTGGCTTCCAG CCATCTCATCGCCAGCCTCCTCCTGGAC CTCTTGGCCCCCAGCCCCTTCCCCACAC AGCCCCAGAAGGGTCCCAGAGCTGACC CCACTCCAGGACCTAGGCCCAGCCCCTC AGCCTCATCTGGAGCCCCTGAAGACCA GTCCCACCCACCTTTCTGGCCTCATCTG ACACTGCTCCGCATCCTGCTGTGTGTCC TGTTCCATGTTCCGGTTCATCCAAATA CACTTTCTGGAACAAA	
3UTR-017	α -globin	GCTGGAGCCTCGGTGGCCATGCTTCTTG CCCCTTGGGCCTCCCCCAGCCCCTCCT CCCCTTCCCTGCACCCGTACCCCGTGGT CTTTGAATAAAGTCTGAGTGGGCGGC	21

[000194] It should be understood that those listed in the previous tables are examples and that any UTR from any gene may be incorporated into the respective first or second flanking region of the primary construct. Furthermore, multiple wild-type UTRs of any known gene may be utilized. It is also within the scope of the present invention to provide artificial UTRs which are not variants of wild type genes. These UTRs or portions thereof may be placed in the same orientation as in the transcript from which they were selected or may be altered in orientation or location. Hence a 5' or 3' UTR may be inverted, shortened, lengthened, made chimeric with one or more other 5' UTRs or 3' UTRs. As used herein, the term "altered" as it relates to a UTR sequence, means that the UTR has been changed in some way in relation to a reference sequence. For example, a 3' or 5' UTR may be altered relative to a wild type or native UTR by the change in orientation or location as taught above or may be altered by the inclusion of additional nucleotides, deletion of nucleotides, swapping or transposition of nucleotides. Any of these changes producing an "altered" UTR (whether 3' or 5') comprise a variant UTR.

[000195] In one embodiment, a double, triple or quadruple UTR such as a 5' or 3' UTR may be used. As used herein, a "double" UTR is one in which two copies of the same UTR are encoded either in series or substantially in series. For example, a double beta-globin 3' UTR may be used as described in US Patent publication 20100129877, the contents of which are incorporated herein by reference in its entirety.

[000196] It is also within the scope of the present invention to have patterned UTRs. As used herein "patterned UTRs" are those UTRs which reflect a repeating or alternating pattern, such as ABABAB or AABBAABBAABB or ABCABCABC or variants thereof repeated once, twice, or more than 3 times. In these patterns, each letter, A, B, or C represent a different UTR at the nucleotide level.

[000197] In one embodiment, flanking regions are selected from a family of transcripts whose proteins share a common function, structure, feature of property. For example, polypeptides of interest may belong to a family of proteins which are expressed in a particular cell, tissue or at some time during development. The UTRs from any of these genes may be swapped for any other UTR of the same or different family of proteins to create a new chimeric primary transcript. As used herein, a "family of proteins" is used in the broadest sense to refer to a group of two or more polypeptides of interest which share at least one function, structure, feature, localization, origin, or expression pattern.

[000198] After optimization (if desired), the primary construct components are reconstituted and transformed into a vector such as, but not limited to, plasmids, viruses, cosmids, and artificial chromosomes. For example, the optimized construct may be reconstituted and transformed into chemically competent *E. coli*, yeast, neurospora, maize, drosophila, etc. where high copy plasmid-like or chromosome structures occur by methods described herein.

[000199] The untranslated region may also include translation enhancer elements (TEE). As a non-limiting example, the TEE may include those described in US Application No. 20090226470, herein incorporated by reference in its entirety, and those known in the art.

Stop Codons

[000200] In one embodiment, the primary constructs of the present invention may include at least two stop codons before the 3' untranslated region (UTR). The stop codon

may be selected from TGA, TAA and TAG. In one embodiment, the primary constructs of the present invention include the stop codon TGA and one additional stop codon. In a further embodiment the addition stop codon may be TAA. In another embodiment, the primary constructs of the present invention include three stop codons.

Vector Amplification

[000201] The vector containing the primary construct is then amplified and the plasmid isolated and purified using methods known in the art such as, but not limited to, a maxi prep using the Invitrogen PURELINK™ HiPure Maxiprep Kit (Carlsbad, CA).

Plasmid Linearization

[000202] The plasmid may then be linearized using methods known in the art such as, but not limited to, the use of restriction enzymes and buffers. The linearization reaction may be purified using methods including, for example Invitrogen's PURELINK™ PCR Micro Kit (Carlsbad, CA), and HPLC based purification methods such as, but not limited to, strong anion exchange HPLC, weak anion exchange HPLC, reverse phase HPLC (RP-HPLC), and hydrophobic interaction HPLC (HIC-HPLC) and Invitrogen's standard PURELINK™ PCR Kit (Carlsbad, CA). The purification method may be modified depending on the size of the linearization reaction which was conducted. The linearized plasmid is then used to generate cDNA for *in vitro* transcription (IVT) reactions.

cDNA Template Synthesis

[000203] A cDNA template may be synthesized by having a linearized plasmid undergo polymerase chain reaction (PCR). Table 4 is a listing of primers and probes that may be usefully in the PCR reactions of the present invention. It should be understood that the listing is not exhaustive and that primer-probe design for any amplification is within the skill of those in the art. Probes may also contain chemically modified bases to increase base-pairing fidelity to the target molecule and base-pairing strength. Such modifications may include 5-methyl-Cytidine, 2, 6-di-amino-purine, 2'-fluoro, phosphoro-thioate, or locked nucleic acids.

Table 4. Primers and Probes

Primer/ Probe Identifier	Sequence (5'-3')	Hybridization target	SEQ ID NO.
UFP	TTGGACCCTCGTACAGAAGCTAA TACG	cDNA Template	22

URP	T _{x160} CTTCCTACTCAGGCTTTATTC AAAGACCA	cDNA Template	23
GBA1	CCTTGACCTTCTGGAACTTC	Acid glucocerebrosidase	24
GBA2	CCAAGCACTGAAACGGATAT	Acid glucocerebrosidase	25
LUC1	GATGAAAAGTGCTCCAAGGA	Luciferase	26
LUC2	AACCGTGATGAAAAGGTACC	Luciferase	27
LUC3	TCATGCAGATTGGAAAGGTC	Luciferase	28
GCSF1	CTTCTTGGACTGTCCAGAGG	G-CSF	29
GCSF2	GCAGTCCCTGATACAAGAAC	G-CSF	30
GCSF3	GATTGAAGGTGGCTCGCTAC	G-CSF	31

*UFP is universal forward primer; URP is universal reverse primer.

[000204] In one embodiment, the cDNA may be submitted for sequencing analysis before undergoing transcription.

mRNA Production

[000205] The process of mRNA or mmRNA production may include, but is not limited to, *in vitro* transcription, cDNA template removal and RNA clean-up, and mRNA capping and/or tailing reactions.

In Vitro Transcription

[000206] The cDNA produced in the previous step may be transcribed using an *in vitro* transcription (IVT) system. The system typically comprises a transcription buffer, nucleotide triphosphates (NTPs), an RNase inhibitor and a polymerase. The NTPs may be manufactured in house, may be selected from a supplier, or may be synthesized as described herein. The NTPs may be selected from, but are not limited to, those described herein including natural and unnatural (modified) NTPs. The polymerase may be selected from, but is not limited to, T7 RNA polymerase, T3 RNA polymerase and mutant polymerases such as, but not limited to, polymerases able to incorporate modified nucleic acids.

RNA Polymerases

[000207] Any number of RNA polymerases or variants may be used in the design of the primary constructs of the present invention.

[000208] RNA polymerases may be modified by inserting or deleting amino acids of the RNA polymerase sequence. As a non-limiting example, the RNA polymerase may be modified to exhibit an increased ability to incorporate a 2'-modified nucleotide triphosphate compared to an unmodified RNA polymerase (see International Publication WO2008078180 and U.S. Patent 8,101,385; herein incorporated by reference in their entireties).

[000209] Variants may be obtained by evolving an RNA polymerase, optimizing the RNA polymerase amino acid and/or nucleic acid sequence and/or by using other methods known in the art. As a non-limiting example, T7 RNA polymerase variants may be evolved using the continuous directed evolution system set out by Esvelt *et al.* (Nature (2011) 472(7344):499-503; herein incorporated by reference in its entirety) where clones of T7 RNA polymerase may encode at least one mutation such as, but not limited to, lysine at position 93 substituted for threonine (K93T), I4M, A7T, E63V, V64D, A65E, D66Y, T76N, C125R, S128R, A136T, N165S, G175R, H176L, Y178H, F182L, L196F, G198V, D208Y, E222K, S228A, Q239R, T243N, G259D, M267I, G280C, H300R, D351A, A354S, E356D, L360P, A383V, Y385C, D388Y, S397R, M401T, N410S, K450R, P451T, G452V, E484A, H523L, H524N, G542V, E565K, K577E, K577M, N601S, S684Y, L699I, K713E, N748D, Q754R, E775K, A827V, D851N or L864F. As another non-limiting example, T7 RNA polymerase variants may encode at least mutation as described in U.S. Pub. Nos. 20100120024 and 20070117112; herein incorporated by reference in their entireties. Variants of RNA polymerase may also include, but are not limited to, substitutional variants, conservative amino acid substitution, insertional variants, deletional variants and/or covalent derivatives.

[000210] In one embodiment, the primary construct may be designed to be recognized by the wild type or variant RNA polymerases. In doing so, the primary construct may be modified to contain sites or regions of sequence changes from the wild type or parent primary construct.

[000211] In one embodiment, the primary construct may be designed to include at least one substitution and/or insertion upstream of an RNA polymerase binding or recognition site, downstream of the RNA polymerase binding or recognition site, upstream of the TATA box sequence, downstream of the TATA box sequence of the primary construct

but upstream of the coding region of the primary construct, within the 5'UTR, before the 5'UTR and/or after the 5'UTR.

[000212] In one embodiment, the 5'UTR of the primary construct may be replaced by the insertion of at least one region and/or string of nucleotides of the same base. The region and/or string of nucleotides may include, but is not limited to, at least 3, at least 4, at least 5, at least 6, at least 7 or at least 8 nucleotides and the nucleotides may be natural and/or unnatural. As a non-limiting example, the group of nucleotides may include 5-8 adenine, cytosine, thymine, a string of any of the other nucleotides disclosed herein and/or combinations thereof.

[000213] In one embodiment, the 5'UTR of the primary construct may be replaced by the insertion of at least two regions and/or strings of nucleotides of two different bases such as, but not limited to, adenine, cytosine, thymine, any of the other nucleotides disclosed herein and/or combinations thereof. For example, the 5'UTR may be replaced by inserting 5-8 adenine bases followed by the insertion of 5-8 cytosine bases. In another example, the 5'UTR may be replaced by inserting 5-8 cytosine bases followed by the insertion of 5-8 adenine bases.

[000214] In one embodiment, the primary construct may include at least one substitution and/or insertion downstream of the transcription start site which may be recognized by an RNA polymerase. As a non-limiting example, at least one substitution and/or insertion may occur downstream the transcription start site by substituting at least one nucleic acid in the region just downstream of the transcription start site (such as, but not limited to, +1 to +6). Changes to region of nucleotides just downstream of the transcription start site may affect initiation rates, increase apparent nucleotide triphosphate (NTP) reaction constant values, and increase the dissociation of short transcripts from the transcription complex curing initial transcription (Briebe et al, *Biochemistry* (2002) 41: 5144-5149; herein incorporated by reference in its entirety). The modification, substitution and/or insertion of at least one nucleic acid may cause a silent mutation of the nucleic acid sequence or may cause a mutation in the amino acid sequence.

[000215] In one embodiment, the primary construct may include the substitution of at least 1, at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9,

at least 10, at least 11, at least 12 or at least 13 guanine bases downstream of the transcription start site.

[000216] In one embodiment, the primary construct may include the substitution of at least 1, at least 2, at least 3, at least 4, at least 5 or at least 6 guanine bases in the region just downstream of the transcription start site. As a non-limiting example, if the nucleotides in the region are GGGAGA the guanine bases may be substituted by at least 1, at least 2, at least 3 or at least 4 adenine nucleotides. In another non-limiting example, if the nucleotides in the region are GGGAGA the guanine bases may be substituted by at least 1, at least 2, at least 3 or at least 4 cytosine bases. In another non-limiting example, if the nucleotides in the region are GGGAGA the guanine bases may be substituted by at least 1, at least 2, at least 3 or at least 4 thymine, and/or any of the nucleotides described herein.

[000217] In one embodiment, the primary construct may include at least one substitution and/or insertion upstream of the start codon. For the purpose of clarity, one of skill in the art would appreciate that the start codon is the first codon of the protein coding region whereas the transcription start site is the site where transcription begins. The primary construct may include, but is not limited to, at least 1, at least 2, at least 3, at least 4, at least 5, at least 6, at least 7 or at least 8 substitutions and/or insertions of nucleotide bases. The nucleotide bases may be inserted or substituted at 1, at least 1, at least 2, at least 3, at least 4 or at least 5 locations upstream of the start codon. The nucleotides inserted and/or substituted may be the same base (e.g., all A or all C or all T or all G), two different bases (e.g., A and C, A and T, or C and T), three different bases (e.g., A, C and T or A, C and T) or at least four different bases. As a non-limiting example, the guanine base upstream of the coding region in the primary construct may be substituted with adenine, cytosine, thymine, or any of the nucleotides described herein. In another non-limiting example the substitution of guanine bases in the primary construct may be designed so as to leave one guanine base in the region downstream of the transcription start site and before the start codon (see Esvelt *et al.* Nature (2011) 472(7344):499-503; herein incorporated by reference in its entirety). As a non-limiting example, at least 5 nucleotides may be inserted at 1 location downstream of the

transcription start site but upstream of the start codon and the at least 5 nucleotides may be the same base type.

cDNA Template Removal and Clean-Up

[000218] The cDNA template may be removed using methods known in the art such as, but not limited to, treatment with Deoxyribonuclease I (DNase I). RNA clean-up may also include a purification method such as, but not limited to, AGENCOURT® CLEANSEQ® system from Beckman Coulter (Danvers, MA), HPLC based purification methods such as, but not limited to, strong anion exchange HPLC, weak anion exchange HPLC, reverse phase HPLC (RP-HPLC), and hydrophobic interaction HPLC (HIC-HPLC).

Capping and/or Tailing Reactions

[000219] The primary construct or mmRNA may also undergo capping and/or tailing reactions. A capping reaction may be performed by methods known in the art to add a 5' cap to the 5' end of the primary construct. Methods for capping include, but are not limited to, using a Vaccinia Capping enzyme (New England Biolabs, Ipswich, MA).

[000220] A poly-A tailing reaction may be performed by methods known in the art, such as, but not limited to, 2' O-methyltransferase and by methods as described herein. If the primary construct generated from cDNA does not include a poly-T, it may be beneficial to perform the poly-A-tailing reaction before the primary construct is cleaned.

mRNA Purification

[000221] Primary construct or mmRNA purification may include, but is not limited to, mRNA or mmRNA clean-up, quality assurance and quality control. mRNA or mmRNA clean-up may be performed by methods known in the arts such as, but not limited to, AGENCOURT® beads (Beckman Coulter Genomics, Danvers, MA), poly-T beads, LNATM oligo-T capture probes (EXIQON® Inc, Vedbaek, Denmark) or HPLC based purification methods such as, but not limited to, strong anion exchange HPLC, weak anion exchange HPLC, reverse phase HPLC (RP-HPLC), and hydrophobic interaction HPLC (HIC-HPLC). The term “purified” when used in relation to a polynucleotide such as a “purified mRNA or mmRNA” refers to one that is separated from at least one contaminant. As used herein, a “contaminant” is any substance which makes another unfit, impure or inferior. Thus, a purified polynucleotide (e.g., DNA and RNA) is present

in a form or setting different from that in which it is found in nature, or a form or setting different from that which existed prior to subjecting it to a treatment or purification method.

[000222] A quality assurance and/or quality control check may be conducted using methods such as, but not limited to, gel electrophoresis, UV absorbance, or analytical HPLC.

[000223] In another embodiment, the mRNA or mmRNA may be sequenced by methods including, but not limited to reverse-transcriptase-PCR.

[000224] In one embodiment, the mRNA or mmRNA may be quantified using methods such as, but not limited to, ultraviolet visible spectroscopy (UV/Vis). A non-limiting example of a UV/Vis spectrometer is a NANODROP® spectrometer (ThermoFisher, Waltham, MA). The quantified mRNA or mmRNA may be analyzed in order to determine if the mRNA or mmRNA may be of proper size, check that no degradation of the mRNA or mmRNA has occurred. Degradation of the mRNA and/or mmRNA may be checked by methods such as, but not limited to, agarose gel electrophoresis, HPLC based purification methods such as, but not limited to, strong anion exchange HPLC, weak anion exchange HPLC, reverse phase HPLC (RP-HPLC), and hydrophobic interaction HPLC (HIC-HPLC), liquid chromatography-mass spectrometry (LCMS), capillary electrophoresis (CE) and capillary gel electrophoresis (CGE).

Signal Sequences

[000225] The primary constructs or mmRNA may also encode additional features which facilitate trafficking of the polypeptides to therapeutically relevant sites. One such feature which aids in protein trafficking is the signal sequence. As used herein, a “signal sequence” or “signal peptide” is a polynucleotide or polypeptide, respectively, which is from about 9 to 200 nucleotides (3-60 amino acids) in length which is incorporated at the 5' (or N-terminus) of the coding region or polypeptide encoded, respectively. Addition of these sequences result in trafficking of the encoded polypeptide to the endoplasmic reticulum through one or more secretory pathways. Some signal peptides are cleaved from the protein by signal peptidase after the proteins are transported.

[000226] Table 5 is a representative listing of protein signal sequences which may be incorporated for encoding by the polynucleotides, primary constructs or mmRNA of the invention.

Table 5. Signal Sequences

ID	Description	NUCLEOTIDE SEQUENCE (5'-3')	SEQ ID NO.	ENCODED PEPTIDE	SEQ ID NO.
SS-001	α -1-antitrypsin	ATGATGCCATCCTCAGTCTC ATGGGGTATTTTGTCTTTGG CGGGTCTGTGCTGTCTCGTG CCGGTGTCTGCTCGCA	32	MMPSSVSW GILLAGLCCL VPVSLA	94
SS-002	G-CSF	ATGGCCGGACCGGCGACTC AGTCGCCCATGAAACTCAT GGCCCTGCAGTTGTTGCTTT GGCACTCAGCCCTCTGGACC GTCCAAGAGGCG	33	MAGPATQSP MKLMALQL LLWHSALW TVQEA	95
SS-003	Factor IX	ATGCAGAGAGTGAACATGA TTATGGCCGAGTCCCCATCG CTCATACAATCTGCCTGCT TGGTACCTGCTTTCCGCCGA ATGCACTGTCTTTCTGGATC ACGAGAATGCGAATAAGAT CTTGAACCGACCCAAACGG	34	MQRVNMIM AESPSLITICL LGYLLSAEC TVFLDHENA NKILNRPKR	96
SS-004	Prolactin	ATGAAAGGATCATTGCTGTT GCTCCTCGTGTGCGAACCTTC TGCTTTGCCAGTCCGTAGCC CCC	35	MKGSLLLLL VSNLLLCQS VAP	97
SS-005	Albumin	ATGAAATGGGTGACGTTCA TCTCACTGTTGTTTTTGTCT CGTCCGCCTACTCCAGGGG AGTATTCCGCCGA	36	MKWVTFISL LFLFSSAYS R G VFRR	98
SS-006	HMMSP38	ATGTGGTGGCGGCTCTGGTG GCTGCTCCTGTTGCTCCTCT TGCTGTGGCCCATGGTGTGG GCA	37	MWWRLWW LLLLLLLLP MWA	99
MLS-001	ornithine carbamoyltransferase	TGCTCTTTAACCTCCGCATC CTGTTGAATAACGCTGCGTT CCGAAATGGGCATAACTTC ATGGTACGCAACTTCAGAT GCGGCCAGCCACTCCAG	38	MLFNLRILL NNAAFRNGH NFMVRNFR C GQPLQ	100
MLS-002	Cytochrome C Oxidase subunit 8A	ATGTCCGTCTTGACACCCCT GCTCTTGAGAGGGCTGACG GGGTCCGCTAGACGCCTGC CGGTACCGCGAGCGAAGAT CCACTCCCTG	39	MSVLTPLLL RGLTGSARR LPVPRAKIHS L	101
MLS-003	Cytochrome C Oxidase subunit 8A	ATGAGCGTGCTCACTCCGTT GCTTCTTCGAGGGCTTACGG GATCGGCTCGGAGGTTGCC	40	MSVLTPLLL RGLTGSARR LPVPRAKIHS	102

		CGTCCCGAGAGCGAAGATC CATTCGTTG		L	
SS-007	Type III, bacterial	TGACAAAAATAACTTTATCT CCCCAGAATTTTAGAATCCA AAAACAGGAAACCACACTA CTAAAAGAAAAATCAACCG AGAAAAATTCTTTAGCAAA AAGTATTCTCGCAGTAAA ATCACTTCATCGAATTAAGG TCAAATTATCGGAACGTTT TATTCGCATAAGAACA	41	MVTKITLSP QNFRIQKQE TTLLKEKSTE KNSLAKSILA VKNHFIELRS KLSERFISHK NT	103
SS-008	Viral	ATGCTGAGCTTTGTGGATAC CCGCACCCTGCTGCTGCTGG CGGTGACCAGCTGCCTGGC GACCTGCCAG	42	MLSFVDTRT LLLLAVTSC LATCQ	104
SS-009	viral	ATGGGCAGCAGCCAGGCGC CGCGCATGGGCAGCGTGGG CGGCCATGGCCTGATGGCG CTGCTGATGGCGGGCCTGAT TCTGCCGGGCATTCTGGCG	43	MGSSQAPRM GSVGGHGL MALLMAGLI LPGILA	105
SS-010	Viral	ATGGCGGGCATTTTTTATTT TCTGTTTAGCTTTCTGTTT GCATTTGCGAT	44	MAGIFYFLFS FLFGICD	106
SS-011	Viral	ATGGAAAACCGCCTGCTGC GCGTGTCTTCTGGTGTGGGCG GCGCTGACCATGGATGGCG CGAGCGCG	45	MENRLLRVF LVWAALTM DGASA	107
SS-012	Viral	ATGGCGCGCCAGGGCTGCT TTGGCAGCTATCAGGTGATT AGCCTGTTTACCTTTGCGAT TGGCGTGAACCTGTGCCTGG GC	46	MARQGCFGS YQVISLFTFA IGVNLCLG	108
SS-013	<i>Bacillus</i>	ATGAGCCGCCTGCCGGTGCT GCTGCTGCTGCAGCTGCTGG TGCGCCCGGGCCTGCAG	47	MSRLPVLLL LQLLVRPGL Q	109
SS-014	<i>Bacillus</i>	ATGAAACAGCAGAAACGCC TGTATGCGCGCCTGCTGACC CTGCTGTTTGCCTGATTTT TCTGCTGCCGCATAGCAGCG CGAGCGCG	48	MKQQKRLY ARLLTLLFA LIFLLPHSSA SA	110
SS-015	Secretion signal	ATGGCGACGCCGCTGCCTCC GCCCTCCCCGCGGCACCTGC GGCTGCTGCGGCTGCTGCTC TCCGCCCTCGTCCTCGGC	49	MATPLPPPSP RHLRLLRLL LSG	111
SS-016	Secretion signal	ATGAAGGCTCCGGGTCGGC TCGTGCTCATCATCCTGTGC TCCGTGGTCTTCTCT	50	MKAPGRLVL IILCSVVFS	112
SS-017	Secretion signal	ATGCTTCAGCTTTGGAAACT TGTTCTCCTGTGCGGCGTGC TCACT	51	MLQLWKLL CGVLT	113

SS-018	Secretion signal	ATGCTTTATCTCCAGGGTTG GAGCATGCCTGCTGTGGCA	52	MLYLQGWS MPAVA	114
SS-019	Secretion signal	ATGGATAACGTGCAGCCGA AAATAAAACATCGCCCCTTC TGCTTCAGTGTGAAAGGCC ACGTGAAGATGCTGCGGCT GGATATTATCAACTCACTGG TAACAACAGTATTCATGCTC ATCGTATCTGTGTTGGCACT GATACCA	53	MDNVQPKIK HRPFCFSVK GHVKMLRL DIINSLVTTV FMLIVSVLA LIP	115
SS-020	Secretion signal	ATGCCCTGCCTAGACCAAC AGCTCACTGTTTCATGCCCTA CCCTGCCCTGCCAGCCCTC CTCTCTGGCCTTCTGCCAAG TGGGGTTCTTAACAGCA	54	MPCLDQQLT VHALPCPAQ PSSLAFCQV GFLTA	116
SS-021	Secretion signal	ATGAAAACCTTGTTCAATCC AGCCCCTGCCATTGCTGACC TGGATCCCCAGTTCTACACC CTCTCAGATGTGTTCTGCTG CAATGAAAGTGAGGCTGAG ATTTAACTGGCCTCACGGT GGCAGCGCTGCAGATGCT	55	MKTLFNPAP AIADLDPQF YTLSDVFCC NESEAEILTG LTVGSAADA	117
SS-022	Secretion signal	ATGAAGCCTCTCCTTGTTGT GTTTGTCTTTCTTTTCCTTTG GGATCCAGTGCTGGCA	56	MKPLLVVV FLFLWDPVL A	118
SS-023	Secretion signal	ATGTCCTGTTCCCTAAAGTT TACTTTGATTGTAATTTTTTT TACTGTTGGCTTTCATCCA GC	57	MSCSLKFTLI VIFFTCTLSS S	119
SS-024	Secretion signal	ATGGTTCTTACTAAACCTCT TCAAAGAAATGGCAGCATG ATGAGCTTTGAAAATGTGA AAGAAAAGAGCAGAGAAG GAGGGCCCCATGCACACAC ACCCGAAGAAGAATTGTGT TTCGTGGTAACACACTACCC TCAGGTTTCAGACCACACTCA ACCTGTTTTTCCATATATTC AAGGTTCTTACTCAACCACT TTCCCTTCTGTGGGGT	58	MVLTKPLQR NGSMMSFEN VKEKSREGG PHAHTPEEE LCFVVTHTP QVQTTLNLF FHIFKVLTP LSLLWG	120
SS-025	Secretion signal	ATGGCCACCCCGCCATTCCG GCTGATAAGGAAGATGTTTT CCTTCAAGGTGAGCAGATG GATGGGGCTTGCCTGCTTCC GGTCCCTGGCGGCATCC	59	MATPPFRLIR KMFSFKVSR WMGLACFR SLAAS	121
SS-026	Secretion signal	ATGAGCTTTTTCCAACCTCT GATGAAAAGGAAGGAACCTC ATTCCCTTGGTGGTGTTCAT GACTGTGGCGGGGGTGGA GCCTCATCT	60	MSFFQLLMK RKELIPLVVF MTVAAGGA SS	122

SS-027	Secretion signal	ATGGTCTCAGCTCTGCGGGG AGCACCCCTGATCAGGGTG CACTCAAGCCCTGTTTCTTC TCCTTCTGTGAGTGGACCAC GGAGGCTGGTGGAGCTGCCT GTCATCCCAAAGCTCAGCTC TGAGC	61	MVSALRGAP LIRVHSSPVS SPSVSGPAAL VSCLSSQSSA LS	123
SS-028	Secretion signal	ATGATGGGGTCCCCAGTGA GTCATCTGCTGGCCGGCTTC TGTGTGTGGGTCGTCTTGGG C	62	MMGSPVSHL LAGFCVWV VLG	124
SS-029	Secretion signal	ATGGCAAGCATGGCTGCCG TGCTCACCTGGGCTCTGGCT CTTCTTTCAGCGTTTTTCGGC CACCCAGGCA	63	MASMAAVL TVALALLSA FSATQA	125
SS-030	Secretion signal	ATGGTGCTCATGTGGACCA GTGGTGACGCCTTCAAGAC GGCCTACTTCCTGCTGAAGG GTGCCCTCTGCAGTTCTCC GTGTGCGGCCTGCTGCAGGT GCTGGTGGACCTGGCCATCC TGGGGCAGGCCTACGCC	64	MVLMWTSG DAFKTAYFL LKGAPLQFS VCGLLQVLV DLAILGQAT A	126
SS-031	Secretion signal	ATGGATTTTGTCTGCTGGAGC CATCGGAGGCGTCTGCGGT GTTGCTGTGGGCTACCCCT GGACACGGTGAAGGTCAGG ATCCAGACGGAGCCAAAGT ACACAGGCATCTGGCACTG CGTCCGGGATACGTATCACC GAGAGCGCGTGTGGG GCTTCTACCGGGGCCTCTCG CTGCCCGTGTGCACGGTGTG CCTGGTATCTTCC	65	MDFVAGAIG GVCVAVG YPLDTVKVR IQTEPLYTGI WHCVRDTY HRERVWGF YRGLSLPVC TVSLVSS	127
SS-032	Secretion signal	ATGGAGAAGCCCCTCTTCCC ATTAGTGCCTTTGCATTGGT TTGGCTTTGGCTACACAGCA CTGGTTGTTTCTGGTGGGAT CGTTGGCTATGTAAAAACA GGCAGCGTGCCGTCCCTGG CTGCAGGGCTGCTCTTCGGC AGTCTAGCC	66	MEKPLFPLV PLHWFGFGY TALVVSGGI VGYVKTGSV PSLAAGLLF GSLA	128
SS-033	Secretion signal	ATGGGTCTGCTCCTTCCCCT GGCACTCTGCATCCTAGTCC TGTGC	67	MGLLLPLAL CILVLC	129
SS-034	Secretion signal	ATGGGGATCCAGACGAGCC CCGTCCTGCTGGCCTCCCTG GGGGTGGGGCTGGTCACTC TGCTCGGCCTGGCTGTGGGC	68	MGIQTSPVL LASLGVGLV TLLGLAVG	130
SS-035	Secretion signal	ATGTCGGACCTGCTACTACT GGGCCTGATTGGGGGCCTG	69	MSDLLLLGLI GGLTLLLLL	131

		ACTCTCTTACTGCTGCTGAC GCTGCTAGCCTTTGCC		TLLAFA	
SS-036	Secretion signal	ATGGAGACTGTGGTGATTGT TGCCATAGGTGTGCTGGCCA CCATGTTTCTGGCTTCGTTT GCAGCCTTGGTGCTGGTTTG CAGGCAG	70	METVVIVAI GVLATIFLAS FAALVLVCR Q	132
SS-037	Secretion signal	ATGCGCGGCTCTGTGGAGT GCACCTGGGGTTGGGGGCA CTGTGCCCCAGCCCCCTGC TCCTTTGGACTCTACTTCTG TTTGCAGCCCCATTTGGCCT GCTGGGG	71	MAGSVECT WGWGHCAP SPLLLWTLL LFAAPFGLL G	133
SS-038	Secretion signal	ATGATGCCGTCCCGTACCAA CCTGGCTACTGGAATCCCCA GTAGTAAAGTGAAATATTC AAGGCTCTCCAGCACAGAC GATGGCTACATTGACCTTCA GTTTAAGAAAACCCCTCCTA AGATCCCTTATAAGGCCATC GCACTTGCCACTGTGCTGTT TTTGATTGGCGCC	72	MMPSRTNLA TGIPSSKVKY SRLSSTDDG YIDLQFKKTP PKIPYKAIAL ATVLFLIGA	134
SS-039	Secretion signal	ATGGCCCTGCCCCAGATGTG TGACGGGAGCCACTTGGCC TCCACCCTCCGCTATTGCAT GACAGTCAGCGGCACAGTG GTTCTGGTGGCCGGGACGCT CTGCTTCGCT	73	MALPQMCD GSHLASTLR YCMTVSGTV VLVAGTLCF A	135
SS-041	Vrg-6	TGAAAAAGTGGTTCGTTGCT GCCGGCATCGGCGCTGCCG GACTCATGCTCTCCAGCGCC GCCA	74	MKKWFVAA GIGAGLLML SSAA	136
SS-042	PhoA	ATGAAACAGAGCACCATTG CGCTGGCGCTGCTGCCGCTG CTGTTTACCCCGGTGACCAA AGCG	75	MKQSTIALA LLPLLFTPVT KA	137
SS-043	OmpA	ATGAAAAAAACCGCGATTG CGATTGCGGTGGCGCTGGC GGGCTTTGCGACCGTGGCG CAGGCG	76	MKKTAIAIA VALAGFATV AQA	138
SS-044	STI	ATGAAAAAACTGATGCTGG CGATTTTTTTTAGCGTGCTG AGCTTTCCGAGCTTTAGCCA GAGC	77	MKKLMLAIF FSVLSFPSFS QS	139
SS-045	STII	ATGAAAAAAAACATTGCGT TTCTGCTGGCGAGCATGTTT GTGTTTAGCATTGCGACCAA CGCGTATGCG	78	MKKNIAFLL ASMFVFSIAT NAYA	140
SS-046	Amylase	ATGTTTGCGAAACGCTTTAA AACCAGCCTGCTGCCGCTGT	79	MFAKRFKTS LLPLFAGFLL	141

		TTGCGGGCTTTCTGCTGCTG TTTCATCTGGTGCTGGCGGG CCCGGCGGGCGGCGAGC		LFHLVLAGP AAAS	
SS-047	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCGCGGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	80	MRFPSIFTAV LFAASSALA	142
SS-048	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCACCGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	81	MRFPSIFTTV LFAASSALA	143
SS-049	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCAGCGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	82	MRFPSIFTSV LFAASSALA	144
SS-050	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCCATGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	83	MRFPSIFTHV LFAASSALA	145
SS-051	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCATTGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	84	MRFPSIFTIV LFAASSALA	146
SS-052	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCTTTGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	85	MRFPSIFTFV LFAASSALA	147
SS-053	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCGAAGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	86	MRFPSIFTEV LFAASSALA	148
SS-054	Alpha Factor	ATGCGCTTTCCGAGCATTTT TACCGGCGTGCTGTTTGCGG CGAGCAGCGCGCTGGCG	87	MRFPSIFTGV LFAASSALA	149
SS-055	Endoglucanase V	ATGCGTTCCTCCCCCTCCT CCGCTCCGCCGTTGTGGCCG CCCTGCCGGTGTGGCCCTT GCC	88	MRSSPLRS AVVAALPVL ALA	150
SS-056	Secretion signal	ATGGGCGCGGCGGCCGTGC GCTGGCACTTGTGCGTGCTG CTGGCCCTGGGCACACGCG GGCGGCTG	89	MGAAAVRW HLCVLLALG TRGRL	151
SS-057	Fungal	ATGAGGAGCTCCCTTGTGCT GTTCTTTGTCTCTGCGTGGA CGGCCTTGGCCAG	90	MRSSLVLF VSAWTALA	152
SS-058	Fibronectin	ATGCTCAGGGGTCCGGGAC CCGGGCGGCTGCTGCTGCTA GCAGTCCTGTGCCTGGGGA CATCGGTGCGCTGCACCGA AACCGGGAAGAGCAAGAGG	91	MLRGPGPGR LLLAVLCL GTSVRCTET GKSKR	153
SS-059	Fibronectin	ATGCTTAGGGGTCCGGGGC CCGGGCTGCTGCTGCTGGCC GTCCAGCTGGGGACAGCGG TGCCCTCCACG	92	MLRGPGPGL LLAVQCLG TAVPSTGA	154
SS-060	Fibronectin	ATGCGCCGGGGGGCCCTGA CCGGGCTGCTCCTGGTCCTG TGCTGAGTGTTGTGCTACG	93	MRRGALTGL LLVLCLSVV LRAAPSATS	155

		TGCAGCCCCCTCTGCAACAA GCAAGAAGCGCAGG		KKRR	
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[000227] In the table, SS is secretion signal and MLS is mitochondrial leader signal. The primary constructs or mmRNA of the present invention may be designed to encode any of the signal sequences of SEQ ID NOs 94-155, or fragments or variants thereof. These sequences may be included at the beginning of the polypeptide coding region, in the middle or at the terminus or alternatively into a flanking region. Further, any of the polynucleotide primary constructs of the present invention may also comprise one or more of the sequences defined by SEQ ID NOs 32-93. These may be in the first region or either flanking region.

[000228] Additional signal sequences which may be utilized in the present invention include those taught in, for example, databases such as those found at <http://www.signalpeptide.de/> or <http://proline.bic.nus.edu.sg/spdb/>. Those described in US Patents 8,124,379; 7,413,875 and 7,385,034 are also within the scope of the invention and the contents of each are incorporated herein by reference in their entirety.

Target Selection

[000229] According to the present invention, the primary constructs comprise at least a first region of linked nucleosides encoding at least one polypeptide of interest. The polypeptides of interest or “Targets” of the present invention are listed in Table 6. Shown in Table 6, in addition to the name and description of the gene encoding the polypeptide of interest (Target Description) are the ENSEMBL Transcript ID (ENST), the ENSEMBL Protein ID (ENSP) and when available the optimized open reading frame sequence ID (Optimized ORF SEQ ID). For any particular gene there may exist one or more variants or isoforms. Where these exist, they are shown in the table as well. It will be appreciated by those of skill in the art that disclosed in the Table are potential flanking regions. These are encoded in each ENST transcript either to the 5’ (upstream) or 3’ (downstream) of the ORF or coding region. The coding region is definitively and specifically disclosed by teaching the ENSP sequence. Consequently, the sequences taught flanking that encoding the protein are considered flanking regions. It is also possible to further characterize the 5’ and 3’ flanking regions by utilizing one or more

available databases or algorithms. Databases have annotated the features contained in the flanking regions of the ENST transcripts and these are available in the art.

Table 6. Nuclear Proteins

Target No	Target Description	ENST	Trans SEQ ID NO	ENSP	Peptide SEQ ID NO	Optimized ORF SEQ ID
1	achaete-scute complex homolog 3 (Drosophila)	325884	156	318846	3858	7560, 11262, 14964, 18666, 22368
2	achaete-scute complex homolog 3 (Drosophila)	531618	157	435770	3859	7561, 11263, 14965, 18667, 22369
3	achaete-scute complex homolog 4 (Drosophila)	342331	158	345420	3860	7562, 11264, 14966, 18668, 22370
4	activator of basal transcription 1	274849	159	274849	3861	7563, 11265, 14967, 18669, 22371
5	ADNP homeobox 2	262198	160	262198	3862	7564, 11266, 14968, 18670, 22372
6	ADNP homeobox 2	559951	161	453275	3863	7565, 11267, 14969, 18671, 22373
7	AE binding protein 2	266508	162	266508	3864	7566, 11268, 14970, 18672, 22374
8	AE binding protein 2	360995	163	354267	3865	7567, 11269, 14971, 18673, 22375

9	AE binding protein 2	398864	164	381840	3866	7568, 11270, 14972, 18674, 22376
10	AE binding protein 2	435841	165	399412	3867	7569, 11271, 14973, 18675, 22377
11	AF4/FMR2 family, member 3	317233	166	317421	3868	7570, 11272, 14974, 18676, 22378
12	AF4/FMR2 family, member 3	356421	167	348793	3869	7571, 11273, 14975, 18677, 22379
13	AF4/FMR2 family, member 3	409236	168	387207	3870	7572, 11274, 14976, 18678, 22380
14	AF4/FMR2 family, member 3	416492	169	395068	3871	7573, 11275, 14977, 18679, 22381
15	AF4/FMR2 family, member 3	423966	170	396582	3872	7574, 11276, 14978, 18680, 22382
16	AF4/FMR2 family, member 3	424600	171	411383	3873	7575, 11277, 14979, 18681, 22383
17	AF4/FMR2 family, member 3	427118	172	416131	3874	7576, 11278, 14980, 18682, 22384
18	AF4/FMR2 family, member 3	432037	173	406484	3875	7577, 11279, 14981, 18683, 22385

19	AF4/FMR2 family, member 3	432288	174	392551	3876	7578, 11280, 14982, 18684, 22386
20	AF4/FMR2 family, member 3	433370	175	407254	3877	7579, 11281, 14983, 18685, 22387
21	AF4/FMR2 family, member 3	441400	176	399795	3878	7580, 11282, 14984, 18686, 22388
22	AF4/FMR2 family, member 3	444786	177	388014	3879	7581, 11283, 14985, 18687, 22389
23	AHNAK nucleoprotein 2	333244	178	353114	3880	7582, 11284, 14986, 18688, 22390
24	akirin 1	372975	179	362066	3881	7583, 11285, 14987, 18689, 22391
25	akirin 1	432648	180	392678	3882	7584, 11286, 14988, 18690, 22392
26	akirin 1	446189	181	389866	3883	7585, 11287, 14989, 18691, 22393
27	akirin 2	257787	182	257787	3884	7586, 11288, 14990, 18692, 22394
28	alpha-kinase 3	258888	183	258888	3885	7587, 11289, 14991, 18693, 22395

29	anaphase promoting complex subunit 13	354910	184	346987	3886	7588, 11290, 14992, 18694, 22396
30	anaphase promoting complex subunit 13	510994	185	421842	3887	7589, 11291, 14993, 18695, 22397
31	anaphase promoting complex subunit 13	511751	186	421760	3888	7590, 11292, 14994, 18696, 22398
32	anaphase promoting complex subunit 13	514612	187	427327	3889	7591, 11293, 14995, 18697, 22399
33	ankyrin repeat and LEM domain containing 1	404261	188	384753	3890	7592, 11294, 14996, 18698, 22400
34	ankyrin repeat and LEM domain containing 1	433424	189	394460	3891	7593, 11295, 14997, 18699, 22401
35	ankyrin repeat and LEM domain containing 1	438921	190	415429	3892	7594, 11296, 14998, 18700, 22402
36	ankyrin repeat and LEM domain containing 1	394458	191	377971	3893	7595, 11297, 14999, 18701, 22403
37	ankyrin repeat domain 49	302755	192	303518	3894	7596, 11298, 15000, 18702, 22404
38	ankyrin repeat domain 49	544612	193	440396	3895	7597, 11299, 15001, 18703, 22405

39	aquarius homolog (mouse)	156471	194	156471	3896	7598, 11300, 15002, 18704, 22406, 26070, 26085
40	archaelysin family metallopeptidase 2	580753	195	463012	3897	7599, 11301, 15003, 18705, 22407
41	ARP8 actin-related protein 8 homolog (yeast)	231909	196	231909	3898	7600, 11302, 15004, 18706, 22408
42	ARP8 actin-related protein 8 homolog (yeast)	335754	197	336842	3899	7601, 11303, 15005, 18707, 22409
43	aryl hydrocarbon receptor nuclear translocator	354396	198	346372	3900	7602, 11304, 15006, 18708, 22410
44	aryl hydrocarbon receptor nuclear translocator	358595	199	351407	3901	7603, 11305, 15007, 18709, 22411, 26100- 26153
45	aryl hydrocarbon receptor nuclear translocator-like 2	261178	200	261178	3902	7604, 11306, 15008, 18710, 22412
46	aryl hydrocarbon receptor nuclear translocator-like 2	266503	201	266503	3903	7605, 11307, 15009, 18711, 22413
47	aryl hydrocarbon receptor nuclear translocator-like 2	311001	202	312247	3904	7606, 11308, 15010, 18712, 22414

48	aryl hydrocarbon receptor nuclear translocator-like 2	395901	203	379238	3905	7607, 11309, 15011, 18713, 22415
49	aryl hydrocarbon receptor nuclear translocator-like 2	542388	204	445836	3906	7608, 11310, 15012, 18714, 22416
50	aryl hydrocarbon receptor nuclear translocator-like 2	544915	205	442438	3907	7609, 11311, 15013, 18715, 22417
51	AT rich interactive domain 1A (SWI-like)	324856	206	320485	3908	7610, 11312, 15014, 18716, 22418
52	AT rich interactive domain 1A (SWI-like)	374152	207	363267	3909	7611, 11313, 15015, 18717, 22419
53	AT rich interactive domain 1A (SWI-like)	457599	208	387636	3910	7612, 11314, 15016, 18718, 22420
54	AT rich interactive domain 1A (SWI-like)	540690	209	442437	3911	7613, 11315, 15017, 18719, 22421
55	AT rich interactive domain 1B (SWI1-like)	275248	210	275248	3912	7614, 11316, 15018, 18720, 22422
56	AT rich interactive domain 1B (SWI1-like)	346085	211	344546	3913	7615, 11317, 15019, 18721, 22423
57	AT rich interactive domain 1B (SWI1-like)	350026	212	55163	3914	7616, 11318, 15020, 18722, 22424

58	AT rich interactive domain 1B (SWI1-like)	354354	213	346322	3915	7617, 11319, 15021, 18723, 22425
59	AT rich interactive domain 1B (SWI1-like)	367148	214	356116	3916	7618, 11320, 15022, 18724, 22426
60	AT rich interactive domain 1B (SWI1-like)	400790	215	383596	3917	7619, 11321, 15023, 18725, 22427
61	AT rich interactive domain 1B (SWI1-like)	535255	216	438185	3918	7620, 11322, 15024, 18726, 22428
62	AT rich interactive domain 2 (ARID, RFX-like)	334344	217	335044	3919	7621, 11323, 15025, 18727, 22429
63	AT rich interactive domain 2 (ARID, RFX-like)	338636	218	339739	3920	7622, 11324, 15026, 18728, 22430
64	AT rich interactive domain 2 (ARID, RFX-like)	444670	219	397307	3921	7623, 11325, 15027, 18729, 22431
65	AT rich interactive domain 2 (ARID, RFX-like)	549153	220	449689	3922	7624, 11326, 15028, 18730, 22432
66	ataxin 7-like 3	389384	221	374035	3923	7625, 11327, 15029, 18731, 22433
67	ataxin 7-like 3	454077	222	397259	3924	7626, 11328, 15030, 18732, 22434

68	ataxin 7-like 3	541672	223	441645	3925	7627, 11329, 15031, 18733, 22435
69	AT-hook transcription factor	223791	224	223791	3926	7628, 11330, 15032, 18734, 22436
70	AT-hook transcription factor	307564	225	303769	3927	7629, 11331, 15033, 18735, 22437
71	AT-hook transcription factor	312033	226	309222	3928	7630, 11332, 15034, 18736, 22438
72	AT-hook transcription factor	320310	227	314538	3929	7631, 11333, 15035, 18737, 22439
73	AT-hook transcription factor	374075	228	363188	3930	7632, 11334, 15036, 18738, 22440
74	AT-hook transcription factor	374079	229	363192	3931	7633, 11335, 15037, 18739, 22441
75	AT-hook transcription factor	374088	230	363201	3932	7634, 11336, 15038, 18740, 22442
76	AT-hook transcription factor	394574	231	378075	3933	7635, 11337, 15039, 18741, 22443
77	AT-hook transcription factor	394582	232	378083	3934	7636, 11338, 15040, 18742, 22444

78	ATM interactor	299575	233	299575	3935	7637, 11339, 15041, 18743, 22445
79	ATM interactor	539819	234	440788	3936	7638, 11340, 15042, 18744, 22446
80	atonal homolog 8 (Drosophila)	306279	235	304676	3937	7639, 11341, 15043, 18745, 22447
81	BarH-like homeobox 2	370445	236	359474	3938	7640, 11342, 15044, 18746, 22448
82	basic charge, Y-linked, 2B	382392	237	371829	3939	7641, 11343, 15045, 18747, 22449
83	basic charge, Y-linked, 2C	382287	238	371724	3940	7642, 11344, 15046, 18748, 22450
84	basic helix-loop-helix family, member a15	314018	239	326391	3941	7643, 11345, 15047, 18749, 22451
85	basic helix-loop-helix family, member a9	391429	240	375248	3942	7644, 11346, 15048, 18750, 22452
86	basic leucine zipper transcription factor, ATF- like 2	301887	241	301887	3943	7645, 11347, 15049, 18751, 22453
87	BMP2 inducible kinase	264889	242	264889	3944	7646, 11348, 15050, 18752, 22454

88	BMP2 inducible kinase	335016	243	334836	3945	7647, 11349, 15051, 18753, 22455
89	BMP2 inducible kinase	502871	244	421768	3946	7648, 11350, 15052, 18754, 22456
90	BMS1 homolog, ribosome assembly protein (yeast)	374518	245	363642	3947	7649, 11351, 15053, 18755, 22457
91	bobby sox homolog (Drosophila)	325767	246	319742	3948	7650, 11352, 15054, 18756, 22458
92	bobby sox homolog (Drosophila)	325805	247	319974	3949	7651, 11353, 15055, 18757, 22459
93	bobby sox homolog (Drosophila)	402163	248	385518	3950	7652, 11354, 15056, 18758, 22460
94	bobby sox homolog (Drosophila)	406780	249	385530	3951	7653, 11355, 15057, 18759, 22461
95	bobby sox homolog (Drosophila)	413213	250	403806	3952	7654, 11356, 15058, 18760, 22462
96	bobby sox homolog (Drosophila)	415149	251	408358	3953	7655, 11357, 15059, 18761, 22463
97	bobby sox homolog (Drosophila)	425868	252	412390	3954	7656, 11358, 15060, 18762, 22464

98	bobby sox homolog (Drosophila)	427402	253	413320	3955	7657, 11359, 15061, 18763, 22465
99	bobby sox homolog (Drosophila)	429270	254	414673	3956	7658, 11360, 15062, 18764, 22466
100	bobby sox homolog (Drosophila)	437908	255	403692	3957	7659, 11361, 15063, 18765, 22467
101	bobby sox homolog (Drosophila)	449213	256	407662	3958	7660, 11362, 15064, 18766, 22468
102	bobby sox homolog (Drosophila)	449271	257	406554	3959	7661, 11363, 15065, 18767, 22469
103	bobby sox homolog (Drosophila)	449335	258	408297	3960	7662, 11364, 15066, 18768, 22470
104	bobby sox homolog (Drosophila)	454540	259	396373	3961	7663, 11365, 15067, 18769, 22471
105	bobby sox homolog (Drosophila)	456419	260	413274	3962	7664, 11366, 15068, 18770, 22472
106	bobby sox homolog (Drosophila)	456817	261	400543	3963	7665, 11367, 15069, 18771, 22473
107	bobby sox homolog (Drosophila)	457496	262	404943	3964	7666, 11368, 15070, 18772, 22474

108	bobby sox homolog (Drosophila)	458458	263	404654	3965	7667, 11369, 15071, 18773, 22475
109	BRCA1-associated ATM activator 1	340611	264	339637	3966	7668, 11370, 15072, 18774, 22476
110	breast cancer metastasis- suppressor 1-like	216807	265	216807	3967	7669, 11371, 15073, 18775, 22477
111	breast cancer metastasis- suppressor 1-like	543183	266	443781	3968	7670, 11372, 15074, 18776, 22478
112	bromodomain containing 1	216267	267	216267	3969	7671, 11373, 15075, 18777, 22479
113	bromodomain containing 1	342989	268	345886	3970	7672, 11374, 15076, 18778, 22480
114	bromodomain containing 1	404034	269	384076	3971	7673, 11375, 15077, 18779, 22481
115	bromodomain containing 1	419212	270	399110	3972	7674, 11376, 15078, 18780, 22482
116	bromodomain containing 1	457780	271	410042	3973	7675, 11377, 15079, 18781, 22483
117	bromodomain containing 1	542442	272	437514	3974	7676, 11378, 15080, 18782, 22484

118	bromodomain containing 3	303407	273	305918	3975	7677, 11379, 15081, 18783, 22485
119	bromodomain containing 3	357885	274	350557	3976	7678, 11380, 15082, 18784, 22486
120	bromodomain containing 3	371834	275	360900	3977	7679, 11381, 15083, 18785, 22487
121	bromodomain containing 3	371842	276	360908	3978	7680, 11382, 15084, 18786, 22488
122	bromodomain containing 3	433041	277	406749	3979	7681, 11383, 15085, 18787, 22489
123	bromodomain containing 3	540795	278	442302	3980	7682, 11384, 15086, 18788, 22490
124	BRX1, biogenesis of ribosomes, homolog (<i>S. cerevisiae</i>)	336767	279	338862	3981	7683, 11385, 15087, 18789, 22491
125	BTB (POZ) domain containing 10	278174	280	278174	3982	7684, 11386, 15088, 18790, 22492
126	BTB (POZ) domain containing 10	526841	281	431572	3983	7685, 11387, 15089, 18791, 22493
127	BTB (POZ) domain containing 10	529708	282	434579	3984	7686, 11388, 15090, 18792, 22494

128	BTB (POZ) domain containing 8	342818	283	343686	3985	7687, 11389, 15091, 18793, 22495
129	BTB (POZ) domain containing 8	370382	284	359408	3986	7688, 11390, 15092, 18794, 22496
130	BTB (POZ) domain containing 8	540648	285	443397	3987	7689, 11391, 15093, 18795, 22497
131	BUD31 homolog (S. cerevisiae)	222969	286	222969	3988	7690, 11392, 15094, 18796, 22498
132	BUD31 homolog (S. cerevisiae)	403633	287	386023	3989	7691, 11393, 15095, 18797, 22499
133	BUD31 homolog (S. cerevisiae)	456893	288	395269	3990	7692, 11394, 15096, 18798, 22500
134	cAMP responsive element binding protein 5	357727	289	350359	3991	7693, 11395, 15097, 18799, 22501
135	cAMP responsive element binding protein 5	396298	290	379592	3992	7694, 11396, 15098, 18800, 22502
136	cAMP responsive element binding protein 5	396299	291	379593	3993	7695, 11397, 15099, 18801, 22503
137	cAMP responsive element binding protein 5	396300	292	379594	3994	7696, 11398, 15100, 18802, 22504

138	cAMP responsive element binding protein 5	409603	293	387197	3995	7697, 11399, 15101, 18803, 22505
139	cAMP responsive element binding protein 5	424599	294	394088	3996	7698, 11400, 15102, 18804, 22506
140	CCAAT/enhancer binding protein (C/EBP), gamma	284000	295	284000	3997	7699, 11401, 15103, 18805, 22507
141	CCDC169-SOHLH2 readthrough	511166	296	421868	3998	7700, 11402, 15104, 18806, 22508
142	CD3e molecule, epsilon associated protein	309424	297	310966	3999	7701, 11403, 15105, 18807, 22509
143	CDC-like kinase 4	316308	298	316948	4000	7702, 11404, 15106, 18808, 22510
144	CDC-like kinase 4	520957	299	430892	4001	7703, 11405, 15107, 18809, 22511
145	CDC-like kinase 4	521621	300	428651	4002	7704, 11406, 15108, 18810, 22512
146	CDC-like kinase 4	522136	301	429195	4003	7705, 11407, 15109, 18811, 22513
147	CDC-like kinase 4	522556	302	430216	4004	7706, 11408, 15110, 18812, 22514

148	CDC-like kinase 4	536763	303	442780	4005	7707, 11409, 15111, 18813, 22515
149	CDKN1A interacting zinc finger protein 1	277465	304	277465	4006	7708, 11410, 15112, 18814, 22516
150	CDKN1A interacting zinc finger protein 1	324544	305	321780	4007	7709, 11411, 15113, 18815, 22517
151	CDKN1A interacting zinc finger protein 1	325721	306	320374	4008	7710, 11412, 15114, 18816, 22518
152	CDKN1A interacting zinc finger protein 1	357558	307	350169	4009	7711, 11413, 15115, 18817, 22519
153	CDKN1A interacting zinc finger protein 1	372938	308	362029	4010	7712, 11414, 15116, 18818, 22520
154	CDKN1A interacting zinc finger protein 1	372941	309	362032	4011	7713, 11415, 15117, 18819, 22521
155	CDKN1A interacting zinc finger protein 1	372948	310	362039	4012	7714, 11416, 15118, 18820, 22522
156	CDKN1A interacting zinc finger protein 1	372954	311	362045	4013	7715, 11417, 15119, 18821, 22523
157	CDKN1A interacting zinc finger protein 1	393608	312	377232	4014	7716, 11418, 15120, 18822, 22524

158	CDKN1A interacting zinc finger protein 1	415526	313	398011	4015	7717, 11419, 15121, 18823, 22525
159	CDKN1A interacting zinc finger protein 1	420484	314	407265	4016	7718, 11420, 15122, 18824, 22526
160	CDKN1A interacting zinc finger protein 1	537314	315	438641	4017	7719, 11421, 15123, 18825, 22527
161	CDKN1A interacting zinc finger protein 1	538431	316	439244	4018	7720, 11422, 15124, 18826, 22528
162	CDKN1A interacting zinc finger protein 1	541172	317	445057	4019	7721, 11423, 15125, 18827, 22529
163	CDKN2A interacting protein	504169	318	427108	4020	7722, 11424, 15126, 18828, 22530
164	CENPB DNA-binding domains containing 1	314994	319	393854	4021	7723, 11425, 15127, 18829, 22531
165	centromere protein W	368325	320	357308	4022	7724, 11426, 15128, 18830, 22532
166	centromere protein W	368326	321	357309	4023	7725, 11427, 15129, 18831, 22533
167	centromere protein W	368328	322	357311	4024	7726, 11428, 15130, 18832, 22534

168	chromatin accessibility complex 1	220913	323	220913	4025	7727, 11429, 15131, 18833, 22535
169	chromatin assembly factor 1, subunit A (p150)	301280	324	301280	4026	7728, 11430, 15132, 18834, 22536
170	chromatin assembly factor 1, subunit A (p150)	344143	325	341884	4027	7729, 11431, 15133, 18835, 22537
171	chromatin assembly factor 1, subunit A (p150)	535117	326	437930	4028	7730, 11432, 15134, 18836, 22538
172	chromatin complexes subunit BAP18 isoform 2	439424	327	411851	4029	7731, 11433, 15135, 18837, 22539
173	chromatin complexes subunit BAP18 isoform 2	546495	328	448598	4030	7732, 11434, 15136, 18838, 22540
174	chromatin complexes subunit BAP18 isoform 2	552402	329	448746	4031	7733, 11435, 15137, 18839, 22541
175	chromobox homolog 3	409747	330	387348	4032	7734, 11436, 15138, 18840, 22542
176	chromobox homolog 6	216083	331	216083	4033	7735, 11437, 15139, 18841, 22543
177	chromobox homolog 6	407418	332	384490	4034	7736, 11438, 15140, 18842, 22544

178	chromobox homolog 8	269385	333	269385	4035	7737, 11439, 15141, 18843, 22545
179	chromodomain helicase DNA binding protein 6	309279	334	308684	4036	7738, 11440, 15142, 18844, 22546
180	chromodomain helicase DNA binding protein 6	373222	335	362319	4037	7739, 11441, 15143, 18845, 22547
181	chromodomain helicase DNA binding protein 6	373233	336	362330	4038	7740, 11442, 15144, 18846, 22548
182	chromodomain helicase DNA binding protein 6	440647	337	392503	4039	7741, 11443, 15145, 18847, 22549
183	chromodomain helicase DNA binding protein 6	440697	338	404637	4040	7742, 11444, 15146, 18848, 22550
184	chromodomain protein, Y- like 2	299564	339	299564	4041	7743, 11445, 15147, 18849, 22551
185	chromodomain protein, Y- linked, 1B	306882	340	303178	4042	7744, 11446, 15148, 18850, 22552
186	chromodomain protein, Y- linked, 1B	382407	341	371844	4043	7745, 11447, 15149, 18851, 22553
187	chromodomain protein, Y- linked, 2B	382867	342	372319	4044	7746, 11448, 15150, 18852, 22554

188	chromodomain protein, Y-linked, 2B	544303	343	441273	4045	7747, 11449, 15151, 18853, 22555
189	chromosome 1 open reading frame 61	310027	344	310651	4046	7748, 11450, 15152, 18854, 22556
190	chromosome 1 open reading frame 61	357975	345	350661	4047	7749, 11451, 15153, 18855, 22557
191	chromosome 1 open reading frame 61	368242	346	357225	4048	7750, 11452, 15154, 18856, 22558
192	chromosome 1 open reading frame 61	368243	347	357226	4049	7751, 11453, 15155, 18857, 22559
193	chromosome 1 open reading frame 61	400991	348	383776	4050	7752, 11454, 15156, 18858, 22560
194	chromosome 10 open reading frame 137	337623	349	336727	4051	7753, 11455, 15157, 18859, 22561
195	chromosome 10 open reading frame 137	356792	350	349244	4052	7754, 11456, 15158, 18860, 22562
196	chromosome 10 open reading frame 137	368813	351	357803	4053	7755, 11457, 15159, 18861, 22563
197	chromosome 10 open reading frame 137	392732	352	376491	4054	7756, 11458, 15160, 18862, 22564

198	chromosome 10 open reading frame 140	444772	353	442432	4055	7757, 11459, 15161, 18863, 22565
199	chromosome 10 open reading frame 140	449193	354	410041	4056	7758, 11460, 15162, 18864, 22566
200	chromosome 11 open reading frame 1	260276	355	260276	4057	7759, 11461, 15163, 18865, 22567
201	chromosome 11 open reading frame 54	331239	356	331209	4058	7760, 11462, 15164, 18866, 22568
202	chromosome 11 open reading frame 54	354421	357	346403	4059	7761, 11463, 15165, 18867, 22569
203	chromosome 11 open reading frame 54	524485	358	435107	4060	7762, 11464, 15166, 18868, 22570
204	chromosome 11 open reading frame 54	526335	359	435231	4061	7763, 11465, 15167, 18869, 22571
205	chromosome 11 open reading frame 54	527003	360	434291	4062	7764, 11466, 15168, 18870, 22572
206	chromosome 11 open reading frame 54	527363	361	435729	4063	7765, 11467, 15169, 18871, 22573
207	chromosome 11 open reading frame 54	528099	362	435113	4064	7766, 11468, 15170, 18872, 22574

208	chromosome 11 open reading frame 54	528288	363	433721	4065	7767, 11469, 15171, 18873, 22575
209	chromosome 11 open reading frame 54	530279	364	434065	4066	7768, 11470, 15172, 18874, 22576
210	chromosome 11 open reading frame 54	530620	365	434382	4067	7769, 11471, 15173, 18875, 22577
211	chromosome 11 open reading frame 54	533585	366	435204	4068	7770, 11472, 15174, 18876, 22578
212	chromosome 11 open reading frame 54	540113	367	442094	4069	7771, 11473, 15175, 18877, 22579
213	chromosome 12 open reading frame 12	358859	368	351727	4070	7772, 11474, 15176, 18878, 22580
214	chromosome 12 open reading frame 32	366285	369	444654	4071	7773, 11475, 15177, 18879, 22581
215	chromosome 12 open reading frame 32	489288	370	438590	4072	7774, 11476, 15178, 18880, 22582
216	chromosome 12 open reading frame 32	538636	371	442319	4073	7775, 11477, 15179, 18881, 22583
217	chromosome 12 open reading frame 32	538700	372	445936	4074	7776, 11478, 15180, 18882, 22584

218	chromosome 14 open reading frame 43	286523	373	286523	4075	7777, 11479, 15181, 18883, 22585
219	chromosome 14 open reading frame 43	394071	374	377634	4076	7778, 11480, 15182, 18884, 22586
220	chromosome 14 open reading frame 43	421708	375	401344	4077	7779, 11481, 15183, 18885, 22587
221	chromosome 14 open reading frame 43	423556	376	407767	4078	7780, 11482, 15184, 18886, 22588
222	chromosome 14 open reading frame 43	435371	377	402380	4079	7781, 11483, 15185, 18887, 22589
223	chromosome 15 open reading frame 23	249776	378	249776	4080	7782, 11484, 15186, 18888, 22590
224	chromosome 15 open reading frame 23	416151	379	391233	4081	7783, 11485, 15187, 18889, 22591
225	chromosome 15 open reading frame 23	448395	380	393001	4082	7784, 11486, 15188, 18890, 22592
226	chromosome 15 open reading frame 29	256544	381	256544	4083	7785, 11487, 15189, 18891, 22593
227	chromosome 15 open reading frame 29	557877	382	452963	4084	7786, 11488, 15190, 18892, 22594

228	chromosome 15 open reading frame 29	559464	383	453283	4085	7787, 11489, 15191, 18893, 22595
229	chromosome 15 open reading frame 29	559515	384	453991	4086	7788, 11490, 15192, 18894, 22596
230	chromosome 15 open reading frame 29	560108	385	453996	4087	7789, 11491, 15193, 18895, 22597
231	chromosome 16 open reading frame 88	219837	386	219837	4088	7790, 11492, 15194, 18896, 22598
232	chromosome 17 open reading frame 49	293804	387	293804	4089	7791, 11493, 15195, 18897, 22599
233	chromosome 17 open reading frame 49	455303	388	407214	4090	7792, 11494, 15196, 18898, 22600
234	chromosome 17 open reading frame 79	302362	389	304327	4091	7793, 11495, 15197, 18899, 22601
235	chromosome 17 open reading frame 79	378634	390	367901	4092	7794, 11496, 15198, 18900, 22602
236	chromosome 19 open reading frame 29	221899	391	221899	4093	7795, 11497, 15199, 18901, 22603
237	chromosome 19 open reading frame 29	248420	392	248420	4094	7796, 11498, 15200, 18902, 22604

238	chromosome 19 open reading frame 29	429344	393	415078	4095	7797, 11499, 15201, 18903, 22605
239	chromosome 19 open reading frame 29	446452	394	411037	4096	7798, 11500, 15202, 18904, 22606
240	chromosome 19 open reading frame 33	301246	395	301246	4097	7799, 11501, 15203, 18905, 22607
241	chromosome 2 open reading frame 51	303254	396	307142	4098	7800, 11502, 15204, 18906, 22608
242	chromosome 4 open reading frame 27	393381	397	406598	4099	7801, 11503, 15205, 18907, 22609
243	chromosome 7 open reading frame 70	313324	398	317289	4100	7802, 11504, 15206, 18908, 22610
244	chromosome 7 open reading frame 70	524898	399	432444	4101	7803, 11505, 15207, 18909, 22611
245	chromosome 7 open reading frame 70	530143	400	436886	4102	7804, 11506, 15208, 18910, 22612
246	chromosome 8 open reading frame 80	341513	401	345031	4103	7805, 11507, 15209, 18911, 22613
247	chromosome 8 open reading frame 80	413272	402	408697	4104	7806, 11508, 15210, 18912, 22614

248	claspin	251195	403	251195	4105	7807, 11509, 15211, 18913, 22615
249	claspin	318121	404	312995	4106	7808, 11510, 15212, 18914, 22616
250	claspin	373220	405	362317	4107	7809, 11511, 15213, 18915, 22617
251	claspin	544356	406	442335	4108	7810, 11512, 15214, 18916, 22618
252	class II, major histocompatibility complex, transactivator	324288	407	316328	4109	7811, 11513, 15215, 18917, 22619
253	class II, major histocompatibility complex, transactivator	381835	408	371257	4110	7812, 11514, 15216, 18918, 22620
254	class II, major histocompatibility complex, transactivator	388910	409	373562	4111	7813, 11515, 15217, 18919, 22621
255	class II, major histocompatibility complex, transactivator	537380	410	446228	4112	7814, 11516, 15218, 18920, 22622
256	cleavage and polyadenylation specific factor 1, 160kDa	349769	411	339353	4113	7815, 11517, 15219, 18921, 22623
257	cleavage and polyadenylation specific factor 2, 100kDa	298875	412	298875	4114	7816, 11518, 15220, 18922, 22624

258	cleavage and polyadenylation specific factor 2, 100kDa	553427	413	451418	4115	7817, 11519, 15221, 18923, 22625
259	cleavage and polyadenylation specific factor 3, 73kDa	238112	414	238112	4116	7818, 11520, 15222, 18924, 22626
260	cleavage and polyadenylation specific factor 3, 73kDa	427001	415	390264	4117	7819, 11521, 15223, 18925, 22627
261	cleavage and polyadenylation specific factor 3, 73kDa	540142	416	440140	4118	7820, 11522, 15224, 18926, 22628
262	cleavage and polyadenylation specific factor 7, 59kDa	340437	417	345412	4119	7821, 11523, 15225, 18927, 22629
263	cleavage and polyadenylation specific factor 7, 59kDa	394888	418	378352	4120	7822, 11524, 15226, 18928, 22630
264	cleavage and polyadenylation specific factor 7, 59kDa	413232	419	393828	4121	7823, 11525, 15227, 18929, 22631
265	cleavage and polyadenylation specific factor 7, 59kDa	439958	420	397203	4122	7824, 11526, 15228, 18930, 22632
266	cleavage and polyadenylation specific factor 7, 59kDa	448745	421	407394	4123	7825, 11527, 15229, 18931, 22633
267	cleavage and polyadenylation specific factor 7, 59kDa	449811	422	392400	4124	7826, 11528, 15230, 18932, 22634

268	cleavage and polyadenylation specific factor 7, 59kDa	450000	423	391359	4125	7827, 11529, 15231, 18933, 22635
269	cleavage and polyadenylation specific factor 7, 59kDa	539952	424	438381	4126	7828, 11530, 15232, 18934, 22636
270	cleavage stimulation factor, 3' pre-RNA, subunit 1, 50kDa	217109	425	217109	4127	7829, 11531, 15233, 18935, 22637
271	cleavage stimulation factor, 3' pre-RNA, subunit 1, 50kDa	415828	426	387968	4128	7830, 11532, 15234, 18936, 22638
272	cleavage stimulation factor, 3' pre-RNA, subunit 1, 50kDa	425890	427	398984	4129	7831, 11533, 15235, 18937, 22639
273	cleavage stimulation factor, 3' pre-RNA, subunit 1, 50kDa	428552	428	405171	4130	7832, 11534, 15236, 18938, 22640
274	cleavage stimulation factor, 3' pre-RNA, subunit 1, 50kDa	452950	429	409035	4131	7833, 11535, 15237, 18939, 22641
275	cleavage stimulation factor, 3' pre-RNA, subunit 2, 64kDa	372972	430	362063	4132	7834, 11536, 15238, 18940, 22642
276	cleavage stimulation factor, 3' pre-RNA, subunit 2, 64kDa	458320	431	407000	4133	7835, 11537, 15239, 18941, 22643
277	cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa	323959	432	315791	4134	7836, 11538, 15240, 18942, 22644

278	cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa	431742	433	393064	4135	7837, 11539, 15241, 18943, 22645
279	cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa	438862	434	388711	4136	7838, 11540, 15242, 18944, 22646
280	cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa	524775	435	431903	4137	7839, 11541, 15243, 18945, 22647
281	cleavage stimulation factor, 3' pre-RNA, subunit 3, 77kDa	537832	436	439860	4138	7840, 11542, 15244, 18946, 22648
282	CLK4-associating serine/arginine rich protein	221455	437	221455	4139	7841, 11543, 15245, 18947, 22649
283	CLK4-associating serine/arginine rich protein	391952	438	375814	4140	7842, 11544, 15246, 18948, 22650
284	CLK4-associating serine/arginine rich protein	391953	439	375815	4141	7843, 11545, 15247, 18949, 22651
285	CLK4-associating serine/arginine rich protein	544944	440	438702	4142	7844, 11546, 15248, 18950, 22652
286	clusterin associated protein 1	341633	441	344392	4143	7845, 11547, 15249, 18951, 22653
287	clusterin associated protein 1	417763	442	388642	4144	7846, 11548, 15250, 18952, 22654

288	clusterin associated protein 1	445795	443	397710	4145	7847, 11549, 15251, 18953, 22655
289	clusterin associated protein 1	576634	444	460850	4146	7848, 11550, 15252, 18954, 22656
290	coagulation factor VIII-associated 1	369446	445	358456	4147	7849, 11551, 15253, 18955, 22657
291	coagulation factor VIII-associated 2	369505	446	358518	4148	7850, 11552, 15254, 18956, 22658
292	coagulation factor VIII-associated 3	369445	447	358454	4149	7851, 11553, 15255, 18957, 22659
293	coiled-coil domain containing 110	307588	448	306776	4150	7852, 11554, 15256, 18958, 22660
294	coiled-coil domain containing 110	393540	449	377172	4151	7853, 11555, 15257, 18959, 22661
295	coiled-coil domain containing 59	256151	450	256151	4152	7854, 11556, 15258, 18960, 22662
296	coiled-coil domain containing 86	227520	451	227520	4153	7855, 11557, 15259, 18961, 22663
297	coiled-coil domain containing 86	339492	452	343680	4154	7856, 11558, 15260, 18962, 22664

298	coiled-coil domain containing 86	545580	453	440906	4155	7857, 11559, 15261, 18963, 22665
299	CREB/ATF bZIP transcription factor	398294	454	381342	4156	7858, 11560, 15262, 18964, 22666
300	CREB/ATF bZIP transcription factor	490820	455	434281	4157	7859, 11561, 15263, 18965, 22667
301	CREB/ATF bZIP transcription factor	527447	456	433459	4158	7860, 11562, 15264, 18966, 22668
302	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase 2	398073	457	381148	4159	7861, 11563, 15265, 18967, 22669
303	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase-like	273179	458	273179	4160	7862, 11564, 15266, 18968, 22670
304	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) small phosphatase-like	443503	459	398288	4161	7863, 11565, 15267, 18969, 22671
305	Ctr9, Paf1/RNA polymerase II complex component, homolog (<i>S. cerevisiae</i>)	361367	460	355013	4162	7864, 11566, 15268, 18970, 22672
306	cullin-associated and neddylation-dissociated 1	299218	461	299218	4163	7865, 11567, 15269, 18971, 22673
307	cullin-associated and neddylation-dissociated 1	540047	462	444141	4164	7866, 11568, 15270, 18972, 22674

308	cullin-associated and neddylation-dissociated 1	545606	463	442318	4165	7867, 11569, 15271, 18973, 22675
309	cullin-associated and neddylation-dissociated 2 (putative)	295989	464	295989	4166	7868, 11570, 15272, 18974, 22676
310	cullin-associated and neddylation-dissociated 2 (putative)	456430	465	387641	4167	7869, 11571, 15273, 18975, 22677
311	cut-like homeobox 2	261726	466	261726	4168	7870, 11572, 15274, 18976, 22678
312	cut-like homeobox 2	552889	467	446656	4169	7871, 11573, 15275, 18977, 22679
313	CWC22 spliceosome-associated protein homolog (S. cerevisiae)	295749	468	295749	4170	7872, 11574, 15276, 18978, 22680
314	CWC22 spliceosome-associated protein homolog (S. cerevisiae)	404136	469	384159	4171	7873, 11575, 15277, 18979, 22681
315	CWC22 spliceosome-associated protein homolog (S. cerevisiae)	410053	470	387006	4172	7874, 11576, 15278, 18980, 22682
316	CWC27 spliceosome-associated protein homolog (S. cerevisiae)	381070	471	370460	4173	7875, 11577, 15279, 18981, 22683
317	CWC27 spliceosome-associated protein homolog (S. cerevisiae)	538793	472	437939	4174	7876, 11578, 15280, 18982, 22684

318	CXXC finger protein 1	285106	473	285106	4175	7877, 11579, 15281, 18983, 22685
319	CXXC finger protein 1	412036	474	390475	4176	7878, 11580, 15282, 18984, 22686
320	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	353689	475	337396	4177	7879, 11581, 15283, 18985, 22687
321	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	358932	476	351810	4178	7880, 11582, 15284, 18986, 22688
322	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	398160	477	381226	4179	7881, 11583, 15285, 18987, 22689
323	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	398163	478	381229	4180	7882, 11584, 15286, 18988, 22690
324	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	398169	479	381235	4181	7883, 11585, 15287, 18989, 22691
325	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	437553	480	409896	4182	7884, 11586, 15288, 18990, 22692
326	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	553291	481	452182	4183	7885, 11587, 15289, 18991, 22693
327	cyclin B1 interacting protein 1, E3 ubiquitin protein ligase	557665	482	452486	4184	7886, 11588, 15290, 18992, 22694

328	cyclin J	265992	483	265992	4185	7887, 11589, 15291, 18993, 22695
329	cyclin J	403870	484	384498	4186	7888, 11590, 15292, 18994, 22696
330	cyclin J	419934	485	388902	4187	7889, 11591, 15293, 18995, 22697
331	cyclin J	534974	486	441415	4188	7890, 11592, 15294, 18996, 22698
332	cyclin-dependent kinase 12	430627	487	407720	4189	7891, 11593, 15295, 18997, 22699
333	cyclin-dependent kinase 12	447079	488	398880	4190	7892, 11594, 15296, 18998, 22700
334	cyclin-dependent kinase 13	181839	489	181839	4191	7893, 11595, 15297, 18999, 22701
335	cyclin-dependent kinase 13	340829	490	340557	4192	7894, 11596, 15298, 19000, 22702
336	cysteine-serine-rich nuclear protein 1	273153	491	273153	4193	7895, 11597, 15299, 19001, 22703
337	cysteine-serine-rich nuclear protein 1	318290	492	316882	4194	7896, 11598, 15300, 19002, 22704

338	cysteine-serine-rich nuclear protein 1	514182	493	422532	4195	7897, 11599, 15301, 19003, 22705
339	cysteine-serine-rich nuclear protein 2	228515	494	228515	4196	7898, 11600, 15302, 19004, 22706
340	cysteine-serine-rich nuclear protein 2	546935	495	449152	4197	7899, 11601, 15303, 19005, 22707
341	cysteine-serine-rich nuclear protein 2	548981	496	447657	4198	7900, 11602, 15304, 19006, 22708
342	cysteine-serine-rich nuclear protein 2	552899	497	447065	4199	7901, 11603, 15305, 19007, 22709
343	cysteine-serine-rich nuclear protein 3	314499	498	318258	4200	7902, 11604, 15306, 19008, 22710
344	cysteine-serine-rich nuclear protein 3	342316	499	344042	4201	7903, 11605, 15307, 19009, 22711
345	cysteine-serine-rich nuclear protein 3	409420	500	387195	4202	7904, 11606, 15308, 19010, 22712
346	cysteine-serine-rich nuclear protein 3	409664	501	386278	4203	7905, 11607, 15309, 19011, 22713
347	cysteine-serine-rich nuclear protein 3	421875	502	412081	4204	7906, 11608, 15310, 19012, 22714

348	cysteine-serine-rich nuclear protein 3	431452	503	404667	4205	7907, 11609, 15311, 19013, 22715
349	dachshund homolog 1 (Drosophila)	305425	504	304994	4206	7908, 11610, 15312, 19014, 22716
350	dachshund homolog 1 (Drosophila)	313174	505	318506	4207	7909, 11611, 15313, 19015, 22717
351	dachshund homolog 1 (Drosophila)	354591	506	346604	4208	7910, 11612, 15314, 19016, 22718
352	dachshund homolog 1 (Drosophila)	359684	507	352712	4209	7911, 11613, 15315, 19017, 22719
353	dachshund homolog 1 (Drosophila)	377826	508	367057	4210	7912, 11614, 15316, 19018, 22720
354	dachshund homolog 2 (Drosophila)	344497	509	345134	4211	7913, 11615, 15317, 19019, 22721
355	dachshund homolog 2 (Drosophila)	373125	510	362217	4212	7914, 11616, 15318, 19020, 22722
356	dachshund homolog 2 (Drosophila)	373131	511	362223	4213	7915, 11617, 15319, 19021, 22723
357	dachshund homolog 2 (Drosophila)	400297	512	383153	4214	7916, 11618, 15320, 19022, 22724

358	dachshund homolog 2 (Drosophila)	508860	513	420896	4215	7917, 11619, 15321, 19023, 22725
359	dachshund homolog 2 (Drosophila)	510272	514	421919	4216	7918, 11620, 15322, 19024, 22726
360	DDB1 and CUL4 associated factor 13	297579	515	297579	4217	7919, 11621, 15323, 19025, 22727
361	DDB1 and CUL4 associated factor 13	388778	516	373430	4218	7920, 11622, 15324, 19026, 22728
362	DDB1 and CUL4 associated factor 6	312263	517	311949	4219	7921, 11623, 15325, 19027, 22729
363	DDB1 and CUL4 associated factor 6	367840	518	356814	4220	7922, 11624, 15326, 19028, 22730
364	DDB1 and CUL4 associated factor 6	367843	519	356817	4221	7923, 11625, 15327, 19029, 22731
365	DDB1 and CUL4 associated factor 6	432587	520	396238	4222	7924, 11626, 15328, 19030, 22732
366	DEAD (Asp-Glu-Ala-Asp) box helicase 56	431640	521	393488	4223	7925, 11627, 15329, 19031, 22733
367	DEAD (Asp-Glu-Ala-Asp) box polypeptide 27	371764	522	360828	4224	7926, 11628, 15330, 19032, 22734

368	DEAD (Asp-Glu-Ala-Asp) box polypeptide 27	535160	523	439851	4225	7927, 11629, 15331, 19033, 22735
369	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	310532	524	310539	4226	7928, 11630, 15332, 19034, 22736
370	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	372153	525	361226	4227	7929, 11631, 15333, 19035, 22737
371	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	372155	526	361228	4228	7930, 11632, 15334, 19036, 22738
372	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	372159	527	361232	4229	7931, 11633, 15335, 19037, 22739
373	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	438527	528	387730	4230	7932, 11634, 15336, 19038, 22740
374	DEAD (Asp-Glu-Ala-Asp) box polypeptide 31	544003	529	442425	4231	7933, 11635, 15337, 19039, 22741
375	DEAD (Asp-Glu-Ala-Asp) box polypeptide 39A	242776	530	242776	4232	7934, 11636, 15338, 19040, 22742
376	DEAD (Asp-Glu-Ala-Asp) box polypeptide 39A	324340	531	322749	4233	7935, 11637, 15339, 19041, 22743
377	DEAD (Asp-Glu-Ala-Asp) box polypeptide 39A	451994	532	388769	4234	7936, 11638, 15340, 19042, 22744

378	DEAD (Asp-Glu-Ala-Asp) box polypeptide 39A	454233	533	392929	4235	7937, 11639, 15341, 19043, 22745
379	DEAD (Asp-Glu-Ala-Asp) box polypeptide 46	354283	534	346236	4236	7938, 11640, 15342, 19044, 22746
380	DEAD (Asp-Glu-Ala-Asp) box polypeptide 46	452510	535	416534	4237	7939, 11641, 15343, 19045, 22747
381	DEAD (Asp-Glu-Ala-Asp) box polypeptide 46	537371	536	441412	4238	7940, 11642, 15344, 19046, 22748
382	DEAD (Asp-Glu-Ala-Asp) box polypeptide 47	352940	537	319578	4239	7941, 11643, 15345, 19047, 22749
383	DEAD (Asp-Glu-Ala-Asp) box polypeptide 47	358007	538	350698	4240	7942, 11644, 15346, 19048, 22750
384	DEAD (Asp-Glu-Ala-Asp) box polypeptide 50	373585	539	362687	4241	7943, 11645, 15347, 19049, 22751
385	DEAD (Asp-Glu-Ala-Asp) box polypeptide 50	541832	540	438907	4242	7944, 11646, 15348, 19050, 22752
386	DEAD (Asp-Glu-Ala-Asp) box polypeptide 51	397333	541	380495	4243	7945, 11647, 15349, 19051, 22753
387	DEAD (Asp-Glu-Ala-Asp) box polypeptide 53	327968	542	368667	4244	7946, 11648, 15350, 19052, 22754

388	DEAD (Asp-Glu-Ala-Asp) box polypeptide 56	258772	543	258772	4245	7947, 11649, 15351, 19053, 22755
389	DEAH (Asp-Glu-Ala-His) box polypeptide 35	252011	544	252011	4246	7948, 11650, 15352, 19054, 22756
390	DEAH (Asp-Glu-Ala-His) box polypeptide 35	373321	545	362418	4247	7949, 11651, 15353, 19055, 22757
391	DEAH (Asp-Glu-Ala-His) box polypeptide 35	373323	546	362420	4248	7950, 11652, 15354, 19056, 22758
392	DEAQ box RNA-dependent ATPase 1	393951	547	377523	4249	7951, 11653, 15355, 19057, 22759
393	DEAQ box RNA-dependent ATPase 1	404568	548	384621	4250	7952, 11654, 15356, 19058, 22760
394	death effector domain containing 2	336034	549	336972	4251	7953, 11655, 15357, 19059, 22761
395	death effector domain containing 2	595337	550	470082	4252	7954, 11656, 15358, 19060, 22762
396	debranching enzyme homolog 1 (<i>S. cerevisiae</i>)	260803	551	260803	4253	7955, 11657, 15359, 19061, 22763
397	debranching enzyme homolog 1 (<i>S. cerevisiae</i>)	505015	552	441945	4254	7956, 11658, 15360, 19062, 22764

398	de-etiolated homolog 1 (Arabidopsis)	268148	553	268148	4255	7957, 11659, 15361, 19063, 22765
399	de-etiolated homolog 1 (Arabidopsis)	444300	554	408994	4256	7958, 11660, 15362, 19064, 22766
400	de-etiolated homolog 1 (Arabidopsis)	564406	555	456340	4257	7959, 11661, 15363, 19065, 22767
401	DENN/MADD domain containing 4A	431932	556	396830	4258	7960, 11662, 15364, 19066, 22768
402	DENN/MADD domain containing 4A	443035	557	391167	4259	7961, 11663, 15365, 19067, 22769
403	DENN/MADD domain containing 4A	539602	558	445295	4260	7962, 11664, 15366, 19068, 22770
404	deoxynucleotidyltransferase, terminal, interacting protein 1	372622	559	361705	4261	7963, 11665, 15367, 19069, 22771
405	deoxynucleotidyltransferase, terminal, interacting protein 2	436063	560	411010	4262	7964, 11666, 15368, 19070, 22772
406	developing brain homeobox 2	332700	561	331470	4263	7965, 11667, 15369, 19071, 22773
407	diencephalon/mesencephalon homeobox 1	360032	562	353132	4264	7966, 11668, 15370, 19072, 22774

408	diencephalon/mesencephalon homeobox 1	371956	563	361024	4265	7967, 11669, 15371, 19073, 22775
409	DiGeorge syndrome critical region gene 14	252137	564	252137	4266	7968, 11670, 15372, 19074, 22776
410	digestive organ expansion factor homolog (zebrafish)	457820	565	407345	4267	7969, 11671, 15373, 19075, 22777
411	digestive organ expansion factor homolog (zebrafish)	491415	566	419005	4268	7970, 11672, 15374, 19076, 22778
412	DIM1 dimethyladenosine transferase 1 homolog (<i>S. cerevisiae</i>)	199320	567	199320	4269	7971, 11673, 15375, 19077, 22779
413	DIP2 disco-interacting protein 2 homolog A (<i>Drosophila</i>)	318711	568	323633	4270	7972, 11674, 15376, 19078, 22780
414	DIP2 disco-interacting protein 2 homolog A (<i>Drosophila</i>)	358985	569	351876	4271	7973, 11675, 15377, 19079, 22781
415	DIP2 disco-interacting protein 2 homolog A (<i>Drosophila</i>)	400274	570	383133	4272	7974, 11676, 15378, 19080, 22782
416	DIP2 disco-interacting protein 2 homolog A (<i>Drosophila</i>)	417564	571	392066	4273	7975, 11677, 15379, 19081, 22783
417	DIP2 disco-interacting protein 2 homolog A (<i>Drosophila</i>)	427143	572	400528	4274	7976, 11678, 15380, 19082, 22784

418	DIP2 disco-interacting protein 2 homolog A (Drosophila)	435722	573	415089	4275	7977, 11679, 15381, 19083, 22785
419	DIP2 disco-interacting protein 2 homolog A (Drosophila)	457905	574	393434	4276	7978, 11680, 15382, 19084, 22786
420	DIP2 disco-interacting protein 2 homolog A (Drosophila)	466639	575	430249	4277	7979, 11681, 15383, 19085, 22787
421	DMRT-like family A1	325870	576	319651	4278	7980, 11682, 15384, 19086, 22788
422	DMRT-like family A2	404795	577	383909	4279	7981, 11683, 15385, 19087, 22789
423	DMRT-like family A2	418121	578	399370	4280	7982, 11684, 15386, 19088, 22790
424	DMRT-like family B with proline-rich C-terminal, 1	371445	579	360500	4281	7983, 11685, 15387, 19089, 22791
425	DMRT-like family B with proline-rich C-terminal, 1	431335	580	395130	4282	7984, 11686, 15388, 19090, 22792
426	DMRT-like family C2	269945	581	269945	4283	7985, 11687, 15389, 19091, 22793
427	DNA methyltransferase 1 associated protein 1	315913	582	312697	4284	7986, 11688, 15390, 19092, 22794

428	DNA methyltransferase 1 associated protein 1	361745	583	354697	4285	7987, 11689, 15391, 19093, 22795
429	DNA methyltransferase 1 associated protein 1	372283	584	361357	4286	7988, 11690, 15392, 19094, 22796
430	DNA methyltransferase 1 associated protein 1	372289	585	361363	4287	7989, 11691, 15393, 19095, 22797
431	DNA methyltransferase 1 associated protein 1	372290	586	361364	4288	7990, 11692, 15394, 19096, 22798
432	DNA methyltransferase 1 associated protein 1	436069	587	400269	4289	7991, 11693, 15395, 19097, 22799
433	DNA methyltransferase 1 associated protein 1	437511	588	402494	4290	7992, 11694, 15396, 19098, 22800
434	DNA methyltransferase 1 associated protein 1	440641	589	401099	4291	7993, 11695, 15397, 19099, 22801
435	DNA methyltransferase 1 associated protein 1	446292	590	409200	4292	7994, 11696, 15398, 19100, 22802
436	DnaJ (Hsp40) homolog, subfamily C, member 8	263697	591	263697	4293	7995, 11697, 15399, 19101, 22803
437	double homeobox 4 like 2	440426	592	389585	4294	7996, 11698, 15400, 19102, 22804

438	double homeobox 4 like 2	553702	593	451545	4295	7997, 11699, 15401, 19103, 22805
439	double homeobox 4 like 3	554690	594	451798	4296	7998, 11700, 15402, 19104, 22806
440	double homeobox 4 like 3	557656	595	451859	4297	7999, 11701, 15403, 19105, 22807
441	double homeobox 4 like 4	538692	596	438513	4298	8000, 11702, 15404, 19106, 22808
442	double homeobox 4 like 4	554637	597	451270	4299	8001, 11703, 15405, 19107, 22809
443	double homeobox 4 like 5	554668	598	451995	4300	8002, 11704, 15406, 19108, 22810
444	double homeobox 4 like 5	557283	599	451107	4301	8003, 11705, 15407, 19109, 22811
445	double homeobox 4 like 6	553722	600	451087	4302	8004, 11706, 15408, 19110, 22812
446	double homeobox 4 like 6	555191	601	451253	4303	8005, 11707, 15409, 19111, 22813
447	double homeobox 4 like 7	553598	602	451700	4304	8006, 11708, 15410, 19112, 22814

448	double homeobox 4 like 7	553820	603	451411	4305	8007, 11709, 15411, 19113, 22815
449	double homeobox 4 like 7	554906	604	452371	4306	8008, 11710, 15412, 19114, 22816
450	doublesex and mab-3 related transcription factor 3	190165	605	190165	4307	8009, 11711, 15413, 19115, 22817
451	doublesex and mab-3 related transcription factor 3	417254	606	387472	4308	8010, 11712, 15414, 19116, 22818
452	downstream neighbor of SON	303071	607	307143	4309	8011, 11713, 15415, 19117, 22819
453	DR1-associated protein 1 (negative cofactor 2 alpha)	312515	608	307850	4310	8012, 11714, 15416, 19118, 22820
454	E2F transcription factor 6	307236	609	302159	4311	8013, 11715, 15417, 19119, 22821
455	E2F transcription factor 6	362009	610	355036	4312	8014, 11716, 15418, 19120, 22822
456	E2F transcription factor 6	381525	611	370936	4313	8015, 11717, 15419, 19121, 22823
457	E2F transcription factor 6	542100	612	446315	4314	8016, 11718, 15420, 19122, 22824

458	E2F transcription factor 6	546212	613	438864	4315	8017, 11719, 15421, 19123, 22825
459	E74-like factor 1 (ets domain transcription factor)	239882	614	239882	4316	8018, 11720, 15422, 19124, 22826
460	E74-like factor 1 (ets domain transcription factor)	379498	615	368812	4317	8019, 11721, 15423, 19125, 22827
461	E74-like factor 1 (ets domain transcription factor)	405737	616	384135	4318	8020, 11722, 15424, 19126, 22828
462	E74-like factor 1 (ets domain transcription factor)	442101	617	405580	4319	8021, 11723, 15425, 19127, 22829
463	early B-cell factor 1	313708	618	322898	4320	8022, 11724, 15426, 19128, 22830
464	early B-cell factor 1	318060	619	321355	4321	8023, 11725, 15427, 19129, 22831
465	early B-cell factor 1	380654	620	370029	4322	8024, 11726, 15428, 19130, 22832
466	EF-hand calcium binding domain 6	262726	621	262726	4323	8025, 11727, 15429, 19131, 22833
467	EF-hand calcium binding domain 6	358439	622	351219	4324	8026, 11728, 15430, 19132, 22834

468	EF-hand calcium binding domain 6	396231	623	379533	4325	8027, 11729, 15431, 19133, 22835
469	ELL associated factor 2	273668	624	273668	4326	8028, 11730, 15432, 19134, 22836
470	ELL associated factor 2	451944	625	410708	4327	8029, 11731, 15433, 19135, 22837
471	elongation factor 1 homolog (S. cerevisiae)	252445	626	252445	4328	8030, 11732, 15434, 19136, 22838
472	enhancer of yellow 2 homolog (Drosophila)	521688	627	429986	4329	8031, 11733, 15435, 19137, 22839
473	enhancer of yellow 2 homolog (Drosophila)	521662	628	429713	4330	8032, 11734, 15436, 19138, 22840
474	EP300 interacting inhibitor of differentiation 2B	326282	629	317564	4331	8033, 11735, 15437, 19139, 22841
475	ESF1, nucleolar pre-rRNA processing protein, homolog (S. cerevisiae)	202816	630	202816	4332	8034, 11736, 15438, 19140, 22842
476	ESF1, nucleolar pre-rRNA processing protein, homolog (S. cerevisiae)	541185	631	445227	4333	8035, 11737, 15439, 19141, 22843
477	ets variant 3-like	454449	632	430271	4334	8036, 11738, 15440, 19142, 22844

478	eukaryotic translation initiation factor 1A domain containing	312234	633	309175	4335	8037, 11739, 15441, 19143, 22845
479	eukaryotic translation initiation factor 1A domain containing	526451	634	436644	4336	8038, 11740, 15442, 19144, 22846
480	eukaryotic translation initiation factor 1A domain containing	527051	635	432135	4337	8039, 11741, 15443, 19145, 22847
481	eukaryotic translation initiation factor 1A domain containing	527249	636	435439	4338	8040, 11742, 15444, 19146, 22848
482	eukaryotic translation initiation factor 1A domain containing	529964	637	435942	4339	8041, 11743, 15445, 19147, 22849
483	eukaryotic translation initiation factor 1A domain containing	530462	638	435891	4340	8042, 11744, 15446, 19148, 22850
484	eukaryotic translation initiation factor 1A domain containing	532707	639	433320	4341	8043, 11745, 15447, 19149, 22851
485	eukaryotic translation initiation factor 1A domain containing	533544	640	434056	4342	8044, 11746, 15448, 19150, 22852
486	family with sequence similarity 175, member A	321945	641	369857	4343	8045, 11747, 15449, 19151, 22853
487	family with sequence similarity 175, member A	506553	642	426763	4344	8046, 11748, 15450, 19152, 22854

488	family with sequence similarity 175, member A	511801	643	421876	4345	8047, 11749, 15451, 19153, 22855
489	family with sequence similarity 188, member A	277632	644	277632	4346	8048, 11750, 15452, 19154, 22856
490	family with sequence similarity 188, member A	378033	645	367272	4347	8049, 11751, 15453, 19155, 22857
491	family with sequence similarity 188, member A	378036	646	367275	4348	8050, 11752, 15454, 19156, 22858
492	family with sequence similarity 188, member A	418767	647	388661	4349	8051, 11753, 15455, 19157, 22859
493	family with sequence similarity 188, member A	436829	648	389883	4350	8052, 11754, 15456, 19158, 22860
494	family with sequence similarity 192, member A	309137	649	335808	4351	8053, 11755, 15457, 19159, 22861
495	family with sequence similarity 192, member A	389447	650	374098	4352	8054, 11756, 15458, 19160, 22862
496	family with sequence similarity 192, member A	538505	651	440265	4353	8055, 11757, 15459, 19161, 22863
497	family with sequence similarity 214, member B	322813	652	319897	4354	8056, 11758, 15460, 19162, 22864

498	family with sequence similarity 214, member B	378554	653	367816	4355	8057, 11759, 15461, 19163, 22865
499	family with sequence similarity 214, member B	378557	654	367819	4356	8058, 11760, 15462, 19164, 22866
500	family with sequence similarity 214, member B	378561	655	367823	4357	8059, 11761, 15463, 19165, 22867
501	family with sequence similarity 214, member B	378566	656	367829	4358	8060, 11762, 15464, 19166, 22868
502	family with sequence similarity 32, member A	263384	657	263384	4359	8061, 11763, 15465, 19167, 22869
503	family with sequence similarity 40, member A	369794	658	358809	4360	8062, 11764, 15466, 19168, 22870
504	family with sequence similarity 40, member A	369795	659	358810	4361	8063, 11765, 15467, 19169, 22871
505	family with sequence similarity 40, member A	369796	660	358811	4362	8064, 11766, 15468, 19170, 22872
506	family with sequence similarity 50, member A	158526	661	158526	4363	8065, 11767, 15469, 19171, 22873, 26071, 26086
507	family with sequence similarity 50, member A	393600	662	377225	4364	8066, 11768, 15470,

						19172, 22874
508	family with sequence similarity 53, member A	308132	663	310057	4365	8067, 11769, 15471, 19173, 22875
509	family with sequence similarity 53, member A	461064	664	418243	4366	8068, 11770, 15472, 19174, 22876
510	family with sequence similarity 53, member A	463238	665	417615	4367	8069, 11771, 15473, 19175, 22877
511	family with sequence similarity 53, member A	472884	666	426260	4368	8070, 11772, 15474, 19176, 22878
512	family with sequence similarity 64 member A	572447	667	459235	4369	8071, 11773, 15475, 19177, 22879
513	family with sequence similarity 64, member A	250056	668	250056	4370	8072, 11774, 15476, 19178, 22880
514	family with sequence similarity 64, member A	308855	669	308470	4371	8073, 11775, 15477, 19179, 22881
515	family with sequence similarity 71, member B	302938	670	305596	4372	8074, 11776, 15478, 19180, 22882
516	FANCD2/FANCI-associated nuclease 1	362065	671	354497	4373	8075, 11777, 15479, 19181, 22883
517	FANCD2/FANCI-associated nuclease 1	561594	672	455983	4374	8076, 11778, 15480,

						19182, 22884
518	far upstream element (FUSE) binding protein 3	319725	673	318177	4375	8077, 11779, 15481, 19183, 22885
519	far upstream element (FUSE) binding protein 3	358721	674	351562	4376	8078, 11780, 15482, 19184, 22886
520	far upstream element (FUSE) binding protein 3	372376	675	361451	4377	8079, 11781, 15483, 19185, 22887
521	FCF1 small subunit (SSU) processome component homolog (<i>S. cerevisiae</i>)	341162	676	344393	4378	8080, 11782, 15484, 19186, 22888
522	Fer3-like (<i>Drosophila</i>)	275461	677	275461	4379	8081, 11783, 15485, 19187, 22889
523	fidgetin	333129	678	333836	4380	8082, 11784, 15486, 19188, 22890
524	FK506 binding protein like	375156	679	364298	4381	8083, 11785, 15487, 19189, 22891
525	FK506 binding protein like	425378	680	397530	4382	8084, 11786, 15488, 19190, 22892
526	FK506 binding protein like	443350	681	398812	4383	8085, 11787, 15489, 19191, 22893
527	FLYWCH-type zinc finger 1	253928	682	253928	4384	8086, 11788, 15490,

						19192, 22894
528	FLYWCH-type zinc finger 1	344592	683	344122	4385	8087, 11789, 15491, 19193, 22895
529	FLYWCH-type zinc finger 1	399667	684	382575	4386	8088, 11790, 15492, 19194, 22896
530	FLYWCH-type zinc finger 1	416288	685	399938	4387	8089, 11791, 15493, 19195, 22897
531	forkhead box B1	396057	686	379369	4388	8090, 11792, 15494, 19196, 22898
532	forkhead box B2	376708	687	365898	4389	8091, 11793, 15495, 19197, 22899
533	forkhead box D4-like 4	377413	688	366630	4390	8092, 11794, 15496, 19198, 22900
534	forkhead box D4-like 5	377420	689	366637	4391	8093, 11795, 15497, 19199, 22901
535	forkhead box D4-like 6	377473	690	366693	4392	8094, 11796, 15498, 19200, 22902
536	forkhead box F1	262426	691	262426	4393	8095, 11797, 15499, 19201, 22903
537	forkhead box H1	292541	692	292541	4394	8096, 11798, 15500,

						19202, 22904
538	forkhead box H1	377317	693	366534	4395	8097, 11799, 15501, 19203, 22905
539	forkhead box I2	388920	694	373572	4396	8098, 11800, 15502, 19204, 22906
540	forkhead box J2	162391	695	162391	4397	8099, 11801, 15503, 19205, 22907, 26072, 26087
541	forkhead box J2	428177	696	403411	4398	8100, 11802, 15504, 19206, 22908
542	forkhead box J3	361346	697	354620	4399	8101, 11803, 15505, 19207, 22909
543	forkhead box J3	361776	698	354449	4400	8102, 11804, 15506, 19208, 22910
544	forkhead box J3	372571	699	361652	4401	8103, 11805, 15507, 19209, 22911
545	forkhead box J3	372572	700	361653	4402	8104, 11806, 15508, 19210, 22912
546	forkhead box J3	372573	701	361654	4403	8105, 11807, 15509, 19211, 22913

547	forkhead box J3	422278	702	388099	4404	8106, 11808, 15510, 19212, 22914
548	forkhead box J3	445886	703	393408	4405	8107, 11809, 15511, 19213, 22915
549	forkhead box J3	454417	704	403060	4406	8108, 11810, 15512, 19214, 22916
550	forkhead box J3	545068	705	439044	4407	8109, 11811, 15513, 19215, 22917
551	forkhead box N2	304367	706	305685	4408	8110, 11812, 15514, 19216, 22918
552	forkhead box N2	340553	707	343633	4409	8111, 11813, 15515, 19217, 22919
553	forkhead box N2	413569	708	388486	4410	8112, 11814, 15516, 19218, 22920
554	forkhead box R1	317011	709	314806	4411	8113, 11815, 15517, 19219, 22921
555	forkhead box R2	339140	710	427329	4412	8114, 11816, 15518, 19220, 22922
556	forkhead box S1	375978	711	365145	4413	8115, 11817, 15519, 19221, 22923

557	forty-two-three domain containing 1	241502	712	241502	4414	8116, 11818, 15520, 19222, 22924
558	forty-two-three domain containing 1	428395	713	391157	4415	8117, 11819, 15521, 19223, 22925
559	forty-two-three domain containing 1	415708	714	393746	4416	8118, 11820, 15522, 19224, 22926
560	FSDH region gene 2 family, member B	425520	715	401310	4417	8119, 11821, 15523, 19225, 22927
561	FSDH region gene 2 family, member B	443774	716	408343	4418	8120, 11822, 15524, 19226, 22928
562	FtsJ homolog 3 (E. coli)	427159	717	396673	4419	8121, 11823, 15525, 19227, 22929
563	G patch domain and KOW motifs	156109	718	156109	4420	8122, 11824, 15526, 19228, 22930, 26073, 26088
564	G patch domain containing 1	170564	719	170564	4421	8123, 11825, 15527, 19229, 22931
565	G protein pathway suppressor 2	315601	720	319371	4422	8124, 11826, 15528, 19230, 22932
566	G protein pathway suppressor 2	380728	721	370104	4423	8125, 11827, 15529,

						19231, 22933
567	G protein pathway suppressor 2	389167	722	379841	4424	8126, 11828, 15530, 19232, 22934
568	G protein pathway suppressor 2	391950	723	438697	4425	8127, 11829, 15531, 19233, 22935
569	G protein-coupled receptor kinase interacting ArfGAP 2	338373	724	340342	4426	8128, 11830, 15532, 19234, 22936
570	G protein-coupled receptor kinase interacting ArfGAP 2	343646	725	340938	4427	8129, 11831, 15533, 19235, 22937
571	G protein-coupled receptor kinase interacting ArfGAP 2	354574	726	346585	4428	8130, 11832, 15534, 19236, 22938
572	G protein-coupled receptor kinase interacting ArfGAP 2	355312	727	347464	4429	8131, 11833, 15535, 19237, 22939
573	G protein-coupled receptor kinase interacting ArfGAP 2	356259	728	348595	4430	8132, 11834, 15536, 19238, 22940
574	G protein-coupled receptor kinase interacting ArfGAP 2	360185	729	353312	4431	8133, 11835, 15537, 19239, 22941
575	G protein-coupled receptor kinase interacting ArfGAP 2	361006	730	354282	4432	8134, 11836, 15538, 19240, 22942
576	G protein-coupled receptor kinase interacting ArfGAP 2	457474	731	391813	4433	8135, 11837, 15539,

						19241, 22943
577	G protein-coupled receptor kinase interacting ArfGAP 2	542273	732	442101	4434	8136, 11838, 15540, 19242, 22944
578	G protein-coupled receptor kinase interacting ArfGAP 2	547815	733	450348	4435	8137, 11839, 15541, 19243, 22945
579	G protein-coupled receptor kinase interacting ArfGAP 2	553118	734	447465	4436	8138, 11840, 15542, 19244, 22946
580	GA binding protein transcription factor, beta subunit 2	368916	735	357912	4437	8139, 11841, 15543, 19245, 22947
581	GA binding protein transcription factor, beta subunit 2	368917	736	357913	4438	8140, 11842, 15544, 19246, 22948
582	GA binding protein transcription factor, beta subunit 2	368918	737	357914	4439	8141, 11843, 15545, 19247, 22949
583	GA binding protein transcription factor, beta subunit 2	446567	738	413721	4440	8142, 11844, 15546, 19248, 22950
584	GATA zinc finger domain containing 2A	252577	739	252577	4441	8143, 11845, 15547, 19249, 22951
585	GATA zinc finger domain containing 2A	358713	740	351552	4442	8144, 11846, 15548, 19250, 22952
586	GATA zinc finger domain containing 2A	360315	741	353463	4443	8145, 11847, 15549,

						19251, 22953
587	GATA zinc finger domain containing 2A	417582	742	403703	4444	8146, 11848, 15550, 19252, 22954
588	GATA zinc finger domain containing 2A	429242	743	414252	4445	8147, 11849, 15551, 19253, 22955
589	GATA zinc finger domain containing 2A	429563	744	388416	4446	8148, 11850, 15552, 19254, 22956
590	GATA zinc finger domain containing 2A	432704	745	390495	4447	8149, 11851, 15553, 19255, 22957
591	GATA zinc finger domain containing 2A	444839	746	407293	4448	8150, 11852, 15554, 19256, 22958
592	GATA zinc finger domain containing 2A	448576	747	416452	4449	8151, 11853, 15555, 19257, 22959
593	GATA zinc finger domain containing 2A	457895	748	404212	4450	8152, 11854, 15556, 19258, 22960
594	GATA zinc finger domain containing 2A	537887	749	442588	4451	8153, 11855, 15557, 19259, 22961
595	GATA zinc finger domain containing 2B	368655	750	357644	4452	8154, 11856, 15558, 19260, 22962
596	GC-rich promoter binding protein 1-like 1	290795	751	290795	4453	8155, 11857, 15559,

						19261, 22963
597	GC-rich promoter binding protein 1-like 1	355105	752	347224	4454	8156, 11858, 15560, 19262, 22964
598	GC-rich sequence DNA-binding factor 1	290178	753	290178	4455	8157, 11859, 15561, 19263, 22965
599	GC-rich sequence DNA-binding factor 1	331923	754	328992	4456	8158, 11860, 15562, 19264, 22966
600	GC-rich sequence DNA-binding factor 2	321027	755	318690	4457	8159, 11861, 15563, 19265, 22967
601	GC-rich sequence DNA-binding factor 2	409857	756	386552	4458	8160, 11862, 15564, 19266, 22968
602	GC-rich sequence DNA-binding factor 2	541687	757	437767	4459	8161, 11863, 15565, 19267, 22969
603	gem (nuclear organelle) associated protein 6	281950	758	281950	4460	8162, 11864, 15566, 19268, 22970
604	gem (nuclear organelle) associated protein 6	409566	759	386613	4461	8163, 11865, 15567, 19269, 22971
605	general transcription factor IIA, 2, 12kDa	396060	760	379372	4462	8164, 11866, 15568, 19270, 22972
606	general transcription factor IIA, 2, 12kDa	396061	761	379373	4463	8165, 11867, 15569,

						19271, 22973
607	general transcription factor IIA, 2, 12kDa	396063	762	379375	4464	8166, 11868, 15570, 19272, 22974
608	general transcription factor IIE, polypeptide 1, alpha 56kDa	283875	763	283875	4465	8167, 11869, 15571, 19273, 22975
609	general transcription factor IIE, polypeptide 1, alpha 56kDa	484715	764	417342	4466	8168, 11870, 15572, 19274, 22976
610	general transcription factor IIE, polypeptide 1, alpha 56kDa	492959	765	417077	4467	8169, 11871, 15573, 19275, 22977
611	general transcription factor IIH, polypeptide 2C	380729	766	370105	4468	8170, 11872, 15574, 19276, 22978
612	general transcription factor IIH, polypeptide 2C	508344	767	423952	4469	8171, 11873, 15575, 19277, 22979
613	general transcription factor IIH, polypeptide 2C	510979	768	422907	4470	8172, 11874, 15576, 19278, 22980
614	general transcription factor IIH, polypeptide 3, 34kDa	228955	769	228955	4471	8173, 11875, 15577, 19279, 22981
615	general transcription factor IIH, polypeptide 3, 34kDa	542231	770	441811	4472	8174, 11876, 15578, 19280, 22982
616	general transcription factor IIH, polypeptide 3, 34kDa	543341	771	445162	4473	8175, 11877, 15579,

						19281, 22983
617	general transcription factor IIIC, polypeptide 1, alpha 220kDa	356183	772	348510	4474	8176, 11878, 15580, 19282, 22984
618	general transcription factor IIIC, polypeptide 1, alpha 220kDa	388971	773	373623	4475	8177, 11879, 15581, 19283, 22985
619	general transcription factor IIIC, polypeptide 2, beta 110kDa	264720	774	264720	4476	8178, 11880, 15582, 19284, 22986
620	general transcription factor IIIC, polypeptide 2, beta 110kDa	359541	775	352536	4477	8179, 11881, 15583, 19285, 22987
621	general transcription factor IIIC, polypeptide 2, beta 110kDa	423998	776	408174	4478	8180, 11882, 15584, 19286, 22988
622	general transcription factor IIIC, polypeptide 2, beta 110kDa	457748	777	389518	4479	8181, 11883, 15585, 19287, 22989
623	general transcription factor IIIC, polypeptide 3, 102kDa	263956	778	263956	4480	8182, 11884, 15586, 19288, 22990
624	general transcription factor IIIC, polypeptide 3, 102kDa	409364	779	386465	4481	8183, 11885, 15587, 19289, 22991
625	general transcription factor IIIC, polypeptide 4, 90kDa	372146	780	361219	4482	8184, 11886, 15588, 19290, 22992
626	general transcription factor IIIC, polypeptide 5, 63kDa	342018	781	339530	4483	8185, 11887, 15589,

						19291, 22993
627	general transcription factor IIIC, polypeptide 5, 63kDa	372089	782	361161	4484	8186, 11888, 15590, 19292, 22994
628	general transcription factor IIIC, polypeptide 5, 63kDa	372095	783	361167	4485	8187, 11889, 15591, 19293, 22995
629	general transcription factor IIIC, polypeptide 5, 63kDa	372097	784	361169	4486	8188, 11890, 15592, 19294, 22996
630	general transcription factor IIIC, polypeptide 5, 63kDa	372099	785	361171	4487	8189, 11891, 15593, 19295, 22997
631	general transcription factor IIIC, polypeptide 5, 63kDa	372108	786	361180	4488	8190, 11892, 15594, 19296, 22998
632	general transcription factor IIIC, polypeptide 5, 63kDa	434175	787	387697	4489	8191, 11893, 15595, 19297, 22999
633	general transcription factor IIIC, polypeptide 5, 63kDa	435745	788	397961	4490	8192, 11894, 15596, 19298, 23000
634	general transcription factor IIIC, polypeptide 5, 63kDa	439697	789	393207	4491	8193, 11895, 15597, 19299, 23001
635	general transcription factor IIIC, polypeptide 5, 63kDa	440319	790	389498	4492	8194, 11896, 15598, 19300, 23002
636	germ cell-less homolog 1 (Drosophila)	282570	791	282570	4493	8195, 11897, 15599,

						19301, 23003
637	glial cells missing homolog 1 (Drosophila)	259803	792	259803	4494	8196, 11898, 15600, 19302, 23004
638	glial cells missing homolog 2 (Drosophila)	379491	793	368805	4495	8197, 11899, 15601, 19303, 23005
639	GLIS family zinc finger 1	312233	794	309653	4496	8198, 11900, 15602, 19304, 23006
640	glyoxylate reductase 1 homolog (Arabidopsis)	321919	795	322716	4497	8199, 11901, 15603, 19305, 23007
641	glyoxylate reductase 1 homolog (Arabidopsis)	381983	796	371413	4498	8200, 11902, 15604, 19306, 23008
642	glyoxylate reductase 1 homolog (Arabidopsis)	436648	797	390276	4499	8201, 11903, 15605, 19307, 23009
643	gon-4-like (C. elegans)	271883	798	271883	4500	8202, 11904, 15606, 19308, 23010
644	gon-4-like (C. elegans)	361040	799	354322	4501	8203, 11905, 15607, 19309, 23011
645	gon-4-like (C. elegans)	368327	800	357310	4502	8204, 11906, 15608, 19310, 23012
646	gon-4-like (C. elegans)	368331	801	357315	4503	8205, 11907, 15609,

						19311, 23013
647	gon-4-like (C. elegans)	437809	802	396117	4504	8206, 11908, 15610, 19312, 23014
648	gon-4-like (C. elegans)	539959	803	444059	4505	8207, 11909, 15611, 19313, 23015
649	goosecoid homeobox 2	86933	804	86933	4506	8208, 11910, 15612, 19314, 23016, 26074, 26089
650	grainyhead-like 3 (Drosophila)	236255	805	236255	4507	8209, 11911, 15613, 19315, 23017
651	grainyhead-like 3 (Drosophila)	342072	806	340543	4508	8210, 11912, 15614, 19316, 23018
652	grainyhead-like 3 (Drosophila)	350501	807	288955	4509	8211, 11913, 15615, 19317, 23019
653	grainyhead-like 3 (Drosophila)	356046	808	348333	4510	8212, 11914, 15616, 19318, 23020
654	grainyhead-like 3 (Drosophila)	361548	809	354943	4511	8213, 11915, 15617, 19319, 23021
655	GS homeobox 1	302945	810	304331	4512	8214, 11916, 15618, 19320, 23022

656	GS homeobox 2	326902	811	319118	4513	8215, 11917, 15619, 19321, 23023
657	GTF2I repeat domain containing 2	405086	812	385491	4514	8216, 11918, 15620, 19322, 23024
658	GTF2I repeat domain containing 2	451013	813	406723	4515	8217, 11919, 15621, 19323, 23025
659	GTF2I repeat domain containing 2	453619	814	402105	4516	8218, 11920, 15622, 19324, 23026
660	GTF2I repeat domain containing 2B	312575	815	308080	4517	8219, 11921, 15623, 19325, 23027
661	GTF2I repeat domain containing 2B	412484	816	393677	4518	8220, 11922, 15624, 19326, 23028
662	GTF2I repeat domain containing 2B	418185	817	411454	4519	8221, 11923, 15625, 19327, 23029
663	GTF2I repeat domain containing 2B	430511	818	413588	4520	8222, 11924, 15626, 19328, 23030
664	H1 histone family, member N, testis-specific	335017	819	334805	4521	8223, 11925, 15627, 19329, 23031
665	H1 histone family, member X	333762	820	329662	4522	8224, 11926, 15628, 19330, 23032

666	H2.0-like homeobox	366903	821	355870	4523	8225, 11927, 15629, 19331, 23033
667	H2A histone family member Y	304332	822	302572	4524	8226, 11928, 15630, 19332, 23034
668	H2A histone family, member B1	354461	823	346450	4525	8227, 11929, 15631, 19333, 23035
669	H2A histone family, member B2	354514	824	346509	4526	8228, 11930, 15632, 19334, 23036
670	H2A histone family, member B3	369444	825	358452	4527	8229, 11931, 15633, 19335, 23037
671	H2A histone family, member J	228929	826	228929	4528	8230, 11932, 15634, 19336, 23038
672	H2A histone family, member J	389078	827	373730	4529	8231, 11933, 15635, 19337, 23039
673	H2A histone family, member J	544848	828	438553	4530	8232, 11934, 15636, 19338, 23040
674	H2A histone family, member V	222690	829	222690	4531	8233, 11935, 15637, 19339, 23041, 26075, 26090
675	H2A histone family, member V	308153	830	308405	4532	8234, 11936, 15638,

						19340, 23042
676	H2A histone family, member V	349299	831	342714	4533	8235, 11937, 15639, 19341, 23043
677	H2A histone family, member V	350771	832	340708	4534	8236, 11938, 15640, 19342, 23044
678	H2A histone family, member V	381124	833	370516	4535	8237, 11939, 15641, 19343, 23045
679	H2A histone family, member Y	312469	834	310169	4536	8238, 11940, 15642, 19344, 23046
680	H2A histone family, member Y	423969	835	415121	4537	8239, 11941, 15643, 19345, 23047
681	H2A histone family, member Y	510038	836	424971	4538	8240, 11942, 15644, 19346, 23048
682	H2A histone family, member Y	511689	837	423563	4539	8241, 11943, 15645, 19347, 23049
683	H2A histone family, member Y2	373255	838	362352	4540	8242, 11944, 15646, 19348, 23050
684	H2A histone family, member Y2	395046	839	378486	4541	8243, 11945, 15647, 19349, 23051
685	H2A histone family, member Y2	455786	840	404584	4542	8244, 11946, 15648,

						19350, 23052
686	H2A histone family, member Z	296417	841	296417	4543	8245, 11947, 15649, 19351, 23053
687	H2B histone family, member M	243297	842	243297	4544	8246, 11948, 15650, 19352, 23054
688	H2B histone family, member M	355016	843	347119	4545	8247, 11949, 15651, 19353, 23055
689	H2B histone family, member W, testis-specific	217926	844	354723	4546	8248, 11950, 15652, 19354, 23056
690	H3 histone, family 3C	340398	845	339835	4547	8249, 11951, 15653, 19355, 23057
691	HEAT repeat containing 1	366579	846	355538	4548	8250, 11952, 15654, 19356, 23058
692	HEAT repeat containing 1	366581	847	355540	4549	8251, 11953, 15655, 19357, 23059
693	HEAT repeat containing 1	366582	848	355541	4550	8252, 11954, 15656, 19358, 23060
694	heat shock factor binding protein 1	433866	849	392896	4551	8253, 11955, 15657, 19359, 23061
695	heat shock transcription factor family member 5	323777	850	313243	4552	8254, 11956, 15658,

						19360, 23062
696	heat shock transcription factor family member 5	412540	851	396453	4553	8255, 11957, 15659, 19361, 23063
697	helicase (DNA) B	247815	852	247815	4554	8256, 11958, 15660, 19362, 23064
698	helicase (DNA) B	545134	853	443287	4555	8257, 11959, 15661, 19363, 23065
699	helicase-like transcription factor	310053	854	308944	4556	8258, 11960, 15662, 19364, 23066
700	helicase-like transcription factor	392912	855	376644	4557	8259, 11961, 15663, 19365, 23067
701	helicase-like transcription factor	392913	856	376645	4558	8260, 11962, 15664, 19366, 23068
702	helicase-like transcription factor	416117	857	439163	4559	8261, 11963, 15665, 19367, 23069
703	helicase-like transcription factor	494055	858	420429	4560	8262, 11964, 15666, 19368, 23070
704	helt bHLH transcription factor	338875	859	343464	4561	8263, 11965, 15667, 19369, 23071
705	helt bHLH transcription factor	505610	860	422140	4562	8264, 11966, 15668,

						19370, 23072
706	helt bHLH transcription factor	515777	861	426033	4563	8265, 11967, 15669, 19371, 23073
707	Hepatoma-derived growth factor-related protein 2	301284	862	301284	4564	8266, 11968, 15670, 19372, 23074
708	Hepatoma-derived growth factor-related protein 2	398364	863	381405	4565	8267, 11969, 15671, 19373, 23075
709	heterochromatin protein 1, binding protein 3	312239	864	312625	4566	8268, 11970, 15672, 19374, 23076
710	heterochromatin protein 1, binding protein 3	375000	865	364139	4567	8269, 11971, 15673, 19375, 23077
711	heterochromatin protein 1, binding protein 3	375003	866	364142	4568	8270, 11972, 15674, 19376, 23078
712	heterochromatin protein 1, binding protein 3	375004	867	364143	4569	8271, 11973, 15675, 19377, 23079
713	heterochromatin protein 1, binding protein 3	414993	868	405362	4570	8272, 11974, 15676, 19378, 23080
714	heterochromatin protein 1, binding protein 3	417710	869	391281	4571	8273, 11975, 15677, 19379, 23081
715	heterochromatin protein 1, binding protein 3	419490	870	397656	4572	8274, 11976, 15678,

						19380, 23082
716	heterochromatin protein 1, binding protein 3	419948	871	391721	4573	8275, 11977, 15679, 19381, 23083
717	heterochromatin protein 1, binding protein 3	424732	872	402754	4574	8276, 11978, 15680, 19382, 23084
718	heterochromatin protein 1, binding protein 3	437575	873	402096	4575	8277, 11979, 15681, 19383, 23085
719	heterochromatin protein 1, binding protein 3	438032	874	403039	4576	8278, 11980, 15682, 19384, 23086
720	heterochromatin protein 1, binding protein 3	443615	875	401874	4577	8279, 11981, 15683, 19385, 23087
721	heterogeneous nuclear ribonucleoprotein A0	314940	876	316042	4578	8280, 11982, 15684, 19386, 23088
722	heterogeneous nuclear ribonucleoprotein C (C1/C2)	216296	877	216296	4579	8281, 11983, 15685, 19387, 23089
723	heterogeneous nuclear ribonucleoprotein C (C1/C2)	320084	878	319690	4580	8282, 11984, 15686, 19388, 23090
724	heterogeneous nuclear ribonucleoprotein C (C1/C2)	400042	879	382917	4581	8283, 11985, 15687, 19389, 23091
725	heterogeneous nuclear ribonucleoprotein C (C1/C2)	420743	880	404848	4582	8284, 11986, 15688,

						19390, 23092
726	heterogeneous nuclear ribonucleoprotein C (C1/C2)	430246	881	442816	4583	8285, 11987, 15689, 19391, 23093
727	heterogeneous nuclear ribonucleoprotein C (C1/C2)	445284	882	415799	4584	8286, 11988, 15690, 19392, 23094
728	heterogeneous nuclear ribonucleoprotein C (C1/C2)	449098	883	404559	4585	8287, 11989, 15691, 19393, 23095
729	heterogeneous nuclear ribonucleoprotein C (C1/C2)	452166	884	391047	4586	8288, 11990, 15692, 19394, 23096
730	heterogeneous nuclear ribonucleoprotein C (C1/C2)	553300	885	450544	4587	8289, 11991, 15693, 19395, 23097
731	heterogeneous nuclear ribonucleoprotein C (C1/C2)	554383	886	452021	4588	8290, 11992, 15694, 19396, 23098
732	heterogeneous nuclear ribonucleoprotein C (C1/C2)	554455	887	451291	4589	8291, 11993, 15695, 19397, 23099
733	heterogeneous nuclear ribonucleoprotein C (C1/C2)	554891	888	450467	4590	8292, 11994, 15696, 19398, 23100
734	heterogeneous nuclear ribonucleoprotein C (C1/C2)	554969	889	450725	4591	8293, 11995, 15697, 19399, 23101
735	heterogeneous nuclear ribonucleoprotein C (C1/C2)	555137	890	452185	4592	8294, 11996, 15698,

						19400, 23102
736	heterogeneous nuclear ribonucleoprotein C (C1/C2)	555176	891	452573	4593	8295, 11997, 15699, 19401, 23103
737	heterogeneous nuclear ribonucleoprotein C (C1/C2)	555215	892	452213	4594	8296, 11998, 15700, 19402, 23104
738	heterogeneous nuclear ribonucleoprotein C (C1/C2)	555883	893	450629	4595	8297, 11999, 15701, 19403, 23105
739	heterogeneous nuclear ribonucleoprotein C (C1/C2)	556226	894	451292	4596	8298, 12000, 15702, 19404, 23106
740	heterogeneous nuclear ribonucleoprotein C (C1/C2)	556628	895	451652	4597	8299, 12001, 15703, 19405, 23107
741	heterogeneous nuclear ribonucleoprotein C (C1/C2)	556897	896	451176	4598	8300, 12002, 15704, 19406, 23108
742	heterogeneous nuclear ribonucleoprotein C (C1/C2)	557201	897	452276	4599	8301, 12003, 15705, 19407, 23109
743	heterogeneous nuclear ribonucleoprotein C (C1/C2)	557336	898	451892	4600	8302, 12004, 15706, 19408, 23110
744	heterogeneous nuclear ribonucleoprotein C (C1/C2)	557442	899	452599	4601	8303, 12005, 15707, 19409, 23111
745	heterogeneous nuclear ribonucleoprotein C (C1/C2)	557768	900	450669	4602	8304, 12006, 15708,

						19410, 23112
746	heterogeneous nuclear ribonucleoprotein C-like 1	317869	901	365370	4603	8305, 12007, 15709, 19411, 23113
747	heterogeneous nuclear ribonucleoprotein H3 (2H9)	265866	902	265866	4604	8306, 12008, 15710, 19412, 23114
748	heterogeneous nuclear ribonucleoprotein H3 (2H9)	354695	903	346726	4605	8307, 12009, 15711, 19413, 23115
749	heterogeneous nuclear ribonucleoprotein H3 (2H9)	441000	904	409869	4606	8308, 12010, 15712, 19414, 23116
750	heterogeneous nuclear ribonucleoprotein K	351839	905	317788	4607	8309, 12011, 15713, 19415, 23117
751	heterogeneous nuclear ribonucleoprotein K	360384	906	353552	4608	8310, 12012, 15714, 19416, 23118
752	heterogeneous nuclear ribonucleoprotein K	376256	907	365432	4609	8311, 12013, 15715, 19417, 23119
753	heterogeneous nuclear ribonucleoprotein K	376258	908	365434	4610	8312, 12014, 15716, 19418, 23120
754	heterogeneous nuclear ribonucleoprotein K	376263	909	365439	4611	8313, 12015, 15717, 19419, 23121
755	heterogeneous nuclear ribonucleoprotein K	376264	910	365440	4612	8314, 12016, 15718,

						19420, 23122
756	heterogeneous nuclear ribonucleoprotein K	376268	911	365444	4613	8315, 12017, 15719, 19421, 23123
757	heterogeneous nuclear ribonucleoprotein K	376281	912	365458	4614	8316, 12018, 15720, 19422, 23124
758	heterogeneous nuclear ribonucleoprotein K	435158	913	397725	4615	8317, 12019, 15721, 19423, 23125
759	heterogeneous nuclear ribonucleoprotein K	457156	914	409456	4616	8318, 12020, 15722, 19424, 23126
760	heterogeneous nuclear ribonucleoprotein L	221419	915	221419	4617	8319, 12021, 15723, 19425, 23127
761	heterogeneous nuclear ribonucleoprotein L	388749	916	373401	4618	8320, 12022, 15724, 19426, 23128
762	heterogeneous nuclear ribonucleoprotein L	388750	917	373402	4619	8321, 12023, 15725, 19427, 23129
763	heterogeneous nuclear ribonucleoprotein L	423415	918	409582	4620	8322, 12024, 15726, 19428, 23130
764	heterogeneous nuclear ribonucleoprotein L	536292	919	439384	4621	8323, 12025, 15727, 19429, 23131
765	heterogeneous nuclear ribonucleoprotein L-like	358367	920	351136	4622	8324, 12026, 15728,

						19430, 23132
766	heterogeneous nuclear ribonucleoprotein L-like	378915	921	368195	4623	8325, 12027, 15729, 19431, 23133
767	heterogeneous nuclear ribonucleoprotein L-like	409328	922	386575	4624	8326, 12028, 15730, 19432, 23134
768	heterogeneous nuclear ribonucleoprotein L-like	409636	923	387088	4625	8327, 12029, 15731, 19433, 23135
769	heterogeneous nuclear ribonucleoprotein L-like	410076	924	386695	4626	8328, 12030, 15732, 19434, 23136
770	heterogeneous nuclear ribonucleoprotein L-like	449105	925	390625	4627	8329, 12031, 15733, 19435, 23137
771	heterogeneous nuclear ribonucleoprotein U-like 2	301785	926	301785	4628	8330, 12032, 15734, 19436, 23138
772	high mobility group box 4	519684	927	429214	4629	8331, 12033, 15735, 19437, 23139
773	high mobility group box 4	522796	928	430919	4630	8332, 12034, 15736, 19438, 23140
774	high mobility group nucleosomal binding domain 4	328219	929	327691	4631	8333, 12035, 15737, 19439, 23141
775	high mobility group nucleosomal binding domain 4	377575	930	366798	4632	8334, 12036, 15738,

						19440, 23142
776	high mobility group nucleosome binding domain 5	358130	931	350848	4633	8335, 12037, 15739, 19441, 23143
777	high mobility group nucleosome binding domain 5	373250	932	362347	4634	8336, 12038, 15740, 19442, 23144
778	high mobility group nucleosome binding domain 5	430960	933	399626	4635	8337, 12039, 15741, 19443, 23145
779	high mobility group nucleosome binding domain 5	436386	934	413402	4636	8338, 12040, 15742, 19444, 23146
780	high mobility group nucleosome binding domain 5	447319	935	408060	4637	8339, 12041, 15743, 19445, 23147
781	high mobility group nucleosome binding domain 5	451455	936	404810	4638	8340, 12042, 15744, 19446, 23148
782	highly divergent homeobox	297977	937	297977	4639	8341, 12043, 15745, 19447, 23149
783	highly divergent homeobox	373177	938	362272	4640	8342, 12044, 15746, 19448, 23150
784	highly divergent homeobox	449553	939	387790	4641	8343, 12045, 15747, 19449, 23151
785	highly divergent homeobox	506585	940	423670	4642	8344, 12046, 15748,

						19450, 23152
786	HIRA interacting protein 3	279392	941	279392	4643	8345, 12047, 15749, 19451, 23153
787	HIRA interacting protein 3	352552	942	342616	4644	8346, 12048, 15750, 19452, 23154
788	histamine receptor H3	317393	943	321482	4645	8347, 12049, 15751, 19453, 23155
789	histamine receptor H3	340177	944	342560	4646	8348, 12050, 15752, 19454, 23156
790	histamine receptor H3	370797	945	359833	4647	8349, 12051, 15753, 19455, 23157
791	histone cluster 1, H2aa	297012	946	297012	4648	8350, 12052, 15754, 19456, 23158
792	histone cluster 1, H2ag	359193	947	352119	4649	8351, 12053, 15755, 19457, 23159
793	histone cluster 1, H2ah	377459	948	366679	4650	8352, 12054, 15756, 19458, 23160
794	histone cluster 1, H2bj	339812	949	342886	4651	8353, 12055, 15757, 19459, 23161
795	histone cluster 1, H2bj	541790	950	445633	4652	8354, 12056, 15758,

						19460, 23162
796	histone cluster 1, H2bk	356950	951	349430	4653	8355, 12057, 15759, 19461, 23163
797	histone cluster 1, H2bk	396891	952	380100	4654	8356, 12058, 15760, 19462, 23164
798	histone cluster 2, H2aa3	369161	953	358158	4655	8357, 12059, 15761, 19463, 23165
799	histone cluster 2, H2aa4	369159	954	358155	4656	8358, 12060, 15762, 19464, 23166
800	histone cluster 2, H2ab	331128	955	332790	4657	8359, 12061, 15763, 19465, 23167
801	histone cluster 2, H2bf	369167	956	358164	4658	8360, 12062, 15764, 19466, 23168
802	histone cluster 2, H2bf	427880	957	407461	4659	8361, 12063, 15765, 19467, 23169
803	histone cluster 2, H2bf	545683	958	445831	4660	8362, 12064, 15766, 19468, 23170
804	histone cluster 2, H3, pseudogene 2	392948	959	376675	4661	8363, 12065, 15767, 19469, 23171
805	histone cluster 3, H2a	366695	960	355656	4662	8364, 12066, 15768,

						19470, 23172
806	histone cluster 3, H2bb	369160	961	375736	4663	8365, 12067, 15769, 19471, 23173
807	histone H4 transcription factor	350777	962	318085	4664	8366, 12068, 15770, 19472, 23174
808	histone H4 transcription factor	527410	963	436815	4665	8367, 12069, 15771, 19473, 23175
809	Histone-lysine N-methyltransferase MLL4	222270	964	222270	4666	8368, 12070, 15772, 19474, 23176
810	Histone-lysine N-methyltransferase MLL4	341701	965	345761	4667	8369, 12071, 15773, 19475, 23177
811	Histone-lysine N-methyltransferase MLL4	420124	966	398837	4668	8370, 12072, 15774, 19476, 23178
812	HIV-1 Tat specific factor 1	218364	967	218364	4669	8371, 12073, 15775, 19477, 23179
813	HIV-1 Tat specific factor 1	415377	968	395152	4670	8372, 12074, 15776, 19478, 23180
814	HIV-1 Tat specific factor 1	425695	969	412420	4671	8373, 12075, 15777, 19479, 23181
815	HIV-1 Tat specific factor 1	448450	970	411381	4672	8374, 12076, 15778,

						19480, 23182
816	HIV-1 Tat specific factor 1	535601	971	442699	4673	8375, 12077, 15779, 19481, 23183
817	HMG box domain containing 3	502717	972	421917	4674	8376, 12078, 15780, 19482, 23184
818	HMG-box transcription factor 1	222574	973	222574	4675	8377, 12079, 15781, 19483, 23185
819	HMG-box transcription factor 1	464009	974	420137	4676	8378, 12080, 15782, 19484, 23186
820	HMG-box transcription factor 1	468401	975	420281	4677	8379, 12081, 15783, 19485, 23187
821	HMG-box transcription factor 1	468410	976	420500	4678	8380, 12082, 15784, 19486, 23188
822	HMG-box transcription factor 1	478930	977	418022	4679	8381, 12083, 15785, 19487, 23189
823	HMG-box transcription factor 1	479011	978	417927	4680	8382, 12084, 15786, 19488, 23190
824	HMG-box transcription factor 1	485846	979	418738	4681	8383, 12085, 15787, 19489, 23191
825	HMG-box transcription factor 1	497535	980	417631	4682	8384, 12086, 15788,

						19490, 23192
826	HMG-box transcription factor 1	498408	981	418017	4683	8385, 12087, 15789, 19491, 23193
827	homeobox A3	317201	982	324884	4684	8386, 12088, 15790, 19492, 23194
828	homeobox A3	396350	983	379639	4685	8387, 12089, 15791, 19493, 23195
829	homeobox A3	396352	984	379640	4686	8388, 12090, 15792, 19494, 23196
830	homeobox A3	521779	985	430111	4687	8389, 12091, 15793, 19495, 23197
831	homeobox A3	522456	986	430566	4688	8390, 12092, 15794, 19496, 23198
832	homeobox A3	522788	987	429426	4689	8391, 12093, 15795, 19497, 23199
833	homeobox and leucine zipper encoding	357460	988	350049	4690	8392, 12094, 15796, 19498, 23200
834	homeobox D13	392539	989	376322	4691	8393, 12095, 15797, 19499, 23201
835	HORMA domain containing 2	336726	990	336984	4692	8394, 12096, 15798,

						19500, 23202
836	HORMA domain containing 2	403975	991	385055	4693	8395, 12097, 15799, 19501, 23203
837	HtrA serine peptidase 3	382512	992	371952	4694	8396, 12098, 15800, 19502, 23204
838	IKAROS family zinc finger 2 (Helios)	342002	993	342876	4695	8397, 12099, 15801, 19503, 23205
839	IKAROS family zinc finger 2 (Helios)	374319	994	363439	4696	8398, 12100, 15802, 19504, 23206
840	IKAROS family zinc finger 2 (Helios)	374327	995	363447	4697	8399, 12101, 15803, 19505, 23207
841	IKAROS family zinc finger 2 (Helios)	413091	996	402334	4698	8400, 12102, 15804, 19506, 23208
842	IKAROS family zinc finger 2 (Helios)	421754	997	399574	4699	8401, 12103, 15805, 19507, 23209
843	IKAROS family zinc finger 2 (Helios)	431520	998	396253	4700	8402, 12104, 15806, 19508, 23210
844	IKAROS family zinc finger 2 (Helios)	433134	999	406783	4701	8403, 12105, 15807, 19509, 23211
845	IKAROS family zinc finger 2 (Helios)	434687	1000	412869	4702	8404, 12106, 15808,

						19510, 23212
846	IKAROS family zinc finger 2 (Helios)	439848	1001	389548	4703	8405, 12107, 15809, 19511, 23213
847	IKAROS family zinc finger 2 (Helios)	451136	1002	395203	4704	8406, 12108, 15810, 19512, 23214
848	IKAROS family zinc finger 2 (Helios)	452786	1003	402132	4705	8407, 12109, 15811, 19513, 23215
849	IKAROS family zinc finger 2 (Helios)	457361	1004	410447	4706	8408, 12110, 15812, 19514, 23216
850	IKAROS family zinc finger 2 (Helios)	542010	1005	442643	4707	8409, 12111, 15813, 19515, 23217
851	IKAROS family zinc finger 5 (Pegasus)	368886	1006	357881	4708	8410, 12112, 15814, 19516, 23218
852	INO80 complex subunit B	233331	1007	233331	4709	8411, 12113, 15815, 19517, 23219
853	INO80 complex subunit B	452361	1008	388677	4710	8412, 12114, 15816, 19518, 23220
854	INO80 complex subunit C	283410	1009	283410	4711	8413, 12115, 15817, 19519, 23221
855	INO80 complex subunit C	334598	1010	334473	4712	8414, 12116, 15818,

						19520, 23222
856	INO80 complex subunit C	441607	1011	391457	4713	8415, 12117, 15819, 19521, 23223
857	INO80 complex subunit D	233270	1012	233270	4714	8416, 12118, 15820, 19522, 23224
858	INO80 complex subunit D	403263	1013	384198	4715	8417, 12119, 15821, 19523, 23225
859	INO80 complex subunit D	414320	1014	409031	4716	8418, 12120, 15822, 19524, 23226
860	INO80 complex subunit E	304516	1015	303977	4717	8419, 12121, 15823, 19525, 23227
861	INO80 complex subunit E	380503	1016	369872	4718	8420, 12122, 15824, 19526, 23228
862	INO80 complex subunit E	540562	1017	442755	4719	8421, 12123, 15825, 19527, 23229
863	INO80 complex subunit E	563197	1018	457016	4720	8422, 12124, 15826, 19528, 23230
864	integrator complex subunit 10	397977	1019	381064	4721	8423, 12125, 15827, 19529, 23231
865	integrator complex subunit 12	340139	1020	340737	4722	8424, 12126, 15828,

						19530, 23232
866	integrator complex subunit 12	394735	1021	378221	4723	8425, 12127, 15829, 19531, 23233
867	integrator complex subunit 12	416543	1022	396309	4724	8426, 12128, 15830, 19532, 23234
868	integrator complex subunit 12	420368	1023	412317	4725	8427, 12129, 15831, 19533, 23235
869	integrator complex subunit 12	433009	1024	396729	4726	8428, 12130, 15832, 19534, 23236
870	integrator complex subunit 12	451321	1025	415433	4727	8429, 12131, 15833, 19535, 23237
871	integrator complex subunit 12	503746	1026	423618	4728	8430, 12132, 15834, 19536, 23238
872	integrator complex subunit 12	515819	1027	422048	4729	8431, 12133, 15835, 19537, 23239
873	integrator complex subunit 3	318967	1028	318641	4730	8432, 12134, 15836, 19538, 23240
874	integrator complex subunit 3	435409	1029	404290	4731	8433, 12135, 15837, 19539, 23241
875	integrator complex subunit 3	456435	1030	398222	4732	8434, 12136, 15838,

						19540, 23242
876	integrator complex subunit 3	512605	1031	425437	4733	8435, 12137, 15839, 19541, 23243
877	integrator complex subunit 4	354849	1032	346913	4734	8436, 12138, 15840, 19542, 23244
878	integrator complex subunit 4	534064	1033	434466	4735	8437, 12139, 15841, 19543, 23245
879	integrator complex subunit 4	535943	1034	441084	4736	8438, 12140, 15842, 19544, 23246
880	integrator complex subunit 7	366992	1035	355959	4737	8439, 12141, 15843, 19545, 23247
881	integrator complex subunit 7	366993	1036	355960	4738	8440, 12142, 15844, 19546, 23248
882	integrator complex subunit 7	366994	1037	355961	4739	8441, 12143, 15845, 19547, 23249
883	integrator complex subunit 7	440600	1038	388908	4740	8442, 12144, 15846, 19548, 23250
884	integrator complex subunit 8	447247	1039	398203	4741	8443, 12145, 15847, 19549, 23251
885	integrator complex subunit 8	523731	1040	430338	4742	8444, 12146, 15848,

						19550, 23252
886	integrator complex subunit 9	397363	1041	380520	4743	8445, 12147, 15849, 19551, 23253
887	integrator complex subunit 9	521022	1042	429065	4744	8446, 12148, 15850, 19552, 23254
888	integrator complex subunit 9	541706	1043	441372	4745	8447, 12149, 15851, 19553, 23255
889	integrator complex subunit 9	416984	1044	398208	4746	8448, 12150, 15852, 19554, 23256
890	integrator complex subunit 9	521777	1045	430943	4747	8449, 12151, 15853, 19555, 23257
891	interferon regulatory factor 2 binding protein 1	302165	1046	307265	4748	8450, 12152, 15854, 19556, 23258
892	interferon regulatory factor 2 binding protein 2	366609	1047	355568	4749	8451, 12153, 15855, 19557, 23259
893	interferon regulatory factor 2 binding protein 2	366610	1048	355569	4750	8452, 12154, 15856, 19558, 23260
894	interferon regulatory factor 2 binding protein-like	238647	1049	238647	4751	8453, 12155, 15857, 19559, 23261
895	iroquois homeobox 6	290552	1050	290552	4752	8454, 12156, 15858,

						19560, 23262
896	ISL LIM homeobox 2	290759	1051	290759	4753	8455, 12157, 15859, 19561, 23263
897	IWS1 homolog (S. cerevisiae)	295321	1052	295321	4754	8456, 12158, 15860, 19562, 23264
898	IWS1 homolog (S. cerevisiae)	433551	1053	407184	4755	8457, 12159, 15861, 19563, 23265
899	IWS1 homolog (S. cerevisiae)	455721	1054	399245	4756	8458, 12160, 15862, 19564, 23266
900	jumonji C domain containing histone demethylase 1 homolog D (S. cerevisiae)	6967	1055	6967	4757	8459, 12161, 15863, 19565, 23267, 26076, 26091
901	jumonji C domain containing histone demethylase 1 homolog D (S. cerevisiae)	397560	1056	380692	4758	8460, 12162, 15864, 19566, 23268
902	jumonji domain containing 1C	399251	1057	382195	4759	8461, 12163, 15865, 19567, 23269
903	jumonji domain containing 1C	399262	1058	382204	4760	8462, 12164, 15866, 19568, 23270
904	jumonji domain containing 1C	402544	1059	384990	4761	8463, 12165, 15867, 19569, 23271

905	jumonji domain containing 1C	542921	1060	444682	4762	8464, 12166, 15868, 19570, 23272
906	jumonji, AT rich interactive domain 2	341776	1061	341280	4763	8465, 12167, 15869, 19571, 23273
907	jumonji, AT rich interactive domain 2	397311	1062	380478	4764	8466, 12168, 15870, 19572, 23274
908	jumonji, AT rich interactive domain 2	538175	1063	443116	4765	8467, 12169, 15871, 19573, 23275
909	jumonji, AT rich interactive domain 2	541660	1064	444623	4766	8468, 12170, 15872, 19574, 23276
910	Jun dimerization protein 2	267569	1065	267569	4767	8469, 12171, 15873, 19575, 23277
911	Jun dimerization protein 2	419727	1066	415558	4768	8470, 12172, 15874, 19576, 23278
912	Jun dimerization protein 2	435893	1067	399587	4769	8471, 12173, 15875, 19577, 23279
913	Jun dimerization protein 2	437176	1068	409787	4770	8472, 12174, 15876, 19578, 23280
914	Jun dimerization protein 2	559060	1069	452769	4771	8473, 12175, 15877, 19579, 23281

915	K(lysine) acetyltransferase 6A	265713	1070	265713	4772	8474, 12176, 15878, 19580, 23282
916	K(lysine) acetyltransferase 6A	396930	1071	380136	4773	8475, 12177, 15879, 19581, 23283
917	K(lysine) acetyltransferase 6A	406337	1072	385888	4774	8476, 12178, 15880, 19582, 23284
918	K(lysine) acetyltransferase 6A	426524	1073	396699	4775	8477, 12179, 15881, 19583, 23285
919	K(lysine) acetyltransferase 6A	485568	1074	430606	4776	8478, 12180, 15882, 19584, 23286
920	K(lysine) acetyltransferase 7	259021	1075	259021	4777	8479, 12181, 15883, 19585, 23287
921	K(lysine) acetyltransferase 7	424009	1076	398961	4778	8480, 12182, 15884, 19586, 23288
922	K(lysine) acetyltransferase 7	435742	1077	409477	4779	8481, 12183, 15885, 19587, 23289
923	K(lysine) acetyltransferase 7	454930	1078	413415	4780	8482, 12184, 15886, 19588, 23290
924	K(lysine) acetyltransferase 7	503935	1079	429939	4781	8483, 12185, 15887, 19589, 23291

925	K(lysine) acetyltransferase 7	509773	1080	424577	4782	8484, 12186, 15888, 19590, 23292
926	K(lysine) acetyltransferase 7	510819	1081	423385	4783	8485, 12187, 15889, 19591, 23293
927	K(lysine) acetyltransferase 8	219797	1082	219797	4784	8486, 12188, 15890, 19592, 23294
928	K(lysine) acetyltransferase 8	448516	1083	406037	4785	8487, 12189, 15891, 19593, 23295
929	kelch domain containing 2	298307	1084	298307	4786	8488, 12190, 15892, 19594, 23296
930	keratin associated protein 4-2	377726	1085	366955	4787	8489, 12191, 15893, 19595, 23297
931	keratin associated protein 4-2	458321	1086	407056	4788	8490, 12192, 15894, 19596, 23298
932	KH domain containing, RNA binding, signal transduction associated 1	327300	1087	313829	4789	8491, 12193, 15895, 19597, 23299
933	KH domain containing, RNA binding, signal transduction associated 1	355201	1088	347336	4790	8492, 12194, 15896, 19598, 23300
934	KH domain containing, RNA binding, signal transduction associated 1	492989	1089	417731	4791	8493, 12195, 15897, 19599, 23301

935	KH domain containing, RNA binding, signal transduction associated 2	281156	1090	281156	4792	8494, 12196, 15898, 19600, 23302
936	KH domain containing, RNA binding, signal transduction associated 2	539571	1091	443437	4793	8495, 12197, 15899, 19601, 23303
937	KM-PA-2 protein Uncharacterized protein	377412	1092	366629	4794	8496, 12198, 15900, 19602, 23304
938	Kruppel-like factor 10	285407	1093	285407	4795	8497, 12199, 15901, 19603, 23305
939	Kruppel-like factor 10	395884	1094	379222	4796	8498, 12200, 15902, 19604, 23306
940	Kruppel-like factor 14	310992	1095	310878	4797	8499, 12201, 15903, 19605, 23307
941	Kruppel-like factor 16	250916	1096	250916	4798	8500, 12202, 15904, 19606, 23308
942	Kruppel-like factor 16	541015	1097	439973	4799	8501, 12203, 15905, 19607, 23309
943	Kruppel-like factor 17	372299	1098	361373	4800	8502, 12204, 15906, 19608, 23310
944	Kruppel-like factor 3 (basic)	261438	1099	261438	4801	8503, 12205, 15907, 19609, 23311

945	Kruppel-like factor 5 (intestinal)	377687	1100	366915	4802	8504, 12206, 15908, 19610, 23312
946	Kruppel-like factor 5 (intestinal)	539231	1101	440407	4803	8505, 12207, 15909, 19611, 23313
947	Kruppel-like factor 5 (intestinal)	545883	1102	443600	4804	8506, 12208, 15910, 19612, 23314
948	Kruppel-like factor 9	377126	1103	366330	4805	8507, 12209, 15911, 19613, 23315
949	l(3)mbt-like 3 (Drosophila)	361794	1104	354526	4806	8508, 12210, 15912, 19614, 23316
950	l(3)mbt-like 3 (Drosophila)	368136	1105	357118	4807	8509, 12211, 15913, 19615, 23317
951	l(3)mbt-like 3 (Drosophila)	368139	1106	357121	4808	8510, 12212, 15914, 19616, 23318
952	l(3)mbt-like 3 (Drosophila)	526019	1107	436706	4809	8511, 12213, 15915, 19617, 23319
953	l(3)mbt-like 3 (Drosophila)	528385	1108	433257	4810	8512, 12214, 15916, 19618, 23320
954	l(3)mbt-like 3 (Drosophila)	529410	1109	431962	4811	8513, 12215, 15917, 19619, 23321

955	l(3)mbt-like 3 (Drosophila)	533560	1110	437185	4812	8514, 12216, 15918, 19620, 23322
956	l(3)mbt-like 4 (Drosophila)	284898	1111	284898	4813	8515, 12217, 15919, 19621, 23323
957	l(3)mbt-like 4 (Drosophila)	400105	1112	382976	4814	8516, 12218, 15920, 19622, 23324
958	l(3)mbt-like 4 (Drosophila)	535782	1113	444774	4815	8517, 12219, 15921, 19623, 23325
959	LAS1-like (S. cerevisiae)	312391	1114	308649	4816	8518, 12220, 15922, 19624, 23326
960	LAS1-like (S. cerevisiae)	374804	1115	363937	4817	8519, 12221, 15923, 19625, 23327
961	LAS1-like (S. cerevisiae)	374807	1116	363940	4818	8520, 12222, 15924, 19626, 23328
962	LAS1-like (S. cerevisiae)	374811	1117	363944	4819	8521, 12223, 15925, 19627, 23329
963	lectin, galactoside-binding, soluble, 14	360675	1118	353893	4820	8522, 12224, 15926, 19628, 23330
964	lectin, galactoside-binding, soluble, 14	392052	1119	375905	4821	8523, 12225, 15927, 19629, 23331

965	leprecan-like 4	355468	1120	347649	4822	8524, 12226, 15928, 19630, 23332
966	leprecan-like 4	393928	1121	377505	4823	8525, 12227, 15929, 19631, 23333
967	leprecan-like 4	545545	1122	440505	4824	8526, 12228, 15930, 19632, 23334
968	leucine zipper protein 4	371920	1123	360988	4825	8527, 12229, 15931, 19633, 23335
969	leucine zipper protein 4	371921	1124	360989	4826	8528, 12230, 15932, 19634, 23336
970	leucine zipper protein 4	451986	1125	411212	4827	8529, 12231, 15933, 19635, 23337
971	leucine-rich repeats and WD repeat domain containing 1	292616	1126	292616	4828	8530, 12232, 15934, 19636, 23338
972	ligand dependent nuclear receptor interacting factor 1	369763	1127	358778	4829	8531, 12233, 15935, 19637, 23339
973	ligand dependent nuclear receptor interacting factor 1	485275	1128	432290	4830	8532, 12234, 15936, 19638, 23340
974	ligand dependent nuclear receptor interacting factor 1	494675	1129	435259	4831	8533, 12235, 15937, 19639, 23341

975	LIM homeobox 6	340587	1130	340137	4832	8534, 12236, 15938, 19640, 23342
976	LIM homeobox 6	373755	1131	362860	4833	8535, 12237, 15939, 19641, 23343
977	LIM homeobox 6	394319	1132	377854	4834	8536, 12238, 15940, 19642, 23344
978	LIM homeobox 6	541397	1133	441464	4835	8537, 12239, 15941, 19643, 23345
979	LIM homeobox 6	559529	1134	453896	4836	8538, 12240, 15942, 19644, 23346
980	LIM homeobox 6	560485	1135	453606	4837	8539, 12241, 15943, 19645, 23347
981	LIM homeobox 6	559895	1136	453897	4838	8540, 12242, 15944, 19646, 23348
982	LSM10, U7 small nuclear RNA associated	315732	1137	319341	4839	8541, 12243, 15945, 19647, 23349
983	LSM11, U7 small nuclear RNA associated	286307	1138	286307	4840	8542, 12244, 15946, 19648, 23350
984	Ly1 antibody reactive homolog (mouse)	343470	1139	345917	4841	8543, 12245, 15947, 19649, 23351

985	Ly1 antibody reactive homolog (mouse)	452476	1140	397367	4842	8544, 12246, 15948, 19650, 23352
986	Ly1 antibody reactive homolog (mouse)	513174	1141	420902	4843	8545, 12247, 15949, 19651, 23353
987	lysine (K)-specific demethylase 2A	308783	1142	309302	4844	8546, 12248, 15950, 19652, 23354
988	lysine (K)-specific demethylase 2A	398645	1143	381640	4845	8547, 12249, 15951, 19653, 23355
989	lysine (K)-specific demethylase 2A	446134	1144	392902	4846	8548, 12250, 15952, 19654, 23356
990	lysine (K)-specific demethylase 2A	529006	1145	432786	4847	8549, 12251, 15953, 19655, 23357
991	lysine (K)-specific demethylase 2A	530342	1146	435776	4848	8550, 12252, 15954, 19656, 23358
992	lysine (K)-specific demethylase 2B	261824	1147	261824	4849	8551, 12253, 15955, 19657, 23359
993	lysine (K)-specific demethylase 2B	377069	1148	366269	4850	8552, 12254, 15956, 19658, 23360
994	lysine (K)-specific demethylase 2B	377071	1149	366271	4851	8553, 12255, 15957, 19659, 23361

995	lysine (K)-specific demethylase 2B	397478	1150	380615	4852	8554, 12256, 15958, 19660, 23362
996	lysine (K)-specific demethylase 2B	397480	1151	380617	4853	8555, 12257, 15959, 19661, 23363
997	lysine (K)-specific demethylase 2B	536437	1152	445196	4854	8556, 12258, 15960, 19662, 23364
998	lysine (K)-specific demethylase 2B	540043	1153	440430	4855	8557, 12259, 15961, 19663, 23365
999	lysine (K)-specific demethylase 4B	159111	1154	159111	4856	8558, 12260, 15962, 19664, 23366, 26077, 26092
1000	lysine (K)-specific demethylase 4B	381759	1155	371178	4857	8559, 12261, 15963, 19665, 23367
1001	lysine (K)-specific demethylase 4B	536461	1156	440495	4858	8560, 12262, 15964, 19666, 23368
1002	lysine (K)-specific demethylase 4C	381306	1157	370707	4859	8561, 12263, 15965, 19667, 23369
1003	lysine (K)-specific demethylase 4C	381309	1158	370710	4860	8562, 12264, 15966, 19668, 23370
1004	lysine (K)-specific demethylase 4C	420847	1159	400127	4861	8563, 12265, 15967,

						19669, 23371
1005	lysine (K)-specific demethylase 4C	428870	1160	405739	4862	8564, 12266, 15968, 19670, 23372
1006	lysine (K)-specific demethylase 4C	442236	1161	409353	4863	8565, 12267, 15969, 19671, 23373
1007	lysine (K)-specific demethylase 4C	535193	1162	442382	4864	8566, 12268, 15970, 19672, 23374
1008	lysine (K)-specific demethylase 4C	536108	1163	440656	4865	8567, 12269, 15971, 19673, 23375
1009	lysine (K)-specific demethylase 4C	543771	1164	445427	4866	8568, 12270, 15972, 19674, 23376
1010	lysine (K)-specific demethylase 4D	335080	1165	334181	4867	8569, 12271, 15973, 19675, 23377
1011	lysine (K)-specific demethylase 4D-like	450979	1166	397239	4868	8570, 12272, 15974, 19676, 23378
1012	mab-21-like 2 (<i>C. elegans</i>)	317605	1167	324701	4869	8571, 12273, 15975, 19677, 23379
1013	mago-nashi homolog B (<i>Drosophila</i>)	320756	1168	319240	4870	8572, 12274, 15976, 19678, 23380
1014	mago-nashi homolog B (<i>Drosophila</i>)	381881	1169	371305	4871	8573, 12275, 15977,

						19679, 23381
1015	major histocompatibility complex, class I, F	551832	1170	448260	4872	8574, 12276, 15978, 19680, 23382
1016	MAK16 homolog (S. cerevisiae)	360128	1171	353246	4873	8575, 12277, 15979, 19681, 23383
1017	male-specific lethal 1 homolog (Drosophila)	339569	1172	341409	4874	8576, 12278, 15980, 19682, 23384
1018	male-specific lethal 1 homolog (Drosophila)	398532	1173	381543	4875	8577, 12279, 15981, 19683, 23385
1019	male-specific lethal 1 homolog (Drosophila)	579565	1174	462945	4876	8578, 12280, 15982, 19684, 23386
1020	male-specific lethal 2 homolog (Drosophila)	309993	1175	311827	4877	8579, 12281, 15983, 19685, 23387
1021	male-specific lethal 2 homolog (Drosophila)	434835	1176	387948	4878	8580, 12282, 15984, 19686, 23388
1022	male-specific lethal 3 homolog (Drosophila)	312196	1177	312244	4879	8581, 12283, 15985, 19687, 23389
1023	male-specific lethal 3 homolog (Drosophila)	337339	1178	338078	4880	8582, 12284, 15986, 19688, 23390
1024	male-specific lethal 3 homolog (Drosophila)	361672	1179	354562	4881	8583, 12285, 15987,

						19689, 23391
1025	male-specific lethal 3 homolog (Drosophila)	380692	1180	370068	4882	8584, 12286, 15988, 19690, 23392
1026	male-specific lethal 3 homolog (Drosophila)	380693	1181	370069	4883	8585, 12287, 15989, 19691, 23393
1027	male-specific lethal 3 homolog (Drosophila)	398527	1182	381538	4884	8586, 12288, 15990, 19692, 23394
1028	male-specific lethal 3 homolog (Drosophila)	476743	1183	419976	4885	8587, 12289, 15991, 19693, 23395
1029	MAU2 chromatid cohesion factor homolog (C. elegans)	262815	1184	262815	4886	8588, 12290, 15992, 19694, 23396
1030	MAU2 chromatid cohesion factor homolog (C. elegans)	262816	1185	262816	4887	8589, 12291, 15993, 19695, 23397
1031	MAU2 chromatid cohesion factor homolog (C. elegans)	392313	1186	376127	4888	8590, 12292, 15994, 19696, 23398
1032	MAU2 chromatid cohesion factor homolog (C. elegans)	499453	1187	437731	4889	8591, 12293, 15995, 19697, 23399
1033	MAU2 chromatid cohesion factor homolog (C. elegans)	501391	1188	442641	4890	8592, 12294, 15996, 19698, 23400
1034	MAX dimerization protein 1	264444	1189	264444	4891	8593, 12295, 15997,

						19699, 23401
1035	MAX dimerization protein 1	540449	1190	443935	4892	8594, 12296, 15998, 19700, 23402
1036	MAX dimerization protein 4	337190	1191	337889	4893	8595, 12297, 15999, 19701, 23403
1037	MAX dimerization protein 4	537353	1192	444390	4894	8596, 12298, 16000, 19702, 23404
1038	mbt domain containing 1	376381	1193	365561	4895	8597, 12299, 16001, 19703, 23405
1039	mbt domain containing 1	405860	1194	386072	4896	8598, 12300, 16002, 19704, 23406
1040	mbt domain containing 1	415868	1195	403946	4897	8599, 12301, 16003, 19705, 23407
1041	mbt domain containing 1	586178	1196	468304	4898	8600, 12302, 16004, 19706, 23408
1042	MDN1, midasin homolog (yeast)	369393	1197	358400	4899	8601, 12303, 16005, 19707, 23409
1043	MDN1, midasin homolog (yeast)	428876	1198	413970	4900	8602, 12304, 16006, 19708, 23410
1044	MDN1, midasin homolog (yeast)	439638	1199	409664	4901	8603, 12305, 16007,

						19709, 23411
1045	MDS1 and EVI1 complex locus	264674	1200	264674	4902	8604, 12306, 16008, 19710, 23412
1046	MDS1 and EVI1 complex locus	392736	1201	376493	4903	8605, 12307, 16009, 19711, 23413
1047	MDS1 and EVI1 complex locus	433243	1202	394302	4904	8606, 12308, 16010, 19712, 23414
1048	MDS1 and EVI1 complex locus	460814	1203	420466	4905	8607, 12309, 16011, 19713, 23415
1049	MDS1 and EVI1 complex locus	460890	1204	417922	4906	8608, 12310, 16012, 19714, 23416
1050	MDS1 and EVI1 complex locus	464456	1205	419770	4907	8609, 12311, 16013, 19715, 23417
1051	MDS1 and EVI1 complex locus	466623	1206	418689	4908	8610, 12312, 16014, 19716, 23418
1052	MDS1 and EVI1 complex locus	468789	1207	419995	4909	8611, 12313, 16015, 19717, 23419
1053	MDS1 and EVI1 complex locus	472280	1208	420048	4910	8612, 12314, 16016, 19718, 23420
1054	MDS1 and EVI1 complex locus	475754	1209	418828	4911	8613, 12315, 16017,

						19719, 23421
1055	MDS1 and EVI1 complex locus	481315	1210	418046	4912	8614, 12316, 16018, 19720, 23422
1056	MDS1 and EVI1 complex locus	484519	1211	417299	4913	8615, 12317, 16019, 19721, 23423
1057	MDS1 and EVI1 complex locus	487503	1212	419757	4914	8616, 12318, 16020, 19722, 23424
1058	MDS1 and EVI1 complex locus	494292	1213	417899	4915	8617, 12319, 16021, 19723, 23425
1059	MDS1 and EVI1 complex locus	494597	1214	420072	4916	8618, 12320, 16022, 19724, 23426
1060	mediator complex subunit 16	269814	1215	269814	4917	8619, 12321, 16023, 19725, 23427
1061	mediator complex subunit 16	312090	1216	308528	4918	8620, 12322, 16024, 19726, 23428
1062	mediator complex subunit 16	325464	1217	325612	4919	8621, 12323, 16025, 19727, 23429
1063	mediator complex subunit 16	395808	1218	379153	4920	8622, 12324, 16026, 19728, 23430
1064	mediator complex subunit 16	424039	1219	398529	4921	8623, 12325, 16027,

						19729, 23431
1065	mediator complex subunit 16	534906	1220	440702	4922	8624, 12326, 16028, 19730, 23432
1066	mediator complex subunit 16	537596	1221	443310	4923	8625, 12327, 16029, 19731, 23433
1067	mediator complex subunit 16	538572	1222	438714	4924	8626, 12328, 16030, 19732, 23434
1068	mediator complex subunit 16	540679	1223	438163	4925	8627, 12329, 16031, 19733, 23435
1069	mediator complex subunit 16	541440	1224	446139	4926	8628, 12330, 16032, 19734, 23436
1070	mediator complex subunit 22	343730	1225	342343	4927	8629, 12331, 16033, 19735, 23437
1071	mediator complex subunit 22	344469	1226	341761	4928	8630, 12332, 16034, 19736, 23438
1072	mediator complex subunit 22	371999	1227	361067	4929	8631, 12333, 16035, 19737, 23439
1073	mediator complex subunit 22	446777	1228	394781	4930	8632, 12334, 16036, 19738, 23440
1074	mediator complex subunit 22	457204	1229	404178	4931	8633, 12335, 16037,

						19739, 23441
1075	mediator complex subunit 22	476080	1230	419098	4932	8634, 12336, 16038, 19740, 23442
1076	mediator complex subunit 22	486395	1231	420276	4933	8635, 12337, 16039, 19741, 23443
1077	mediator complex subunit 22	491289	1232	420393	4934	8636, 12338, 16040, 19742, 23444
1078	mediator complex subunit 22	494177	1233	420815	4935	8637, 12339, 16041, 19743, 23445
1079	mediator complex subunit 31	225728	1234	225728	4936	8638, 12340, 16042, 19744, 23446
1080	mediator complex subunit 6	256379	1235	256379	4937	8639, 12341, 16043, 19745, 23447
1081	mediator complex subunit 6	430055	1236	413343	4938	8640, 12342, 16044, 19746, 23448
1082	mediator complex subunit 6	440435	1237	394502	4939	8641, 12343, 16045, 19747, 23449
1083	mediator complex subunit 6	554963	1238	451684	4940	8642, 12344, 16046, 19748, 23450
1084	mediator complex subunit 8	290663	1239	290663	4941	8643, 12345, 16047,

						19749, 23451
1085	mediator complex subunit 8	372457	1240	361535	4942	8644, 12346, 16048, 19750, 23452
1086	MEF2 activating motif and SAP domain containing transcriptional regulator	318083	1241	324175	4943	8645, 12347, 16049, 19751, 23453
1087	MEF2 activating motif and SAP domain containing transcriptional regulator	356751	1242	349192	4944	8646, 12348, 16050, 19752, 23454
1088	MEF2 activating motif and SAP domain containing transcriptional regulator	377367	1243	366584	4945	8647, 12349, 16051, 19753, 23455
1089	MEF2 activating motif and SAP domain containing transcriptional regulator	419611	1244	393801	4946	8648, 12350, 16052, 19754, 23456
1090	meiotic nuclear divisions 1 homolog (<i>S. cerevisiae</i>)	240488	1245	240488	4947	8649, 12351, 16053, 19755, 23457
1091	Meis homeobox 3	437609	1246	401116	4948	8650, 12352, 16054, 19756, 23458
1092	Meis homeobox 3	441740	1247	388667	4949	8651, 12353, 16055, 19757, 23459
1093	Meis homeobox 3	558555	1248	454073	4950	8652, 12354, 16056, 19758, 23460
1094	Meis homeobox 3	559524	1249	452854	4951	8653, 12355, 16057,

						19759, 23461
1095	Meis homeobox 3	561293	1250	453307	4952	8654, 12356, 16058, 19760, 23462
1096	Meis homeobox 3	561293	1251	453307	4953	8655, 12357, 16059, 19761, 23463
1097	melanoma associated antigen (mutated) 1	311401	1252	309135	4954	8656, 12358, 16060, 19762, 23464
1098	melanoma associated antigen (mutated) 1	344663	1253	345789	4955	8657, 12359, 16061, 19763, 23465
1099	melanoma associated antigen (mutated) 1	356765	1254	349207	4956	8658, 12360, 16062, 19764, 23466
1100	melanoma associated antigen (mutated) 1	415183	1255	394925	4957	8659, 12361, 16063, 19765, 23467
1101	melanoma associated antigen (mutated) 1	542512	1256	439335	4958	8660, 12362, 16064, 19766, 23468
1102	mesoderm induction early response 1 homolog (Xenopus laevis)	355356	1257	347514	4959	8661, 12363, 16065, 19767, 23469
1103	mesoderm induction early response 1 homolog (Xenopus laevis)	355977	1258	348253	4960	8662, 12364, 16066, 19768, 23470

1104	mesoderm induction early response 1 homolog (Xenopus laevis)	357692	1259	350321	4961	8663, 12365, 16067, 19769, 23471
1105	mesoderm induction early response 1 homolog (Xenopus laevis)	371014	1260	360053	4962	8664, 12366, 16068, 19770, 23472
1106	mesoderm induction early response 1 homolog (Xenopus laevis)	371016	1261	360055	4963	8665, 12367, 16069, 19771, 23473
1107	mesoderm induction early response 1 homolog (Xenopus laevis)	371017	1262	360056	4964	8666, 12368, 16070, 19772, 23474
1108	mesoderm induction early response 1 homolog (Xenopus laevis)	371018	1263	360057	4965	8667, 12369, 16071, 19773, 23475
1109	mesoderm induction early response 1 homolog (Xenopus laevis)	401041	1264	383820	4966	8668, 12370, 16072, 19774, 23476
1110	mesoderm induction early response 1 homolog (Xenopus laevis)	401042	1265	383821	4967	8669, 12371, 16073, 19775, 23477
1111	mesoderm induction early response 1, family member 2	264819	1266	264819	4968	8670, 12372, 16074, 19776, 23478
1112	mesoderm induction early response 1, family member 3	381199	1267	370596	4969	8671, 12373, 16075, 19777, 23479
1113	mesoderm induction early response 1, family member 3	381213	1268	370611	4970	8672, 12374, 16076, 19778, 23480

1114	mesoderm posterior 1 homolog (mouse)	300057	1269	300057	4971	8673, 12375, 16077, 19779, 23481
1115	metastasis associated 1 family, member 2	278823	1270	278823	4972	8674, 12376, 16078, 19780, 23482
1116	metastasis associated 1 family, member 2	524902	1271	431346	4973	8675, 12377, 16079, 19781, 23483
1117	metastasis associated 1 family, member 2	527204	1272	431797	4974	8676, 12378, 16080, 19782, 23484
1118	metastasis associated 1 family, member 3	282366	1273	282366	4975	8677, 12379, 16081, 19783, 23485
1119	metastasis associated 1 family, member 3	405094	1274	385823	4976	8678, 12380, 16082, 19784, 23486
1120	metastasis associated 1 family, member 3	407270	1275	385045	4977	8679, 12381, 16083, 19785, 23487
1121	methyl-CpG binding domain protein 3-like 1	305625	1276	304198	4978	8680, 12382, 16084, 19786, 23488
1122	methyl-CpG binding domain protein 6	300263	1277	300263	4979	8681, 12383, 16085, 19787, 23489
1123	methyl-CpG binding domain protein 6	355673	1278	347896	4980	8682, 12384, 16086, 19788, 23490

1124	methyl-CpG binding domain protein 6	431731	1279	390211	4981	8683, 12385, 16087, 19789, 23491
1125	methyl-CpG binding domain protein 6	546632	1280	448202	4982	8684, 12386, 16088, 19790, 23492
1126	methyl-CpG binding domain protein 6	546805	1281	449603	4983	8685, 12387, 16089, 19791, 23493
1127	methyl-CpG binding domain protein 6	548887	1282	448070	4984	8686, 12388, 16090, 19792, 23494
1128	methyl-CpG binding domain protein 6	551351	1283	450370	4985	8687, 12389, 16091, 19793, 23495
1129	methyl-CpG binding domain protein 6	552255	1284	447365	4986	8688, 12390, 16092, 19794, 23496
1130	methyltransferase like 11A	372480	1285	361558	4987	8689, 12391, 16093, 19795, 23497
1131	methyltransferase like 11A	372481	1286	361559	4988	8690, 12392, 16094, 19796, 23498
1132	methyltransferase like 11A	372483	1287	361561	4989	8691, 12393, 16095, 19797, 23499
1133	methyltransferase like 11A	372486	1288	361564	4990	8692, 12394, 16096, 19798, 23500

1134	methyltransferase like 14	388822	1289	373474	4991	8693, 12395, 16097, 19799, 23501
1135	MIS18 binding protein 1	310806	1290	309790	4992	8694, 12396, 16098, 19800, 23502
1136	MIS18 binding protein 1	451174	1291	397184	4993	8695, 12397, 16099, 19801, 23503
1137	MIS18 kinetochore protein homolog A (S. pombe)	290130	1292	290130	4994	8696, 12398, 16100, 19802, 23504
1138	MKL/myocardin-like 2	318282	1293	339086	4995	8697, 12399, 16101, 19803, 23505
1139	MKL/myocardin-like 2	341243	1294	345841	4996	8698, 12400, 16102, 19804, 23506
1140	MKL/myocardin-like 2	389126	1295	373778	4997	8699, 12401, 16103, 19805, 23507
1141	MMS22-like, DNA repair protein	275053	1296	275053	4998	8700, 12402, 16104, 19806, 23508
1142	mortality factor 4 like 2	360458	1297	353643	4999	8701, 12403, 16105, 19807, 23509
1143	mortality factor 4 like 2	372619	1298	361702	5000	8702, 12404, 16106, 19808, 23510

1144	mortality factor 4 like 2	372620	1299	361703	5001	8703, 12405, 16107, 19809, 23511
1145	mortality factor 4 like 2	418819	1300	393283	5002	8704, 12406, 16108, 19810, 23512
1146	mortality factor 4 like 2	422154	1301	394417	5003	8705, 12407, 16109, 19811, 23513
1147	mortality factor 4 like 2	422355	1302	408607	5004	8706, 12408, 16110, 19812, 23514
1148	mortality factor 4 like 2	423833	1303	416120	5005	8707, 12409, 16111, 19813, 23515
1149	mortality factor 4 like 2	433176	1304	415476	5006	8708, 12410, 16112, 19814, 23516
1150	mortality factor 4 like 2	434230	1305	413664	5007	8709, 12411, 16113, 19815, 23517
1151	mortality factor 4 like 2	441076	1306	391969	5008	8710, 12412, 16114, 19816, 23518
1152	mortality factor 4 like 2	442614	1307	400938	5009	8711, 12413, 16115, 19817, 23519
1153	mortality factor 4 like 2	451301	1308	410532	5010	8712, 12414, 16116, 19818, 23520

1154	M-phase phosphoprotein 10 (U3 small nucleolar ribonucleoprotein)	244230	1309	244230	5011	8713, 12415, 16117, 19819, 23521
1155	mRNA turnover 4 homolog (S. cerevisiae)	330263	1310	364320	5012	8714, 12416, 16118, 19820, 23522
1156	musculin	325509	1311	321445	5013	8715, 12417, 16119, 19821, 23523
1157	musculoskeletal, embryonic nuclear protein 1	446157	1312	410910	5014	8716, 12418, 16120, 19822, 23524
1158	mutS homolog 5 (E. coli)	375703	1313	364855	5015	8717, 12419, 16121, 19823, 23525
1159	mutS homolog 5 (E. coli)	375740	1314	364892	5016	8718, 12420, 16122, 19824, 23526
1160	mutS homolog 5 (E. coli)	375742	1315	364894	5017	8719, 12421, 16123, 19825, 23527
1161	mutS homolog 5 (E. coli)	375750	1316	364903	5018	8720, 12422, 16124, 19826, 23528
1162	mutS homolog 5 (E. coli)	375755	1317	364908	5019	8721, 12423, 16125, 19827, 23529
1163	mutS homolog 5 (E. coli)	383401	1318	372893	5020	8722, 12424, 16126, 19828, 23530

1164	mutS homolog 5 (E. coli)	412201	1319	407288	5021	8723, 12425, 16127, 19829, 23531
1165	mutS homolog 5 (E. coli)	414412	1320	391394	5022	8724, 12426, 16128, 19830, 23532
1166	mutS homolog 5 (E. coli)	416549	1321	399721	5023	8725, 12427, 16129, 19831, 23533
1167	mutS homolog 5 (E. coli)	419269	1322	394649	5024	8726, 12428, 16130, 19832, 23534
1168	mutS homolog 5 (E. coli)	425703	1323	402842	5025	8727, 12429, 16131, 19833, 23535
1169	mutS homolog 5 (E. coli)	427298	1324	403240	5026	8728, 12430, 16132, 19834, 23536
1170	mutS homolog 5 (E. coli)	427735	1325	388037	5027	8729, 12431, 16133, 19835, 23537
1171	mutS homolog 5 (E. coli)	430217	1326	399470	5028	8730, 12432, 16134, 19836, 23538
1172	mutS homolog 5 (E. coli)	431848	1327	416784	5029	8731, 12433, 16135, 19837, 23539
1173	mutS homolog 5 (E. coli)	435700	1328	407047	5030	8732, 12434, 16136, 19838, 23540

1174	mutS homolog 5 (E. coli)	435942	1329	411551	5031	8733, 12435, 16137, 19839, 23541
1175	mutS homolog 5 (E. coli)	436192	1330	406868	5032	8734, 12436, 16138, 19840, 23542
1176	mutS homolog 5 (E. coli)	436559	1331	395133	5033	8735, 12437, 16139, 19841, 23543
1177	mutS homolog 5 (E. coli)	439816	1332	403531	5034	8736, 12438, 16140, 19842, 23544
1178	mutS homolog 5 (E. coli)	441395	1333	402659	5035	8737, 12439, 16141, 19843, 23545
1179	mutS homolog 5 (E. coli)	441401	1334	406269	5036	8738, 12440, 16142, 19844, 23546
1180	mutS homolog 5 (E. coli)	445611	1335	387921	5037	8739, 12441, 16143, 19845, 23547
1181	mutS homolog 5 (E. coli)	448617	1336	387609	5038	8740, 12442, 16144, 19846, 23548
1182	mutS homolog 5 (E. coli)	452856	1337	387458	5039	8741, 12443, 16145, 19847, 23549
1183	mutS homolog 5 (E. coli)	456839	1338	394017	5040	8742, 12444, 16146, 19848, 23550

1184	mutS homolog 5 (E. coli)	457742	1339	409181	5041	8743, 12445, 16147, 19849, 23551
1185	mutS homolog 5 (E. coli)	457795	1340	413269	5042	8744, 12446, 16148, 19850, 23552
1186	mutS homolog 5 (E. coli)	458144	1341	414937	5043	8745, 12447, 16149, 19851, 23553
1187	mutS homolog 5 (E. coli)	534153	1342	431693	5044	8746, 12448, 16150, 19852, 23554
1188	mutS homolog 5 (E. coli)	547775	1343	448368	5045	8747, 12449, 16151, 19853, 23555
1189	mutS homolog 5 (E. coli)	548494	1344	450030	5046	8748, 12450, 16152, 19854, 23556
1190	mutS homolog 5 (E. coli)	549604	1345	447856	5047	8749, 12451, 16153, 19855, 23557
1191	mutS homolog 5 (E. coli)	549618	1346	450231	5048	8750, 12452, 16154, 19856, 23558
1192	mutS homolog 5 (E. coli)	549746	1347	447399	5049	8751, 12453, 16155, 19857, 23559
1193	mutS homolog 5 (E. coli)	550068	1348	447692	5050	8752, 12454, 16156, 19858, 23560

1194	mutS homolog 5 (E. coli)	550586	1349	447230	5051	8753, 12455, 16157, 19859, 23561
1195	mutS homolog 5 (E. coli)	551879	1350	450124	5052	8754, 12456, 16158, 19860, 23562
1196	mutS homolog 5 (E. coli)	556604	1351	450536	5053	8755, 12457, 16159, 19861, 23563
1197	Myb-related transcription factor, partner of profilin	322217	1352	325402	5054	8756, 12458, 16160, 19862, 23564
1198	myc target 1	367245	1353	356214	5055	8757, 12459, 16161, 19863, 23565
1199	myc target 1	532295	1354	434396	5056	8758, 12460, 16162, 19864, 23566
1200	myoneurin	349841	1355	326240	5057	8759, 12461, 16163, 19865, 23567
1201	myoneurin	356716	1356	349150	5058	8760, 12462, 16164, 19866, 23568
1202	myoneurin	392733	1357	376492	5059	8761, 12463, 16165, 19867, 23569
1203	myoneurin	544106	1358	440637	5060	8762, 12464, 16166, 19868, 23570

1204	myosin light chain kinase family, member 4	268446	1359	268446	5061	8763, 12465, 16167, 19869, 23571
1205	myosin light chain kinase family, member 4	274643	1360	274643	5062	8764, 12466, 16168, 19870, 23572
1206	MYST/Esa1-associated factor 6	296214	1361	296214	5063	8765, 12467, 16169, 19871, 23573
1207	MYST/Esa1-associated factor 6	373073	1362	362164	5064	8766, 12468, 16170, 19872, 23574
1208	MYST/Esa1-associated factor 6	373074	1363	362165	5065	8767, 12469, 16171, 19873, 23575
1209	MYST/Esa1-associated factor 6	373075	1364	362166	5066	8768, 12470, 16172, 19874, 23576
1210	MYST/Esa1-associated factor 6	448519	1365	394966	5067	8769, 12471, 16173, 19875, 23577
1211	N(alpha)-acetyltransferase 38, NatC auxiliary subunit	249299	1366	249299	5068	8770, 12472, 16174, 19876, 23578
1212	NACC family member 2, BEN and BTB (POZ) domain containing	277554	1367	277554	5069	8771, 12473, 16175, 19877, 23579
1213	NACC family member 2, BEN and BTB (POZ) domain containing	371753	1368	360818	5070	8772, 12474, 16176, 19878, 23580

1214	N-acetyltransferase 10 (GCN5-related)	257829	1369	257829	5071	8773, 12475, 16177, 19879, 23581
1215	N-acetyltransferase 10 (GCN5-related)	531159	1370	433011	5072	8774, 12476, 16178, 19880, 23582
1216	Nanog homeobox	229307	1371	229307	5073	8775, 12477, 16179, 19881, 23583
1217	Nanog homeobox	526286	1372	435288	5074	8776, 12478, 16180, 19882, 23584
1218	NANOG neighbor homeobox	382119	1373	371553	5075	8777, 12479, 16181, 19883, 23585
1219	NEDD4 binding protein 1	262384	1374	262384	5076	8778, 12480, 16182, 19884, 23586
1220	negative regulator of ubiquitin-like proteins 1	355851	1375	348110	5077	8779, 12481, 16183, 19885, 23587
1221	negative regulator of ubiquitin-like proteins 1	413040	1376	398644	5078	8780, 12482, 16184, 19886, 23588
1222	negative regulator of ubiquitin-like proteins 1	470229	1377	418234	5079	8781, 12483, 16185, 19887, 23589
1223	negative regulator of ubiquitin-like proteins 1	483358	1378	420086	5080	8782, 12484, 16186, 19888, 23590

1224	negative regulator of ubiquitin-like proteins 1	490215	1379	420222	5081	8783, 12485, 16187, 19889, 23591
1225	negative regulator of ubiquitin-like proteins 1	566856	1380	457628	5082	8784, 12486, 16188, 19890, 23592
1226	negative regulator of ubiquitin-like proteins 1	568733	1381	454264	5083	8785, 12487, 16189, 19891, 23593
1227	neural precursor cell expressed, developmentally down-regulated 8	250495	1382	250495	5084	8786, 12488, 16190, 19892, 23594
1228	neurogenin 2	313341	1383	317333	5085	8787, 12489, 16191, 19893, 23595
1229	neuro-oncological ventral antigen 1	267422	1384	267422	5086	8788, 12490, 16192, 19894, 23596
1230	neuro-oncological ventral antigen 1	344429	1385	342387	5087	8789, 12491, 16193, 19895, 23597
1231	neuro-oncological ventral antigen 1	465357	1386	447391	5088	8790, 12492, 16194, 19896, 23598
1232	neuro-oncological ventral antigen 1	539517	1387	438875	5089	8791, 12493, 16195, 19897, 23599
1233	neuro-oncological ventral antigen 2	263257	1388	263257	5090	8792, 12494, 16196, 19898, 23600

1234	nicotinamide nucleotide adenylyltransferase 1	377205	1389	366410	5091	8793, 12495, 16197, 19899, 23601
1235	nicotinamide nucleotide adenylyltransferase 1	403197	1390	385131	5092	8794, 12496, 16198, 19900, 23602
1236	nicotinamide nucleotide adenylyltransferase 1	462686	1391	435134	5093	8795, 12497, 16199, 19901, 23603
1237	NIN1/RPN12 binding protein 1 homolog (<i>S. cerevisiae</i>)	268802	1392	268802	5094	8796, 12498, 16200, 19902, 23604
1238	NK1 homeobox 1	422806	1393	407978	5095	8797, 12499, 16201, 19903, 23605
1239	NK2 homeobox 3	344586	1394	342828	5096	8798, 12500, 16202, 19904, 23606
1240	NK6 homeobox 1	295886	1395	295886	5097	8799, 12501, 16203, 19905, 23607
1241	NK6 homeobox 2	368592	1396	357581	5098	8800, 12502, 16204, 19906, 23608
1242	non-SMC condensin II complex, subunit D3	525485	1397	436037	5099	8801, 12503, 16205, 19907, 23609
1243	non-SMC condensin II complex, subunit D3	534227	1398	431436	5100	8802, 12504, 16206, 19908, 23610

1244	non-SMC condensin II complex, subunit D3	534548	1399	433681	5101	8803, 12505, 16207, 19909, 23611
1245	non-SMC condensin II complex, subunit G2	275830	1400	275830	5102	8804, 12506, 16208, 19910, 23612
1246	non-SMC condensin II complex, subunit G2	356309	1401	348657	5103	8805, 12507, 16209, 19911, 23613
1247	non-SMC condensin II complex, subunit G2	409339	1402	387007	5104	8806, 12508, 16210, 19912, 23614
1248	non-SMC condensin II complex, subunit G2	409423	1403	386569	5105	8807, 12509, 16211, 19913, 23615
1249	non-SMC condensin II complex, subunit G2	441982	1404	408080	5106	8808, 12510, 16212, 19914, 23616
1250	non-SMC condensin II complex, subunit G2	449727	1405	388326	5107	8809, 12511, 16213, 19915, 23617
1251	non-SMC condensin II complex, subunit G2	541468	1406	442337	5108	8810, 12512, 16214, 19916, 23618
1252	non-SMC condensin II complex, subunit G2	545393	1407	445148	5109	8811, 12513, 16215, 19917, 23619
1253	non-SMC condensin II complex, subunit H2	299821	1408	299821	5110	8812, 12514, 16216, 19918, 23620

1254	non-SMC condensin II complex, subunit H2	395698	1409	379050	5111	8813, 12515, 16217, 19919, 23621
1255	non-SMC condensin II complex, subunit H2	420993	1410	410088	5112	8814, 12516, 16218, 19920, 23622
1256	non-SMC element 1 homolog (<i>S. cerevisiae</i>)	361439	1411	355077	5113	8815, 12517, 16219, 19921, 23623
1257	non-SMC element 2, MMS21 homolog (<i>S. cerevisiae</i>)	287437	1412	287437	5114	8816, 12518, 16220, 19922, 23624
1258	non-SMC element 2, MMS21 homolog (<i>S. cerevisiae</i>)	517532	1413	429612	5115	8817, 12519, 16221, 19923, 23625
1259	non-SMC element 2, MMS21 homolog (<i>S. cerevisiae</i>)	518013	1414	431002	5116	8818, 12520, 16222, 19924, 23626
1260	non-SMC element 2, MMS21 homolog (<i>S. cerevisiae</i>)	522563	1415	430668	5117	8819, 12521, 16223, 19925, 23627
1261	non-SMC element 2, MMS21 homolog (<i>S. cerevisiae</i>)	523741	1416	429383	5118	8820, 12522, 16224, 19926, 23628
1262	NOP16 nucleolar protein homolog (yeast)	341213	1417	340662	5119	8821, 12523, 16225, 19927, 23629
1263	NOP16 nucleolar protein homolog (yeast)	389158	1418	373810	5120	8822, 12524, 16226, 19928, 23630

1264	NOP16 nucleolar protein homolog (yeast)	451293	1419	394139	5121	8823, 12525, 16227, 19929, 23631
1265	NOP16 nucleolar protein homolog (yeast)	510123	1420	421302	5122	8824, 12526, 16228, 19930, 23632
1266	NOP2 nucleolar protein homolog (yeast)	322166	1421	313272	5123	8825, 12527, 16229, 19931, 23633
1267	NOP2 nucleolar protein homolog (yeast)	399466	1422	382392	5124	8826, 12528, 16230, 19932, 23634
1268	NOP2 nucleolar protein homolog (yeast)	537442	1423	444437	5125	8827, 12529, 16231, 19933, 23635
1269	NOP2 nucleolar protein homolog (yeast)	541778	1424	443150	5126	8828, 12530, 16232, 19934, 23636
1270	NOP2 nucleolar protein homolog (yeast)	382421	1425	371858	5127	8829, 12531, 16233, 19935, 23637
1271	NOP2 nucleolar protein homolog (yeast)	545200	1426	439422	5128	8830, 12532, 16234, 19936, 23638
1272	notchless homolog 1 (Drosophila)	360831	1427	354075	5129	8831, 12533, 16235, 19937, 23639
1273	notchless homolog 1 (Drosophila)	436188	1428	416023	5130	8832, 12534, 16236, 19938, 23640

1274	notchless homolog 1 (Drosophila)	442241	1429	413572	5131	8833, 12535, 16237, 19939, 23641
1275	notchless homolog 1 (Drosophila)	537697	1430	443885	5132	8834, 12536, 16238, 19940, 23642
1276	notchless homolog 1 (Drosophila)	586869	1431	466588	5133	8835, 12537, 16239, 19941, 23643
1277	notochord homeobox	398468	1432	381486	5134	8836, 12538, 16240, 19942, 23644
1278	NPIP-like protein 1	331436	1433	330634	5135	8837, 12539, 16241, 19943, 23645
1279	NPIP-like protein 1	381497	1434	370908	5136	8838, 12540, 16242, 19944, 23646
1280	NPIP-like protein 1	427999	1435	389275	5137	8839, 12541, 16243, 19945, 23647
1281	NPIP-like protein 1	531453	1436	431760	5138	8840, 12542, 16244, 19946, 23648
1282	NPIP-like protein 1	541593	1437	441983	5139	8841, 12543, 16245, 19947, 23649
1283	NPIP-like protein 1	541810	1438	438887	5140	8842, 12544, 16246, 19948, 23650

1284	nuclear autoantigenic sperm protein (histone-binding)	341288	1439	345532	5141	8843, 12545, 16247, 19949, 23651
1285	nuclear autoantigenic sperm protein (histone-binding)	350030	1440	255120	5142	8844, 12546, 16248, 19950, 23652
1286	nuclear autoantigenic sperm protein (histone-binding)	351223	1441	255121	5143	8845, 12547, 16249, 19951, 23653
1287	nuclear autoantigenic sperm protein (histone-binding)	402363	1442	384529	5144	8846, 12548, 16250, 19952, 23654
1288	nuclear autoantigenic sperm protein (histone-binding)	437901	1443	400792	5145	8847, 12549, 16251, 19953, 23655
1289	nuclear autoantigenic sperm protein (histone-binding)	537798	1444	438871	5146	8848, 12550, 16252, 19954, 23656
1290	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, delta	340950	1445	343093	5147	8849, 12551, 16253, 19955, 23657
1291	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, delta	352614	1446	252985	5148	8850, 12552, 16254, 19956, 23658
1292	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, delta	396901	1447	380109	5149	8851, 12553, 16255, 19957, 23659
1293	nuclear import 7 homolog (<i>S. cerevisiae</i>)	254940	1448	254940	5150	8852, 12554, 16256, 19958, 23660

1294	nuclear import 7 homolog (<i>S. cerevisiae</i>)	254941	1449	254941	5151	8853, 12555, 16257, 19959, 23661
1295	nuclear protein, transcriptional regulator, 1	324873	1450	315559	5152	8854, 12556, 16258, 19960, 23662
1296	nuclear protein, transcriptional regulator, 1	395641	1451	379003	5153	8855, 12557, 16259, 19961, 23663
1297	nuclear receptor 2C2- associated protein	331552	1452	332823	5154	8856, 12558, 16260, 19962, 23664
1298	nuclear receptor coactivator 5	290231	1453	290231	5155	8857, 12559, 16261, 19963, 23665
1299	nuclear receptor coactivator 5	372291	1454	361365	5156	8858, 12560, 16262, 19964, 23666
1300	nuclear receptor subfamily 1 group H member 4	549996	1455	448978	5157	8859, 12561, 16263, 19965, 23667
1301	nuclear receptor subfamily 1, group D, member 2	312521	1456	310006	5158	8860, 12562, 16264, 19966, 23668
1302	nuclear receptor subfamily 1, group D, member 2	383773	1457	373283	5159	8861, 12563, 16265, 19967, 23669
1303	nuclear receptor subfamily 1, group D, member 2	396676	1458	379909	5160	8862, 12564, 16266, 19968, 23670

1304	nuclear receptor subfamily 1, group H, member 4	188403	1459	188403	5161	8863, 12565, 16267, 19969, 23671
1305	nuclear receptor subfamily 1, group H, member 4	392986	1460	376712	5162	8864, 12566, 16268, 19970, 23672
1306	nuclear receptor subfamily 1, group H, member 4	548884	1461	448506	5163	8865, 12567, 16269, 19971, 23673
1307	nuclear receptor subfamily 1, group H, member 4	551379	1462	447149	5164	8866, 12568, 16270, 19972, 23674
1308	nuclear receptor subfamily 1, group I, member 3	367979	1463	356958	5165	8867, 12569, 16271, 19973, 23675
1309	nuclear receptor subfamily 1, group I, member 3	367980	1464	356959	5166	8868, 12570, 16272, 19974, 23676
1310	nuclear receptor subfamily 1, group I, member 3	367981	1465	356960	5167	8869, 12571, 16273, 19975, 23677
1311	nuclear receptor subfamily 1, group I, member 3	367982	1466	356961	5168	8870, 12572, 16274, 19976, 23678
1312	nuclear receptor subfamily 1, group I, member 3	367983	1467	356962	5169	8871, 12573, 16275, 19977, 23679
1313	nuclear receptor subfamily 1, group I, member 3	367984	1468	356963	5170	8872, 12574, 16276, 19978, 23680

1314	nuclear receptor subfamily 1, group I, member 3	367985	1469	356965	5171	8873, 12575, 16277, 19979, 23681
1315	nuclear receptor subfamily 1, group I, member 3	412844	1470	399361	5172	8874, 12576, 16278, 19980, 23682
1316	nuclear receptor subfamily 1, group I, member 3	428574	1471	412672	5173	8875, 12577, 16279, 19981, 23683
1317	nuclear receptor subfamily 1, group I, member 3	437437	1472	407446	5174	8876, 12578, 16280, 19982, 23684
1318	nuclear receptor subfamily 1, group I, member 3	442691	1473	406493	5175	8877, 12579, 16281, 19983, 23685
1319	nuclear receptor subfamily 1, group I, member 3	502848	1474	426016	5176	8878, 12580, 16282, 19984, 23686
1320	nuclear receptor subfamily 1, group I, member 3	502985	1475	421374	5177	8879, 12581, 16283, 19985, 23687
1321	nuclear receptor subfamily 1, group I, member 3	504010	1476	424345	5178	8880, 12582, 16284, 19986, 23688
1322	nuclear receptor subfamily 1, group I, member 3	505005	1477	424934	5179	8881, 12583, 16285, 19987, 23689
1323	nuclear receptor subfamily 1, group I, member 3	506018	1478	424834	5180	8882, 12584, 16286, 19988, 23690

1324	nuclear receptor subfamily 1, group I, member 3	507215	1479	425900	5181	8883, 12585, 16287, 19989, 23691
1325	nuclear receptor subfamily 1, group I, member 3	508387	1480	422982	5182	8884, 12586, 16288, 19990, 23692
1326	nuclear receptor subfamily 1, group I, member 3	508740	1481	423666	5183	8885, 12587, 16289, 19991, 23693
1327	nuclear receptor subfamily 1, group I, member 3	510951	1482	425607	5184	8886, 12588, 16290, 19992, 23694
1328	nuclear receptor subfamily 1, group I, member 3	511676	1483	427175	5185	8887, 12589, 16291, 19993, 23695
1329	nuclear receptor subfamily 1, group I, member 3	511748	1484	427600	5186	8888, 12590, 16292, 19994, 23696
1330	nuclear receptor subfamily 1, group I, member 3	511944	1485	426292	5187	8889, 12591, 16293, 19995, 23697
1331	nuclear receptor subfamily 1, group I, member 3	512340	1486	423007	5188	8890, 12592, 16294, 19996, 23698
1332	nuclear receptor subfamily 1, group I, member 3	512372	1487	425417	5189	8891, 12593, 16295, 19997, 23699
1333	nuclear receptor subfamily 1, group I, member 3	515452	1488	427034	5190	8892, 12594, 16296, 19998, 23700

1334	nuclear receptor subfamily 2, group C, member 1	330677	1489	328843	5191	8893, 12595, 16297, 19999, 23701
1335	nuclear receptor subfamily 2, group C, member 1	333003	1490	333275	5192	8894, 12596, 16298, 20000, 23702
1336	nuclear receptor subfamily 2, group C, member 1	393101	1491	376813	5193	8895, 12597, 16299, 20001, 23703
1337	nuclear receptor subfamily 2, group C, member 1	547469	1492	446906	5194	8896, 12598, 16300, 20002, 23704
1338	nuclear receptor subfamily 2, group E, member 3	326995	1493	317199	5195	8897, 12599, 16301, 20003, 23705
1339	nuclear receptor subfamily 2, group E, member 3	398840	1494	381820	5196	8898, 12600, 16302, 20004, 23706
1340	nuclear receptor subfamily 6, group A, member 1	373584	1495	362686	5197	8899, 12601, 16303, 20005, 23707
1341	nuclear receptor subfamily 6, group A, member 1	416460	1496	413701	5198	8900, 12602, 16304, 20006, 23708
1342	nuclear receptor subfamily 6, group A, member 1	487099	1497	420267	5199	8901, 12603, 16305, 20007, 23709
1343	nuclear speckle splicing regulatory protein 1	247026	1498	247026	5200	8902, 12604, 16306, 20008, 23710

1344	nuclear speckle splicing regulatory protein 1	394826	1499	378303	5201	8903, 12605, 16307, 20009, 23711
1345	nuclear speckle splicing regulatory protein 1	540900	1500	442854	5202	8904, 12606, 16308, 20010, 23712
1346	nuclear transcription factor, X-box binding 1	263220	1501	263220	5203	8905, 12607, 16309, 20011, 23713
1347	nuclear transcription factor, X-box binding 1	318524	1502	317695	5204	8906, 12608, 16310, 20012, 23714
1348	nuclear transcription factor, X-box binding 1	379521	1503	368836	5205	8907, 12609, 16311, 20013, 23715
1349	nuclear transcription factor, X-box binding 1	379540	1504	368856	5206	8908, 12610, 16312, 20014, 23716
1350	nuclear transcription factor, X-box binding 1	536210	1505	441049	5207	8909, 12611, 16313, 20015, 23717
1351	nucleolar protein 10	345985	1506	263837	5208	8910, 12612, 16314, 20016, 23718
1352	nucleolar protein 10	381685	1507	371101	5209	8911, 12613, 16315, 20017, 23719
1353	nucleolar protein 10	538384	1508	439663	5210	8912, 12614, 16316, 20018, 23720

1354	nucleolar protein 10	542668	1509	437625	5211	8913, 12615, 16317, 20019, 23721
1355	nucleolar protein 11	253247	1510	253247	5212	8914, 12616, 16318, 20020, 23722
1356	nucleolar protein 11	535137	1511	443765	5213	8915, 12617, 16319, 20021, 23723
1357	Nucleolar protein 12	359114	1512	352021	5214	8916, 12618, 16320, 20022, 23724
1358	Nucleolar protein 12	438329	1513	403059	5215	8917, 12619, 16321, 20023, 23725
1359	nucleolar protein 4	261592	1514	261592	5216	8918, 12620, 16322, 20024, 23726
1360	nucleolar protein 4	269185	1515	269185	5217	8919, 12621, 16323, 20025, 23727
1361	nucleolar protein 4	399171	1516	382124	5218	8920, 12622, 16324, 20026, 23728
1362	nucleolar protein 4	535384	1517	445733	5219	8921, 12623, 16325, 20027, 23729
1363	nucleolar protein 4	535475	1518	438190	5220	8922, 12624, 16326, 20028, 23730

1364	nucleolar protein 4	538587	1519	443472	5221	8923, 12625, 16327, 20029, 23731
1365	nucleolar protein 9	377705	1520	366934	5222	8924, 12626, 16328, 20030, 23732
1366	nucleolar protein with MIF4G domain 1	275820	1521	275820	5223	8925, 12627, 16329, 20031, 23733
1367	nucleoporin 188kDa	356693	1522	349125	5224	8926, 12628, 16330, 20032, 23734
1368	nucleoporin 188kDa	372577	1523	361658	5225	8927, 12629, 16331, 20033, 23735
1369	nucleoporin 62kDa C- terminal like	372461	1524	361539	5226	8928, 12630, 16332, 20034, 23736
1370	nucleoporin 62kDa C- terminal like	372465	1525	361543	5227	8929, 12631, 16333, 20035, 23737
1371	nucleoporin 62kDa C- terminal like	372466	1526	361544	5228	8930, 12632, 16334, 20036, 23738
1372	nucleoporin 62kDa C- terminal like	421752	1527	405906	5229	8931, 12633, 16335, 20037, 23739
1373	nucleoporin 62kDa C- terminal like	432145	1528	408612	5230	8932, 12634, 16336, 20038, 23740

1374	nucleosome assembly protein 1-like 2	373517	1529	362616	5231	8933, 12635, 16337, 20039, 23741
1375	nucleosome assembly protein 1-like 2	536638	1530	441555	5232	8934, 12636, 16338, 20040, 23742
1376	nudix (nucleoside diphosphate linked moiety X)-type motif 16	359850	1531	352911	5233	8935, 12637, 16339, 20041, 23743
1377	nudix (nucleoside diphosphate linked moiety X)-type motif 16	521288	1532	429274	5234	8936, 12638, 16340, 20042, 23744
1378	nudix (nucleoside diphosphate linked moiety X)-type motif 16	537561	1533	440230	5235	8937, 12639, 16341, 20043, 23745
1379	nudix (nucleoside diphosphate linked moiety X)-type motif 16	502852	1534	422375	5236	8938, 12640, 16342, 20044, 23746
1380	oligodendrocyte transcription factor 1	333063	1535	331066	5237	8939, 12641, 16343, 20045, 23747
1381	oligodendrocyte transcription factor 1	382348	1536	371785	5238	8940, 12642, 16344, 20046, 23748
1382	oligodendrocyte transcription factor 1	426947	1537	414840	5239	8941, 12643, 16345, 20047, 23749
1383	one cut homeobox 3	382349	1538	371786	5240	8942, 12644, 16346, 20048, 23750

1384	Opa interacting protein 5	220514	1539	220514	5241	8943, 12645, 16347, 20049, 23751
1385	ovo-like 2 (Drosophila)	278780	1540	278780	5242	8944, 12646, 16348, 20050, 23752
1386	paired box 6	241001	1541	241001	5243	8945, 12647, 16349, 20051, 23753
1387	paired box 6	379107	1542	368401	5244	8946, 12648, 16350, 20052, 23754
1388	paired box 6	379109	1543	368403	5245	8947, 12649, 16351, 20053, 23755
1389	paired box 6	379111	1544	368406	5246	8948, 12650, 16352, 20054, 23756
1390	paired box 6	379115	1545	368410	5247	8949, 12651, 16353, 20055, 23757
1391	paired box 6	379123	1546	368418	5248	8950, 12652, 16354, 20056, 23758
1392	paired box 6	379129	1547	368424	5249	8951, 12653, 16355, 20057, 23759
1393	paired box 6	379132	1548	368427	5250	8952, 12654, 16356, 20058, 23760

1394	paired box 6	419022	1549	404100	5251	8953, 12655, 16357, 20059, 23761
1395	paired box 6	423822	1550	388132	5252	8954, 12656, 16358, 20060, 23762
1396	paired box 6	438681	1551	404356	5253	8955, 12657, 16359, 20061, 23763
1397	paired box 6	455099	1552	397384	5254	8956, 12658, 16360, 20062, 23764
1398	paired box 6	524853	1553	431585	5255	8957, 12659, 16361, 20063, 23765
1399	paired box 6	525535	1554	436365	5256	8958, 12660, 16362, 20064, 23766
1400	paired box 6	533333	1555	451372	5257	8959, 12661, 16363, 20065, 23767
1401	PAP associated domain containing 7	230859	1556	230859	5258	8960, 12662, 16364, 20066, 23768
1402	PAP associated domain containing 7	515721	1557	427232	5259	8961, 12663, 16365, 20067, 23769
1403	paraneoplastic antigen MA2	522362	1558	429344	5260	8962, 12664, 16366, 20068, 23770

1404	paraneoplastic antigen MA3	370264	1559	359286	5261	8963, 12665, 16367, 20069, 23771
1405	paraneoplastic antigen MA3	424805	1560	390576	5262	8964, 12666, 16368, 20070, 23772
1406	paraneoplastic antigen MA3	447306	1561	407642	5263	8965, 12667, 16369, 20071, 23773
1407	partner of NOB1 homolog (<i>S. cerevisiae</i>)	263657	1562	263657	5264	8966, 12668, 16370, 20072, 23774
1408	PAS domain containing 1	370357	1563	359382	5265	8967, 12669, 16371, 20073, 23775
1409	PAX interacting (with transcription-activation domain) protein 1	323199	1564	319149	5266	8968, 12670, 16372, 20074, 23776
1410	PAX interacting (with transcription-activation domain) protein 1	357094	1565	349606	5267	8969, 12671, 16373, 20075, 23777
1411	PAX interacting (with transcription-activation domain) protein 1	397192	1566	380376	5268	8970, 12672, 16374, 20076, 23778
1412	PAX interacting (with transcription-activation domain) protein 1	404141	1567	384048	5269	8971, 12673, 16375, 20077, 23779
1413	PCF11, cleavage and polyadenylation factor subunit, homolog (<i>S.</i> <i>cerevisiae</i>)	298281	1568	298281	5270	8972, 12674, 16376, 20078, 23780

1414	PCF11, cleavage and polyadenylation factor subunit, homolog (S. cerevisiae)	530304	1569	431567	5271	8973, 12675, 16377, 20079, 23781
1415	PDS5, regulator of cohesion maintenance, homolog B (S. cerevisiae)	315596	1570	313851	5272	8974, 12676, 16378, 20080, 23782
1416	PDS5, regulator of cohesion maintenance, homolog B (S. cerevisiae)	421084	1571	387860	5273	8975, 12677, 16379, 20081, 23783
1417	PDX1 C-terminal inhibiting factor 1	372409	1572	361486	5274	8976, 12678, 16380, 20082, 23784
1418	PDX1 C-terminal inhibiting factor 1	443130	1573	398721	5275	8977, 12679, 16381, 20083, 23785
1419	peptidylprolyl isomerase (cyclophilin)-like 3	286175	1574	286175	5276	8978, 12680, 16382, 20084, 23786
1420	peptidylprolyl isomerase (cyclophilin)-like 3	392283	1575	376107	5277	8979, 12681, 16383, 20085, 23787
1421	peptidylprolyl isomerase (cyclophilin)-like 3	409449	1576	387012	5278	8980, 12682, 16384, 20086, 23788
1422	peptidylprolyl isomerase (cyclophilin)-like 3	457063	1577	401196	5279	8981, 12683, 16385, 20087, 23789
1423	peptidylprolyl isomerase domain and WD repeat containing 1	261308	1578	261308	5280	8982, 12684, 16386, 20088, 23790

1424	peptidylprolyl isomerase domain and WD repeat containing 1	535264	1579	442371	5281	8983, 12685, 16387, 20089, 23791
1425	peptidylprolyl isomerase domain and WD repeat containing 1	538977	1580	444496	5282	8984, 12686, 16388, 20090, 23792
1426	peptidylprolyl isomerase E (cyclophilin E)	324379	1581	312769	5283	8985, 12687, 16389, 20091, 23793
1427	peptidylprolyl isomerase E (cyclophilin E)	356511	1582	348904	5284	8986, 12688, 16390, 20092, 23794
1428	peptidylprolyl isomerase E (cyclophilin E)	372830	1583	361918	5285	8987, 12689, 16391, 20093, 23795
1429	Peroxisomal proliferator-activated receptor A-interacting complex 285 kDa protein	427522	1584	393257	5286	8988, 12690, 16392, 20094, 23796
1430	Peroxisomal proliferator-activated receptor A-interacting complex 285 kDa protein	467148	1585	417401	5287	8989, 12691, 16393, 20095, 23797
1431	peroxisome proliferator-activated receptor gamma, coactivator-related 1	278070	1586	278070	5288	8990, 12692, 16394, 20096, 23798
1432	peroxisome proliferator-activated receptor gamma, coactivator-related 1	413464	1587	399743	5289	8991, 12693, 16395, 20097, 23799
1433	PEST proteolytic signal containing nuclear protein	265260	1588	265260	5290	8992, 12694, 16396, 20098, 23800

1434	PHD and ring finger domains 1	264555	1589	264555	5291	8993, 12695, 16397, 20099, 23801
1435	PHD and ring finger domains 1	416188	1590	410626	5292	8994, 12696, 16398, 20100, 23802
1436	PHD finger protein 12	268756	1591	268756	5293	8995, 12697, 16399, 20101, 23803
1437	PHD finger protein 12	332830	1592	329933	5294	8996, 12698, 16400, 20102, 23804
1438	PHD finger protein 12	378879	1593	368157	5295	8997, 12699, 16401, 20103, 23805
1439	PHD finger protein 13	377648	1594	366876	5296	8998, 12700, 16402, 20104, 23806
1440	PHD finger protein 15	395003	1595	378451	5297	8999, 12701, 16403, 20105, 23807
1441	PHD finger protein 15	413974	1596	410568	5298	9000, 12702, 16404, 20106, 23808
1442	PHD finger protein 15	431355	1597	406189	5299	9001, 12703, 16405, 20107, 23809
1443	PHD finger protein 15	432594	1598	409961	5300	9002, 12704, 16406, 20108, 23810

1444	PHD finger protein 15	448712	1599	393804	5301	9003, 12705, 16407, 20109, 23811
1445	PHD finger protein 15	512386	1600	422991	5302	9004, 12706, 16408, 20110, 23812
1446	PHD finger protein 16	218343	1601	218343	5303	9005, 12707, 16409, 20111, 23813
1447	PHD finger protein 16	397189	1602	380373	5304	9006, 12708, 16410, 20112, 23814
1448	PHD finger protein 16	424392	1603	391009	5305	9007, 12709, 16411, 20113, 23815
1449	PHD finger protein 16	455411	1604	400584	5306	9008, 12710, 16412, 20114, 23816
1450	PHD finger protein 20	339089	1605	341900	5307	9009, 12711, 16413, 20115, 23817
1451	PHD finger protein 20	374000	1606	363112	5308	9010, 12712, 16414, 20116, 23818
1452	PHD finger protein 20	374012	1607	363124	5309	9011, 12713, 16415, 20117, 23819
1453	PHD finger protein 20	439301	1608	410373	5310	9012, 12714, 16416, 20118, 23820

1454	PHD finger protein 5A	216252	1609	216252	5311	9013, 12715, 16417, 20119, 23821, 26078, 26093
1455	PHD finger protein 7	327906	1610	333024	5312	9014, 12716, 16418, 20120, 23822
1456	PHD finger protein 7	347025	1611	246282	5313	9015, 12717, 16419, 20121, 23823
1457	PHD finger protein 7	394916	1612	378374	5314	9016, 12718, 16420, 20122, 23824
1458	PHD finger protein 7	454052	1613	399257	5315	9017, 12719, 16421, 20123, 23825
1459	PHD finger protein 7	462532	1614	417144	5316	9018, 12720, 16422, 20124, 23826
1460	PHD finger protein 7	478707	1615	419316	5317	9019, 12721, 16423, 20125, 23827
1461	phosphatase and actin regulator 3	355648	1616	347866	5318	9020, 12722, 16424, 20126, 23828
1462	phosphatase and actin regulator 3	361300	1617	354555	5319	9021, 12723, 16425, 20127, 23829
1463	phosphatase and actin regulator 3	371015	1618	360054	5320	9022, 12724, 16426,

						20128, 23830
1464	phosphatase and actin regulator 3	395636	1619	378998	5321	9023, 12725, 16427, 20129, 23831
1465	phosphatase and actin regulator 3	395639	1620	379001	5322	9024, 12726, 16428, 20130, 23832
1466	phosphatase and actin regulator 3	434923	1621	390915	5323	9025, 12727, 16429, 20131, 23833
1467	phosphatase and actin regulator 3	541461	1622	442483	5324	9026, 12728, 16430, 20132, 23834
1468	piggyBac transposable element derived 1	259883	1623	259883	5325	9027, 12729, 16431, 20133, 23835
1469	piggyBac transposable element derived 1	405948	1624	385213	5326	9028, 12730, 16432, 20134, 23836
1470	PNN-interacting serine/arginine-rich protein	369239	1625	358242	5327	9029, 12731, 16433, 20135, 23837
1471	PNN-interacting serine/arginine-rich protein	438806	1626	387997	5328	9030, 12732, 16434, 20136, 23838
1472	pogo transposable element with KRAB domain	367875	1627	356849	5329	9031, 12733, 16435, 20137, 23839
1473	pogo transposable element with KRAB domain	367876	1628	356850	5330	9032, 12734, 16436,

						20138, 23840
1474	pogo transposable element with KRAB domain	449930	1629	404402	5331	9033, 12735, 16437, 20139, 23841
1475	pogo transposable element with KRAB domain	536514	1630	441187	5332	9034, 12736, 16438, 20140, 23842
1476	poly(A) polymerase gamma	238714	1631	238714	5333	9035, 12737, 16439, 20141, 23843
1477	poly(A) polymerase gamma	378104	1632	367344	5334	9036, 12738, 16440, 20142, 23844
1478	poly(A) polymerase gamma	412217	1633	405570	5335	9037, 12739, 16441, 20143, 23845
1479	polycomb group ring finger 1	233630	1634	233630	5336	9038, 12740, 16442, 20144, 23846
1480	polycomb group ring finger 2	360797	1635	354033	5337	9039, 12741, 16443, 20145, 23847
1481	polycomb group ring finger 3	362003	1636	354724	5338	9040, 12742, 16444, 20146, 23848
1482	polycomb group ring finger 3	419774	1637	416279	5339	9041, 12743, 16445, 20147, 23849
1483	polycomb group ring finger 3	427463	1638	401431	5340	9042, 12744, 16446,

						20148, 23850
1484	polycomb group ring finger 3	433814	1639	398493	5341	9043, 12745, 16447, 20149, 23851
1485	polycomb group ring finger 3	470161	1640	420489	5342	9044, 12746, 16448, 20150, 23852
1486	polycomb group ring finger 3	505655	1641	423393	5343	9045, 12747, 16449, 20151, 23853
1487	polycomb group ring finger 3	521023	1642	430393	5344	9046, 12748, 16450, 20152, 23854
1488	polyhomeotic homolog 1 (Drosophila)	251757	1643	251757	5345	9047, 12749, 16451, 20153, 23855
1489	polyhomeotic homolog 1 (Drosophila)	536844	1644	440488	5346	9048, 12750, 16452, 20154, 23856
1490	polyhomeotic homolog 1 (Drosophila)	538657	1645	437654	5347	9049, 12751, 16453, 20155, 23857
1491	polyhomeotic homolog 1 (Drosophila)	543824	1646	440674	5348	9050, 12752, 16454, 20156, 23858
1492	polyhomeotic homolog 1 (Drosophila)	544916	1647	437659	5349	9051, 12753, 16455, 20157, 23859
1493	polyhomeotic homolog 2 (Drosophila)	257118	1648	257118	5350	9052, 12754, 16456,

						20158, 23860
1494	polyhomeotic homolog 2 (Drosophila)	307890	1649	310685	5351	9053, 12755, 16457, 20159, 23861
1495	polyhomeotic homolog 2 (Drosophila)	373416	1650	362515	5352	9054, 12756, 16458, 20160, 23862
1496	polyhomeotic homolog 2 (Drosophila)	373418	1651	362517	5353	9055, 12757, 16459, 20161, 23863
1497	polyhomeotic homolog 2 (Drosophila)	373422	1652	362521	5354	9056, 12758, 16460, 20162, 23864
1498	polyhomeotic homolog 2 (Drosophila)	419414	1653	391440	5355	9057, 12759, 16461, 20163, 23865
1499	polyhomeotic homolog 2 (Drosophila)	431992	1654	389436	5356	9058, 12760, 16462, 20164, 23866
1500	polyhomeotic homolog 3 (Drosophila)	474275	1655	418266	5357	9059, 12761, 16463, 20165, 23867
1501	polyhomeotic homolog 3 (Drosophila)	475729	1656	419899	5358	9060, 12762, 16464, 20166, 23868
1502	polyhomeotic homolog 3 (Drosophila)	481639	1657	417540	5359	9061, 12763, 16465, 20167, 23869
1503	polyhomeotic homolog 3 (Drosophila)	484068	1658	418835	5360	9062, 12764, 16466,

						20168, 23870
1504	polyhomeotic homolog 3 (Drosophila)	494943	1659	420271	5361	9063, 12765, 16467, 20169, 23871
1505	polyhomeotic homolog 3 (Drosophila)	495893	1660	420294	5362	9064, 12766, 16468, 20170, 23872
1506	polyhomeotic homolog 3 (Drosophila)	497658	1661	420454	5363	9065, 12767, 16469, 20171, 23873
1507	polymerase (DNA directed), alpha 2 (70kD subunit)	265465	1662	265465	5364	9066, 12768, 16470, 20172, 23874
1508	polymerase (DNA directed), alpha 2 (70kD subunit)	541089	1663	443222	5365	9067, 12769, 16471, 20173, 23875
1509	polymerase (DNA directed), mu	242248	1664	242248	5366	9068, 12770, 16472, 20174, 23876
1510	polymerase (DNA directed), mu	335195	1665	335141	5367	9069, 12771, 16473, 20175, 23877
1511	polymerase (DNA directed), mu	395831	1666	379174	5368	9070, 12772, 16474, 20176, 23878
1512	polymerase (DNA directed), mu	414235	1667	390899	5369	9071, 12773, 16475, 20177, 23879
1513	polymerase (DNA directed), mu	430942	1668	396571	5370	9072, 12774, 16476,

						20178, 23880
1514	polymerase (DNA directed), mu	458246	1669	414025	5371	9073, 12775, 16477, 20179, 23881
1515	polymerase (RNA) I polypeptide A, 194kDa	263857	1670	263857	5372	9074, 12776, 16478, 20180, 23882
1516	polymerase (RNA) I polypeptide A, 194kDa	409681	1671	386300	5373	9075, 12777, 16479, 20181, 23883
1517	polymerase (RNA) I polypeptide B, 128kDa	263331	1672	263331	5374	9076, 12778, 16480, 20182, 23884
1518	polymerase (RNA) I polypeptide B, 128kDa	417433	1673	405358	5375	9077, 12779, 16481, 20183, 23885
1519	polymerase (RNA) I polypeptide B, 128kDa	430769	1674	415754	5376	9078, 12780, 16482, 20184, 23886
1520	polymerase (RNA) I polypeptide B, 128kDa	438748	1675	388577	5377	9079, 12781, 16483, 20185, 23887
1521	polymerase (RNA) I polypeptide B, 128kDa	536096	1676	441192	5378	9080, 12782, 16484, 20186, 23888
1522	polymerase (RNA) I polypeptide B, 128kDa	537335	1677	437914	5379	9081, 12783, 16485, 20187, 23889
1523	polymerase (RNA) I polypeptide B, 128kDa	541869	1678	444136	5380	9082, 12784, 16486,

						20188, 23890
1524	polymerase (RNA) II (DNA directed) polypeptide B, 140kDa	314595	1679	312735	5381	9083, 12785, 16487, 20189, 23891
1525	polymerase (RNA) II (DNA directed) polypeptide B, 140kDa	381227	1680	370625	5382	9084, 12786, 16488, 20190, 23892
1526	polymerase (RNA) II (DNA directed) polypeptide D	272645	1681	272645	5383	9085, 12787, 16489, 20191, 23893
1527	polymerase (RNA) II (DNA directed) polypeptide J3	379340	1682	368645	5384	9086, 12788, 16490, 20192, 23894
1528	polymerase (RNA) II (DNA directed) polypeptide J3	508848	1683	425877	5385	9087, 12789, 16491, 20193, 23895
1529	polymerase (RNA) II (DNA directed) polypeptide M	299638	1684	299638	5386	9088, 12790, 16492, 20194, 23896
1530	polymerase (RNA) II (DNA directed) polypeptide M	380557	1685	369930	5387	9089, 12791, 16493, 20195, 23897
1531	polymerase (RNA) II (DNA directed) polypeptide M	380563	1686	369937	5388	9090, 12792, 16494, 20196, 23898
1532	polymerase (RNA) III (DNA directed) polypeptide C (62kD)	334163	1687	334564	5389	9091, 12793, 16495, 20197, 23899
1533	polymerase (RNA) III (DNA directed) polypeptide C (62kD)	369294	1688	358300	5390	9092, 12794, 16496,

						20198, 23900
1534	polymerase (RNA) III (DNA directed) polypeptide D, 44kDa	306433	1689	303088	5391	9093, 12795, 16497, 20199, 23901
1535	polymerase (RNA) III (DNA directed) polypeptide D, 44kDa	397802	1690	380904	5392	9094, 12796, 16498, 20200, 23902
1536	polymerase (RNA) III (DNA directed) polypeptide E (80kD)	299853	1691	299853	5393	9095, 12797, 16499, 20201, 23903
1537	polymerase (RNA) III (DNA directed) polypeptide E (80kD)	359210	1692	352140	5394	9096, 12798, 16500, 20202, 23904
1538	polymerase (RNA) III (DNA directed) polypeptide E (80kD)	418581	1693	399254	5395	9097, 12799, 16501, 20203, 23905
1539	polymerase (RNA) III (DNA directed) polypeptide E (80kD)	564209	1694	456967	5396	9098, 12800, 16502, 20204, 23906
1540	polymerase (RNA) III (DNA directed) polypeptide F, 39 kDa	377603	1695	366828	5397	9099, 12801, 16503, 20205, 23907
1541	polymerase (RNA) III (DNA directed) polypeptide G (32kD)	399107	1696	382058	5398	9100, 12802, 16504, 20206, 23908
1542	polymerase (RNA) III (DNA directed) polypeptide G (32kD)	504930	1697	421637	5399	9101, 12803, 16505, 20207, 23909

1543	polymerase (RNA) III (DNA directed) polypeptide H (22.9kD)	337566	1698	337627	5400	9102, 12804, 16506, 20208, 23910
1544	polymerase (RNA) III (DNA directed) polypeptide H (22.9kD)	355209	1699	347345	5401	9103, 12805, 16507, 20209, 23911
1545	polymerase (RNA) III (DNA directed) polypeptide H (22.9kD)	396504	1700	379761	5402	9104, 12806, 16508, 20210, 23912
1546	polymerase (RNA) III (DNA directed) polypeptide H (22.9kD)	407461	1701	385315	5403	9105, 12807, 16509, 20211, 23913
1547	polymerase (RNA) III (DNA directed) polypeptide K, 12.3 kDa	293860	1702	293860	5404	9106, 12808, 16510, 20212, 23914
1548	polypyrimidine tract binding protein 3	210227	1703	210227	5405	9107, 12809, 16511, 20213, 23915
1549	polypyrimidine tract binding protein 3	334318	1704	334499	5406	9108, 12810, 16512, 20214, 23916
1550	polypyrimidine tract binding protein 3	343327	1705	340705	5407	9109, 12811, 16513, 20215, 23917
1551	polypyrimidine tract binding protein 3	374255	1706	363373	5408	9110, 12812, 16514, 20216, 23918
1552	polypyrimidine tract binding protein 3	374257	1707	363375	5409	9111, 12813, 16515, 20217, 23919

1553	polypyrimidine tract binding protein 3	450374	1708	388024	5410	9112, 12814, 16516, 20218, 23920
1554	polypyrimidine tract binding protein 3	458258	1709	414921	5411	9113, 12815, 16517, 20219, 23921
1555	poly-U binding splicing factor 60KDa	313352	1710	322016	5412	9114, 12816, 16518, 20220, 23922
1556	poly-U binding splicing factor 60KDa	349157	1711	322036	5413	9115, 12817, 16519, 20221, 23923
1557	poly-U binding splicing factor 60KDa	453551	1712	402953	5414	9116, 12818, 16520, 20222, 23924
1558	poly-U binding splicing factor 60KDa	526683	1713	434359	5415	9117, 12819, 16521, 20223, 23925
1559	POU class 2 homeobox 1	271411	1714	271411	5416	9118, 12820, 16522, 20224, 23926
1560	POU class 2 homeobox 1	367862	1715	356836	5417	9119, 12821, 16523, 20225, 23927
1561	POU class 2 homeobox 1	367865	1716	356839	5418	9120, 12822, 16524, 20226, 23928
1562	POU class 2 homeobox 1	367866	1717	356840	5419	9121, 12823, 16525, 20227, 23929

1563	POU class 2 homeobox 1	420254	1718	414660	5420	9122, 12824, 16526, 20228, 23930
1564	POU class 2 homeobox 1	429375	1719	401217	5421	9123, 12825, 16527, 20229, 23931
1565	POU class 2 homeobox 1	442313	1720	404571	5422	9124, 12826, 16528, 20230, 23932
1566	POU class 2 homeobox 1	452019	1721	391523	5423	9125, 12827, 16529, 20231, 23933
1567	POU class 2 homeobox 1	492850	1722	444625	5424	9126, 12828, 16530, 20232, 23934
1568	POU class 2 homeobox 1	541643	1723	441285	5425	9127, 12829, 16531, 20233, 23935
1569	POU class 2 homeobox 1	557909	1724	452761	5426	9128, 12830, 16532, 20234, 23936
1570	POU class 2 homeobox 1	558944	1725	453135	5427	9129, 12831, 16533, 20235, 23937
1571	POU class 2 homeobox 1	559038	1726	452912	5428	9130, 12832, 16534, 20236, 23938
1572	POU class 2 homeobox 1	560232	1727	453094	5429	9131, 12833, 16535, 20237, 23939

1573	POU class 4 homeobox 2	281321	1728	281321	5430	9132, 12834, 16536, 20238, 23940
1574	POU class 6 homeobox 1	333640	1729	330190	5431	9133, 12835, 16537, 20239, 23941
1575	POU class 6 homeobox 1	389243	1730	373895	5432	9134, 12836, 16538, 20240, 23942
1576	POU class 6 homeobox 1	547855	1731	448266	5433	9135, 12837, 16539, 20241, 23943
1577	POU class 6 homeobox 1	550824	1732	448389	5434	9136, 12838, 16540, 20242, 23944
1578	POZ (BTB) and AT hook containing zinc finger 1	215919	1733	215919	5435	9137, 12839, 16541, 20243, 23945
1579	POZ (BTB) and AT hook containing zinc finger 1	266269	1734	266269	5436	9138, 12840, 16542, 20244, 23946
1580	POZ (BTB) and AT hook containing zinc finger 1	351933	1735	337520	5437	9139, 12841, 16543, 20245, 23947
1581	POZ (BTB) and AT hook containing zinc finger 1	405309	1736	384173	5438	9140, 12842, 16544, 20246, 23948
1582	PR domain containing 12	253008	1737	253008	5439	9141, 12843, 16545, 20247, 23949

1583	PR domain containing 13	369214	1738	358216	5440	9142, 12844, 16546, 20248, 23950
1584	PR domain containing 13	369215	1739	358217	5441	9143, 12845, 16547, 20249, 23951
1585	PR domain containing 15	269844	1740	269844	5442	9144, 12846, 16548, 20250, 23952
1586	PR domain containing 15	380489	1741	369856	5443	9145, 12847, 16549, 20251, 23953
1587	PR domain containing 15	398548	1742	381556	5444	9146, 12848, 16550, 20252, 23954
1588	PR domain containing 15	433067	1743	415471	5445	9147, 12849, 16551, 20253, 23955
1589	PR domain containing 15	441787	1744	387958	5446	9148, 12850, 16552, 20254, 23956
1590	PR domain containing 15	447207	1745	390245	5447	9149, 12851, 16553, 20255, 23957
1591	PR domain containing 15	449395	1746	396943	5448	9150, 12852, 16554, 20256, 23958
1592	PR domain containing 15	538201	1747	444044	5449	9151, 12853, 16555, 20257, 23959

1593	PR domain containing 6	407847	1748	384725	5450	9152, 12854, 16556, 20258, 23960
1594	PR domain containing 7	325921	1749	315512	5451	9153, 12855, 16557, 20259, 23961
1595	PR domain containing 7	407825	1750	385121	5452	9154, 12856, 16558, 20260, 23962
1596	PR domain containing 7	414728	1751	392897	5453	9155, 12857, 16559, 20261, 23963
1597	PR domain containing 7	449207	1752	396732	5454	9156, 12858, 16560, 20262, 23964
1598	PR domain containing 8	339711	1753	339764	5455	9157, 12859, 16561, 20263, 23965
1599	PR domain containing 8	415738	1754	406998	5456	9158, 12860, 16562, 20264, 23966
1600	PR domain containing 8	504452	1755	423985	5457	9159, 12861, 16563, 20265, 23967
1601	PR domain containing 8	515013	1756	425149	5458	9160, 12862, 16564, 20266, 23968
1602	pre-B-cell leukemia homeobox 4	251203	1757	251203	5459	9161, 12863, 16565, 20267, 23969

1603	Pre-mRNA branch site protein p14	233468	1758	233468	5460	9162, 12864, 16566, 20268, 23970
1604	prickle homolog 4 (Drosophila)	359201	1759	352128	5461	9163, 12865, 16567, 20269, 23971
1605	prickle homolog 4 (Drosophila)	394259	1760	377802	5462	9164, 12866, 16568, 20270, 23972
1606	prickle homolog 4 (Drosophila)	394260	1761	377803	5463	9165, 12867, 16569, 20271, 23973
1607	prickle homolog 4 (Drosophila)	458694	1762	404911	5464	9166, 12868, 16570, 20272, 23974
1608	prickle homolog 4 (Drosophila)	456057	1763	389023	5465	9167, 12869, 16571, 20273, 23975
1609	PRKR interacting protein 1 (IL11 inducible)	354783	1764	346837	5466	9168, 12870, 16572, 20274, 23976
1610	PRKR interacting protein 1 (IL11 inducible)	397912	1765	381010	5467	9169, 12871, 16573, 20275, 23977
1611	PRKR interacting protein 1 (IL11 inducible)	496391	1766	419270	5468	9170, 12872, 16574, 20276, 23978
1612	processing of precursor 1, ribonuclease P/MRP subunit (S. cerevisiae)	349693	1767	339529	5469	9171, 12873, 16575, 20277, 23979

1613	processing of precursor 1, ribonuclease P/MRP subunit (<i>S. cerevisiae</i>)	401707	1768	385787	5470	9172, 12874, 16576, 20278, 23980
1614	processing of precursor 1, ribonuclease P/MRP subunit (<i>S. cerevisiae</i>)	522319	1769	428945	5471	9173, 12875, 16577, 20279, 23981
1615	proline rich 13	379786	1770	369112	5472	9174, 12876, 16578, 20280, 23982
1616	proline rich 13	429243	1771	412064	5473	9175, 12877, 16579, 20281, 23983
1617	proline rich 13	547368	1772	446818	5474	9176, 12878, 16580, 20282, 23984
1618	proline rich 13	549135	1773	447777	5475	9177, 12879, 16581, 20283, 23985
1619	proline rich 13	549924	1774	448761	5476	9178, 12880, 16582, 20284, 23986
1620	prospero homeobox 2	389664	1775	374315	5477	9179, 12881, 16583, 20285, 23987
1621	prospero homeobox 2	445876	1776	405932	5478	9180, 12882, 16584, 20286, 23988
1622	prospero homeobox 2	556489	1777	451223	5479	9181, 12883, 16585, 20287, 23989

1623	prostate cancer susceptibility candidate	290294	1778	290294	5480	9182, 12884, 16586, 20288, 23990
1624	Protein Coding	297591	1779	297591	5481	9183, 12885, 16587, 20289, 23991
1625	Protein Coding	301919	1780	304713	5482	9184, 12886, 16588, 20290, 23992
1626	Protein Coding	316407	1781	320794	5483	9185, 12887, 16589, 20291, 23993
1627	Protein Coding	421249	1782	398390	5484	9186, 12888, 16590, 20292, 23994
1628	Protein Coding	437199	1783	395600	5485	9187, 12889, 16591, 20293, 23995
1629	Protein Coding	449327	1784	391266	5486	9188, 12890, 16592, 20294, 23996
1630	Protein Coding	478658	1785	420721	5487	9189, 12891, 16593, 20295, 23997
1631	Protein Coding	530108	1786	435372	5488	9190, 12892, 16594, 20296, 23998
1632	Protein Coding	530788	1787	435125	5489	9191, 12893, 16595, 20297, 23999

1633	Protein Coding	534458	1788	432245	5490	9192, 12894, 16596, 20298, 24000
1634	Protein Idas	513312	1789	426359	5491	9193, 12895, 16597, 20299, 24001
1635	protein inhibitor of activated STAT 2	585916	1790	465676	5492	9194, 12896, 16598, 20300, 24002
1636	protein inhibitor of activated STAT, 2	262161	1791	262161	5493	9195, 12897, 16599, 20301, 24003
1637	protein inhibitor of activated STAT, 2	324794	1792	317163	5494	9196, 12898, 16600, 20302, 24004
1638	protein inhibitor of activated STAT, 2	398651	1793	381645	5495	9197, 12899, 16601, 20303, 24005
1639	protein inhibitor of activated STAT, 2	398654	1794	381648	5496	9198, 12900, 16602, 20304, 24006
1640	protein inhibitor of activated STAT, 2	545673	1795	443238	5497	9199, 12901, 16603, 20305, 24007
1641	protein kinase, AMP-activated, gamma 1 non-catalytic subunit	316299	1796	323867	5498	9200, 12902, 16604, 20306, 24008
1642	protein kinase, AMP-activated, gamma 1 non-catalytic subunit	552212	1797	448972	5499	9201, 12903, 16605, 20307, 24009

1643	protein phosphatase 1, regulatory subunit 10	376511	1798	365694	5500	9202, 12904, 16606, 20308, 24010
1644	protein phosphatase 1, regulatory subunit 10	383586	1799	373080	5501	9203, 12905, 16607, 20309, 24011
1645	protein phosphatase 1, regulatory subunit 10	420949	1800	413554	5502	9204, 12906, 16608, 20310, 24012
1646	protein phosphatase 1, regulatory subunit 10	424446	1801	407181	5503	9205, 12907, 16609, 20311, 24013
1647	protein phosphatase 1, regulatory subunit 10	426299	1802	389299	5504	9206, 12908, 16610, 20312, 24014
1648	protein phosphatase 1, regulatory subunit 10	429597	1803	407310	5505	9207, 12909, 16611, 20313, 24015
1649	protein phosphatase 1, regulatory subunit 10	449113	1804	416060	5506	9208, 12910, 16612, 20314, 24016
1650	protein phosphatase 1, regulatory subunit 10	537132	1805	443342	5507	9209, 12911, 16613, 20315, 24017
1651	protein phosphatase 1, regulatory subunit 10	547333	1806	450177	5508	9210, 12912, 16614, 20316, 24018
1652	protein phosphatase 1, regulatory subunit 10	548899	1807	448150	5509	9211, 12913, 16615, 20317, 24019

1653	protein phosphatase 1, regulatory subunit 10	549281	1808	449477	5510	9212, 12914, 16616, 20318, 24020
1654	protein phosphatase 1, regulatory subunit 10	549865	1809	449458	5511	9213, 12915, 16617, 20319, 24021
1655	protein phosphatase 1, regulatory subunit 10	551493	1810	447936	5512	9214, 12916, 16618, 20320, 24022
1656	protein phosphatase 1, regulatory subunit 10	552146	1811	449372	5513	9215, 12917, 16619, 20321, 24023
1657	protein phosphatase 1, regulatory subunit 26	356818	1812	349274	5514	9216, 12918, 16620, 20322, 24024
1658	protein phosphatase 1, regulatory subunit 26	401470	1813	385826	5515	9217, 12919, 16621, 20323, 24025
1659	protein phosphatase 2, regulatory subunit B", beta	390665	1814	375080	5516	9218, 12920, 16622, 20324, 24026
1660	protein-kinase, interferon-inducible double stranded RNA dependent inhibitor, repressor of (P58 repressor)	260045	1815	260045	5517	9219, 12921, 16623, 20325, 24027
1661	protein-kinase, interferon-inducible double stranded RNA dependent inhibitor, repressor of (P58 repressor)	529901	1816	436249	5518	9220, 12922, 16624, 20326, 24028
1662	PRP38 pre-mRNA processing factor 38 (yeast) domain containing A	257181	1817	257181	5519	9221, 12923, 16625, 20327, 24029

1663	PRP38 pre-mRNA processing factor 38 (yeast) domain containing B	370021	1818	359038	5520	9222, 12924, 16626, 20328, 24030
1664	PRP38 pre-mRNA processing factor 38 (yeast) domain containing B	370022	1819	359039	5521	9223, 12925, 16627, 20329, 24031
1665	PRP38 pre-mRNA processing factor 38 (yeast) domain containing B	370025	1820	359042	5522	9224, 12926, 16628, 20330, 24032
1666	PRP39 pre-mRNA processing factor 39 homolog (<i>S. cerevisiae</i>)	355765	1821	348010	5523	9225, 12927, 16629, 20331, 24033
1667	PRP39 pre-mRNA processing factor 39 homolog (<i>S. cerevisiae</i>)	355846	1822	348105	5524	9226, 12928, 16630, 20332, 24034
1668	PRP40 pre-mRNA processing factor 40 homolog B (<i>S. cerevisiae</i>)	261897	1823	261897	5525	9227, 12929, 16631, 20333, 24035
1669	PRP40 pre-mRNA processing factor 40 homolog B (<i>S. cerevisiae</i>)	380281	1824	369634	5526	9228, 12930, 16632, 20334, 24036
1670	PRP40 pre-mRNA processing factor 40 homolog B (<i>S. cerevisiae</i>)	551063	1825	449569	5527	9229, 12931, 16633, 20335, 24037
1671	pseudouridylate synthase 3	227474	1826	227474	5528	9230, 12932, 16634, 20336, 24038
1672	pseudouridylate synthase 3	530811	1827	432386	5529	9231, 12933, 16635, 20337, 24039

1673	purine-rich element binding protein B	395699	1828	379051	5530	9232, 12934, 16636, 20338, 24040
1674	purine-rich element binding protein G	339382	1829	345168	5531	9233, 12935, 16637, 20339, 24041
1675	purine-rich element binding protein G	475541	1830	418721	5532	9234, 12936, 16638, 20340, 24042
1676	Putative short transient receptor potential channel 2-like protein	529844	1831	433080	5533	9235, 12937, 16639, 20341, 24043
1677	PWP1 homolog (S. cerevisiae)	412830	1832	387365	5534	9236, 12938, 16640, 20342, 24044
1678	PWP1 homolog (S. cerevisiae)	538327	1833	439490	5535	9237, 12939, 16641, 20343, 24045
1679	PWP1 homolog (S. cerevisiae)	546068	1834	438775	5536	9238, 12940, 16642, 20344, 24046
1680	PWP1 homolog (S. cerevisiae)	547995	1835	447770	5537	9239, 12941, 16643, 20345, 24047
1681	pygopus homolog 1 (Drosophila)	302000	1836	302327	5538	9240, 12942, 16644, 20346, 24048
1682	pygopus homolog 1 (Drosophila)	401688	1837	384544	5539	9241, 12943, 16645, 20347, 24049

1683	R3H domain containing 2	347140	1838	317903	5540	9242, 12944, 16646, 20348, 24050
1684	R3H domain containing 2	358907	1839	351784	5541	9243, 12945, 16647, 20349, 24051
1685	R3H domain containing 2	393811	1840	377400	5542	9244, 12946, 16648, 20350, 24052
1686	R3H domain containing 2	413953	1841	409146	5543	9245, 12947, 16649, 20351, 24053
1687	R3H domain containing 2	441731	1842	408536	5544	9246, 12948, 16650, 20352, 24054
1688	R3H domain containing 2	448732	1843	405777	5545	9247, 12949, 16651, 20353, 24055
1689	RAD21-like 1 (S. pombe)	246108	1844	246108	5546	9248, 12950, 16652, 20354, 24056
1690	RAD21-like 1 (S. pombe)	381882	1845	371306	5547	9249, 12951, 16653, 20355, 24057
1691	RAD21-like 1 (S. pombe)	402452	1846	385925	5548	9250, 12952, 16654, 20356, 24058
1692	RAD21-like 1 (S. pombe)	409241	1847	386414	5549	9251, 12953, 16655, 20357, 24059

1693	RAD54-like 2 (<i>S. cerevisiae</i>)	296477	1848	296477	5550	9252, 12954, 16656, 20358, 24060
1694	RAD54-like 2 (<i>S. cerevisiae</i>)	409535	1849	386520	5551	9253, 12955, 16657, 20359, 24061
1695	RAD9-HUS1-RAD1 interacting nuclear orphan 1	461997	1850	438828	5552	9254, 12956, 16658, 20360, 24062
1696	Rap guanine nucleotide exchange factor (GEF) 5	258735	1851	258735	5553	9255, 12957, 16659, 20361, 24063
1697	Rap guanine nucleotide exchange factor (GEF) 5	344041	1852	343656	5554	9256, 12958, 16660, 20362, 24064
1698	Rap guanine nucleotide exchange factor (GEF) 5	401957	1853	384044	5555	9257, 12959, 16661, 20363, 24065
1699	Rap guanine nucleotide exchange factor (GEF) 5	425852	1854	404972	5556	9258, 12960, 16662, 20364, 24066
1700	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	344375	1855	344226	5557	9259, 12961, 16663, 20365, 24067
1701	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	397582	1856	380712	5558	9260, 12962, 16664, 20366, 24068
1702	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	397583	1857	380713	5559	9261, 12963, 16665, 20367, 24069

1703	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	431809	1858	403068	5560	9262, 12964, 16666, 20368, 24070
1704	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	454668	1859	405606	5561	9263, 12965, 16667, 20369, 24071
1705	Ras association (RalGDS/AF-6) domain family (N-terminal) member 7	528736	1860	433165	5562	9264, 12966, 16668, 20370, 24072
1706	RB-associated KRAB zinc finger	353796	1861	275423	5563	9265, 12967, 16669, 20371, 24073
1707	RB-associated KRAB zinc finger	396912	1862	380120	5564	9266, 12968, 16670, 20372, 24074
1708	RB-associated KRAB zinc finger	407184	1863	385560	5565	9267, 12969, 16671, 20373, 24075
1709	RB-associated KRAB zinc finger	396904	1864	380112	5566	9268, 12970, 16672, 20374, 24076
1710	recombination signal binding protein for immunoglobulin kappa J region-like	343694	1865	341243	5567	9269, 12971, 16673, 20375, 24077
1711	recombination signal binding protein for immunoglobulin kappa J region-like	372741	1866	361826	5568	9270, 12972, 16674, 20376, 24078
1712	recombination signal binding protein for immunoglobulin kappa J region-like	372743	1867	361828	5569	9271, 12973, 16675, 20377, 24079

1713	regulatory factor X, 3 (influences HLA class II expression)	302303	1868	303847	5570	9272, 12974, 16676, 20378, 24080
1714	regulatory factor X, 3 (influences HLA class II expression)	358730	1869	351574	5571	9273, 12975, 16677, 20379, 24081
1715	regulatory factor X, 3 (influences HLA class II expression)	381984	1870	371414	5572	9274, 12976, 16678, 20380, 24082
1716	regulatory factor X, 3 (influences HLA class II expression)	381985	1871	371415	5573	9275, 12977, 16679, 20381, 24083
1717	regulatory factor X, 3 (influences HLA class II expression)	381986	1872	371416	5574	9276, 12978, 16680, 20382, 24084
1718	regulatory factor X, 3 (influences HLA class II expression)	381992	1873	371422	5575	9277, 12979, 16681, 20383, 24085
1719	regulatory factor X, 3 (influences HLA class II expression)	382004	1874	371434	5576	9278, 12980, 16682, 20384, 24086
1720	regulatory factor X, 3 (influences HLA class II expression)	420720	1875	416189	5577	9279, 12981, 16683, 20385, 24087
1721	regulatory factor X, 3 (influences HLA class II expression)	442560	1876	410988	5578	9280, 12982, 16684, 20386, 24088
1722	regulatory factor X, 3 (influences HLA class II expression)	449190	1877	399352	5579	9281, 12983, 16685, 20387, 24089

1723	regulatory factor X, 3 (influences HLA class II expression)	449234	1878	415594	5580	9282, 12984, 16686, 20388, 24090
1724	regulatory factor X, 3 (influences HLA class II expression)	451859	1879	411756	5581	9283, 12985, 16687, 20389, 24091
1725	regulatory factor X, 3 (influences HLA class II expression)	457373	1880	405664	5582	9284, 12986, 16688, 20390, 24092
1726	regulatory factor X, 3 (influences HLA class II expression)	458034	1881	400026	5583	9285, 12987, 16689, 20391, 24093
1727	regulatory factor X, 4 (influences HLA class II expression)	229387	1882	229387	5584	9286, 12988, 16690, 20392, 24094
1728	regulatory factor X, 4 (influences HLA class II expression)	357881	1883	350552	5585	9287, 12989, 16691, 20393, 24095
1729	regulatory factor X, 4 (influences HLA class II expression)	392842	1884	376585	5586	9288, 12990, 16692, 20394, 24096
1730	regulatory factor X, 8	376826	1885	366022	5587	9289, 12991, 16693, 20395, 24097
1731	regulatory factor X, 8	428343	1886	401536	5588	9290, 12992, 16694, 20396, 24098
1732	regulatory factor X, 8	540519	1887	439387	5589	9291, 12993, 16695, 20397, 24099

1733	replication initiator 1	397281	1888	380451	5590	9292, 12994, 16696, 20398, 24100
1734	replication initiator 1	425389	1889	388287	5591	9293, 12995, 16697, 20399, 24101
1735	replication initiator 1	444957	1890	407714	5592	9294, 12996, 16698, 20400, 24102
1736	replication initiator 1	461637	1891	417756	5593	9295, 12997, 16699, 20401, 24103
1737	replication initiator 1	489432	1892	417291	5594	9296, 12998, 16700, 20402, 24104
1738	replication initiator 1	519397	1893	428562	5595	9297, 12999, 16701, 20403, 24105
1739	replication initiator 1	540729	1894	445016	5596	9298, 13000, 16702, 20404, 24106
1740	REST corepressor 1	262241	1895	262241	5597	9299, 13001, 16703, 20405, 24107
1741	REST corepressor 1	570597	1896	459789	5598	9300, 13002, 16704, 20406, 24108
1742	REST corepressor 2	301459	1897	301459	5599	9301, 13003, 16705, 20407, 24109

1743	REST corepressor 3	367005	1898	355972	5600	9302, 13004, 16706, 20408, 24110
1744	REST corepressor 3	367006	1899	355973	5601	9303, 13005, 16707, 20409, 24111
1745	REST corepressor 3	419091	1900	413929	5602	9304, 13006, 16708, 20410, 24112
1746	REST corepressor 3	452621	1901	398558	5603	9305, 13007, 16709, 20411, 24113
1747	REST corepressor 3	533469	1902	436838	5604	9306, 13008, 16710, 20412, 24114
1748	REST corepressor 3	534478	1903	436057	5605	9307, 13009, 16711, 20413, 24115
1749	retina and anterior neural fold homeobox 2	395106	1904	378538	5606	9308, 13010, 16712, 20414, 24116
1750	retina and anterior neural fold homeobox 2	555633	1905	450456	5607	9309, 13011, 16713, 20415, 24117
1751	retina and anterior neural fold homeobox 2	555978	1906	450687	5608	9310, 13012, 16714, 20416, 24118
1752	retinoblastoma binding protein 4	373493	1907	362592	5609	9311, 13013, 16715, 20417, 24119

1753	retinoblastoma binding protein 4	414241	1908	398242	5610	9312, 13014, 16716, 20418, 24120
1754	retinoblastoma binding protein 4	445722	1909	389437	5611	9313, 13015, 16717, 20419, 24121
1755	retinoblastoma binding protein 4	458695	1910	396057	5612	9314, 13016, 16718, 20420, 24122
1756	retinoblastoma binding protein 4	460669	1911	432298	5613	9315, 13017, 16719, 20421, 24123
1757	retinoblastoma binding protein 4	490500	1912	437210	5614	9316, 13018, 16720, 20422, 24124
1758	retinoblastoma binding protein 4	544435	1913	442384	5615	9317, 13019, 16721, 20423, 24125
1759	Rhox homeobox family, member 1	217999	1914	217999	5616	9318, 13020, 16722, 20424, 24126
1760	Rhox homeobox family, member 2	371388	1915	360441	5617	9319, 13021, 16723, 20425, 24127
1761	Rhox homeobox family, member 2B	371402	1916	360455	5618	9320, 13022, 16724, 20426, 24128
1762	ribonuclease P/MRP 14kDa subunit	295959	1917	295959	5619	9321, 13023, 16725, 20427, 24129

1763	ribonuclease P/MRP 14kDa subunit	445193	1918	412894	5620	9322, 13024, 16726, 20428, 24130
1764	ribonuclease P/MRP 14kDa subunit	466547	1919	419909	5621	9323, 13025, 16727, 20429, 24131
1765	ribonuclease P/MRP 25kDa subunit	322177	1920	317691	5622	9324, 13026, 16728, 20430, 24132
1766	ribonuclease P/MRP 25kDa subunit	499788	1921	446246	5623	9325, 13027, 16729, 20431, 24133
1767	ribosomal RNA processing 1 homolog (<i>S. cerevisiae</i>)	400387	1922	383237	5624	9326, 13028, 16730, 20432, 24134
1768	ribosomal RNA processing 1 homolog (<i>S. cerevisiae</i>)	497547	1923	417464	5625	9327, 13029, 16731, 20433, 24135
1769	ribosomal RNA processing 8, methyltransferase, homolog (yeast)	254605	1924	254605	5626	9328, 13030, 16732, 20434, 24136
1770	ribosomal RNA processing 9, small subunit (SSU) processome component, homolog (yeast)	232888	1925	232888	5627	9329, 13031, 16733, 20435, 24137
1771	ribosome production factor 1 homolog (<i>S. cerevisiae</i>)	370654	1926	359688	5628	9330, 13032, 16734, 20436, 24138
1772	ribosome production factor 1 homolog (<i>S. cerevisiae</i>)	370656	1927	359690	5629	9331, 13033, 16735, 20437, 24139

1773	ribosome production factor 2 homolog (<i>S. cerevisiae</i>)	368864	1928	357857	5630	9332, 13034, 16736, 20438, 24140
1774	ribosome production factor 2 homolog (<i>S. cerevisiae</i>)	425871	1929	414026	5631	9333, 13035, 16737, 20439, 24141
1775	ribosome production factor 2 homolog (<i>S. cerevisiae</i>)	441448	1930	402338	5632	9334, 13036, 16738, 20440, 24142
1776	ring finger protein 20	374819	1931	363952	5633	9335, 13037, 16739, 20441, 24143
1777	ring finger protein 20	389120	1932	373772	5634	9336, 13038, 16740, 20442, 24144
1778	ring finger protein 20	466817	1933	418924	5635	9337, 13039, 16741, 20443, 24145
1779	ring finger protein 20	479306	1934	419201	5636	9338, 13040, 16742, 20444, 24146
1780	RMI1, RecQ mediated genome instability 1, homolog (<i>S. cerevisiae</i>)	325875	1935	317039	5637	9339, 13041, 16743, 20445, 24147
1781	RNA binding motif protein 12	349942	1936	339879	5638	9340, 13042, 16744, 20446, 24148
1782	RNA binding motif protein 12	359646	1937	352668	5639	9341, 13043, 16745, 20447, 24149

1783	RNA binding motif protein 12	374104	1938	363217	5640	9342, 13044, 16746, 20448, 24150
1784	RNA binding motif protein 12	374114	1939	363228	5641	9343, 13045, 16747, 20449, 24151
1785	RNA binding motif protein 12	424458	1940	411036	5642	9344, 13046, 16748, 20450, 24152
1786	RNA binding motif protein 12	431148	1941	392642	5643	9345, 13047, 16749, 20451, 24153
1787	RNA binding motif protein 12	435161	1942	411692	5644	9346, 13048, 16750, 20452, 24154
1788	RNA binding motif protein 23	338980	1943	345496	5645	9347, 13049, 16751, 20453, 24155
1789	RNA binding motif protein 23	346528	1944	339220	5646	9348, 13050, 16752, 20454, 24156
1790	RNA binding motif protein 23	359890	1945	352956	5647	9349, 13051, 16753, 20455, 24157
1791	RNA binding motif protein 23	399922	1946	382806	5648	9350, 13052, 16754, 20456, 24158
1792	RNA binding motif protein 23	553876	1947	450672	5649	9351, 13053, 16755, 20457, 24159

1793	RNA binding motif protein 23	554256	1948	452583	5650	9352, 13054, 16756, 20458, 24160
1794	RNA binding motif protein 23	554618	1949	451448	5651	9353, 13055, 16757, 20459, 24161
1795	RNA binding motif protein 23	555676	1950	451364	5652	9354, 13056, 16758, 20460, 24162
1796	RNA binding motif protein 23	555691	1951	452538	5653	9355, 13057, 16759, 20461, 24163
1797	RNA binding motif protein 23	556862	1952	452557	5654	9356, 13058, 16760, 20462, 24164
1798	RNA binding motif protein 23	557464	1953	451403	5655	9357, 13059, 16761, 20463, 24165
1799	RNA binding motif protein 23	557549	1954	450558	5656	9358, 13060, 16762, 20464, 24166
1800	RNA binding motif protein 23	557571	1955	452382	5657	9359, 13061, 16763, 20465, 24167
1801	RNA binding motif protein 34	400947	1956	383731	5658	9360, 13062, 16764, 20466, 24168
1802	RNA binding motif protein 34	408888	1957	386226	5659	9361, 13063, 16765, 20467, 24169

1803	RNA binding motif protein 34	429912	1958	413409	5660	9362, 13064, 16766, 20468, 24170
1804	RNA binding motif protein 43	331426	1959	331211	5661	9363, 13065, 16767, 20469, 24171
1805	RNA binding motif protein 47	295971	1960	295971	5662	9364, 13066, 16768, 20470, 24172
1806	RNA binding motif protein 47	319592	1961	320108	5663	9365, 13067, 16769, 20471, 24173
1807	RNA binding motif protein 47	381793	1962	371212	5664	9366, 13068, 16770, 20472, 24174
1808	RNA binding motif protein 47	381795	1963	371214	5665	9367, 13069, 16771, 20473, 24175
1809	RNA binding motif protein 47	505220	1964	425507	5666	9368, 13070, 16772, 20474, 24176
1810	RNA binding motif protein 47	505414	1965	423527	5667	9369, 13071, 16773, 20475, 24177
1811	RNA binding motif protein 47	507180	1966	423398	5668	9370, 13072, 16774, 20476, 24178
1812	RNA binding motif protein 47	511598	1967	424019	5669	9371, 13073, 16775, 20477, 24179

1813	RNA binding motif protein 47	511902	1968	425111	5670	9372, 13074, 16776, 20478, 24180
1814	RNA binding motif protein 47	513473	1969	421589	5671	9373, 13075, 16777, 20479, 24181
1815	RNA binding motif protein 47	514782	1970	426542	5672	9374, 13076, 16778, 20480, 24182
1816	RNA binding motif protein 47	515053	1971	422564	5673	9375, 13077, 16779, 20481, 24183
1817	RNA binding motif protein 4B	310046	1972	310471	5674	9376, 13078, 16780, 20482, 24184
1818	RNA binding motif protein 4B	525754	1973	433071	5675	9377, 13079, 16781, 20483, 24185
1819	RNA binding motif protein 5	347869	1974	343054	5676	9378, 13080, 16782, 20484, 24186
1820	RNA binding motif protein 5	417905	1975	406119	5677	9379, 13081, 16783, 20485, 24187
1821	RNA binding motif protein 5	437500	1976	394622	5678	9380, 13082, 16784, 20486, 24188
1822	RNA binding motif protein 5	441305	1977	390711	5679	9381, 13083, 16785, 20487, 24189

1823	RNA binding motif protein 5	469838	1978	419534	5680	9382, 13084, 16786, 20488, 24190
1824	RNA binding motif protein 5	536082	1979	445347	5681	9383, 13085, 16787, 20489, 24191
1825	RNA binding motif protein 5	539538	1980	440744	5682	9384, 13086, 16788, 20490, 24192
1826	RNA binding motif protein 5	543047	1981	442591	5683	9385, 13087, 16789, 20491, 24193
1827	RNA binding motif protein 5	544851	1982	439808	5684	9386, 13088, 16790, 20492, 24194
1828	RNA binding motif protein 6	266022	1983	266022	5685	9387, 13089, 16791, 20493, 24195
1829	RNA binding motif protein 6	416583	1984	390202	5686	9388, 13090, 16792, 20494, 24196
1830	RNA binding motif protein 6	422955	1985	392939	5687	9389, 13091, 16793, 20495, 24197
1831	RNA binding motif protein 6	425608	1986	408665	5688	9390, 13092, 16794, 20496, 24198
1832	RNA binding motif protein 6	433811	1987	389763	5689	9391, 13093, 16795, 20497, 24199

1833	RNA binding motif protein 6	442092	1988	393530	5690	9392, 13094, 16796, 20498, 24200
1834	RNA binding motif protein 6	443081	1989	396466	5691	9393, 13095, 16797, 20499, 24201
1835	RNA binding motif protein 6	539992	1990	443165	5692	9394, 13096, 16798, 20500, 24202
1836	RNA binding motif protein, X-linked-like 1	321792	1991	318415	5693	9395, 13097, 16799, 20501, 24203
1837	RNA binding motif protein, X-linked-like 1	399794	1992	446099	5694	9396, 13098, 16800, 20502, 24204
1838	RNA binding motif protein, Y-linked, family 1, member F	303766	1993	307155	5695	9397, 13099, 16801, 20503, 24205
1839	RNA binding motif protein, Y-linked, family 1, member F	454978	1994	406005	5696	9398, 13100, 16802, 20504, 24206
1840	RNA binding motif protein, Y-linked, family 1, member J	250831	1995	250831	5697	9399, 13101, 16803, 20505, 24207
1841	RNA binding motif protein, Y-linked, family 1, member J	414629	1996	405745	5698	9400, 13102, 16804, 20506, 24208
1842	RNA binding motif protein, Y-linked, family 1, member J	445779	1997	389621	5699	9401, 13103, 16805, 20507, 24209

1843	RNA binding motif, single stranded interacting protein 1	348849	1998	294904	5700	9402, 13104, 16806, 20508, 24210
1844	RNA binding motif, single stranded interacting protein 1	392753	1999	376508	5701	9403, 13105, 16807, 20509, 24211
1845	RNA binding motif, single stranded interacting protein 1	409075	2000	386347	5702	9404, 13106, 16808, 20510, 24212
1846	RNA binding motif, single stranded interacting protein 1	409289	2001	386571	5703	9405, 13107, 16809, 20511, 24213
1847	RNA binding motif, single stranded interacting protein 1	409972	2002	387280	5704	9406, 13108, 16810, 20512, 24214
1848	RNA binding motif, single stranded interacting protein 1	428519	2003	389016	5705	9407, 13109, 16811, 20513, 24215
1849	RNA binding motif, single stranded interacting protein 2	262031	2004	262031	5706	9408, 13110, 16812, 20514, 24216
1850	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))	246194	2005	246194	5707	9409, 13111, 16813, 20515, 24217
1851	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))	375114	2006	364255	5708	9410, 13112, 16814, 20516, 24218
1852	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))	413297	2007	403744	5709	9411, 13113, 16815, 20517, 24219

1853	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))	442805	2008	415973	5710	9412, 13114, 16816, 20518, 24220
1854	RNA binding protein, autoantigenic (hnRNP-associated with lethal yellow homolog (mouse))	448364	2009	413638	5711	9413, 13115, 16817, 20519, 24221
1855	RNA terminal phosphate cyclase-like 1	381728	2010	371147	5712	9414, 13116, 16818, 20520, 24222
1856	RNA terminal phosphate cyclase-like 1	381730	2011	371149	5713	9415, 13117, 16819, 20521, 24223
1857	RNA terminal phosphate cyclase-like 1	381732	2012	371151	5714	9416, 13118, 16820, 20522, 24224
1858	RNA terminal phosphate cyclase-like 1	381750	2013	371169	5715	9417, 13119, 16821, 20523, 24225
1859	RNA terminal phosphate cyclase-like 1	441844	2014	413381	5716	9418, 13120, 16822, 20524, 24226
1860	RNA terminal phosphate cyclase-like 1	442869	2015	412000	5717	9419, 13121, 16823, 20525, 24227
1861	RNA terminal phosphate cyclase-like 1	448872	2016	388096	5718	9420, 13122, 16824, 20526, 24228
1862	RNA-binding region (RNP1, RRM) containing 3	423855	2017	391432	5719	9421, 13123, 16825, 20527, 24229

1863	RNA-binding region (RNP1, RRM) containing 3	531127	2018	436853	5720	9422, 13124, 16826, 20528, 24230
1864	RNA-binding region (RNP1, RRM) containing 3	531883	2019	431344	5721	9423, 13125, 16827, 20529, 24231
1865	RNA-binding region (RNP1, RRM) containing 3	533099	2020	432886	5722	9424, 13126, 16828, 20530, 24232
1866	round spermatid basic protein 1	261441	2021	261441	5723	9425, 13127, 16829, 20531, 24233
1867	round spermatid basic protein 1-like	334955	2022	334040	5724	9426, 13128, 16830, 20532, 24234
1868	round spermatid basic protein 1-like	445288	2023	393888	5725	9427, 13129, 16831, 20533, 24235
1869	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	265814	2024	265814	5726	9428, 13130, 16832, 20534, 24236
1870	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	360348	2025	353504	5727	9429, 13131, 16833, 20535, 24237
1871	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	396218	2026	379520	5728	9430, 13132, 16834, 20536, 24238
1872	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	422361	2027	390137	5729	9431, 13133, 16835, 20537, 24239

1873	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	436581	2028	402257	5730	9432, 13134, 16836, 20538, 24240
1874	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	517792	2029	429940	5731	9433, 13135, 16837, 20539, 24241
1875	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	517919	2030	429506	5732	9434, 13136, 16838, 20540, 24242
1876	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518317	2031	429062	5733	9435, 13137, 16839, 20541, 24243
1877	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518449	2032	428133	5734	9436, 13138, 16840, 20542, 24244
1878	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518823	2033	428475	5735	9437, 13139, 16841, 20543, 24245
1879	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518832	2034	429864	5736	9438, 13140, 16842, 20544, 24246
1880	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518844	2035	430728	5737	9439, 13141, 16843, 20545, 24247
1881	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518954	2036	430080	5738	9440, 13142, 16844, 20546, 24248
1882	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	518992	2037	431094	5739	9441, 13143, 16845, 20547, 24249

1883	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	519061	2038	430334	5740	9442, 13144, 16846, 20548, 24250
1884	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	519847	2039	430204	5741	9443, 13145, 16847, 20549, 24251
1885	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	520428	2040	429857	5742	9444, 13146, 16848, 20550, 24252
1886	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	520556	2041	428100	5743	9445, 13147, 16849, 20551, 24253
1887	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	520583	2042	430070	5744	9446, 13148, 16850, 20552, 24254
1888	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	520724	2043	428742	5745	9447, 13149, 16851, 20553, 24255
1889	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	520974	2044	429375	5746	9448, 13150, 16852, 20554, 24256
1890	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	521054	2045	427763	5747	9449, 13151, 16853, 20555, 24257
1891	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	521319	2046	429137	5748	9450, 13152, 16854, 20556, 24258
1892	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	521375	2047	429666	5749	9451, 13153, 16855, 20557, 24259

1893	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	521733	2048	430637	5750	9452, 13154, 16856, 20558, 24260
1894	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	522467	2049	429532	5751	9453, 13155, 16857, 20559, 24261
1895	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	523168	2050	429118	5752	9454, 13156, 16858, 20560, 24262
1896	runt-related transcription factor 1; translocated to, 1 (cyclin D-related)	523629	2051	428543	5753	9455, 13157, 16859, 20561, 24263
1897	SAFB-like, transcription modulator	380516	2052	369887	5754	9456, 13158, 16860, 20562, 24264
1898	SAFB-like, transcription modulator	536328	2053	439271	5755	9457, 13159, 16861, 20563, 24265
1899	SAFB-like, transcription modulator	560494	2054	452805	5756	9458, 13160, 16862, 20564, 24266
1900	SAP30-like	297109	2055	297109	5757	9459, 13161, 16863, 20565, 24267
1901	SAP30-like	426761	2056	416393	5758	9460, 13162, 16864, 20566, 24268
1902	SAP30-like	440364	2057	390927	5759	9461, 13163, 16865, 20567, 24269

1903	SCAN domain containing 1	305978	2058	301995	5760	9462, 13164, 16866, 20568, 24270
1904	SCAN domain containing 1	373991	2059	363103	5761	9463, 13165, 16867, 20569, 24271
1905	SCAN domain containing 3	452236	2060	395259	5762	9464, 13166, 16868, 20570, 24272
1906	schlafen family member 11	308377	2061	312402	5763	9465, 13167, 16869, 20571, 24273
1907	schlafen family member 11	394566	2062	378067	5764	9466, 13168, 16870, 20572, 24274
1908	schlafen family member 11	427966	2063	395140	5765	9467, 13169, 16871, 20573, 24275
1909	schlafen family member 11	430814	2064	397454	5766	9468, 13170, 16872, 20574, 24276
1910	schlafen family member 11	441608	2065	393615	5767	9469, 13171, 16873, 20575, 24277
1911	scleraxis homolog B (mouse)	340210	2066	342868	5768	9470, 13172, 16874, 20576, 24278
1912	Scm-like with four mbt domains 1	296295	2067	296295	5769	9471, 13173, 16875, 20577, 24279

1913	Scm-like with four mbt domains 1	358080	2068	350789	5770	9472, 13174, 16876, 20578, 24280
1914	Scm-like with four mbt domains 1	394750	2069	378233	5771	9473, 13175, 16877, 20579, 24281
1915	Scm-like with four mbt domains 1	394752	2070	378235	5772	9474, 13176, 16878, 20580, 24282
1916	Scm-like with four mbt domains 1	482396	2071	418860	5773	9475, 13177, 16879, 20581, 24283
1917	Scm-like with four mbt domains 1	483069	2072	418950	5774	9476, 13178, 16880, 20582, 24284
1918	Scm-like with four mbt domains 1	497586	2073	419215	5775	9477, 13179, 16881, 20583, 24285
1919	Scm-like with four mbt domains 2	361972	2074	355109	5776	9478, 13180, 16882, 20584, 24286
1920	Scm-like with four mbt domains 2	379711	2075	369033	5777	9479, 13181, 16883, 20585, 24287
1921	Scm-like with four mbt domains 2	379713	2076	369035	5778	9480, 13182, 16884, 20586, 24288
1922	Scm-like with four mbt domains 2	397160	2077	380346	5779	9481, 13183, 16885, 20587, 24289

1923	Scm-like with four mbt domains 2	397167	2078	380353	5780	9482, 13184, 16886, 20588, 24290
1924	scratch homolog 2, zinc finger protein (Drosophila)	246104	2079	246104	5781	9483, 13185, 16887, 20589, 24291
1925	SDA1 domain containing 1	356260	2080	348596	5782	9484, 13186, 16888, 20590, 24292
1926	serine/arginine-rich splicing factor 12	452027	2081	414302	5783	9485, 13187, 16889, 20591, 24293
1927	serine/threonine kinase 17a	319357	2082	319192	5784	9486, 13188, 16890, 20592, 24294
1928	sestrin 3	278499	2083	278499	5785	9487, 13189, 16891, 20593, 24295
1929	sestrin 3	393234	2084	376926	5786	9488, 13190, 16892, 20594, 24296
1930	sestrin 3	416495	2085	407008	5787	9489, 13191, 16893, 20595, 24297
1931	sestrin 3	536441	2086	441927	5788	9490, 13192, 16894, 20596, 24298
1932	SET domain containing 3	329331	2087	327910	5789	9491, 13193, 16895, 20597, 24299

1933	SET domain containing 3	331768	2088	327436	5790	9492, 13194, 16896, 20598, 24300
1934	SET domain containing 6	219315	2089	219315	5791	9493, 13195, 16897, 20599, 24301
1935	SET domain containing 6	310682	2090	310082	5792	9494, 13196, 16898, 20600, 24302
1936	SET domain containing 6	458571	2091	411123	5793	9495, 13197, 16899, 20601, 24303
1937	seven in absentia homolog 3 (Drosophila)	400405	2092	383256	5794	9496, 13198, 16900, 20602, 24304
1938	sex comb on midleg homolog 1 (Drosophila)	326197	2093	318094	5795	9497, 13199, 16901, 20603, 24305
1939	sex comb on midleg homolog 1 (Drosophila)	337495	2094	337352	5796	9498, 13200, 16902, 20604, 24306
1940	sex comb on midleg homolog 1 (Drosophila)	361191	2095	354656	5797	9499, 13201, 16903, 20605, 24307
1941	sex comb on midleg homolog 1 (Drosophila)	361705	2096	354996	5798	9500, 13202, 16904, 20606, 24308
1942	sex comb on midleg homolog 1 (Drosophila)	372595	2097	361676	5799	9501, 13203, 16905, 20607, 24309

1943	sex comb on midleg homolog 1 (Drosophila)	372596	2098	361677	5800	9502, 13204, 16906, 20608, 24310
1944	sex comb on midleg homolog 1 (Drosophila)	372597	2099	361678	5801	9503, 13205, 16907, 20609, 24311
1945	sex comb on midleg homolog 1 (Drosophila)	397171	2100	380356	5802	9504, 13206, 16908, 20610, 24312
1946	sex comb on midleg homolog 1 (Drosophila)	397174	2101	380359	5803	9505, 13207, 16909, 20611, 24313
1947	sex comb on midleg homolog 1 (Drosophila)	402904	2102	386079	5804	9506, 13208, 16910, 20612, 24314
1948	sex comb on midleg homolog 1 (Drosophila)	456518	2103	403974	5805	9507, 13209, 16911, 20613, 24315
1949	sex comb on midleg-like 4 (Drosophila)	369020	2104	358016	5806	9508, 13210, 16912, 20614, 24316
1950	sex comb on midleg-like 4 (Drosophila)	369021	2105	358017	5807	9509, 13211, 16913, 20615, 24317
1951	SH3 domain binding glutamic acid-rich protein like 2	369838	2106	358853	5808	9510, 13212, 16914, 20616, 24318
1952	short stature homeobox protein 2 isoform c	483851	2107	419362	5809	9511, 13213, 16915, 20617, 24319

1953	Sin3A-associated protein, 30kDa	296504	2108	296504	5810	9512, 13214, 16916, 20618, 24320
1954	SLX1 structure-specific endonuclease subunit homolog A (<i>S. cerevisiae</i>)	251303	2109	251303	5811	9513, 13215, 16917, 20619, 24321
1955	SLX1 structure-specific endonuclease subunit homolog A (<i>S. cerevisiae</i>)	345535	2110	333945	5812	9514, 13216, 16918, 20620, 24322
1956	SLX1 structure-specific endonuclease subunit homolog A (<i>S. cerevisiae</i>)	539274	2111	438663	5813	9515, 13217, 16919, 20621, 24323
1957	SLX1 structure-specific endonuclease subunit homolog B (<i>S. cerevisiae</i>)	330181	2112	328940	5814	9516, 13218, 16920, 20622, 24324
1958	SLX1 structure-specific endonuclease subunit homolog B (<i>S. cerevisiae</i>)	351581	2113	335316	5815	9517, 13219, 16921, 20623, 24325
1959	SLX1 structure-specific endonuclease subunit homolog B (<i>S. cerevisiae</i>)	538376	2114	441979	5816	9518, 13220, 16922, 20624, 24326
1960	small nuclear ribonucleoprotein 25kDa (U11/U12)	293861	2115	293861	5817	9519, 13221, 16923, 20625, 24327
1961	small nuclear ribonucleoprotein 25kDa (U11/U12)	383018	2116	372482	5818	9520, 13222, 16924, 20626, 24328
1962	small nuclear ribonucleoprotein 27kDa (U4/U6.U5)	244227	2117	244227	5819	9521, 13223, 16925, 20627, 24329

1963	small nuclear ribonucleoprotein 27kDa (U4/U6.U5)	450162	2118	395144	5820	9522, 13224, 16926, 20628, 24330
1964	small nuclear ribonucleoprotein 35kDa (U11/U12)	350887	2119	340774	5821	9523, 13225, 16927, 20629, 24331
1965	small nuclear ribonucleoprotein 35kDa (U11/U12)	412157	2120	403310	5822	9524, 13226, 16928, 20630, 24332
1966	small nuclear ribonucleoprotein 35kDa (U11/U12)	526639	2121	432595	5823	9525, 13227, 16929, 20631, 24333
1967	small nuclear ribonucleoprotein 70kDa (U1)	221448	2122	221448	5824	9526, 13228, 16930, 20632, 24334
1968	small nuclear ribonucleoprotein 70kDa (U1)	401730	2123	385077	5825	9527, 13229, 16931, 20633, 24335
1969	small nuclear ribonucleoprotein 70kDa (U1)	438617	2124	387351	5826	9528, 13230, 16932, 20634, 24336
1970	small nuclear ribonucleoprotein 70kDa (U1)	544278	2125	444479	5827	9529, 13231, 16933, 20635, 24337
1971	small nuclear ribonucleoprotein 70kDa (U1)	598441	2126	472998	5828	9530, 13232, 16934, 20636, 24338
1972	small nuclear ribonucleoprotein polypeptide B	246071	2127	246071	5829	9531, 13233, 16935, 20637, 24339

1973	small nuclear ribonucleoprotein polypeptide B	377943	2128	367178	5830	9532, 13234, 16936, 20638, 24340
1974	small nuclear RNA activating complex, polypeptide 1, 43kDa	216294	2129	216294	5831	9533, 13235, 16937, 20639, 24341
1975	small nuclear RNA activating complex, polypeptide 2, 45kDa	221573	2130	221573	5832	9534, 13236, 16938, 20640, 24342, 26079, 26094
1976	small nuclear RNA activating complex, polypeptide 2, 45kDa	394102	2131	377662	5833	9535, 13237, 16939, 20641, 24343
1977	small nuclear RNA activating complex, polypeptide 3, 50kDa	380799	2132	370177	5834	9536, 13238, 16940, 20642, 24344
1978	small nuclear RNA activating complex, polypeptide 3, 50kDa	380807	2133	370185	5835	9537, 13239, 16941, 20643, 24345
1979	small nuclear RNA activating complex, polypeptide 3, 50kDa	380821	2134	370200	5836	9538, 13240, 16942, 20644, 24346
1980	small nuclear RNA activating complex, polypeptide 3, 50kDa	421710	2135	391832	5837	9539, 13241, 16943, 20645, 24347
1981	small nuclear RNA activating complex, polypeptide 3, 50kDa	447670	2136	406100	5838	9540, 13242, 16944, 20646, 24348
1982	small nuclear RNA activating complex, polypeptide 3, 50kDa	467062	2137	436699	5839	9541, 13243, 16945,

						20647, 24349
1983	small nuclear RNA activating complex, polypeptide 3, 50kDa	490969	2138	432393	5840	9542, 13244, 16946, 20648, 24350
1984	small nuclear RNA activating complex, polypeptide 4, 190kDa	298532	2139	298532	5841	9543, 13245, 16947, 20649, 24351
1985	small nuclear RNA activating complex, polypeptide 5, 19kDa	307979	2140	308439	5842	9544, 13246, 16948, 20650, 24352
1986	small nuclear RNA activating complex, polypeptide 5, 19kDa	316634	2141	319597	5843	9545, 13247, 16949, 20651, 24353
1987	small nuclear RNA activating complex, polypeptide 5, 19kDa	395589	2142	378954	5844	9546, 13248, 16950, 20652, 24354
1988	SNF2 histone linker PHD RING helicase	275233	2143	275233	5845	9547, 13249, 16951, 20653, 24355
1989	SNF2 histone linker PHD RING helicase	367503	2144	356473	5846	9548, 13250, 16952, 20654, 24356
1990	SNF2 histone linker PHD RING helicase	367505	2145	356475	5847	9549, 13251, 16953, 20655, 24357
1991	SNF2 histone linker PHD RING helicase	367507	2146	356477	5848	9550, 13252, 16954, 20656, 24358
1992	SNF2 histone linker PHD RING helicase	438092	2147	412797	5849	9551, 13253, 16955,

						20657, 24359
1993	SNF2 histone linker PHD RING helicase	444767	2148	388065	5850	9552, 13254, 16956, 20658, 24360
1994	SNRPN upstream reading frame	338094	2149	336543	5851	9553, 13255, 16957, 20659, 24361
1995	SNRPN upstream reading frame	338327	2150	342152	5852	9554, 13256, 16958, 20660, 24362
1996	SNRPN upstream reading frame	346403	2151	306223	5853	9555, 13257, 16959, 20661, 24363
1997	SNRPN upstream reading frame	551312	2152	451421	5854	9556, 13258, 16960, 20662, 24364
1998	SNW domain containing 1	261531	2153	261531	5855	9557, 13259, 16961, 20663, 24365
1999	SNW domain containing 1	416259	2154	387847	5856	9558, 13260, 16962, 20664, 24366
2000	SNW domain containing 1	554324	2155	452473	5857	9559, 13261, 16963, 20665, 24367
2001	SP140 nuclear body protein	350136	2156	345846	5858	9560, 13262, 16964, 20666, 24368
2002	SP140 nuclear body protein	373645	2157	362749	5859	9561, 13263, 16965,

						20667, 24369
2003	SP140 nuclear body protein	392044	2158	375898	5860	9562, 13264, 16966, 20668, 24370
2004	SP140 nuclear body protein	392045	2159	375899	5861	9563, 13265, 16967, 20669, 24371
2005	SP140 nuclear body protein	420434	2160	398210	5862	9564, 13266, 16968, 20670, 24372
2006	SP140 nuclear body protein	486687	2161	440107	5863	9565, 13267, 16969, 20671, 24373
2007	SP140 nuclear body protein	537563	2162	445084	5864	9566, 13268, 16970, 20672, 24374
2008	SP140 nuclear body protein-like	243810	2163	243810	5865	9567, 13269, 16971, 20673, 24375
2009	SP140 nuclear body protein-like	396563	2164	379811	5866	9568, 13270, 16972, 20674, 24376
2010	SP140 nuclear body protein-like	415673	2165	397911	5867	9569, 13271, 16973, 20675, 24377
2011	SP140 nuclear body protein-like	444636	2166	395195	5868	9570, 13272, 16974, 20676, 24378
2012	SP140 nuclear body protein-like	458341	2167	395223	5869	9571, 13273, 16975,

						20677, 24379
2013	Sp2 transcription factor	322172	2168	316942	5870	9572, 13274, 16976, 20678, 24380
2014	Sp2 transcription factor	376741	2169	365931	5871	9573, 13275, 16977, 20679, 24381
2015	Sp5 transcription factor	375281	2170	364430	5872	9574, 13276, 16978, 20680, 24382
2016	Sp6 transcription factor	342234	2171	340799	5873	9575, 13277, 16979, 20681, 24383
2017	Sp6 transcription factor	536300	2172	438209	5874	9576, 13278, 16980, 20682, 24384
2018	Sp9 transcription factor homolog (mouse)	394967	2173	378418	5875	9577, 13279, 16981, 20683, 24385
2019	speckle-type POZ protein	347630	2174	240327	5876	9578, 13280, 16982, 20684, 24386
2020	speckle-type POZ protein	393328	2175	377001	5877	9579, 13281, 16983, 20685, 24387
2021	speckle-type POZ protein	393331	2176	377004	5878	9580, 13282, 16984, 20686, 24388
2022	speckle-type POZ protein	451526	2177	423076	5879	9581, 13283, 16985,

						20687, 24389
2023	speckle-type POZ protein	503536	2178	423124	5880	9582, 13284, 16986, 20688, 24390
2024	speckle-type POZ protein	503676	2179	420908	5881	9583, 13285, 16987, 20689, 24391
2025	speckle-type POZ protein	504102	2180	425905	5882	9584, 13286, 16988, 20690, 24392
2026	speckle-type POZ protein	505581	2181	420960	5883	9585, 13287, 16989, 20691, 24393
2027	speckle-type POZ protein	507970	2182	426262	5884	9586, 13288, 16990, 20692, 24394
2028	speckle-type POZ protein	508805	2183	427419	5885	9587, 13289, 16991, 20693, 24395
2029	speckle-type POZ protein	509079	2184	426986	5886	9588, 13290, 16992, 20694, 24396
2030	speckle-type POZ protein	510476	2185	425410	5887	9589, 13291, 16993, 20695, 24397
2031	speckle-type POZ protein	513872	2186	420852	5888	9590, 13292, 16994, 20696, 24398
2032	speckle-type POZ protein	514121	2187	424119	5889	9591, 13293, 16995,

						20697, 24399
2033	speckle-type POZ protein	515508	2188	426537	5890	9592, 13294, 16996, 20698, 24400
2034	speckle-type POZ protein- like	280098	2189	280098	5891	9593, 13295, 16997, 20699, 24401
2035	SPEG complex locus	265327	2190	265327	5892	9594, 13296, 16998, 20700, 24402
2036	SPEG complex locus	312358	2191	311684	5893	9595, 13297, 16999, 20701, 24403
2037	SPEG complex locus	396686	2192	379917	5894	9596, 13298, 17000, 20702, 24404
2038	SPEG complex locus	396688	2193	379919	5895	9597, 13299, 17001, 20703, 24405
2039	SPEG complex locus	396689	2194	379920	5896	9598, 13300, 17002, 20704, 24406
2040	SPEG complex locus	396695	2195	379923	5897	9599, 13301, 17003, 20705, 24407
2041	sperm associated antigen 7	206020	2196	206020	5898	9600, 13302, 17004, 20706, 24408
2042	spermatogenesis and oogenesis specific basic helix-loop-helix 2	379881	2197	369210	5899	9601, 13303, 17005,

						20707, 24409
2043	spermatogenesis and oogenesis specific basic helix-loop-helix 2	554962	2198	451542	5900	9602, 13304, 17006, 20708, 24410
2044	spindlin family, member 2B	275988	2199	275988	5901	9603, 13305, 17007, 20709, 24411
2045	spindlin family, member 2B	333933	2200	335008	5902	9604, 13306, 17008, 20710, 24412
2046	spindlin family, member 2B	374910	2201	364045	5903	9605, 13307, 17009, 20711, 24413
2047	spindlin family, member 2B	374912	2202	364047	5904	9606, 13308, 17010, 20712, 24414
2048	spindlin family, member 2B	434397	2203	404314	5905	9607, 13309, 17011, 20713, 24415
2049	splicing factor 3a, subunit 3, 60kDa	373019	2204	362110	5906	9608, 13310, 17012, 20714, 24416
2050	splicing factor 3a, subunit 3, 60kDa	448721	2205	392027	5907	9609, 13311, 17013, 20715, 24417
2051	splicing factor 3b, subunit 5, 10kDa	367569	2206	356541	5908	9610, 13312, 17014, 20716, 24418

2052	splicing factor suppressor of white-apricot homolog (Drosophila)	541286	2207	437738	5909	9611, 13313, 17015, 20717, 24419
2053	splicing factor, suppressor of white-apricot homolog (Drosophila)	261674	2208	261674	5910	9612, 13314, 17016, 20718, 24420
2054	splicing factor, suppressor of white-apricot homolog (Drosophila)	544623	2209	444745	5911	9613, 13315, 17017, 20719, 24421
2055	SPOC domain containing 1	257100	2210	257100	5912	9614, 13316, 17018, 20720, 24422
2056	SPOC domain containing 1	294514	2211	294514	5913	9615, 13317, 17019, 20721, 24423
2057	SPOC domain containing 1	360482	2212	353670	5914	9616, 13318, 17020, 20722, 24424
2058	SPOC domain containing 1	373648	2213	362752	5915	9617, 13319, 17021, 20723, 24425
2059	SPOC domain containing 1	449266	2214	404677	5916	9618, 13320, 17022, 20724, 24426
2060	SPOC domain containing 1	525930	2215	436239	5917	9619, 13321, 17023, 20725, 24427
2061	SPOC domain containing 1	528791	2216	435385	5918	9620, 13322, 17024, 20726, 24428

2062	SPOC domain containing 1	533231	2217	435851	5919	9621, 13323, 17025, 20727, 24429
2063	SR-related CTD-associated factor 1	360565	2218	353769	5920	9622, 13324, 17026, 20728, 24430
2064	SR-related CTD-associated factor 1	447618	2219	416014	5921	9623, 13325, 17027, 20729, 24431
2065	SR-related CTD-associated factor 4	286835	2220	286835	5922	9624, 13326, 17028, 20730, 24432
2066	SR-related CTD-associated factor 4	399804	2221	382703	5923	9625, 13327, 17029, 20731, 24433
2067	SR-related CTD-associated factor 4	434667	2222	402377	5924	9626, 13328, 17030, 20732, 24434
2068	SR-related CTD-associated factor 8	367178	2223	356146	5925	9627, 13329, 17031, 20733, 24435
2069	SR-related CTD-associated factor 8	367186	2224	356154	5926	9628, 13330, 17032, 20734, 24436
2070	SR-related CTD-associated factor 8	417268	2225	413098	5927	9629, 13331, 17033, 20735, 24437
2071	SRY (sex determining region Y)-box 30	265007	2226	265007	5928	9630, 13332, 17034, 20736, 24438

2072	SRY (sex determining region Y)-box 30	311371	2227	309343	5929	9631, 13333, 17035, 20737, 24439
2073	SSU72 RNA polymerase II CTD phosphatase homolog (<i>S. cerevisiae</i>)	291386	2228	291386	5930	9632, 13334, 17036, 20738, 24440
2074	SSU72 RNA polymerase II CTD phosphatase homolog (<i>S. cerevisiae</i>)	359060	2229	351955	5931	9633, 13335, 17037, 20739, 24441
2075	SSU72 RNA polymerase II CTD phosphatase homolog (<i>S. cerevisiae</i>)	378725	2230	367999	5932	9634, 13336, 17038, 20740, 24442
2076	SSU72 RNA polymerase II CTD phosphatase homolog (<i>S. cerevisiae</i>)	378726	2231	368000	5933	9635, 13337, 17039, 20741, 24443
2077	sterile alpha motif domain containing 10	369886	2232	358902	5934	9636, 13338, 17040, 20742, 24444
2078	sterile alpha motif domain containing 10	450107	2233	404839	5935	9637, 13339, 17041, 20743, 24445
2079	sterile alpha motif domain containing 11	342066	2234	342313	5936	9638, 13340, 17042, 20744, 24446
2080	sterile alpha motif domain containing 11	420190	2235	411579	5937	9639, 13341, 17043, 20745, 24447
2081	sterile alpha motif domain containing 11	437963	2236	393181	5938	9640, 13342, 17044, 20746, 24448

2082	sterile alpha motif domain containing 12	314727	2237	314173	5939	9641, 13343, 17045, 20747, 24449
2083	sterile alpha motif domain containing 12	409003	2238	387133	5940	9642, 13344, 17046, 20748, 24450
2084	sterile alpha motif domain containing 13	370667	2239	359701	5941	9643, 13345, 17047, 20749, 24451
2085	sterile alpha motif domain containing 13	370668	2240	359702	5942	9644, 13346, 17048, 20750, 24452
2086	sterile alpha motif domain containing 13	370669	2241	359703	5943	9645, 13347, 17049, 20751, 24453
2087	sterile alpha motif domain containing 13	370670	2242	359704	5944	9646, 13348, 17050, 20752, 24454
2088	sterile alpha motif domain containing 13	370671	2243	359705	5945	9647, 13349, 17051, 20753, 24455
2089	sterile alpha motif domain containing 13	370673	2244	359707	5946	9648, 13350, 17052, 20754, 24456
2090	sterile alpha motif domain containing 13	394834	2245	378311	5947	9649, 13351, 17053, 20755, 24457
2091	stromal antigen 1	236698	2246	236698	5948	9650, 13352, 17054, 20756, 24458

2092	stromal antigen 1	383202	2247	372689	5949	9651, 13353, 17055, 20757, 24459
2093	stromal antigen 1	434713	2248	404396	5950	9652, 13354, 17056, 20758, 24460
2094	stromal antigen 1	536929	2249	445787	5951	9653, 13355, 17057, 20759, 24461
2095	stromal antigen 3-like 1	338421	2250	344075	5952	9654, 13356, 17058, 20760, 24462
2096	stromal antigen 3-like 1	339898	2251	340476	5953	9655, 13357, 17059, 20761, 24463
2097	stromal antigen 3-like 1	394930	2252	378388	5954	9656, 13358, 17060, 20762, 24464
2098	stromal antigen 3-like 1	402225	2253	408272	5955	9657, 13359, 17061, 20763, 24465
2099	stromal antigen 3-like 2	359898	2254	352969	5956	9658, 13360, 17062, 20764, 24466
2100	stromal antigen 3-like 2	380775	2255	370152	5957	9659, 13361, 17063, 20765, 24467
2101	stromal antigen 3-like 2	429726	2256	408793	5958	9660, 13362, 17064, 20766, 24468

2102	stromal antigen 3-like 2	448772	2257	401345	5959	9661, 13363, 17065, 20767, 24469
2103	stromal antigen 3-like 2	457631	2258	393809	5960	9662, 13364, 17066, 20768, 24470
2104	stromal antigen 3-like 3	308103	2259	312329	5961	9663, 13365, 17067, 20769, 24471
2105	stromal antigen 3-like 3	423834	2260	396814	5962	9664, 13366, 17068, 20770, 24472
2106	stromal antigen 3-like 3	426587	2261	393385	5963	9665, 13367, 17069, 20771, 24473
2107	stromal antigen 3-like 3	448173	2262	401427	5964	9666, 13368, 17070, 20772, 24474
2108	structural maintenance of chromosomes 1B	357450	2263	350036	5965	9667, 13369, 17071, 20773, 24475
2109	structural maintenance of chromosomes 1B	404354	2264	385902	5966	9668, 13370, 17072, 20774, 24476
2110	structural maintenance of chromosomes flexible hinge domain containing 1	261598	2265	261598	5967	9669, 13371, 17073, 20775, 24477
2111	structural maintenance of chromosomes flexible hinge domain containing 1	320876	2266	326603	5968	9670, 13372, 17074, 20776, 24478

2112	SUB1 homolog (S. cerevisiae)	265073	2267	265073	5969	9671, 13373, 17075, 20777, 24479
2113	SUB1 homolog (S. cerevisiae)	502897	2268	427100	5970	9672, 13374, 17076, 20778, 24480
2114	SUB1 homolog (S. cerevisiae)	506237	2269	422078	5971	9673, 13375, 17077, 20779, 24481
2115	SUB1 homolog (S. cerevisiae)	510442	2270	423893	5972	9674, 13376, 17078, 20780, 24482
2116	SUB1 homolog (S. cerevisiae)	512913	2271	422806	5973	9675, 13377, 17079, 20781, 24483
2117	SUB1 homolog (S. cerevisiae)	515355	2272	426850	5974	9676, 13378, 17080, 20782, 24484
2118	SUB1 homolog (S. cerevisiae)	542111	2273	439631	5975	9677, 13379, 17081, 20783, 24485
2119	superkiller viralicidic activity 2-like 2 (S. cerevisiae)	230640	2274	230640	5976	9678, 13380, 17082, 20784, 24486
2120	superkiller viralicidic activity 2-like 2 (S. cerevisiae)	545714	2275	442583	5977	9679, 13381, 17083, 20785, 24487
2121	suppression of tumorigenicity 18 (breast carcinoma) (zinc finger protein)	276480	2276	276480	5978	9680, 13382, 17084, 20786, 24488

2122	suppression of tumorigenicity 18 (breast carcinoma) (zinc finger protein)	517580	2277	428521	5979	9681, 13383, 17085, 20787, 24489
2123	suppression of tumorigenicity 18 (breast carcinoma) (zinc finger protein)	519118	2278	428096	5980	9682, 13384, 17086, 20788, 24490
2124	suppressor of defective silencing 3 homolog (S. cerevisiae)	397564	2279	380695	5981	9683, 13385, 17087, 20789, 24491
2125	suppressor of defective silencing 3 homolog (S. cerevisiae)	543473	2280	443988	5982	9684, 13386, 17088, 20790, 24492
2126	suppressor of Ty 16 homolog (S. cerevisiae)	216297	2281	216297	5983	9685, 13387, 17089, 20791, 24493
2127	suppressor of Ty 16 homolog (S. cerevisiae)	538230	2282	438340	5984	9686, 13388, 17090, 20792, 24494
2128	suppressor of Ty 3 homolog (S. cerevisiae)	306867	2283	306718	5985	9687, 13389, 17091, 20793, 24495
2129	suppressor of Ty 3 homolog (S. cerevisiae)	371458	2284	360513	5986	9688, 13390, 17092, 20794, 24496
2130	suppressor of Ty 3 homolog (S. cerevisiae)	371459	2285	360514	5987	9689, 13391, 17093, 20795, 24497
2131	suppressor of Ty 3 homolog (S. cerevisiae)	371460	2286	360515	5988	9690, 13392, 17094, 20796, 24498

2132	suppressor of Ty 3 homolog (<i>S. cerevisiae</i>)	371461	2287	360516	5989	9691, 13393, 17095, 20797, 24499
2133	suppressor of Ty 3 homolog (<i>S. cerevisiae</i>)	475057	2288	436411	5990	9692, 13394, 17096, 20798, 24500
2134	suppressor of Ty 4 homolog 1 (<i>S. cerevisiae</i>)	225504	2289	225504	5991	9693, 13395, 17097, 20799, 24501, 26080, 26095
2135	suppressor of zeste 12 homolog (<i>Drosophila</i>)	322652	2290	316578	5992	9694, 13396, 17098, 20800, 24502
2136	SURP and G patch domain containing 1	247001	2291	247001	5993	9695, 13397, 17099, 20801, 24503
2137	SURP and G patch domain containing 1	334782	2292	334032	5994	9696, 13398, 17100, 20802, 24504
2138	SURP and G patch domain containing 1	535070	2293	439172	5995	9697, 13399, 17101, 20803, 24505
2139	SURP and G patch domain containing 2	330854	2294	332373	5996	9698, 13400, 17102, 20804, 24506
2140	SURP and G patch domain containing 2	337018	2295	337926	5997	9699, 13401, 17103, 20805, 24507
2141	SURP and G patch domain containing 2	452918	2296	389380	5998	9700, 13402, 17104,

						20806, 24508
2142	SURP and G patch domain containing 2	456085	2297	409603	5999	9701, 13403, 17105, 20807, 24509
2143	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	264640	2298	264640	6000	9702, 13404, 17106, 20808, 24510
2144	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	348513	2299	323967	6001	9703, 13405, 17107, 20809, 24511
2145	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	377808	2300	367039	6002	9704, 13406, 17108, 20810, 24512
2146	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	400122	2301	411607	6003	9705, 13407, 17109, 20811, 24513
2147	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	431889	2302	445370	6004	9706, 13408, 17110, 20812, 24514
2148	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	447024	2303	392958	6005	9707, 13409, 17111, 20813, 24515
2149	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily e, member 1	544009	2304	441857	6006	9708, 13410, 17112, 20814, 24516
2150	SWI5 recombination repair homolog (yeast)	320188	2305	316609	6007	9709, 13411, 17113, 20815, 24517
2151	SWI5-dependent recombination repair 1	336358	2306	338089	6008	9710, 13412, 17114,

						20816, 24518
2152	SWI5-dependent recombination repair 1	369727	2307	358742	6009	9711, 13413, 17115, 20817, 24519
2153	SWI5-dependent recombination repair 1	369729	2308	358744	6010	9712, 13414, 17116, 20818, 24520
2154	synapse associated protein 1	380155	2309	369500	6011	9713, 13415, 17117, 20819, 24521
2155	synaptonemal complex protein 2-like	283141	2310	283141	6012	9714, 13416, 17118, 20820, 24522
2156	synaptonemal complex protein 2-like	543878	2311	440676	6013	9715, 13417, 17119, 20821, 24523
2157	synovial sarcoma, X breakpoint 2 interacting protein	342203	2312	340279	6014	9716, 13418, 17120, 20822, 24524
2158	synovial sarcoma, X breakpoint 2 interacting protein	370612	2313	359644	6015	9717, 13419, 17121, 20823, 24525
2159	synovial sarcoma, X breakpoint 2 interacting protein	422026	2314	416067	6016	9718, 13420, 17122, 20824, 24526
2160	synovial sarcoma, X breakpoint 2 interacting protein	437941	2315	412781	6017	9719, 13421, 17123, 20825, 24527
2161	synovial sarcoma, X breakpoint 2 interacting protein	544699	2316	444731	6018	9720, 13422, 17124,

						20826, 24528
2162	synovial sarcoma, X breakpoint 2B	276049	2317	276049	6019	9721, 13423, 17125, 20827, 24529
2163	synovial sarcoma, X breakpoint 2B	375515	2318	364665	6020	9722, 13424, 17126, 20828, 24530
2164	synovial sarcoma, X breakpoint 4B	376884	2319	366081	6021	9723, 13425, 17127, 20829, 24531
2165	synovial sarcoma, X breakpoint 4B	396928	2320	380134	6022	9724, 13426, 17128, 20830, 24532
2166	synovial sarcoma, X breakpoint 5	311798	2321	312415	6023	9725, 13427, 17129, 20831, 24533
2167	synovial sarcoma, X breakpoint 5	347757	2322	290558	6024	9726, 13428, 17130, 20832, 24534
2168	synovial sarcoma, X breakpoint 5	376923	2323	366122	6025	9727, 13429, 17131, 20833, 24535
2169	synovial sarcoma, X breakpoint 5	403001	2324	385051	6026	9728, 13430, 17132, 20834, 24536
2170	synovial sarcoma, X breakpoint 6 (pseudogene)	319275	2325	325176	6027	9729, 13431, 17133, 20835, 24537
2171	synovial sarcoma, X breakpoint 6 (pseudogene)	376932	2326	366131	6028	9730, 13432, 17134,

						20836, 24538
2172	synovial sarcoma, X breakpoint 7	298181	2327	298181	6029	9731, 13433, 17135, 20837, 24539
2173	synovial sarcoma, X breakpoint 9	376909	2328	366107	6030	9732, 13434, 17136, 20838, 24540
2174	synovial sarcoma, X breakpoint 9	407081	2329	385293	6031	9733, 13435, 17137, 20839, 24541
2175	TAF1 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 210kDa-like	242310	2330	418379	6032	9734, 13436, 17138, 20840, 24542
2176	TAF13 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 18kDa	338366	2331	355051	6033	9735, 13437, 17139, 20841, 24543
2177	TAF13 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 18kDa	461096	2332	433883	6034	9736, 13438, 17140, 20842, 24544
2178	TAF2 RNA polymerase II, TATA box binding protein (TBP)-associated factor, 150kDa	378164	2333	367406	6035	9737, 13439, 17141, 20843, 24545
2179	TAF5-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	258281	2334	258281	6036	9738, 13440, 17142, 20844, 24546
2180	TAF5-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	366674	2335	355634	6037	9739, 13441, 17143, 20845, 24547

2181	TAF5-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	366675	2336	355635	6038	9740, 13442, 17144, 20846, 24548
2182	TAF5-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	366676	2337	355636	6039	9741, 13443, 17145, 20847, 24549
2183	TAF6-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	294168	2338	294168	6040	9742, 13444, 17146, 20848, 24550
2184	TAF6-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	526261	2339	435116	6041	9743, 13445, 17147, 20849, 24551
2185	TAF6-like RNA polymerase II, p300/CBP-associated factor (PCAF)-associated factor, 65kDa	529509	2340	434662	6042	9744, 13446, 17148, 20850, 24552
2186	tandem C2 domains, nuclear	340892	2341	343199	6043	9745, 13447, 17149, 20851, 24553
2187	tandem C2 domains, nuclear	360594	2342	353802	6044	9746, 13448, 17150, 20852, 24554
2188	tandem C2 domains, nuclear	435962	2343	387882	6045	9747, 13449, 17151, 20853, 24555
2189	tandem C2 domains, nuclear	556018	2344	451317	6046	9748, 13450, 17152, 20854, 24556
2190	TATA box binding protein (TBP)-associated factor, RNA polymerase I, B, 63kDa	263663	2345	263663	6047	9749, 13451, 17153, 20855, 24557

2191	TATA box binding protein (TBP)-associated factor, RNA polymerase I, B, 63kDa	396242	2346	379542	6048	9750, 13452, 17154, 20856, 24558
2192	TatD DNase domain containing 1	276692	2347	276692	6049	9751, 13453, 17155, 20857, 24559
2193	TatD DNase domain containing 1	519548	2348	428336	6050	9752, 13454, 17156, 20858, 24560
2194	TatD DNase domain containing 1	523888	2349	428109	6051	9753, 13455, 17157, 20859, 24561
2195	TatD DNase domain containing 2	287652	2350	287652	6052	9754, 13456, 17158, 20860, 24562
2196	TatD DNase domain containing 2	448281	2351	408736	6053	9755, 13457, 17159, 20861, 24563
2197	TatD DNase domain containing 3	366973	2352	355940	6054	9756, 13458, 17160, 20862, 24564
2198	TatD DNase domain containing 3	366974	2353	355941	6055	9757, 13459, 17161, 20863, 24565
2199	TatD DNase domain containing 3	526641	2354	434801	6056	9758, 13460, 17162, 20864, 24566
2200	TatD DNase domain containing 3	531963	2355	433755	6057	9759, 13461, 17163, 20865, 24567

2201	TatD DNase domain containing 3	532324	2356	431376	6058	9760, 13462, 17164, 20866, 24568
2202	T-box 18	369663	2357	358677	6059	9761, 13463, 17165, 20867, 24569
2203	T-box 18	416980	2358	415771	6060	9762, 13464, 17166, 20868, 24570
2204	T-box, brain, 1	389554	2359	374205	6061	9763, 13465, 17167, 20869, 24571
2205	T-box, brain, 1	410035	2360	387023	6062	9764, 13466, 17168, 20870, 24572
2206	T-box, brain, 1	539334	2361	445681	6063	9765, 13467, 17169, 20871, 24573
2207	terminal uridylyl transferase 1, U6 snRNA-specific	308436	2362	308000	6064	9766, 13468, 17170, 20872, 24574
2208	terminal uridylyl transferase 1, U6 snRNA-specific	476907	2363	419607	6065	9767, 13469, 17171, 20873, 24575
2209	testis expressed 19	333437	2364	331500	6066	9768, 13470, 17172, 20874, 24576
2210	tetra-peptide repeat homeobox 1	322175	2365	323455	6067	9769, 13471, 17173, 20875, 24577

2211	tetra-peptide repeat homeobox 1	535759	2366	438832	6068	9770, 13472, 17174, 20876, 24578
2212	tetra-peptide repeat homeobox 1	543508	2367	438712	6069	9771, 13473, 17175, 20877, 24579
2213	TGFB-induced factor homeobox 1	330513	2368	327959	6070	9772, 13474, 17176, 20878, 24580
2214	TGFB-induced factor homeobox 1	343820	2369	339631	6071	9773, 13475, 17177, 20879, 24581
2215	TGFB-induced factor homeobox 1	345133	2370	343969	6072	9774, 13476, 17178, 20880, 24582
2216	TGFB-induced factor homeobox 1	400167	2371	383031	6073	9775, 13477, 17179, 20881, 24583
2217	TGFB-induced factor homeobox 1	401449	2372	385206	6074	9776, 13478, 17180, 20882, 24584
2218	TGFB-induced factor homeobox 1	405385	2373	384970	6075	9777, 13479, 17181, 20883, 24585
2219	TGFB-induced factor homeobox 1	407501	2374	384133	6076	9778, 13480, 17182, 20884, 24586
2220	TGFB-induced factor homeobox 1	472042	2375	449501	6077	9779, 13481, 17183, 20885, 24587

2221	TGFB-induced factor homeobox 1	548489	2376	447747	6078	9780, 13482, 17184, 20886, 24588
2222	TGFB-induced factor homeobox 1	549253	2377	449973	6079	9781, 13483, 17185, 20887, 24589
2223	TGFB-induced factor homeobox 1	549468	2378	449722	6080	9782, 13484, 17186, 20888, 24590
2224	TGFB-induced factor homeobox 1	549546	2379	449580	6081	9783, 13485, 17187, 20889, 24591
2225	TGFB-induced factor homeobox 1	549780	2380	448121	6082	9784, 13486, 17188, 20890, 24592
2226	TGFB-induced factor homeobox 1	550958	2381	449531	6083	9785, 13487, 17189, 20891, 24593
2227	TGFB-induced factor homeobox 1	551333	2382	446838	6084	9786, 13488, 17190, 20892, 24594
2228	TGFB-induced factor homeobox 1	551541	2383	450025	6085	9787, 13489, 17191, 20893, 24595
2229	TGFB-induced factor homeobox 1	552383	2384	449287	6086	9788, 13490, 17192, 20894, 24596
2230	THAP domain containing 7	215742	2385	215742	6087	9789, 13491, 17193, 20895, 24597

2231	THAP domain containing 7	399133	2386	382084	6088	9790, 13492, 17194, 20896, 24598
2232	Theg homolog (mouse)	342640	2387	340088	6089	9791, 13493, 17195, 20897, 24599
2233	Theg homolog (mouse)	346878	2388	264820	6090	9792, 13494, 17196, 20898, 24600
2234	thioredoxin-like 4B	268483	2389	268483	6091	9793, 13495, 17197, 20899, 24601
2235	thioredoxin-like 4B	423037	2390	408130	6092	9794, 13496, 17198, 20900, 24602
2236	thioredoxin-like 4B	426362	2391	392310	6093	9795, 13497, 17199, 20901, 24603
2237	THO complex 6 homolog (Drosophila)	253952	2392	253952	6094	9796, 13498, 17200, 20902, 24604
2238	THO complex 6 homolog (Drosophila)	326266	2393	326531	6095	9797, 13499, 17201, 20903, 24605
2239	thyroid hormone receptor associated protein 3	354618	2394	346634	6096	9798, 13500, 17202, 20904, 24606
2240	thyroid hormone receptor associated protein 3	469141	2395	433825	6097	9799, 13501, 17203, 20905, 24607

2241	thyroid hormone receptor associated protein 3	478853	2396	433066	6098	9800, 13502, 17204, 20906, 24608
2242	tigger transposable element derived 3	309880	2397	308354	6099	9801, 13503, 17205, 20907, 24609
2243	tigger transposable element derived 4	304337	2398	355162	6100	9802, 13504, 17206, 20908, 24610
2244	tigger transposable element derived 5	321385	2399	315906	6101	9803, 13505, 17207, 20909, 24611
2245	tigger transposable element derived 5	504548	2400	421489	6102	9804, 13506, 17208, 20910, 24612
2246	tigger transposable element derived 6	296736	2401	296736	6103	9805, 13507, 17209, 20911, 24613
2247	tigger transposable element derived 6	515406	2402	425318	6104	9806, 13508, 17210, 20912, 24614
2248	TMF1-regulated nuclear protein 1	522111	2403	429216	6105	9807, 13509, 17211, 20913, 24615
2249	TMF1-regulated nuclear protein 1	531285	2404	436467	6106	9808, 13510, 17212, 20914, 24616
2250	tousled-like kinase 1	356075	2405	348376	6107	9809, 13511, 17213, 20915, 24617

2251	toused-like kinase 1	409443	2406	387313	6108	9810, 13512, 17214, 20916, 24618
2252	toused-like kinase 1	431350	2407	411099	6109	9811, 13513, 17215, 20917, 24619
2253	toused-like kinase 1	434911	2408	409222	6110	9812, 13514, 17216, 20918, 24620
2254	toused-like kinase 1	442919	2409	402165	6111	9813, 13515, 17217, 20919, 24621
2255	toused-like kinase 1	521943	2410	428113	6112	9814, 13516, 17218, 20920, 24622
2256	toused-like kinase 2	326270	2411	316512	6113	9815, 13517, 17219, 20921, 24623
2257	toused-like kinase 2	343388	2412	340800	6114	9816, 13518, 17220, 20922, 24624
2258	toused-like kinase 2	346027	2413	275780	6115	9817, 13519, 17221, 20923, 24625
2259	toused-like kinase 2	542523	2414	442311	6116	9818, 13520, 17222, 20924, 24626
2260	TOX high mobility group box family member 2	341197	2415	344724	6117	9819, 13521, 17223, 20925, 24627

2261	TOX high mobility group box family member 2	358131	2416	350849	6118	9820, 13522, 17224, 20926, 24628
2262	TOX high mobility group box family member 2	372992	2417	362083	6119	9821, 13523, 17225, 20927, 24629
2263	TOX high mobility group box family member 2	372999	2418	362090	6120	9822, 13524, 17226, 20928, 24630
2264	TOX high mobility group box family member 2	413823	2419	390876	6121	9823, 13525, 17227, 20929, 24631
2265	TOX high mobility group box family member 2	423191	2420	390278	6122	9824, 13526, 17228, 20930, 24632
2266	TOX high mobility group box family member 2	435864	2421	396777	6123	9825, 13527, 17229, 20931, 24633
2267	TOX high mobility group box family member 2	442881	2422	396584	6124	9826, 13528, 17230, 20932, 24634
2268	TP53 regulating kinase	372102	2423	361174	6125	9827, 13529, 17231, 20933, 24635
2269	TP53 regulating kinase	372114	2424	361186	6126	9828, 13530, 17232, 20934, 24636
2270	transcription elongation factor A (SII) N-terminal and central domain containing	314720	2425	313886	6127	9829, 13531, 17233, 20935, 24637

2271	transcription elongation factor A (SII) N-terminal and central domain containing	380600	2426	369974	6128	9830, 13532, 17234, 20936, 24638
2272	transcription elongation factor A (SII) N-terminal and central domain containing	544987	2427	440038	6129	9831, 13533, 17235, 20937, 24639
2273	transcription elongation factor A (SII) N-terminal and central domain containing	545566	2428	438952	6130	9832, 13534, 17236, 20938, 24640
2274	transcription elongation factor A (SII) N-terminal and central domain containing 2	234827	2429	234827	6131	9833, 13535, 17237, 20939, 24641, 26081, 26096
2275	transcription elongation factor A (SII) N-terminal and central domain containing 2	371331	2430	360382	6132	9834, 13536, 17238, 20940, 24642
2276	transcription elongation factor A (SII), 2	339217	2431	339432	6133	9835, 13537, 17239, 20941, 24643
2277	transcription elongation factor A (SII), 2	343484	2432	343515	6134	9836, 13538, 17240, 20942, 24644
2278	transcription elongation factor A (SII), 2	361317	2433	354552	6135	9837, 13539, 17241, 20943, 24645
2279	transcription elongation factor A (SII), 2	395053	2434	378493	6136	9838, 13540, 17242, 20944, 24646
2280	transcription elongation factor A (SII), 2	415602	2435	391807	6137	9839, 13541, 17243,

						20945, 24647
2281	transcription elongation factor A (SII), 2	440819	2436	407085	6138	9840, 13542, 17244, 20946, 24648
2282	transcription elongation factor A (SII), 2	458442	2437	416026	6139	9841, 13543, 17245, 20947, 24649
2283	transcription elongation factor A (SII), 3	374601	2438	363729	6140	9842, 13544, 17246, 20948, 24650
2284	transcription elongation factor A (SII), 3	450454	2439	406293	6141	9843, 13545, 17247, 20949, 24651
2285	transcription elongation factor A (SII)-like 2	329035	2440	332359	6142	9844, 13546, 17248, 20950, 24652
2286	transcription elongation factor A (SII)-like 2	372780	2441	361866	6143	9845, 13547, 17249, 20951, 24653
2287	transcription elongation factor A (SII)-like 3	243286	2442	243286	6144	9846, 13548, 17250, 20952, 24654
2288	transcription elongation factor A (SII)-like 3	372627	2443	361710	6145	9847, 13549, 17251, 20953, 24655
2289	transcription elongation factor A (SII)-like 3	372628	2444	361711	6146	9848, 13550, 17252, 20954, 24656
2290	transcription elongation factor A (SII)-like 4	372629	2445	361712	6147	9849, 13551, 17253,

						20955, 24657
2291	transcription elongation factor A (SII)-like 4	414064	2446	399669	6148	9850, 13552, 17254, 20956, 24658
2292	transcription elongation factor A (SII)-like 4	415568	2447	415564	6149	9851, 13553, 17255, 20957, 24659
2293	transcription elongation factor A (SII)-like 4	425011	2448	394029	6150	9852, 13554, 17256, 20958, 24660
2294	transcription elongation factor A (SII)-like 4	434216	2449	411320	6151	9853, 13555, 17257, 20959, 24661
2295	transcription elongation factor A (SII)-like 4	459722	2450	423723	6152	9854, 13556, 17258, 20960, 24662
2296	transcription elongation factor A (SII)-like 4	468024	2451	421857	6153	9855, 13557, 17259, 20961, 24663
2297	transcription elongation factor A (SII)-like 4	469586	2452	427053	6154	9856, 13558, 17260, 20962, 24664
2298	transcription elongation factor A (SII)-like 4	472484	2453	421156	6155	9857, 13559, 17261, 20963, 24665
2299	transcription elongation factor A (SII)-like 4	472745	2454	424314	6156	9858, 13560, 17262, 20964, 24666
2300	transcription elongation factor A (SII)-like 4	490644	2455	425883	6157	9859, 13561, 17263,

						20965, 24667
2301	transcription elongation factor A (SII)-like 4	494801	2456	427494	6158	9860, 13562, 17264, 20966, 24668
2302	transcription elongation factor A (SII)-like 5	372680	2457	361765	6159	9861, 13563, 17265, 20967, 24669
2303	transcription elongation factor A (SII)-like 6	372773	2458	361859	6160	9862, 13564, 17266, 20968, 24670
2304	transcription elongation factor A (SII)-like 6	372774	2459	361860	6161	9863, 13565, 17267, 20969, 24671
2305	transcription elongation factor A (SII)-like 6	536102	2460	437364	6162	9864, 13566, 17268, 20970, 24672
2306	transcription elongation factor A (SII)-like 8	360000	2461	353093	6163	9865, 13567, 17269, 20971, 24673
2307	transcription elongation factor A (SII)-like 8	372685	2462	361770	6164	9866, 13568, 17270, 20972, 24674
2308	transcription elongation factor A (SII)-like 8	451678	2463	390880	6165	9867, 13569, 17271, 20973, 24675
2309	transcription factor 7 (T-cell specific, HMG-box)	321584	2464	326540	6166	9868, 13570, 17272, 20974, 24676
2310	transcription factor 7 (T-cell specific, HMG-box)	321603	2465	326654	6167	9869, 13571, 17273,

						20975, 24677
2311	transcription factor 7 (T-cell specific, HMG-box)	342854	2466	340347	6168	9870, 13572, 17274, 20976, 24678
2312	transcription factor 7 (T-cell specific, HMG-box)	361590	2467	354863	6169	9871, 13573, 17275, 20977, 24679
2313	transcription factor 7 (T-cell specific, HMG-box)	378560	2468	367822	6170	9872, 13574, 17276, 20978, 24680
2314	transcription factor 7 (T-cell specific, HMG-box)	378564	2469	367827	6171	9873, 13575, 17277, 20979, 24681
2315	transcription factor 7 (T-cell specific, HMG-box)	395023	2470	378469	6172	9874, 13576, 17278, 20980, 24682
2316	transcription factor 7 (T-cell specific, HMG-box)	395029	2471	378472	6173	9875, 13577, 17279, 20981, 24683
2317	transcription factor 7 (T-cell specific, HMG-box)	432532	2472	397946	6174	9876, 13578, 17280, 20982, 24684
2318	transcription factor 7 (T-cell specific, HMG-box)	518887	2473	430617	6175	9877, 13579, 17281, 20983, 24685
2319	transcription factor 7 (T-cell specific, HMG-box)	518915	2474	430179	6176	9878, 13580, 17282, 20984, 24686
2320	transcription factor 7 (T-cell specific, HMG-box)	521639	2475	427782	6177	9879, 13581, 17283,

						20985, 24687
2321	transcription factor 7-like 1 (T-cell specific, HMG-box)	282111	2476	282111	6178	9880, 13582, 17284, 20986, 24688
2322	transcription factor AP-4 (activating enhancer binding protein 4)	204517	2477	204517	6179	9881, 13583, 17285, 20987, 24689
2323	transcription factor EB	230323	2478	230323	6180	9882, 13584, 17286, 20988, 24690
2324	transcription factor EB	343317	2479	343948	6181	9883, 13585, 17287, 20989, 24691
2325	transcription factor EB	358871	2480	351742	6182	9884, 13586, 17288, 20990, 24692
2326	transcription factor EB	373033	2481	362124	6183	9885, 13587, 17289, 20991, 24693
2327	transcription factor EB	394283	2482	377824	6184	9886, 13588, 17290, 20992, 24694
2328	transcription factor EB	403298	2483	384203	6185	9887, 13589, 17291, 20993, 24695
2329	transcription factor EB	416140	2484	406491	6186	9888, 13590, 17292, 20994, 24696
2330	transcription factor EB	419396	2485	410391	6187	9889, 13591, 17293,

						20995, 24697
2331	transcription factor EB	419574	2486	400276	6188	9890, 13592, 17294, 20996, 24698
2332	transcription factor EB	419788	2487	389468	6189	9891, 13593, 17295, 20997, 24699
2333	transcription factor EB	420312	2488	412551	6190	9892, 13594, 17296, 20998, 24700
2334	transcription factor EB	424495	2489	396168	6191	9893, 13595, 17297, 20999, 24701
2335	transcription factor EB	425401	2490	415035	6192	9894, 13596, 17298, 21000, 24702
2336	transcription factor EB	433032	2491	415946	6193	9895, 13597, 17299, 21001, 24703
2337	transcription factor EB	445214	2492	393874	6194	9896, 13598, 17300, 21002, 24704
2338	transcription factor EB	445700	2493	395208	6195	9897, 13599, 17301, 21003, 24705
2339	transcription factor EC	265440	2494	265440	6196	9898, 13600, 17302, 21004, 24706
2340	transcription factor EC	320239	2495	318676	6197	9899, 13601, 17303,

						21005, 24707
2341	transcription factor EC	393485	2496	377125	6198	9900, 13602, 17304, 21006, 24708
2342	transcription factor EC	457268	2497	387650	6199	9901, 13603, 17305, 21007, 24709
2343	transcription factor EC	484212	2498	417432	6200	9902, 13604, 17306, 21008, 24710
2344	transcription factor-like 5 (basic helix-loop-helix)	217162	2499	217162	6201	9903, 13605, 17307, 21009, 24711
2345	transcription factor-like 5 (basic helix-loop-helix)	335351	2500	334294	6202	9904, 13606, 17308, 21010, 24712
2346	transcriptional adaptor 1	367874	2501	356848	6203	9905, 13607, 17309, 21011, 24713
2347	transcriptional adaptor 2A	225396	2502	225396	6204	9906, 13608, 17310, 21012, 24714
2348	transcriptional adaptor 2A	394395	2503	377918	6205	9907, 13609, 17311, 21013, 24715
2349	transcriptional adaptor 2A	417170	2504	406699	6206	9908, 13610, 17312, 21014, 24716
2350	transcriptional adaptor 2A	428846	2505	438929	6207	9909, 13611, 17313,

						21015, 24717
2351	transcriptional adaptor 2A	490992	2506	432503	6208	9910, 13612, 17314, 21016, 24718
2352	transcriptional regulating factor 1	372917	2507	362008	6209	9911, 13613, 17315, 21017, 24719
2353	transcriptional regulating factor 1	372922	2508	362013	6210	9912, 13614, 17316, 21018, 24720
2354	transcriptional regulating factor 1	541110	2509	439689	6211	9913, 13615, 17317, 21019, 24721
2355	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	265284	2510	265284	6212	9914, 13616, 17318, 21020, 24722
2356	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	376520	2511	365703	6213	9915, 13617, 17319, 21021, 24723
2357	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	376534	2512	365717	6214	9916, 13618, 17320, 21022, 24724
2358	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	376537	2513	365720	6215	9917, 13619, 17321, 21023, 24725
2359	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	376544	2514	365727	6216	9918, 13620, 17322, 21024, 24726
2360	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	376552	2515	365735	6217	9919, 13621, 17323,

						21025, 24727
2361	transducin-like enhancer of split 4 (E(sp1) homolog, Drosophila)	399288	2516	382227	6218	9920, 13622, 17324, 21026, 24728
2362	transformer 2 alpha homolog (Drosophila)	297071	2517	297071	6219	9921, 13623, 17325, 21027, 24729
2363	transformer 2 alpha homolog (Drosophila)	392502	2518	376290	6220	9922, 13624, 17326, 21028, 24730
2364	transformer 2 alpha homolog (Drosophila)	538367	2519	441116	6221	9923, 13625, 17327, 21029, 24731
2365	tripartite motif containing 28	253024	2520	253024	6222	9924, 13626, 17328, 21030, 24732
2366	tripartite motif containing 28	341753	2521	342232	6223	9925, 13627, 17329, 21031, 24733
2367	tripartite motif containing 69	329464	2522	332284	6224	9926, 13628, 17330, 21032, 24734
2368	tripartite motif containing 69	338264	2523	342922	6225	9927, 13629, 17331, 21033, 24735
2369	tripartite motif containing 69	558173	2524	452855	6226	9928, 13630, 17332, 21034, 24736
2370	tripartite motif containing 69	558329	2525	453332	6227	9929, 13631, 17333,

						21035, 24737
2371	tripartite motif containing 69	559390	2526	453177	6228	9930, 13632, 17334, 21036, 24738
2372	tripartite motif containing 69	560442	2527	453549	6229	9931, 13633, 17335, 21037, 24739
2373	tRNA methyltransferase 6 homolog (S. cerevisiae)	203001	2528	203001	6230	9932, 13634, 17336, 21038, 24740
2374	tRNA methyltransferase 6 homolog (S. cerevisiae)	453074	2529	392070	6231	9933, 13635, 17337, 21039, 24741
2375	tRNA methyltransferase 61 homolog A (S. cerevisiae)	299201	2530	299201	6232	9934, 13636, 17338, 21040, 24742
2376	tRNA methyltransferase 61 homolog A (S. cerevisiae)	389749	2531	374399	6233	9935, 13637, 17339, 21041, 24743
2377	TSPY-like 4	420283	2532	410943	6234	9936, 13638, 17340, 21042, 24744
2378	TSPY-like 5	322128	2533	322802	6235	9937, 13639, 17341, 21043, 24745
2379	TSPY-like 6	317802	2534	417919	6236	9938, 13640, 17342, 21044, 24746
2380	TSR1, 20S rRNA accumulation, homolog (S. cerevisiae)	301364	2535	301364	6237	9939, 13641, 17343,

						21045, 24747
2381	TSR1, 20S rRNA accumulation, homolog (S. cerevisiae)	545727	2536	440831	6238	9940, 13642, 17344, 21046, 24748
2382	tubulin tyrosine ligase-like family, member 3	547186	2537	446659	6239	9941, 13643, 17345, 21047, 24749
2383	tumor protein p53 inducible nuclear protein 1	342697	2538	344215	6240	9942, 13644, 17346, 21048, 24750
2384	tumor protein p53 inducible nuclear protein 1	378776	2539	368052	6241	9943, 13645, 17347, 21049, 24751
2385	tumor protein p53 inducible nuclear protein 1	448464	2540	390063	6242	9944, 13646, 17348, 21050, 24752
2386	tumor protein p53 inducible nuclear protein 2	374809	2541	363942	6243	9945, 13647, 17349, 21051, 24753
2387	tumor protein p53 inducible nuclear protein 2	374810	2542	363943	6244	9946, 13648, 17350, 21052, 24754
2388	tumor protein p53 inducible nuclear protein 2	414082	2543	404410	6245	9947, 13649, 17351, 21053, 24755
2389	tumor protein p53 inducible nuclear protein 2	451665	2544	395784	6246	9948, 13650, 17352, 21054, 24756
2390	tyrosyl-DNA phosphodiesterase 2	341060	2545	345345	6247	9949, 13651, 17353,

						21055, 24757
2391	tyrosyl-DNA phosphodiesterase 2	378198	2546	367440	6248	9950, 13652, 17354, 21056, 24758
2392	tyrosyl-DNA phosphodiesterase 2	545780	2547	439150	6249	9951, 13653, 17355, 21057, 24759
2393	tyrosyl-DNA phosphodiesterase 2	545995	2548	437637	6250	9952, 13654, 17356, 21058, 24760
2394	U2 small nuclear RNA auxiliary factor 2	308924	2549	307863	6251	9953, 13655, 17357, 21059, 24761
2395	U2 snRNP-associated SURP domain containing	319822	2550	322376	6252	9954, 13656, 17358, 21060, 24762
2396	U2 snRNP-associated SURP domain containing	397933	2551	381027	6253	9955, 13657, 17359, 21061, 24763
2397	U2 snRNP-associated SURP domain containing	473835	2552	418563	6254	9956, 13658, 17360, 21062, 24764
2398	U2 snRNP-associated SURP domain containing	493598	2553	422011	6255	9957, 13659, 17361, 21063, 24765
2399	U2 snRNP-associated SURP domain containing	493782	2554	418465	6256	9958, 13660, 17362, 21064, 24766
2400	ubiquitin associated protein 2-like	271877	2555	271877	6257	9959, 13661, 17363,

						21065, 24767
2401	ubiquitin associated protein 2-like	343815	2556	345308	6258	9960, 13662, 17364, 21066, 24768
2402	ubiquitin associated protein 2-like	361546	2557	355343	6259	9961, 13663, 17365, 21067, 24769
2403	ubiquitin associated protein 2-like	368504	2558	357490	6260	9962, 13664, 17366, 21068, 24770
2404	ubiquitin associated protein 2-like	412596	2559	389052	6261	9963, 13665, 17367, 21069, 24771
2405	ubiquitin associated protein 2-like	428595	2560	398609	6262	9964, 13666, 17368, 21070, 24772
2406	ubiquitin associated protein 2-like	428931	2561	389445	6263	9965, 13667, 17369, 21071, 24773
2407	ubiquitin associated protein 2-like	433006	2562	396313	6264	9966, 13668, 17370, 21072, 24774
2408	ubiquitin associated protein 2-like	433615	2563	407672	6265	9967, 13669, 17371, 21073, 24775
2409	ubiquitin associated protein 2-like	437652	2564	389717	6266	9968, 13670, 17372, 21074, 24776
2410	ubiquitin associated protein 2-like	441890	2565	399920	6267	9969, 13671, 17373,

						21075, 24777
2411	ubiquitin associated protein 2-like	456325	2566	415310	6268	9970, 13672, 17374, 21076, 24778
2412	ubiquitin associated protein 2-like	456955	2567	405277	6269	9971, 13673, 17375, 21077, 24779
2413	ubiquitin carboxyl-terminal hydrolase 17-like	504104	2568	422887	6270	9972, 13674, 17376, 21078, 24780
2414	ubiquitin carboxyl-terminal hydrolase 17-like	504481	2569	425375	6271	9973, 13675, 17377, 21079, 24781
2415	ubiquitin carboxyl-terminal hydrolase 17-like	504543	2570	423777	6272	9974, 13676, 17378, 21080, 24782
2416	ubiquitin carboxyl-terminal hydrolase 17-like	509271	2571	422097	6273	9975, 13677, 17379, 21081, 24783
2417	ubiquitin carboxyl-terminal hydrolase 17-like	509660	2572	427366	6274	9976, 13678, 17380, 21082, 24784
2418	ubiquitin carboxyl-terminal hydrolase 17-like	511681	2573	422969	6275	9977, 13679, 17381, 21083, 24785
2419	ubiquitin carboxyl-terminal hydrolase 17-like	515574	2574	423211	6276	9978, 13680, 17382, 21084, 24786
2420	ubiquitin protein ligase E3 component n-recognin 5	220959	2575	220959	6277	9979, 13681, 17383,

						21085, 24787
2421	ubiquitin protein ligase E3 component n-recognin 5	518205	2576	428693	6278	9980, 13682, 17384, 21086, 24788
2422	ubiquitin protein ligase E3 component n-recognin 5	520539	2577	429084	6279	9981, 13683, 17385, 21087, 24789
2423	ubiquitin protein ligase E3 component n-recognin 5	521922	2578	427819	6280	9982, 13684, 17386, 21088, 24790
2424	ubiquitin specific peptidase 17-like 2	333796	2579	333329	6281	9983, 13685, 17387, 21089, 24791
2425	ubiquitin specific peptidase 37	258399	2580	258399	6282	9984, 13686, 17388, 21090, 24792
2426	ubiquitin specific peptidase 37	418019	2581	396585	6283	9985, 13687, 17389, 21091, 24793
2427	ubiquitin specific peptidase 37	454775	2582	393662	6284	9986, 13688, 17390, 21092, 24794
2428	ubiquitin-conjugating enzyme E2N-like	370494	2583	359525	6285	9987, 13689, 17391, 21093, 24795
2429	ubiquitin-like modifier activating enzyme 3	349511	2584	340041	6286	9988, 13690, 17392, 21094, 24796
2430	ubiquitin-like modifier activating enzyme 3	361055	2585	354340	6287	9989, 13691, 17393,

						21095, 24797
2431	ubiquitin-like modifier activating enzyme 3	540295	2586	440085	6288	9990, 13692, 17394, 21096, 24798
2432	ubiquitin-like with PHD and ring finger domains 2	276893	2587	276893	6289	9991, 13693, 17395, 21097, 24799
2433	ubiquitin-like with PHD and ring finger domains 2	381373	2588	370778	6290	9992, 13694, 17396, 21098, 24800
2434	ubiquitin-like with PHD and ring finger domains 2	450508	2589	399217	6291	9993, 13695, 17397, 21099, 24801
2435	U-box domain containing 5	217173	2590	217173	6292	9994, 13696, 17398, 21100, 24802
2436	U-box domain containing 5	348031	2591	311726	6293	9995, 13697, 17399, 21101, 24803
2437	U-box domain containing 5	449731	2592	404364	6294	9996, 13698, 17400, 21102, 24804
2438	UDP glucuronosyltransferase 1 family, polypeptide A4	373409	2593	362508	6295	9997, 13699, 17401, 21103, 24805
2439	UNC homeobox	316333	2594	314480	6296	9998, 13700, 17402, 21104, 24806
2440	upstream transcription factor 2, c-fos interacting	222305	2595	222305	6297	9999, 13701, 17403,

						21105, 24807
2441	upstream transcription factor 2, c-fos interacting	343550	2596	340633	6298	10000, 13702, 17404, 21106, 24808
2442	upstream transcription factor 2, c-fos interacting	379134	2597	368429	6299	10001, 13703, 17405, 21107, 24809
2443	URB1 ribosome biogenesis 1 homolog (S. cerevisiae)	382751	2598	372199	6300	10002, 13704, 17406, 21108, 24810
2444	URB2 ribosome biogenesis 2 homolog (S. cerevisiae)	258243	2599	258243	6301	10003, 13705, 17407, 21109, 24811
2445	URB2 ribosome biogenesis 2 homolog (S. cerevisiae)	434387	2600	395107	6302	10004, 13706, 17408, 21110, 24812
2446	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)	371042	2601	360081	6303	10005, 13707, 17409, 21111, 24813
2447	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)	371051	2602	360090	6304	10006, 13708, 17410, 21112, 24814
2448	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)	394422	2603	377944	6305	10007, 13709, 17411, 21113, 24815
2449	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)	425117	2604	388669	6306	10008, 13710, 17412, 21114, 24816

2450	UTP14, U3 small nucleolar ribonucleoprotein, homolog A (yeast)	427972	2605	413187	6307	10009, 13711, 17413, 21115, 24817
2451	UTP14, U3 small nucleolar ribonucleoprotein, homolog C (yeast)	521776	2606	428619	6308	10010, 13712, 17414, 21116, 24818
2452	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	296792	2607	296792	6309	10011, 13713, 17415, 21117, 24819
2453	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	508491	2608	424609	6310	10012, 13714, 17416, 21118, 24820
2454	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	508686	2609	424334	6311	10013, 13715, 17417, 21119, 24821
2455	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	509005	2610	421669	6312	10014, 13716, 17418, 21120, 24822
2456	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	513824	2611	424902	6313	10015, 13717, 17419, 21121, 24823
2457	UTP15, U3 small nucleolar ribonucleoprotein, homolog (S. cerevisiae)	543251	2612	440796	6314	10016, 13718, 17420, 21122, 24824
2458	UTP23, small subunit (SSU) processome component, homolog (yeast)	309822	2613	308332	6315	10017, 13719, 17421, 21123, 24825
2459	UTP23, small subunit (SSU) processome component, homolog (yeast)	357148	2614	349670	6316	10018, 13720, 17422, 21124, 24826

2460	UTP6, small subunit (SSU) processome component, homolog (yeast)	261708	2615	261708	6317	10019, 13721, 17423, 21125, 24827
2461	vaccinia related kinase 3	316763	2616	324636	6318	10020, 13722, 17424, 21126, 24828
2462	vaccinia related kinase 3	377011	2617	366210	6319	10021, 13723, 17425, 21127, 24829
2463	vaccinia related kinase 3	424804	2618	402958	6320	10022, 13724, 17426, 21128, 24830
2464	vaccinia related kinase 3	443401	2619	414907	6321	10023, 13725, 17427, 21129, 24831
2465	variable charge, X-linked 3B	381029	2620	370417	6322	10024, 13726, 17428, 21130, 24832
2466	variable charge, X-linked 3B	440654	2621	410372	6323	10025, 13727, 17429, 21131, 24833
2467	variable charge, X-linked 3B	444481	2622	414780	6324	10026, 13728, 17430, 21132, 24834
2468	variable charge, X-linked 3B	453306	2623	411785	6325	10027, 13729, 17431, 21133, 24835
2469	VENT homeobox	325980	2624	357556	6326	10028, 13730, 17432, 21134, 24836

2470	ventral anterior homeobox 1	277905	2625	277905	6327	10029, 13731, 17433, 21135, 24837
2471	ventral anterior homeobox 1	369206	2626	358207	6328	10030, 13732, 17434, 21136, 24838
2472	V-set and transmembrane domain containing 1	338372	2627	343366	6329	10031, 13733, 17435, 21137, 24839
2473	V-set and transmembrane domain containing 1	366170	2628	444153	6330	10032, 13734, 17436, 21138, 24840
2474	V-set and transmembrane domain containing 1	376626	2629	365813	6331	10033, 13735, 17437, 21139, 24841
2475	V-set and transmembrane domain containing 1	425006	2630	413006	6332	10034, 13736, 17438, 21140, 24842
2476	WD repeat domain 12	261015	2631	261015	6333	10035, 13737, 17439, 21141, 24843
2477	WD repeat domain 43	407426	2632	384302	6334	10036, 13738, 17440, 21142, 24844
2478	WD repeat domain 5	358625	2633	351446	6335	10037, 13739, 17441, 21143, 24845
2479	WD repeat domain 5	425041	2634	401889	6336	10038, 13740, 17442, 21144, 24846

2480	WD repeat domain 74	278856	2635	278856	6337	10039, 13741, 17443, 21145, 24847
2481	WD repeat domain 74	311713	2636	308931	6338	10040, 13742, 17444, 21146, 24848
2482	WD repeat domain 74	525239	2637	432119	6339	10041, 13743, 17445, 21147, 24849
2483	WD repeat domain 74	529106	2638	435726	6340	10042, 13744, 17446, 21148, 24850
2484	WD repeat domain 74	536401	2639	439541	6341	10043, 13745, 17447, 21149, 24851
2485	WD repeat domain 74	538098	2640	440612	6342	10044, 13746, 17448, 21150, 24852
2486	WD repeat domain 75	314761	2641	314193	6343	10045, 13747, 17449, 21151, 24853
2487	WD repeat, sterile alpha motif and U-box domain containing 1	358147	2642	350866	6344	10046, 13748, 17450, 21152, 24854
2488	WD repeat, sterile alpha motif and U-box domain containing 1	359774	2643	352820	6345	10047, 13749, 17451, 21153, 24855
2489	WD repeat, sterile alpha motif and U-box domain containing 1	392796	2644	376545	6346	10048, 13750, 17452, 21154, 24856

2490	WD repeat, sterile alpha motif and U-box domain containing 1	409990	2645	387078	6347	10049, 13751, 17453, 21155, 24857
2491	widely interspaced zinc finger motifs	263381	2646	263381	6348	10050, 13752, 17454, 21156, 24858
2492	widely interspaced zinc finger motifs	389282	2647	373933	6349	10051, 13753, 17455, 21157, 24859
2493	widely interspaced zinc finger motifs	416927	2648	401180	6350	10052, 13754, 17456, 21158, 24860
2494	widely interspaced zinc finger motifs	545156	2649	445824	6351	10053, 13755, 17457, 21159, 24861
2495	Williams Beuren syndrome chromosome region 22	265758	2650	265758	6352	10054, 13756, 17458, 21160, 24862
2496	Williams Beuren syndrome chromosome region 22	423166	2651	397056	6353	10055, 13757, 17459, 21161, 24863
2497	Williams Beuren syndrome chromosome region 22	423497	2652	401191	6354	10056, 13758, 17460, 21162, 24864
2498	WW domain binding protein 4 (formin binding protein 21)	379487	2653	368801	6355	10057, 13759, 17461, 21163, 24865
2499	WW domain binding protein 4 (formin binding protein 21)	542082	2654	439301	6356	10058, 13760, 17462, 21164, 24866

2500	WW domain containing adaptor with coiled-coil	338396	2655	341462	6357	10059, 13761, 17463, 21165, 24867
2501	WW domain containing adaptor with coiled-coil	347934	2656	311106	6358	10060, 13762, 17464, 21166, 24868
2502	WW domain containing adaptor with coiled-coil	354911	2657	346986	6359	10061, 13763, 17465, 21167, 24869
2503	WW domain containing adaptor with coiled-coil	375664	2658	364816	6360	10062, 13764, 17466, 21168, 24870
2504	WW domain containing adaptor with coiled-coil	414108	2659	415645	6361	10063, 13765, 17467, 21169, 24871
2505	WW domain containing adaptor with coiled-coil	420266	2660	404758	6362	10064, 13766, 17468, 21170, 24872
2506	WW domain containing adaptor with coiled-coil	424454	2661	404125	6363	10065, 13767, 17469, 21171, 24873
2507	WW domain containing adaptor with coiled-coil	428935	2662	399706	6364	10066, 13768, 17470, 21172, 24874
2508	WW domain containing adaptor with coiled-coil	442148	2663	400848	6365	10067, 13769, 17471, 21173, 24875
2509	WW domain containing adaptor with coiled-coil	448193	2664	395008	6366	10068, 13770, 17472, 21174, 24876

2510	WW domain containing adaptor with coiled-coil	526722	2665	434903	6367	10069, 13771, 17473, 21175, 24877
2511	WW domain containing adaptor with coiled-coil	538000	2666	444273	6368	10070, 13772, 17474, 21176, 24878
2512	YLP motif containing 1	238571	2667	238571	6369	10071, 13773, 17475, 21177, 24879
2513	YLP motif containing 1	325680	2668	324463	6370	10072, 13774, 17476, 21178, 24880
2514	YLP motif containing 1	423680	2669	409619	6371	10073, 13775, 17477, 21179, 24881
2515	YTH domain containing 1	344157	2670	339245	6372	10074, 13776, 17478, 21180, 24882
2516	YTH domain containing 1	355665	2671	347888	6373	10075, 13777, 17479, 21181, 24883
2517	YTH domain-containing protein 1 isoform 1	550485	2672	447653	6374	10076, 13778, 17480, 21182, 24884
2518	YTH domain-containing protein 1 isoform 1	552105	2673	448618	6375	10077, 13779, 17481, 21183, 24885
2519	Zic family member 5	267294	2674	267294	6376	10078, 13780, 17482, 21184, 24886

2520	Zic family member 5	397451	2675	380593	6377	10079, 13781, 17483, 21185, 24887
2521	zinc finger and AT hook domain containing	520214	2676	428483	6378	10080, 13782, 17484, 21186, 24888
2522	zinc finger and BTB domain containing 1	358738	2677	351587	6379	10081, 13783, 17485, 21187, 24889
2523	zinc finger and BTB domain containing 1	394712	2678	378201	6380	10082, 13784, 17486, 21188, 24890
2524	zinc finger and BTB domain containing 1	553583	2679	451584	6381	10083, 13785, 17487, 21189, 24891
2525	zinc finger and BTB domain containing 1	554015	2680	451000	6382	10084, 13786, 17488, 21190, 24892
2526	zinc finger and BTB domain containing 1	555321	2681	451332	6383	10085, 13787, 17489, 21191, 24893
2527	zinc finger and BTB domain containing 1	556965	2682	450689	6384	10086, 13788, 17490, 21192, 24894
2528	zinc finger and BTB domain containing 10	379091	2683	368384	6385	10087, 13789, 17491, 21193, 24895
2529	zinc finger and BTB domain containing 10	426744	2684	416134	6386	10088, 13790, 17492, 21194, 24896

2530	zinc finger and BTB domain containing 10	430430	2685	387462	6387	10089, 13791, 17493, 21195, 24897
2531	zinc finger and BTB domain containing 10	455036	2686	412036	6388	10090, 13792, 17494, 21196, 24898
2532	zinc finger and BTB domain containing 11	312938	2687	326200	6389	10091, 13793, 17495, 21197, 24899
2533	zinc finger and BTB domain containing 12	375525	2688	364675	6390	10092, 13794, 17496, 21198, 24900
2534	zinc finger and BTB domain containing 12	375527	2689	364677	6391	10093, 13795, 17497, 21199, 24901
2535	zinc finger and BTB domain containing 12	432044	2690	392328	6392	10094, 13796, 17498, 21200, 24902
2536	zinc finger and BTB domain containing 12	441555	2691	414777	6393	10095, 13797, 17499, 21201, 24903
2537	zinc finger and BTB domain containing 12	458242	2692	391563	6394	10096, 13798, 17500, 21202, 24904
2538	zinc finger and BTB domain containing 2	325144	2693	323183	6395	10097, 13799, 17501, 21203, 24905
2539	zinc finger and BTB domain containing 22	418724	2694	404403	6396	10098, 13800, 17502, 21204, 24906

2540	zinc finger and BTB domain containing 22	431845	2695	407545	6397	10099, 13801, 17503, 21205, 24907
2541	zinc finger and BTB domain containing 22	436352	2696	402785	6398	10100, 13802, 17504, 21206, 24908
2542	zinc finger and BTB domain containing 22	441117	2697	413172	6399	10101, 13803, 17505, 21207, 24909
2543	zinc finger and BTB domain containing 22	445320	2698	396292	6400	10102, 13804, 17506, 21208, 24910
2544	zinc finger and BTB domain containing 22	548484	2699	447607	6401	10103, 13805, 17507, 21209, 24911
2545	zinc finger and BTB domain containing 26	373654	2700	362758	6402	10104, 13806, 17508, 21210, 24912
2546	zinc finger and BTB domain containing 26	373656	2701	362760	6403	10105, 13807, 17509, 21211, 24913
2547	zinc finger and BTB domain containing 3	394807	2702	378286	6404	10106, 13808, 17510, 21212, 24914
2548	zinc finger and BTB domain containing 37	367701	2703	356674	6405	10107, 13809, 17511, 21213, 24915
2549	zinc finger and BTB domain containing 37	367703	2704	356676	6406	10108, 13810, 17512, 21214, 24916

2550	zinc finger and BTB domain containing 37	367704	2705	356677	6407	10109, 13811, 17513, 21215, 24917
2551	zinc finger and BTB domain containing 37	427304	2706	415293	6408	10110, 13812, 17514, 21216, 24918
2552	zinc finger and BTB domain containing 37	432989	2707	409408	6409	10111, 13813, 17515, 21217, 24919
2553	zinc finger and BTB domain containing 37	490000	2708	435062	6410	10112, 13814, 17516, 21218, 24920
2554	zinc finger and BTB domain containing 39	300101	2709	300101	6411	10113, 13815, 17517, 21219, 24921
2555	zinc finger and BTB domain containing 41	367405	2710	356375	6412	10114, 13816, 17518, 21220, 24922
2556	zinc finger and BTB domain containing 43	373457	2711	362556	6413	10115, 13817, 17519, 21221, 24923
2557	zinc finger and BTB domain containing 43	373464	2712	362563	6414	10116, 13818, 17520, 21222, 24924
2558	zinc finger and BTB domain containing 43	449886	2713	390344	6415	10117, 13819, 17521, 21223, 24925
2559	zinc finger and BTB domain containing 43	450858	2714	412145	6416	10118, 13820, 17522, 21224, 24926

2560	zinc finger and BTB domain containing 45	354590	2715	346603	6417	10119, 13821, 17523, 21225, 24927
2561	zinc finger and BTB domain containing 46	245663	2716	245663	6418	10120, 13822, 17524, 21226, 24928
2562	zinc finger and BTB domain containing 46	302995	2717	303102	6419	10121, 13823, 17525, 21227, 24929
2563	zinc finger and BTB domain containing 46	395104	2718	378536	6420	10122, 13824, 17526, 21228, 24930
2564	zinc finger and BTB domain containing 47	232974	2719	232974	6421	10123, 13825, 17527, 21229, 24931
2565	zinc finger and BTB domain containing 47	457842	2720	411491	6422	10124, 13826, 17528, 21230, 24932
2566	zinc finger and BTB domain containing 47	542870	2721	437543	6423	10125, 13827, 17529, 21231, 24933
2567	zinc finger and BTB domain containing 49	337872	2722	338807	6424	10126, 13828, 17530, 21232, 24934
2568	zinc finger and BTB domain containing 49	355834	2723	348091	6425	10127, 13829, 17531, 21233, 24935
2569	zinc finger and BTB domain containing 49	502918	2724	425747	6426	10128, 13830, 17532, 21234, 24936

2570	zinc finger and BTB domain containing 49	538529	2725	445653	6427	10129, 13831, 17533, 21235, 24937
2571	zinc finger and BTB domain containing 5	307750	2726	307604	6428	10130, 13832, 17534, 21236, 24938
2572	zinc finger and BTB domain containing 6	373659	2727	362763	6429	10131, 13833, 17535, 21237, 24939
2573	zinc finger and BTB domain containing 7A	322357	2728	323670	6430	10132, 13834, 17536, 21238, 24940
2574	zinc finger and BTB domain containing 7B	292176	2729	292176	6431	10133, 13835, 17537, 21239, 24941
2575	zinc finger and BTB domain containing 7B	368426	2730	357411	6432	10134, 13836, 17538, 21240, 24942
2576	zinc finger and BTB domain containing 7B	417934	2731	406286	6433	10135, 13837, 17539, 21241, 24943
2577	zinc finger and BTB domain containing 7B	535420	2732	438647	6434	10136, 13838, 17540, 21242, 24944
2578	zinc finger and BTB domain containing 8A	316459	2733	317561	6435	10137, 13839, 17541, 21243, 24945
2579	zinc finger and BTB domain containing 8A	373510	2734	362609	6436	10138, 13840, 17542, 21244, 24946

2580	zinc finger and BTB domain containing 8B	415091	2735	400836	6437	10139, 13841, 17543, 21245, 24947
2581	zinc finger and BTB domain containing 9	395064	2736	378503	6438	10140, 13842, 17544, 21246, 24948
2582	zinc finger and BTB domain containing 9	414934	2737	413557	6439	10141, 13843, 17545, 21247, 24949
2583	zinc finger and SCAN domain containing 1	282326	2738	282326	6440	10142, 13844, 17546, 21248, 24950
2584	zinc finger and SCAN domain containing 1	391700	2739	375581	6441	10143, 13845, 17547, 21249, 24951
2585	zinc finger and SCAN domain containing 10	252463	2740	252463	6442	10144, 13846, 17548, 21250, 24952
2586	zinc finger and SCAN domain containing 10	538082	2741	440047	6443	10145, 13847, 17549, 21251, 24953
2587	zinc finger and SCAN domain containing 16	340487	2742	366527	6444	10146, 13848, 17550, 21252, 24954
2588	zinc finger and SCAN domain containing 18	240727	2743	240727	6445	10147, 13849, 17551, 21253, 24955
2589	zinc finger and SCAN domain containing 18	421612	2744	392653	6446	10148, 13850, 17552, 21254, 24956

2590	zinc finger and SCAN domain containing 18	433686	2745	412253	6447	10149, 13851, 17553, 21255, 24957
2591	zinc finger and SCAN domain containing 18	600404	2746	470123	6448	10150, 13852, 17554, 21256, 24958
2592	zinc finger and SCAN domain containing 2	334141	2747	333895	6449	10151, 13853, 17555, 21257, 24959
2593	zinc finger and SCAN domain containing 2	379353	2748	368658	6450	10152, 13854, 17556, 21258, 24960
2594	zinc finger and SCAN domain containing 2	379358	2749	368663	6451	10153, 13855, 17557, 21259, 24961
2595	zinc finger and SCAN domain containing 2	442073	2750	439584	6452	10154, 13856, 17558, 21260, 24962
2596	zinc finger and SCAN domain containing 2	448803	2751	410198	6453	10155, 13857, 17559, 21261, 24963
2597	zinc finger and SCAN domain containing 2	502939	2752	438628	6454	10156, 13858, 17560, 21262, 24964
2598	zinc finger and SCAN domain containing 2	540894	2753	441855	6455	10157, 13859, 17561, 21263, 24965
2599	zinc finger and SCAN domain containing 2	546148	2754	445451	6456	10158, 13860, 17562, 21264, 24966

2600	zinc finger and SCAN domain containing 2	546275	2755	442693	6457	10159, 13861, 17563, 21265, 24967
2601	zinc finger and SCAN domain containing 21	292450	2756	292450	6458	10160, 13862, 17564, 21266, 24968
2602	zinc finger and SCAN domain containing 21	379635	2757	368956	6459	10161, 13863, 17565, 21267, 24969
2603	zinc finger and SCAN domain containing 21	438937	2758	404207	6460	10162, 13864, 17566, 21268, 24970
2604	zinc finger and SCAN domain containing 21	543588	2759	441212	6461	10163, 13865, 17567, 21269, 24971
2605	zinc finger and SCAN domain containing 23	289788	2760	289788	6462	10164, 13866, 17568, 21270, 24972
2606	zinc finger and SCAN domain containing 29	396972	2761	380170	6463	10165, 13867, 17569, 21271, 24973
2607	zinc finger and SCAN domain containing 29	396976	2762	380174	6464	10166, 13868, 17570, 21272, 24974
2608	zinc finger and SCAN domain containing 30	333206	2763	329738	6465	10167, 13869, 17571, 21273, 24975
2609	zinc finger and SCAN domain containing 30	360932	2764	354188	6466	10168, 13870, 17572, 21274, 24976

2610	zinc finger and SCAN domain containing 30	383091	2765	372569	6467	10169, 13871, 17573, 21275, 24977
2611	zinc finger and SCAN domain containing 30	420878	2766	392371	6468	10170, 13872, 17574, 21276, 24978
2612	zinc finger and SCAN domain containing 5A	254165	2767	254165	6469	10171, 13873, 17575, 21277, 24979
2613	zinc finger and SCAN domain containing 5A	391713	2768	375593	6470	10172, 13874, 17576, 21278, 24980
2614	zinc finger CCCH-type containing 18	289509	2769	289509	6471	10173, 13875, 17577, 21279, 24981
2615	zinc finger CCCH-type containing 18	301011	2770	301011	6472	10174, 13876, 17578, 21280, 24982
2616	zinc finger CCCH-type containing 18	452588	2771	416951	6473	10175, 13877, 17579, 21281, 24983
2617	zinc finger CCCH-type containing 18	545404	2772	442341	6474	10176, 13878, 17580, 21282, 24984
2618	zinc finger CCCH-type containing 3	262577	2773	262577	6475	10177, 13879, 17581, 21283, 24985
2619	zinc finger CCCH-type containing 7A	355758	2774	347999	6476	10178, 13880, 17582, 21284, 24986

2620	zinc finger CCCH-type containing 7A	396516	2775	379773	6477	10179, 13881, 17583, 21285, 24987
2621	zinc finger CCCH-type containing 7B	351589	2776	263243	6478	10180, 13882, 17584, 21286, 24988
2622	zinc finger CCCH-type containing 7B	352645	2777	345793	6479	10181, 13883, 17585, 21287, 24989
2623	zinc finger CCCH-type containing 8	272570	2778	272570	6480	10182, 13884, 17586, 21288, 24990
2624	zinc finger CCCH-type containing 8	409573	2779	386488	6481	10183, 13885, 17587, 21289, 24991
2625	zinc finger family member 783	378052	2780	367291	6482	10184, 13886, 17588, 21290, 24992
2626	zinc finger family member 783	418158	2781	391817	6483	10185, 13887, 17589, 21291, 24993
2627	zinc finger family member 783	434415	2782	410890	6484	10186, 13888, 17590, 21292, 24994
2628	zinc finger family member 783	476295	2783	418666	6485	10187, 13889, 17591, 21293, 24995
2629	zinc finger homeobox 2	382785	2784	372235	6486	10188, 13890, 17592, 21294, 24996

2630	zinc finger homeobox 2	412565	2785	409464	6487	10189, 13891, 17593, 21295, 24997
2631	zinc finger homeobox 2	419474	2786	413418	6488	10190, 13892, 17594, 21296, 24998
2632	zinc finger homeobox 2	543520	2787	440448	6489	10191, 13893, 17595, 21297, 24999
2633	zinc finger homeobox 2	555334	2788	451342	6490	10192, 13894, 17596, 21298, 25000
2634	Zinc finger imprinted 2	221722	2789	221722	6491	10193, 13895, 17597, 21299, 25001
2635	Zinc finger imprinted 2	391708	2790	375589	6492	10194, 13896, 17598, 21300, 25002
2636	Zinc finger imprinted 2	558128	2791	452689	6493	10195, 13897, 17599, 21301, 25003
2637	Zinc finger imprinted 2	558257	2792	453156	6494	10196, 13898, 17600, 21302, 25004
2638	Zinc finger imprinted 2	561219	2793	453096	6495	10197, 13899, 17601, 21303, 25005
2639	zinc finger MYND domain- containing protein 11 isoform g	558098	2794	452959	6496	10198, 13900, 17602, 21304, 25006

2640	zinc finger protein 1 homolog (mouse)	332307	2795	333192	6497	10199, 13901, 17603, 21305, 25007
2641	zinc finger protein 1 homolog (mouse)	393430	2796	377080	6498	10200, 13902, 17604, 21306, 25008
2642	zinc finger protein 14 homolog (mouse)	270001	2797	270001	6499	10201, 13903, 17605, 21307, 25009
2643	zinc finger protein 14 homolog (mouse)	392172	2798	376012	6500	10202, 13904, 17606, 21308, 25010
2644	zinc finger protein 167	273320	2799	273320	6501	10203, 13905, 17607, 21309, 25011
2645	zinc finger protein 167	315777	2800	319007	6502	10204, 13906, 17608, 21310, 25012
2646	zinc finger protein 167	341840	2801	345404	6503	10205, 13907, 17609, 21311, 25013
2647	zinc finger protein 167	426540	2802	395524	6504	10206, 13908, 17610, 21312, 25014
2648	zinc finger protein 167	431636	2803	416681	6505	10207, 13909, 17611, 21313, 25015
2649	zinc finger protein 17	307658	2804	302455	6506	10208, 13910, 17612, 21314, 25016

2650	zinc finger protein 17	601808	2805	471905	6507	10209, 13911, 17613, 21315, 25017
2651	zinc finger protein 197	344387	2806	345809	6508	10210, 13912, 17614, 21316, 25018
2652	zinc finger protein 197	383744	2807	373250	6509	10211, 13913, 17615, 21317, 25019
2653	zinc finger protein 197	383745	2808	373251	6510	10212, 13914, 17616, 21318, 25020
2654	zinc finger protein 197	396058	2809	379370	6511	10213, 13915, 17617, 21319, 25021
2655	zinc finger protein 197	412641	2810	394713	6512	10214, 13916, 17618, 21320, 25022
2656	zinc finger protein 197	536299	2811	444069	6513	10215, 13917, 17619, 21321, 25023
2657	zinc finger protein 2 homolog (mouse)	361362	2812	354453	6514	10216, 13918, 17620, 21322, 25024
2658	zinc finger protein 2 homolog (mouse)	503510	2813	438114	6515	10217, 13919, 17621, 21323, 25025
2659	zinc finger protein 2 homolog (mouse)	520301	2814	430980	6516	10218, 13920, 17622, 21324, 25026

2660	zinc finger protein 2 homolog (mouse)	520660	2815	429095	6517	10219, 13921, 17623, 21325, 25027
2661	zinc finger protein 2 homolog (mouse)	520805	2816	431074	6518	10220, 13922, 17624, 21326, 25028
2662	zinc finger protein 2 homolog (mouse)	523286	2817	430531	6519	10221, 13923, 17625, 21327, 25029
2663	zinc finger protein 211	240731	2818	240731	6520	10222, 13924, 17626, 21328, 25030
2664	zinc finger protein 211	254182	2819	254182	6521	10223, 13925, 17627, 21329, 25031
2665	zinc finger protein 211	347302	2820	339562	6522	10224, 13926, 17628, 21330, 25032
2666	zinc finger protein 211	391703	2821	375584	6523	10225, 13927, 17629, 21331, 25033
2667	zinc finger protein 211	420680	2822	399193	6524	10226, 13928, 17630, 21332, 25034
2668	zinc finger protein 211	541801	2823	442601	6525	10227, 13929, 17631, 21333, 25035
2669	zinc finger protein 211	544273	2824	441386	6526	10228, 13930, 17632, 21334, 25036

2670	zinc finger protein 211	299871	2825	299871	6527	10229, 13931, 17633, 21335, 25037
2671	zinc finger protein 211	540556	2826	440793	6528	10230, 13932, 17634, 21336, 25038
2672	zinc finger protein 221	251269	2827	251269	6529	10231, 13933, 17635, 21337, 25039
2673	zinc finger protein 221	539505	2828	438841	6530	10232, 13934, 17636, 21338, 25040
2674	zinc finger protein 222	187879	2829	187879	6531	10233, 13935, 17637, 21339, 25041
2675	zinc finger protein 222	251272	2830	251272	6532	10234, 13936, 17638, 21340, 25042
2676	zinc finger protein 222	391960	2831	375822	6533	10235, 13937, 17639, 21341, 25043
2677	zinc finger protein 223	434772	2832	401947	6534	10236, 13938, 17640, 21342, 25044
2678	zinc finger protein 225	262894	2833	262894	6535	10237, 13939, 17641, 21343, 25045
2679	zinc finger protein 225	544184	2834	441648	6536	10238, 13940, 17642, 21344, 25046

2680	zinc finger protein 226	300823	2835	300823	6537	10239, 13941, 17643, 21345, 25047
2681	zinc finger protein 226	337433	2836	336719	6538	10240, 13942, 17644, 21346, 25048
2682	zinc finger protein 226	413984	2837	407474	6539	10241, 13943, 17645, 21347, 25049
2683	zinc finger protein 226	426739	2838	400878	6540	10242, 13944, 17646, 21348, 25050
2684	zinc finger protein 226	454662	2839	393265	6541	10243, 13945, 17647, 21349, 25051
2685	zinc finger protein 226	536276	2840	445120	6542	10244, 13946, 17648, 21350, 25052
2686	zinc finger protein 226	542402	2841	442013	6543	10245, 13947, 17649, 21351, 25053
2687	zinc finger protein 227	313040	2842	321049	6544	10246, 13948, 17650, 21352, 25054
2688	zinc finger protein 227	328297	2843	328801	6545	10247, 13949, 17651, 21353, 25055
2689	zinc finger protein 227	377916	2844	367149	6546	10248, 13950, 17652, 21354, 25056

2690	zinc finger protein 227	391961	2845	375823	6547	10249, 13951, 17653, 21355, 25057
2691	zinc finger protein 227	418980	2846	389178	6548	10250, 13952, 17654, 21356, 25058
2692	zinc finger protein 229	291187	2847	291187	6549	10251, 13953, 17655, 21357, 25059
2693	zinc finger protein 229	588931	2848	466519	6550	10252, 13954, 17656, 21358, 25060
2694	zinc finger protein 230	429154	2849	409318	6551	10253, 13955, 17657, 21359, 25061
2695	zinc finger protein 232	250076	2850	250076	6552	10254, 13956, 17658, 21360, 25062
2696	zinc finger protein 232	416429	2851	416430	6553	10255, 13957, 17659, 21361, 25063
2697	zinc finger protein 233	280305	2852	280305	6554	10256, 13958, 17660, 21362, 25064
2698	zinc finger protein 233	334152	2853	334957	6555	10257, 13959, 17661, 21363, 25065
2699	zinc finger protein 233	391958	2854	375820	6556	10258, 13960, 17662, 21364, 25066

2700	zinc finger protein 233	544563	2855	444869	6557	10259, 13961, 17663, 21365, 25067
2701	zinc finger protein 235	291182	2856	291182	6558	10260, 13962, 17664, 21366, 25068
2702	zinc finger protein 235	359844	2857	352902	6559	10261, 13963, 17665, 21367, 25069
2703	zinc finger protein 235	391957	2858	375819	6560	10262, 13964, 17666, 21368, 25070
2704	zinc finger protein 235	433015	2859	415123	6561	10263, 13965, 17667, 21369, 25071
2705	zinc finger protein 248	357328	2860	349882	6562	10264, 13966, 17668, 21370, 25072
2706	zinc finger protein 248	374648	2861	363778	6563	10265, 13967, 17669, 21371, 25073
2707	zinc finger protein 248	395867	2862	379208	6564	10266, 13968, 17670, 21372, 25074
2708	zinc finger protein 248	395873	2863	379214	6565	10267, 13969, 17671, 21373, 25075
2709	zinc finger protein 248	395874	2864	379215	6566	10268, 13970, 17672, 21374, 25076

2710	zinc finger protein 250	292579	2865	292579	6567	10269, 13971, 17673, 21375, 25077
2711	zinc finger protein 250	342660	2866	344136	6568	10270, 13972, 17674, 21376, 25078
2712	zinc finger protein 250	394912	2867	378371	6569	10271, 13973, 17675, 21377, 25079
2713	zinc finger protein 250	417550	2868	393442	6570	10272, 13974, 17676, 21378, 25080
2714	zinc finger protein 250	529780	2869	432611	6571	10273, 13975, 17677, 21379, 25081
2715	zinc finger protein 250	543949	2870	445840	6572	10274, 13976, 17678, 21380, 25082
2716	zinc finger protein 251	292562	2871	292562	6573	10275, 13977, 17679, 21381, 25083
2717	Zinc finger protein 26	391574	2872	375416	6574	10276, 13978, 17680, 21382, 25084
2718	zinc finger protein 263	219069	2873	219069	6575	10277, 13979, 17681, 21383, 25085
2719	zinc finger protein 263	538765	2874	444497	6576	10278, 13980, 17682, 21384, 25086

2720	zinc finger protein 273	319636	2875	324518	6577	10279, 13981, 17683, 21385, 25087
2721	zinc finger protein 273	476120	2876	418719	6578	10280, 13982, 17684, 21386, 25088
2722	zinc finger protein 273	545510	2877	440725	6579	10281, 13983, 17685, 21387, 25089
2723	zinc finger protein 275	370249	2878	359269	6580	10282, 13984, 17686, 21388, 25090
2724	zinc finger protein 275	370251	2879	359271	6581	10283, 13985, 17687, 21389, 25091
2725	zinc finger protein 275	421401	2880	398977	6582	10284, 13986, 17688, 21390, 25092
2726	zinc finger protein 275	440091	2881	411097	6583	10285, 13987, 17689, 21391, 25093
2727	zinc finger protein 276	289816	2882	289816	6584	10286, 13988, 17690, 21392, 25094
2728	zinc finger protein 276	443381	2883	415836	6585	10287, 13989, 17691, 21393, 25095
2729	zinc finger protein 276	446326	2884	415999	6586	10288, 13990, 17692, 21394, 25096

2730	zinc finger protein 28	360272	2885	353410	6587	10289, 13991, 17693, 21395, 25097
2731	zinc finger protein 28	414252	2886	444965	6588	10290, 13992, 17694, 21396, 25098
2732	zinc finger protein 28	457749	2887	397693	6589	10291, 13993, 17695, 21397, 25099
2733	zinc finger protein 28 homolog (mouse)	301318	2888	301318	6590	10292, 13994, 17696, 21398, 25100
2734	zinc finger protein 280A	302097	2889	302855	6591	10293, 13995, 17697, 21399, 25101
2735	zinc finger protein 280B	360412	2890	353586	6592	10294, 13996, 17698, 21400, 25102
2736	zinc finger protein 280B	406426	2891	385998	6593	10295, 13997, 17699, 21401, 25103
2737	zinc finger protein 280C	66465	2892	66465	6594	10296, 13998, 17700, 21402, 25104, 26082, 26097
2738	zinc finger protein 280C	370978	2893	360017	6595	10297, 13999, 17701, 21403, 25105
2739	zinc finger protein 280C	447817	2894	408521	6596	10298, 14000, 17702,

						21404, 25106
2740	zinc finger protein 280D	260435	2895	260435	6597	10299, 14001, 17703, 21405, 25107
2741	zinc finger protein 280D	267807	2896	267807	6598	10300, 14002, 17704, 21406, 25108
2742	zinc finger protein 280D	396245	2897	379545	6599	10301, 14003, 17705, 21407, 25109
2743	zinc finger protein 280D	455329	2898	391159	6600	10302, 14004, 17706, 21408, 25110
2744	zinc finger protein 280D	559000	2899	453045	6601	10303, 14005, 17707, 21409, 25111
2745	zinc finger protein 280D	559352	2900	453912	6602	10304, 14006, 17708, 21410, 25112
2746	zinc finger protein 280D	558320	2901	453706	6603	10305, 14007, 17709, 21411, 25113
2747	zinc finger protein 280D	559237	2902	454111	6604	10306, 14008, 17710, 21412, 25114
2748	zinc finger protein 281	294740	2903	294740	6605	10307, 14009, 17711, 21413, 25115
2749	zinc finger protein 281	367352	2904	356321	6606	10308, 14010, 17712,

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2750	zinc finger protein 281	367353	2905	356322	6607	10309, 14011, 17713, 21415, 25117
2751	zinc finger protein 281	537759	2906	445658	6608	10310, 14012, 17714, 21416, 25118
2752	zinc finger protein 282	262085	2907	262085	6609	10311, 14013, 17715, 21417, 25119
2753	zinc finger protein 282	430197	2908	388840	6610	10312, 14014, 17716, 21418, 25120
2754	zinc finger protein 282	479907	2909	418840	6611	10313, 14015, 17717, 21419, 25121
2755	zinc finger protein 283	310738	2910	312519	6612	10314, 14016, 17718, 21420, 25122
2756	zinc finger protein 283	324461	2911	327314	6613	10315, 14017, 17719, 21421, 25123
2757	zinc finger protein 284	421176	2912	411032	6614	10316, 14018, 17720, 21422, 25124
2758	zinc finger protein 285	253426	2913	253426	6615	10317, 14019, 17721, 21423, 25125
2759	zinc finger protein 285	330997	2914	333595	6616	10318, 14020, 17722,

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2760	zinc finger protein 285	337401	2915	337081	6617	10319, 14021, 17723, 21425, 25127
2761	zinc finger protein 285	354340	2916	346305	6618	10320, 14022, 17724, 21426, 25128
2762	zinc finger protein 285	412927	2917	392867	6619	10321, 14023, 17725, 21427, 25129
2763	zinc finger protein 285	536500	2918	441990	6620	10322, 14024, 17726, 21428, 25130
2764	zinc finger protein 285	544719	2919	439431	6621	10323, 14025, 17727, 21429, 25131
2765	zinc finger protein 286A	395893	2920	379230	6622	10324, 14026, 17728, 21430, 25132
2766	zinc finger protein 286A	395894	2921	379231	6623	10325, 14027, 17729, 21431, 25133
2767	zinc finger protein 286A	412988	2922	408168	6624	10326, 14028, 17730, 21432, 25134
2768	zinc finger protein 286A	421016	2923	397163	6625	10327, 14029, 17731, 21433, 25135
2769	zinc finger protein 286A	464847	2924	464218	6626	10328, 14030, 17732,

						21434, 25136
2770	zinc finger protein 286B	545289	2925	461413	6627	10329, 14031, 17733, 21435, 25137
2771	zinc finger protein 287	395824	2926	379168	6628	10330, 14032, 17734, 21436, 25138
2772	zinc finger protein 287	395825	2927	379169	6629	10331, 14033, 17735, 21437, 25139
2773	zinc finger protein 287	448349	2928	406051	6630	10332, 14034, 17736, 21438, 25140
2774	zinc finger protein 292	339907	2929	342847	6631	10333, 14035, 17737, 21439, 25141
2775	zinc finger protein 292	369577	2930	358590	6632	10334, 14036, 17738, 21440, 25142
2776	zinc finger protein 295	310826	2931	308759	6633	10335, 14037, 17739, 21441, 25143
2777	zinc finger protein 295	398497	2932	381510	6634	10336, 14038, 17740, 21442, 25144
2778	zinc finger protein 295	398499	2933	381512	6635	10337, 14039, 17741, 21443, 25145
2779	zinc finger protein 295	398505	2934	381517	6636	10338, 14040, 17742,

						21444, 25146
2780	zinc finger protein 295	398511	2935	381523	6637	10339, 14041, 17743, 21445, 25147
2781	zinc finger protein 295	425521	2936	387788	6638	10340, 14042, 17744, 21446, 25148
2782	zinc finger protein 295	449949	2937	395186	6639	10341, 14043, 17745, 21447, 25149
2783	zinc finger protein 30	303586	2938	303889	6640	10342, 14044, 17746, 21448, 25150
2784	zinc finger protein 30	342559	2939	339811	6641	10343, 14045, 17747, 21449, 25151
2785	zinc finger protein 30	426813	2940	416457	6642	10344, 14046, 17748, 21450, 25152
2786	zinc finger protein 30	439785	2941	403441	6643	10345, 14047, 17749, 21451, 25153
2787	zinc finger protein 30	601142	2942	469954	6644	10346, 14048, 17750, 21452, 25154
2788	zinc finger protein 30 homolog (mouse)	351218	2943	343581	6645	10347, 14049, 17751, 21453, 25155
2789	zinc finger protein 30 homolog (mouse)	392144	2944	375988	6646	10348, 14050, 17752,

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2790	zinc finger protein 30 homolog (mouse)	440715	2945	395911	6647	10349, 14051, 17753, 21455, 25157
2791	zinc finger protein 30 homolog (mouse)	514101	2946	422930	6648	10350, 14052, 17754, 21456, 25158
2792	zinc finger protein 311	377179	2947	366384	6649	10351, 14053, 17755, 21457, 25159
2793	zinc finger protein 311	383655	2948	373151	6650	10352, 14054, 17756, 21458, 25160
2794	zinc finger protein 311	426120	2949	398983	6651	10353, 14055, 17757, 21459, 25161
2795	zinc finger protein 311	429714	2950	399157	6652	10354, 14056, 17758, 21460, 25162
2796	zinc finger protein 311	436574	2951	405154	6653	10355, 14057, 17759, 21461, 25163
2797	zinc finger protein 311	452316	2952	415772	6654	10356, 14058, 17760, 21462, 25164
2798	zinc finger protein 311	535083	2953	438646	6655	10357, 14059, 17761, 21463, 25165
2799	zinc finger protein 311	547962	2954	448013	6656	10358, 14060, 17762,

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2800	zinc finger protein 311	548260	2955	446920	6657	10359, 14061, 17763, 21465, 25167
2801	zinc finger protein 311	548833	2956	449225	6658	10360, 14062, 17764, 21466, 25168
2802	zinc finger protein 311	552159	2957	449120	6659	10361, 14063, 17765, 21467, 25169
2803	zinc finger protein 311	553233	2958	447414	6660	10362, 14064, 17766, 21468, 25170
2804	zinc finger protein 319	299237	2959	299237	6661	10363, 14065, 17767, 21469, 25171
2805	zinc finger protein 322 pseudogene 1	375210	2960	364358	6662	10364, 14066, 17768, 21470, 25172
2806	zinc finger protein 324	196482	2961	196482	6663	10365, 14067, 17769, 21471, 25173
2807	zinc finger protein 324	378044	2962	442927	6664	10366, 14068, 17770, 21472, 25174
2808	zinc finger protein 324	535298	2963	439588	6665	10367, 14069, 17771, 21473, 25175
2809	zinc finger protein 324	536459	2964	444812	6666	10368, 14070, 17772,

						21474, 25176
2810	zinc finger protein 324	539101	2965	442897	6667	10369, 14071, 17773, 21475, 25177
2811	zinc finger protein 324B	336614	2966	337473	6668	10370, 14072, 17774, 21476, 25178
2812	zinc finger protein 324B	391696	2967	375578	6669	10371, 14073, 17775, 21477, 25179
2813	zinc finger protein 324B	545523	2968	438930	6670	10372, 14074, 17776, 21478, 25180
2814	zinc finger protein 326	340281	2969	340796	6671	10373, 14075, 17777, 21479, 25181
2815	zinc finger protein 326	361911	2970	355318	6672	10374, 14076, 17778, 21480, 25182
2816	zinc finger protein 326	370447	2971	359476	6673	10375, 14077, 17779, 21481, 25183
2817	zinc finger protein 326	394590	2972	378091	6674	10376, 14078, 17780, 21482, 25184
2818	zinc finger protein 326	455342	2973	403470	6675	10377, 14079, 17781, 21483, 25185
2819	zinc finger protein 329	358067	2974	350773	6676	10378, 14080, 17782,

						21484, 25186
2820	zinc finger protein 329	500161	2975	439527	6677	10379, 14081, 17783, 21485, 25187
2821	zinc finger protein 329	598312	2976	470008	6678	10380, 14082, 17784, 21486, 25188
2822	zinc finger protein 334	347606	2977	255129	6679	10381, 14083, 17785, 21487, 25189
2823	zinc finger protein 334	457685	2978	402582	6680	10382, 14084, 17786, 21488, 25190
2824	zinc finger protein 337	252979	2979	252979	6681	10383, 14085, 17787, 21489, 25191
2825	zinc finger protein 337	376412	2980	365594	6682	10384, 14086, 17788, 21490, 25192
2826	zinc finger protein 337	376436	2981	365619	6683	10385, 14087, 17789, 21491, 25193
2827	zinc finger protein 337	538750	2982	442181	6684	10386, 14088, 17790, 21492, 25194
2828	zinc finger protein 341	342427	2983	344308	6685	10387, 14089, 17791, 21493, 25195
2829	zinc finger protein 341	375200	2984	364346	6686	10388, 14090, 17792,

						21494, 25196
2830	zinc finger protein 343	278772	2985	278772	6687	10389, 14091, 17793, 21495, 25197
2831	zinc finger protein 343	358413	2986	351188	6688	10390, 14092, 17794, 21496, 25198
2832	zinc finger protein 343	421216	2987	416488	6689	10391, 14093, 17795, 21497, 25199
2833	zinc finger protein 343	445484	2988	399682	6690	10392, 14094, 17796, 21498, 25200
2834	zinc finger protein 345	331800	2989	331120	6691	10393, 14095, 17797, 21499, 25201
2835	zinc finger protein 345	344705	2990	442320	6692	10394, 14096, 17798, 21500, 25202
2836	zinc finger protein 345	420450	2991	431216	6693	10395, 14097, 17799, 21501, 25203
2837	zinc finger protein 345	529555	2992	431202	6694	10396, 14098, 17800, 21502, 25204
2838	zinc finger protein 345	532141	2993	431289	6695	10397, 14099, 17801, 21503, 25205
2839	zinc finger protein 345	589046	2994	465431	6696	10398, 14100, 17802,

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2840	zinc finger protein 346	261948	2995	261948	6697	10399, 14101, 17803, 21505, 25207
2841	zinc finger protein 346	358149	2996	350869	6698	10400, 14102, 17804, 21506, 25208
2842	zinc finger protein 346	503039	2997	424495	6699	10401, 14103, 17805, 21507, 25209
2843	zinc finger protein 346	503425	2998	421212	6700	10402, 14104, 17806, 21508, 25210
2844	zinc finger protein 346	506693	2999	423515	6701	10403, 14105, 17807, 21509, 25211
2845	zinc finger protein 346	511834	3000	425725	6702	10404, 14106, 17808, 21510, 25212
2846	zinc finger protein 346	512315	3001	421089	6703	10405, 14107, 17809, 21511, 25213
2847	zinc finger protein 347	334197	3002	334146	6704	10406, 14108, 17810, 21512, 25214
2848	zinc finger protein 347	436933	3003	445462	6705	10407, 14109, 17811, 21513, 25215
2849	zinc finger protein 347	452676	3004	405218	6706	10408, 14110, 17812,

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2850	zinc finger protein 350	243644	3005	243644	6707	10409, 14111, 17813, 21515, 25217
2851	zinc finger protein 354A	335815	3006	337122	6708	10410, 14112, 17814, 21516, 25218
2852	zinc finger protein 354A	520331	3007	429675	6709	10411, 14113, 17815, 21517, 25219
2853	zinc finger protein 354B	322434	3008	327143	6710	10412, 14114, 17816, 21518, 25220
2854	zinc finger protein 354B	520377	3009	429827	6711	10413, 14115, 17817, 21519, 25221
2855	zinc finger protein 354C	315475	3010	324064	6712	10414, 14116, 17818, 21520, 25222
2856	zinc finger protein 358	361576	3011	354703	6713	10415, 14117, 17819, 21521, 25223
2857	zinc finger protein 358	394341	3012	377873	6714	10416, 14118, 17820, 21522, 25224
2858	zinc finger protein 358	597229	3013	472305	6715	10417, 14119, 17821, 21523, 25225
2859	zinc finger protein 362	373428	3014	362527	6716	10418, 14120, 17822,

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2860	zinc finger protein 362	539719	3015	446335	6717	10419, 14121, 17823, 21525, 25227
2861	zinc finger protein 366	318442	3016	313158	6718	10420, 14122, 17824, 21526, 25228
2862	Zinc finger protein 375192	442497	3017	437406	6719	10421, 14123, 17825, 21527, 25229
2863	zinc finger protein 37A	351773	3018	329141	6720	10422, 14124, 17826, 21528, 25230
2864	zinc finger protein 37A	361085	3019	354377	6721	10423, 14125, 17827, 21529, 25231
2865	zinc finger protein 385D	281523	3020	281523	6722	10424, 14126, 17828, 21530, 25232
2866	zinc finger protein 391	244576	3021	244576	6723	10425, 14127, 17829, 21531, 25233
2867	zinc finger protein 391	461521	3022	419498	6724	10426, 14128, 17830, 21532, 25234
2868	zinc finger protein 394	337673	3023	337363	6725	10427, 14129, 17831, 21533, 25235
2869	zinc finger protein 394	426306	3024	409565	6726	10428, 14130, 17832,

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2870	zinc finger protein 398	335901	3025	338984	6727	10429, 14131, 17833, 21535, 25237
2871	zinc finger protein 398	420008	3026	416751	6728	10430, 14132, 17834, 21536, 25238
2872	zinc finger protein 398	426851	3027	389972	6729	10431, 14133, 17835, 21537, 25239
2873	zinc finger protein 398	475153	3028	420418	6730	10432, 14134, 17836, 21538, 25240
2874	zinc finger protein 398	483892	3029	418564	6731	10433, 14135, 17837, 21539, 25241
2875	zinc finger protein 398	491174	3030	419391	6732	10434, 14136, 17838, 21540, 25242
2876	zinc finger protein 398	540950	3031	439340	6733	10435, 14137, 17839, 21541, 25243
2877	zinc finger protein 407	299687	3032	299687	6734	10436, 14138, 17840, 21542, 25244
2878	zinc finger protein 407	309902	3033	310359	6735	10437, 14139, 17841, 21543, 25245
2879	zinc finger protein 407	577538	3034	463270	6736	10438, 14140, 17842,

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2880	zinc finger protein 407	582337	3035	462348	6737	10439, 14141, 17843, 21545, 25247
2881	zinc finger protein 408	311764	3036	309606	6738	10440, 14142, 17844, 21546, 25248
2882	zinc finger protein 41 homolog (mouse)	330701	3037	327427	6739	10441, 14143, 17845, 21547, 25249
2883	zinc finger protein 41 homolog (mouse)	520584	3038	430465	6740	10442, 14144, 17846, 21548, 25250
2884	zinc finger protein 41 homolog (mouse)	522452	3039	428966	6741	10443, 14145, 17847, 21549, 25251
2885	zinc finger protein 410	324593	3040	323293	6742	10444, 14146, 17848, 21550, 25252
2886	zinc finger protein 410	334521	3041	334170	6743	10445, 14147, 17849, 21551, 25253
2887	zinc finger protein 410	442160	3042	407130	6744	10446, 14148, 17850, 21552, 25254
2888	zinc finger protein 410	458102	3043	401488	6745	10447, 14149, 17851, 21553, 25255
2889	zinc finger protein 410	540593	3044	442228	6746	10448, 14150, 17852,

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2890	zinc finger protein 410	554797	3045	451116	6747	10449, 14151, 17853, 21555, 25257
2891	zinc finger protein 410	555044	3046	451763	6748	10450, 14152, 17854, 21556, 25258
2892	zinc finger protein 410	556160	3047	451458	6749	10451, 14153, 17855, 21557, 25259
2893	zinc finger protein 410	556659	3048	452023	6750	10452, 14154, 17856, 21558, 25260
2894	zinc finger protein 410	398139	3049	381208	6751	10453, 14155, 17857, 21559, 25261
2895	zinc finger protein 414	255616	3050	255616	6752	10454, 14156, 17858, 21560, 25262
2896	zinc finger protein 414	393927	3051	377504	6753	10455, 14157, 17859, 21561, 25263
2897	zinc finger protein 416	196489	3052	196489	6754	10456, 14158, 17860, 21562, 25264
2898	zinc finger protein 416	359489	3053	352468	6755	10457, 14159, 17861, 21563, 25265
2899	zinc finger protein 416	428052	3054	390838	6756	10458, 14160, 17862,

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2900	zinc finger protein 417	312026	3055	311319	6757	10459, 14161, 17863, 21565, 25267
2901	zinc finger protein 417	536263	3056	442760	6758	10460, 14162, 17864, 21566, 25268
2902	zinc finger protein 418	396147	3057	379451	6759	10461, 14163, 17865, 21567, 25269
2903	zinc finger protein 418	425570	3058	407039	6760	10462, 14164, 17866, 21568, 25270
2904	zinc finger protein 418	545403	3059	438277	6761	10463, 14165, 17867, 21569, 25271
2905	zinc finger protein 419	221735	3060	221735	6762	10464, 14166, 17868, 21570, 25272, 26083, 26098
2906	zinc finger protein 419	284020	3061	284020	6763	10465, 14167, 17869, 21571, 25273
2907	zinc finger protein 419	347466	3062	299860	6764	10466, 14168, 17870, 21572, 25274
2908	zinc finger protein 419	354197	3063	346136	6765	10467, 14169, 17871, 21573, 25275

2909	zinc finger protein 419	415379	3064	392129	6766	10468, 14170, 17872, 21574, 25276
2910	zinc finger protein 419	424930	3065	388864	6767	10469, 14171, 17873, 21575, 25277
2911	zinc finger protein 419	426954	3066	390916	6768	10470, 14172, 17874, 21576, 25278
2912	zinc finger protein 419	427558	3067	415213	6769	10471, 14173, 17875, 21577, 25279
2913	zinc finger protein 419	442920	3068	414709	6770	10472, 14174, 17876, 21578, 25280
2914	zinc finger protein 419	517598	3069	430326	6771	10473, 14175, 17877, 21579, 25281
2915	zinc finger protein 419	521754	3070	428523	6772	10474, 14176, 17878, 21580, 25282
2916	zinc finger protein 419	524372	3071	428075	6773	10475, 14177, 17879, 21581, 25283
2917	zinc finger protein 420	304239	3072	306102	6774	10476, 14178, 17880, 21582, 25284
2918	zinc finger protein 420	337995	3073	338770	6775	10477, 14179, 17881, 21583, 25285

2919	zinc finger protein 426	253115	3074	253115	6776	10478, 14180, 17882, 21584, 25286
2920	zinc finger protein 426	535489	3075	439017	6777	10479, 14181, 17883, 21585, 25287
2921	zinc finger protein 426	545189	3076	442711	6778	10480, 14182, 17884, 21586, 25288
2922	zinc finger protein 429	358491	3077	351280	6779	10481, 14183, 17885, 21587, 25289
2923	zinc finger protein 431	311048	3078	308578	6780	10482, 14184, 17886, 21588, 25290
2924	zinc finger protein 432	221315	3079	221315	6781	10483, 14185, 17887, 21589, 25291
2925	zinc finger protein 433	344980	3080	339767	6782	10484, 14186, 17888, 21590, 25292
2926	zinc finger protein 433	419886	3081	393416	6783	10485, 14187, 17889, 21591, 25293
2927	zinc finger protein 433	547560	3082	448806	6784	10486, 14188, 17890, 21592, 25294
2928	zinc finger protein 433	552904	3083	448233	6785	10487, 14189, 17891, 21593, 25295

2929	zinc finger protein 434	304926	3084	302502	6786	10488, 14190, 17892, 21594, 25296
2930	zinc finger protein 434	396846	3085	380057	6787	10489, 14191, 17893, 21595, 25297
2931	zinc finger protein 434	396852	3086	380061	6788	10490, 14192, 17894, 21596, 25298
2932	zinc finger protein 434	418960	3087	413332	6789	10491, 14193, 17895, 21597, 25299
2933	zinc finger protein 434	422427	3088	407312	6790	10492, 14194, 17896, 21598, 25300
2934	zinc finger protein 434	439568	3089	391787	6791	10493, 14195, 17897, 21599, 25301
2935	zinc finger protein 438	331737	3090	333571	6792	10494, 14196, 17898, 21600, 25302
2936	zinc finger protein 438	361310	3091	354663	6793	10495, 14197, 17899, 21601, 25303
2937	zinc finger protein 438	375311	3092	364460	6794	10496, 14198, 17900, 21602, 25304
2938	zinc finger protein 438	413025	3093	387546	6795	10497, 14199, 17901, 21603, 25305

2939	zinc finger protein 438	430896	3094	416214	6796	10498, 14200, 17902, 21604, 25306
2940	zinc finger protein 438	436087	3095	406934	6797	10499, 14201, 17903, 21605, 25307
2941	zinc finger protein 438	442986	3096	412363	6798	10500, 14202, 17904, 21606, 25308
2942	zinc finger protein 438	444692	3097	410898	6799	10501, 14203, 17905, 21607, 25309
2943	zinc finger protein 438	452305	3098	413060	6800	10502, 14204, 17906, 21608, 25310
2944	zinc finger protein 438	538351	3099	445461	6801	10503, 14205, 17907, 21609, 25311
2945	zinc finger protein 439	304030	3100	305077	6802	10504, 14206, 17908, 21610, 25312
2946	zinc finger protein 440	304060	3101	305373	6803	10505, 14207, 17909, 21611, 25313
2947	zinc finger protein 441	357901	3102	350576	6804	10506, 14208, 17910, 21612, 25314
2948	zinc finger protein 441	454339	3103	403738	6805	10507, 14209, 17911, 21613, 25315

2949	zinc finger protein 442	242804	3104	242804	6806	10508, 14210, 17912, 21614, 25316
2950	zinc finger protein 442	438182	3105	388634	6807	10509, 14211, 17913, 21615, 25317
2951	zinc finger protein 443	301547	3106	301547	6808	10510, 14212, 17914, 21616, 25318
2952	zinc finger protein 443	411622	3107	413096	6809	10511, 14213, 17915, 21617, 25319
2953	zinc finger protein 445	340674	3108	342436	6810	10512, 14214, 17916, 21618, 25320
2954	zinc finger protein 445	396077	3109	379387	6811	10513, 14215, 17917, 21619, 25321
2955	zinc finger protein 445	425708	3110	413073	6812	10514, 14216, 17918, 21620, 25322
2956	zinc finger protein 445	430301	3111	412129	6813	10515, 14217, 17919, 21621, 25323
2957	zinc finger protein 446	335841	3112	336565	6814	10516, 14218, 17920, 21622, 25324
2958	zinc finger protein 446	391694	3113	375576	6815	10517, 14219, 17921, 21623, 25325

2959	zinc finger protein 446	539679	3114	443736	6816	10518, 14220, 17922, 21624, 25326
2960	zinc finger protein 446	540481	3115	445639	6817	10519, 14221, 17923, 21625, 25327
2961	zinc finger protein 446	594369	3116	472802	6818	10520, 14222, 17924, 21626, 25328
2962	zinc finger protein 451	357489	3117	350083	6819	10521, 14223, 17925, 21627, 25329
2963	zinc finger protein 451	370706	3118	359740	6820	10522, 14224, 17926, 21628, 25330
2964	zinc finger protein 451	370708	3119	359742	6821	10523, 14225, 17927, 21629, 25331
2965	zinc finger protein 454	320129	3120	326249	6822	10524, 14226, 17928, 21630, 25332
2966	zinc finger protein 454	519564	3121	430354	6823	10525, 14227, 17929, 21631, 25333
2967	zinc finger protein 462	277225	3122	277225	6824	10526, 14228, 17930, 21632, 25334
2968	zinc finger protein 462	427098	3123	405837	6825	10527, 14229, 17931, 21633, 25335

2969	zinc finger protein 462	457913	3124	414570	6826	10528, 14230, 17932, 21634, 25336
2970	zinc finger protein 462	542028	3125	439771	6827	10529, 14231, 17933, 21635, 25337
2971	zinc finger protein 468	243639	3126	243639	6828	10530, 14232, 17934, 21636, 25338
2972	zinc finger protein 468	390651	3127	445669	6829	10531, 14233, 17935, 21637, 25339
2973	zinc finger protein 468	393865	3128	377444	6830	10532, 14234, 17936, 21638, 25340
2974	zinc finger protein 468	396409	3129	379690	6831	10533, 14235, 17937, 21639, 25341
2975	zinc finger protein 468	595646	3130	470381	6832	10534, 14236, 17938, 21640, 25342
2976	zinc finger protein 470	330619	3131	333223	6833	10535, 14237, 17939, 21641, 25343
2977	zinc finger protein 470	391709	3132	375590	6834	10536, 14238, 17940, 21642, 25344
2978	zinc finger protein 471	308031	3133	309161	6835	10537, 14239, 17941, 21643, 25345

2979	zinc finger protein 473	270617	3134	270617	6836	10538, 14240, 17942, 21644, 25346
2980	zinc finger protein 473	391821	3135	375697	6837	10539, 14241, 17943, 21645, 25347
2981	zinc finger protein 473	445728	3136	388961	6838	10540, 14242, 17944, 21646, 25348
2982	zinc finger protein 473	595661	3137	472808	6839	10541, 14243, 17945, 21647, 25349
2983	zinc finger protein 479	331162	3138	333776	6840	10542, 14244, 17946, 21648, 25350
2984	zinc finger protein 48	320159	3139	324056	6841	10543, 14245, 17947, 21649, 25351
2985	zinc finger protein 48	524644	3140	432548	6842	10544, 14246, 17948, 21650, 25352
2986	zinc finger protein 48	528032	3141	435674	6843	10545, 14247, 17949, 21651, 25353
2987	zinc finger protein 483	309235	3142	311679	6844	10546, 14248, 17950, 21652, 25354
2988	zinc finger protein 483	355824	3143	438048	6845	10547, 14249, 17951, 21653, 25355

2989	zinc finger protein 483	358151	3144	350871	6846	10548, 14250, 17952, 21654, 25356
2990	zinc finger protein 483	374374	3145	363494	6847	10549, 14251, 17953, 21655, 25357
2991	zinc finger protein 484	332591	3146	364646	6848	10550, 14252, 17954, 21656, 25358
2992	zinc finger protein 484	375495	3147	364645	6849	10551, 14253, 17955, 21657, 25359
2993	zinc finger protein 484	395505	3148	378881	6850	10552, 14254, 17956, 21658, 25360
2994	zinc finger protein 484	395506	3149	378882	6851	10553, 14255, 17957, 21659, 25361
2995	zinc finger protein 485	361807	3150	354694	6852	10554, 14256, 17958, 21660, 25362
2996	zinc finger protein 485	374435	3151	363558	6853	10555, 14257, 17959, 21661, 25363
2997	zinc finger protein 485	374437	3152	363560	6854	10556, 14258, 17960, 21662, 25364
2998	zinc finger protein 485	430885	3153	393570	6855	10557, 14259, 17961, 21663, 25365

2999	zinc finger protein 486	335117	3154	335042	6856	10558, 14260, 17962, 21664, 25366
3000	zinc finger protein 486	545779	3155	443347	6857	10559, 14261, 17963, 21665, 25367
3001	zinc finger protein 487, pseudogene	315429	3156	314093	6858	10560, 14262, 17964, 21666, 25368
3002	zinc finger protein 487, pseudogene	431662	3157	388421	6859	10561, 14263, 17965, 21667, 25369
3003	zinc finger protein 487, pseudogene	437590	3158	392335	6860	10562, 14264, 17966, 21668, 25370
3004	zinc finger protein 487, pseudogene	442349	3159	411348	6861	10563, 14265, 17967, 21669, 25371
3005	zinc finger protein 487, pseudogene	455398	3160	413773	6862	10564, 14266, 17968, 21670, 25372
3006	zinc finger protein 488	395702	3161	379054	6863	10565, 14267, 17969, 21671, 25373
3007	zinc finger protein 488	412534	3162	406508	6864	10566, 14268, 17970, 21672, 25374
3008	zinc finger protein 488	425196	3163	412898	6865	10567, 14269, 17971, 21673, 25375

3009	zinc finger protein 488	433077	3164	401469	6866	10568, 14270, 17972, 21674, 25376
3010	zinc finger protein 488	436850	3165	415923	6867	10569, 14271, 17973, 21675, 25377
3011	zinc finger protein 488	442001	3166	402147	6868	10570, 14272, 17974, 21676, 25378
3012	zinc finger protein 488	444585	3167	410326	6869	10571, 14273, 17975, 21677, 25379
3013	zinc finger protein 490	311437	3168	311521	6870	10572, 14274, 17976, 21678, 25380
3014	zinc finger protein 491	323169	3169	313443	6871	10573, 14275, 17977, 21679, 25381
3015	zinc finger protein 491	450087	3170	392176	6872	10574, 14276, 17978, 21680, 25382
3016	zinc finger protein 491	455048	3171	402539	6873	10575, 14277, 17979, 21681, 25383
3017	zinc finger protein 492	456783	3172	413660	6874	10576, 14278, 17980, 21682, 25384
3018	zinc finger protein 493	355504	3173	347691	6875	10577, 14279, 17981, 21683, 25385

3019	zinc finger protein 493	392288	3174	376110	6876	10578, 14280, 17982, 21684, 25386
3020	zinc finger protein 493	339914	3175	340651	6877	10579, 14281, 17983, 21685, 25387
3021	zinc finger protein 497	311044	3176	311183	6878	10580, 14282, 17984, 21686, 25388
3022	zinc finger protein 497	391697	3177	375579	6879	10581, 14283, 17985, 21687, 25389
3023	zinc finger protein 497	425453	3178	402815	6880	10582, 14284, 17986, 21688, 25390
3024	zinc finger protein 498	262941	3179	262941	6881	10583, 14285, 17987, 21689, 25391
3025	zinc finger protein 498	334715	3180	334800	6882	10584, 14286, 17988, 21690, 25392
3026	zinc finger protein 498	394152	3181	377708	6883	10585, 14287, 17989, 21691, 25393
3027	zinc finger protein 498	431485	3182	413144	6884	10586, 14288, 17990, 21692, 25394
3028	zinc finger protein 500	219478	3183	219478	6885	10587, 14289, 17991, 21693, 25395

3029	zinc finger protein 500	545009	3184	445714	6886	10588, 14290, 17992, 21694, 25396
3030	zinc finger protein 501	332489	3185	330388	6887	10589, 14291, 17993, 21695, 25397
3031	zinc finger protein 501	396048	3186	379363	6888	10590, 14292, 17994, 21696, 25398
3032	zinc finger protein 502	296091	3187	296091	6889	10591, 14293, 17995, 21697, 25399
3033	zinc finger protein 502	411443	3188	401717	6890	10592, 14294, 17996, 21698, 25400
3034	zinc finger protein 502	427783	3189	397812	6891	10593, 14295, 17997, 21699, 25401
3035	zinc finger protein 502	436624	3190	406469	6892	10594, 14296, 17998, 21700, 25402
3036	zinc finger protein 502	449836	3191	397390	6893	10595, 14297, 17999, 21701, 25403
3037	zinc finger protein 506	443905	3192	393835	6894	10596, 14298, 18000, 21702, 25404
3038	zinc finger protein 506	450683	3193	408892	6895	10597, 14299, 18001, 21703, 25405

3039	zinc finger protein 506	540806	3194	440625	6896	10598, 14300, 18002, 21704, 25406
3040	zinc finger protein 506	545006	3195	445149	6897	10599, 14301, 18003, 21705, 25407
3041	zinc finger protein 507	311921	3196	312277	6898	10600, 14302, 18004, 21706, 25408
3042	zinc finger protein 507	355898	3197	348162	6899	10601, 14303, 18005, 21707, 25409
3043	zinc finger protein 507	544431	3198	441549	6900	10602, 14304, 18006, 21708, 25410
3044	zinc finger protein 510	223428	3199	223428	6901	10603, 14305, 18007, 21709, 25411
3045	zinc finger protein 510	374641	3200	363772	6902	10604, 14306, 18008, 21710, 25412
3046	zinc finger protein 510	375231	3201	364379	6903	10605, 14307, 18009, 21711, 25413
3047	zinc finger protein 511	359035	3202	351929	6904	10606, 14308, 18010, 21712, 25414
3048	zinc finger protein 511	361518	3203	355251	6905	10607, 14309, 18011, 21713, 25415

3049	zinc finger protein 511	368554	3204	357542	6906	10608, 14310, 18012, 21714, 25416
3050	zinc finger protein 512	355467	3205	347648	6907	10609, 14311, 18013, 21715, 25417
3051	zinc finger protein 512	379717	3206	369040	6908	10610, 14312, 18014, 21716, 25418
3052	zinc finger protein 512	413371	3207	395660	6909	10611, 14313, 18015, 21717, 25419
3053	zinc finger protein 512	416005	3208	407038	6910	10612, 14314, 18016, 21718, 25420
3054	zinc finger protein 512	556601	3209	451572	6911	10613, 14315, 18017, 21719, 25421
3055	zinc finger protein 512B	217130	3210	217130	6912	10614, 14316, 18018, 21720, 25422
3056	zinc finger protein 512B	369888	3211	358904	6913	10615, 14317, 18019, 21721, 25423
3057	zinc finger protein 512B	450537	3212	393795	6914	10616, 14318, 18020, 21722, 25424
3058	zinc finger protein 514	295208	3213	295208	6915	10617, 14319, 18021, 21723, 25425

3059	zinc finger protein 514	411425	3214	405509	6916	10618, 14320, 18022, 21724, 25426
3060	zinc finger protein 514	542127	3215	443532	6917	10619, 14321, 18023, 21725, 25427
3061	zinc finger protein 516	443185	3216	394757	6918	10620, 14322, 18024, 21726, 25428
3062	zinc finger protein 516	532857	3217	446211	6919	10621, 14323, 18025, 21727, 25429
3063	zinc finger protein 517	359971	3218	353058	6920	10622, 14324, 18026, 21728, 25430
3064	zinc finger protein 517	531720	3219	436103	6921	10623, 14325, 18027, 21729, 25431
3065	zinc finger protein 517	533965	3220	435166	6922	10624, 14326, 18028, 21730, 25432
3066	zinc finger protein 518B	326756	3221	317614	6923	10625, 14327, 18029, 21731, 25433
3067	zinc finger protein 518B	507515	3222	425298	6924	10626, 14328, 18030, 21732, 25434
3068	zinc finger protein 519	309305	3223	307908	6925	10627, 14329, 18031, 21733, 25435

3069	zinc finger protein 519	590202	3224	464872	6926	10628, 14330, 18032, 21734, 25436
3070	zinc finger protein 524	301073	3225	301073	6927	10629, 14331, 18033, 21735, 25437
3071	zinc finger protein 525	355326	3226	408929	6928	10630, 14332, 18034, 21736, 25438
3072	zinc finger protein 525	467003	3227	419136	6929	10631, 14333, 18035, 21737, 25439
3073	zinc finger protein 525	474037	3228	417696	6930	10632, 14334, 18036, 21738, 25440
3074	zinc finger protein 525	475179	3229	418468	6931	10633, 14335, 18037, 21739, 25441
3075	zinc finger protein 528	360465	3230	353652	6932	10634, 14336, 18038, 21740, 25442
3076	zinc finger protein 528	391787	3231	375664	6933	10635, 14337, 18039, 21741, 25443
3077	zinc finger protein 528	436397	3232	413711	6934	10636, 14338, 18040, 21742, 25444
3078	zinc finger protein 530	332854	3233	332861	6935	10637, 14339, 18041, 21743, 25445

3079	zinc finger protein 532	336078	3234	338217	6936	10638, 14340, 18042, 21744, 25446
3080	zinc finger protein 534	301085	3235	301085	6937	10639, 14341, 18043, 21745, 25447
3081	zinc finger protein 534	332323	3236	327538	6938	10640, 14342, 18044, 21746, 25448
3082	zinc finger protein 534	391790	3237	375667	6939	10641, 14343, 18045, 21747, 25449
3083	zinc finger protein 534	432303	3238	409421	6940	10642, 14344, 18046, 21748, 25450
3084	zinc finger protein 534	433050	3239	391358	6941	10643, 14345, 18047, 21749, 25451
3085	zinc finger protein 536	355537	3240	347730	6942	10644, 14346, 18048, 21750, 25452
3086	zinc finger protein 541	314121	3241	313258	6943	10645, 14347, 18049, 21751, 25453
3087	zinc finger protein 541	448976	3242	410847	6944	10646, 14348, 18050, 21752, 25454
3088	zinc finger protein 543	321545	3243	322545	6945	10647, 14349, 18051, 21753, 25455

3089	zinc finger protein 544	269829	3244	269829	6946	10648, 14350, 18052, 21754, 25456
3090	zinc finger protein 544	333581	3245	329320	6947	10649, 14351, 18053, 21755, 25457
3091	zinc finger protein 544	415203	3246	394341	6948	10650, 14352, 18054, 21756, 25458
3092	zinc finger protein 544	441758	3247	407489	6949	10651, 14353, 18055, 21757, 25459
3093	zinc finger protein 546	347077	3248	339823	6950	10652, 14354, 18056, 21758, 25460
3094	zinc finger protein 546	392042	3249	375896	6951	10653, 14355, 18057, 21759, 25461
3095	zinc finger protein 547	282282	3250	282282	6952	10654, 14356, 18058, 21760, 25462
3096	zinc finger protein 547	391704	3251	375585	6953	10655, 14357, 18059, 21761, 25463
3097	zinc finger protein 548	336128	3252	337555	6954	10656, 14358, 18060, 21762, 25464
3098	zinc finger protein 548	366197	3253	379482	6955	10657, 14359, 18061, 21763, 25465

3099	zinc finger protein 549	240719	3254	240719	6956	10658, 14360, 18062, 21764, 25466
3100	zinc finger protein 549	376233	3255	365407	6957	10659, 14361, 18063, 21765, 25467
3101	Zinc finger protein 550	325134	3256	446224	6958	10660, 14362, 18064, 21766, 25468
3102	Zinc finger protein 550	344222	3257	445978	6959	10661, 14363, 18065, 21767, 25469
3103	Zinc finger protein 550	506609	3258	422344	6960	10662, 14364, 18066, 21768, 25470
3104	zinc finger protein 551	282296	3259	282296	6961	10663, 14365, 18067, 21769, 25471
3105	zinc finger protein 551	356715	3260	349149	6962	10664, 14366, 18068, 21770, 25472
3106	zinc finger protein 551	359821	3261	352875	6963	10665, 14367, 18069, 21771, 25473
3107	zinc finger protein 552	391701	3262	375582	6964	10666, 14368, 18070, 21772, 25474
3108	zinc finger protein 554	317243	3263	321132	6965	10667, 14369, 18071, 21773, 25475

3109	zinc finger protein 555	334241	3264	334853	6966	10668, 14370, 18072, 21774, 25476
3110	zinc finger protein 555	382127	3265	371561	6967	10669, 14371, 18073, 21775, 25477
3111	zinc finger protein 556	307635	3266	302603	6968	10670, 14372, 18074, 21776, 25478
3112	zinc finger protein 557	252840	3267	252840	6969	10671, 14373, 18075, 21777, 25479
3113	zinc finger protein 557	414706	3268	404065	6970	10672, 14374, 18076, 21778, 25480
3114	zinc finger protein 557	439035	3269	398965	6971	10673, 14375, 18077, 21779, 25481
3115	zinc finger protein 558	301475	3270	301475	6972	10674, 14376, 18078, 21780, 25482
3116	zinc finger protein 558	444186	3271	410703	6973	10675, 14377, 18079, 21781, 25483
3117	zinc finger protein 559	317221	3272	325393	6974	10676, 14378, 18080, 21782, 25484
3118	zinc finger protein 559	393883	3273	377461	6975	10677, 14379, 18081, 21783, 25485

3119	zinc finger protein 559	538743	3274	442832	6976	10678, 14380, 18082, 21784, 25486
3120	zinc finger protein 559	587557	3275	468153	6977	10679, 14381, 18083, 21785, 25487
3121	zinc finger protein 560	301480	3276	301480	6978	10680, 14382, 18084, 21786, 25488
3122	zinc finger protein 561	302851	3277	303915	6979	10681, 14383, 18085, 21787, 25489
3123	zinc finger protein 561	354661	3278	346687	6980	10682, 14384, 18086, 21788, 25490
3124	zinc finger protein 561	421525	3279	397599	6981	10683, 14385, 18087, 21789, 25491
3125	zinc finger protein 561	424629	3280	393074	6982	10684, 14386, 18088, 21790, 25492
3126	zinc finger protein 561	435550	3281	408053	6983	10685, 14387, 18089, 21791, 25493
3127	zinc finger protein 562	293648	3282	293648	6984	10686, 14388, 18090, 21792, 25494
3128	zinc finger protein 562	448622	3283	411784	6985	10687, 14389, 18091, 21793, 25495

3129	zinc finger protein 562	453372	3284	410734	6986	10688, 14390, 18092, 21794, 25496
3130	zinc finger protein 562	453792	3285	440451	6987	10689, 14391, 18093, 21795, 25497
3131	zinc finger protein 562	537617	3286	445816	6988	10690, 14392, 18094, 21796, 25498
3132	zinc finger protein 562	541032	3287	442614	6989	10691, 14393, 18095, 21797, 25499
3133	zinc finger protein 563	293725	3288	293725	6990	10692, 14394, 18096, 21798, 25500
3134	zinc finger protein 563	318168	3289	313712	6991	10693, 14395, 18097, 21799, 25501
3135	zinc finger protein 564	339282	3290	340004	6992	10694, 14396, 18098, 21800, 25502
3136	zinc finger protein 566	392170	3291	376010	6993	10695, 14397, 18099, 21801, 25503
3137	zinc finger protein 566	424129	3292	401259	6994	10696, 14398, 18100, 21802, 25504
3138	zinc finger protein 566	427002	3293	400651	6995	10697, 14399, 18101, 21803, 25505

3139	zinc finger protein 566	434377	3294	415520	6996	10698, 14400, 18102, 21804, 25506
3140	zinc finger protein 566	454319	3295	394207	6997	10699, 14401, 18103, 21805, 25507
3141	zinc finger protein 568	333987	3296	334685	6998	10700, 14402, 18104, 21806, 25508
3142	zinc finger protein 568	415168	3297	394514	6999	10701, 14403, 18105, 21807, 25509
3143	zinc finger protein 568	455427	3298	413396	7000	10702, 14404, 18106, 21808, 25510
3144	zinc finger protein 568	444991	3299	389794	7001	10703, 14405, 18107, 21809, 25511
3145	zinc finger protein 57	306908	3300	303696	7002	10704, 14406, 18108, 21810, 25512
3146	zinc finger protein 57	395204	3301	378630	7003	10705, 14407, 18109, 21811, 25513
3147	zinc finger protein 570	330173	3302	331540	7004	10706, 14408, 18110, 21812, 25514
3148	zinc finger protein 570	388801	3303	373453	7005	10707, 14409, 18111, 21813, 25515

3149	zinc finger protein 571	328550	3304	333660	7006	10708, 14410, 18112, 21814, 25516
3150	zinc finger protein 571	358744	3305	351594	7007	10709, 14411, 18113, 21815, 25517
3151	zinc finger protein 571	451802	3306	392638	7008	10710, 14412, 18114, 21816, 25518
3152	zinc finger protein 572	319286	3307	319305	7009	10711, 14413, 18115, 21817, 25519
3153	zinc finger protein 573	339503	3308	340171	7010	10712, 14414, 18116, 21818, 25520
3154	zinc finger protein 573	357309	3309	349861	7011	10713, 14415, 18117, 21819, 25521
3155	zinc finger protein 573	378445	3310	367706	7012	10714, 14416, 18118, 21820, 25522
3156	zinc finger protein 573	392138	3311	375983	7013	10715, 14417, 18119, 21821, 25523
3157	zinc finger protein 573	427026	3312	414239	7014	10716, 14418, 18120, 21822, 25524
3158	zinc finger protein 573	536220	3313	440464	7015	10717, 14419, 18121, 21823, 25525

3159	zinc finger protein 573	590414	3314	465020	7016	10718, 14420, 18122, 21824, 25526
3160	zinc finger protein 574	222339	3315	222339	7017	10719, 14421, 18123, 21825, 25527
3161	zinc finger protein 574	359044	3316	351939	7018	10720, 14422, 18124, 21826, 25528
3162	zinc finger protein 574	535775	3317	445515	7019	10721, 14423, 18125, 21827, 25529
3163	zinc finger protein 574	600245	3318	469029	7020	10722, 14424, 18126, 21828, 25530
3164	zinc finger protein 575	314228	3319	315870	7021	10723, 14425, 18127, 21829, 25531
3165	zinc finger protein 575	458714	3320	413956	7022	10724, 14426, 18128, 21830, 25532
3166	zinc finger protein 576	336564	3321	337852	7023	10725, 14427, 18129, 21831, 25533
3167	zinc finger protein 576	391965	3322	375827	7024	10726, 14428, 18130, 21832, 25534
3168	zinc finger protein 576	525771	3323	436182	7025	10727, 14429, 18131, 21833, 25535

3169	zinc finger protein 576	528387	3324	435934	7026	10728, 14430, 18132, 21834, 25536
3170	zinc finger protein 576	529930	3325	435463	7027	10729, 14431, 18133, 21835, 25537
3171	zinc finger protein 576	533118	3326	435899	7028	10730, 14432, 18134, 21836, 25538
3172	zinc finger protein 577	301399	3327	301399	7029	10731, 14433, 18135, 21837, 25539
3173	zinc finger protein 577	419138	3328	407476	7030	10732, 14434, 18136, 21838, 25540
3174	zinc finger protein 577	446514	3329	415307	7031	10733, 14435, 18137, 21839, 25541
3175	zinc finger protein 577	453272	3330	413560	7032	10734, 14436, 18138, 21840, 25542
3176	zinc finger protein 577	458390	3331	404509	7033	10735, 14437, 18139, 21841, 25543
3177	zinc finger protein 579	325421	3332	320188	7034	10736, 14438, 18140, 21842, 25544
3178	zinc finger protein 580	325333	3333	320050	7035	10737, 14439, 18141, 21843, 25545

3179	zinc finger protein 580	543039	3334	443957	7036	10738, 14440, 18142, 21844, 25546
3180	zinc finger protein 580	545125	3335	446126	7037	10739, 14441, 18143, 21845, 25547
3181	zinc finger protein 581	270451	3336	270451	7038	10740, 14442, 18144, 21846, 25548
3182	zinc finger protein 582	301310	3337	301310	7039	10741, 14443, 18145, 21847, 25549
3183	zinc finger protein 583	291598	3338	291598	7040	10742, 14444, 18146, 21848, 25550
3184	zinc finger protein 583	333201	3339	388502	7041	10743, 14445, 18147, 21849, 25551
3185	zinc finger protein 583	391778	3340	375657	7042	10744, 14446, 18148, 21850, 25552
3186	zinc finger protein 583	537943	3341	444291	7043	10745, 14447, 18149, 21851, 25553
3187	zinc finger protein 584	306910	3342	306756	7044	10746, 14448, 18150, 21852, 25554
3188	zinc finger protein 584	322834	3343	320731	7045	10747, 14449, 18151, 21853, 25555

3189	zinc finger protein 584	354635	3344	346656	7046	10748, 14450, 18152, 21854, 25556
3190	zinc finger protein 585A	292841	3345	292841	7047	10749, 14451, 18153, 21855, 25557
3191	zinc finger protein 585A	355533	3346	347724	7048	10750, 14452, 18154, 21856, 25558
3192	zinc finger protein 585A	356958	3347	349440	7049	10751, 14453, 18155, 21857, 25559
3193	zinc finger protein 585A	392157	3348	375998	7050	10752, 14454, 18156, 21858, 25560
3194	zinc finger protein 585B	312908	3349	442139	7051	10753, 14455, 18157, 21859, 25561
3195	zinc finger protein 585B	531805	3350	436774	7052	10754, 14456, 18158, 21860, 25562
3196	zinc finger protein 585B	532828	3351	433773	7053	10755, 14457, 18159, 21861, 25563
3197	zinc finger protein 586	308137	3352	308355	7054	10756, 14458, 18160, 21862, 25564
3198	zinc finger protein 586	391702	3353	375583	7055	10757, 14459, 18161, 21863, 25565

3199	zinc finger protein 586	396150	3354	379454	7056	10758, 14460, 18162, 21864, 25566
3200	zinc finger protein 586	396154	3355	379458	7057	10759, 14461, 18163, 21865, 25567
3201	zinc finger protein 586	430084	3356	393213	7058	10760, 14462, 18164, 21866, 25568
3202	zinc finger protein 586	449441	3357	410984	7059	10761, 14463, 18165, 21867, 25569
3203	zinc finger protein 587	316462	3358	350696	7060	10762, 14464, 18166, 21868, 25570
3204	zinc finger protein 587	339656	3359	345479	7061	10763, 14465, 18167, 21869, 25571
3205	zinc finger protein 587	376209	3360	365382	7062	10764, 14466, 18168, 21870, 25572
3206	zinc finger protein 587	442832	3361	392410	7063	10765, 14467, 18169, 21871, 25573
3207	zinc finger protein 587	540851	3362	438758	7064	10766, 14468, 18170, 21872, 25574
3208	zinc finger protein 589	296437	3363	296437	7065	10767, 14469, 18171, 21873, 25575

3209	zinc finger protein 589	354698	3364	346729	7066	10768, 14470, 18172, 21874, 25576
3210	zinc finger protein 589	440261	3365	408719	7067	10769, 14471, 18173, 21875, 25577
3211	zinc finger protein 589	448461	3366	404592	7068	10770, 14472, 18174, 21876, 25578
3212	zinc finger protein 593	270812	3367	270812	7069	10771, 14473, 18175, 21877, 25579
3213	zinc finger protein 593	374266	3368	363384	7070	10772, 14474, 18176, 21878, 25580
3214	zinc finger protein 594	381752	3369	371171	7071	10773, 14475, 18177, 21879, 25581
3215	zinc finger protein 594	389222	3370	373874	7072	10774, 14476, 18178, 21880, 25582
3216	zinc finger protein 594	399604	3371	382513	7073	10775, 14477, 18179, 21881, 25583
3217	zinc finger protein 596	308811	3372	310033	7074	10776, 14478, 18180, 21882, 25584
3218	zinc finger protein 596	320552	3373	318719	7075	10777, 14479, 18181, 21883, 25585

3219	zinc finger protein 596	398612	3374	381613	7076	10778, 14480, 18182, 21884, 25586
3220	zinc finger protein 597	301744	3375	301744	7077	10779, 14481, 18183, 21885, 25587
3221	zinc finger protein 599	329285	3376	333802	7078	10780, 14482, 18184, 21886, 25588
3222	zinc finger protein 599	379196	3377	368494	7079	10781, 14483, 18185, 21887, 25589
3223	zinc finger protein 599	392229	3378	376062	7080	10782, 14484, 18186, 21888, 25590
3224	zinc finger protein 599	392231	3379	376064	7081	10783, 14485, 18187, 21889, 25591
3225	zinc finger protein 600	338230	3380	344791	7082	10784, 14486, 18188, 21890, 25592
3226	zinc finger protein 605	360187	3381	353314	7083	10785, 14487, 18189, 21891, 25593
3227	zinc finger protein 605	392321	3382	376135	7084	10786, 14488, 18190, 21892, 25594
3228	zinc finger protein 607	355202	3383	347338	7085	10787, 14489, 18191, 21893, 25595

3229	zinc finger protein 607	395835	3384	438015	7086	10788, 14490, 18192, 21894, 25596
3230	zinc finger protein 609	326648	3385	316527	7087	10789, 14491, 18193, 21895, 25597
3231	zinc finger protein 610	321287	3386	324441	7088	10790, 14492, 18194, 21896, 25598
3232	zinc finger protein 610	327920	3387	327597	7089	10791, 14493, 18195, 21897, 25599
3233	zinc finger protein 610	403906	3388	383922	7090	10792, 14494, 18196, 21898, 25600
3234	zinc finger protein 610	601151	3389	471021	7091	10793, 14495, 18197, 21899, 25601
3235	zinc finger protein 611	319783	3390	322427	7092	10794, 14496, 18198, 21900, 25602
3236	zinc finger protein 611	453741	3391	443505	7093	10795, 14497, 18199, 21901, 25603
3237	zinc finger protein 611	540744	3392	439211	7094	10796, 14498, 18200, 21902, 25604
3238	zinc finger protein 611	543227	3393	437616	7095	10797, 14499, 18201, 21903, 25605

3239	zinc finger protein 613	293471	3394	293471	7096	10798, 14500, 18202, 21904, 25606
3240	zinc finger protein 613	391794	3395	375671	7097	10799, 14501, 18203, 21905, 25607
3241	zinc finger protein 613	535279	3396	437862	7098	10800, 14502, 18204, 21906, 25608
3242	zinc finger protein 614	270649	3397	270649	7099	10801, 14503, 18205, 21907, 25609
3243	zinc finger protein 614	356322	3398	348674	7100	10802, 14504, 18206, 21908, 25610
3244	zinc finger protein 615	354939	3399	347019	7101	10803, 14505, 18207, 21909, 25611
3245	zinc finger protein 615	376716	3400	365906	7102	10804, 14506, 18208, 21910, 25612
3246	zinc finger protein 615	391793	3401	375670	7103	10805, 14507, 18209, 21911, 25613
3247	zinc finger protein 615	391795	3402	375672	7104	10806, 14508, 18210, 21912, 25614
3248	zinc finger protein 615	594083	3403	471549	7105	10807, 14509, 18211, 21913, 25615

3249	zinc finger protein 616	330123	3404	328722	7106	10808, 14510, 18212, 21914, 25616
3250	zinc finger protein 616	600228	3405	471000	7107	10809, 14511, 18213, 21915, 25617
3251	zinc finger protein 618	288466	3406	288466	7108	10810, 14512, 18214, 21916, 25618
3252	zinc finger protein 618	374124	3407	363239	7109	10811, 14513, 18215, 21917, 25619
3253	zinc finger protein 618	374126	3408	363241	7110	10812, 14514, 18216, 21918, 25620
3254	zinc finger protein 618	452710	3409	395400	7111	10813, 14515, 18217, 21919, 25621
3255	zinc finger protein 619	314686	3410	322529	7112	10814, 14516, 18218, 21920, 25622
3256	zinc finger protein 619	429348	3411	398024	7113	10815, 14517, 18219, 21921, 25623
3257	zinc finger protein 619	432264	3412	388710	7114	10816, 14518, 18220, 21922, 25624
3258	zinc finger protein 619	442066	3413	396607	7115	10817, 14519, 18221, 21923, 25625

3259	zinc finger protein 619	447116	3414	411132	7116	10818, 14520, 18222, 21924, 25626
3260	zinc finger protein 619	456778	3415	397232	7117	10819, 14521, 18223, 21925, 25627
3261	zinc finger protein 619	521353	3416	430705	7118	10820, 14522, 18224, 21926, 25628
3262	zinc finger protein 619	522736	3417	428004	7119	10821, 14523, 18225, 21927, 25629
3263	zinc finger protein 621	310898	3418	312144	7120	10822, 14524, 18226, 21928, 25630
3264	zinc finger protein 621	339296	3419	340841	7121	10823, 14525, 18227, 21929, 25631
3265	zinc finger protein 621	403205	3420	386051	7122	10824, 14526, 18228, 21930, 25632
3266	zinc finger protein 621	453351	3421	408779	7123	10825, 14527, 18229, 21931, 25633
3267	zinc finger protein 623	328466	3422	330358	7124	10826, 14528, 18230, 21932, 25634
3268	zinc finger protein 623	458270	3423	411139	7125	10827, 14529, 18231, 21933, 25635

3269	zinc finger protein 623	501748	3424	445979	7126	10828, 14530, 18232, 21934, 25636
3270	zinc finger protein 623	526926	3425	435232	7127	10829, 14531, 18233, 21935, 25637
3271	zinc finger protein 623	532796	3426	434258	7128	10830, 14532, 18234, 21936, 25638
3272	zinc finger protein 624	311331	3427	310472	7129	10831, 14533, 18235, 21937, 25639
3273	zinc finger protein 624	423860	3428	406525	7130	10832, 14534, 18236, 21938, 25640
3274	Zinc finger protein 625	355738	3429	347977	7131	10833, 14535, 18237, 21939, 25641
3275	Zinc finger protein 625	439556	3430	394380	7132	10834, 14536, 18238, 21940, 25642
3276	Zinc finger protein 625	542938	3431	438436	7133	10835, 14537, 18239, 21941, 25643
3277	zinc finger protein 626	291750	3432	291750	7134	10836, 14538, 18240, 21942, 25644
3278	zinc finger protein 626	305570	3433	445201	7135	10837, 14539, 18241, 21943, 25645

3279	zinc finger protein 626	392298	3434	376118	7136	10838, 14540, 18242, 21944, 25646
3280	zinc finger protein 626	453075	3435	390883	7137	10839, 14541, 18243, 21945, 25647
3281	zinc finger protein 626	601440	3436	469958	7138	10840, 14542, 18244, 21946, 25648
3282	zinc finger protein 629	262525	3437	262525	7139	10841, 14543, 18245, 21947, 25649
3283	zinc finger protein 639	326361	3438	325634	7140	10842, 14544, 18246, 21948, 25650
3284	zinc finger protein 639	466264	3439	419650	7141	10843, 14545, 18247, 21949, 25651
3285	zinc finger protein 639	481587	3440	418628	7142	10844, 14546, 18248, 21950, 25652
3286	zinc finger protein 639	484866	3441	418766	7143	10845, 14547, 18249, 21951, 25653
3287	zinc finger protein 639	491818	3442	418870	7144	10846, 14548, 18250, 21952, 25654
3288	zinc finger protein 639	494234	3443	417232	7145	10847, 14549, 18251, 21953, 25655

3289	zinc finger protein 639	496856	3444	417740	7146	10848, 14550, 18252, 21954, 25656
3290	zinc finger protein 64 homolog (mouse)	216923	3445	216923	7147	10849, 14551, 18253, 21955, 25657
3291	zinc finger protein 64 homolog (mouse)	346617	3446	344615	7148	10850, 14552, 18254, 21956, 25658
3292	zinc finger protein 64 homolog (mouse)	361387	3447	355179	7149	10851, 14553, 18255, 21957, 25659
3293	zinc finger protein 64 homolog (mouse)	371515	3448	360570	7150	10852, 14554, 18256, 21958, 25660
3294	zinc finger protein 64 homolog (mouse)	371516	3449	360571	7151	10853, 14555, 18257, 21959, 25661
3295	zinc finger protein 64 homolog (mouse)	371523	3450	360578	7152	10854, 14556, 18258, 21960, 25662
3296	zinc finger protein 64 homolog (mouse)	395979	3451	379303	7153	10855, 14557, 18259, 21961, 25663
3297	zinc finger protein 64 homolog (mouse)	395989	3452	379312	7154	10856, 14558, 18260, 21962, 25664
3298	zinc finger protein 64 homolog (mouse)	456175	3453	403424	7155	10857, 14559, 18261, 21963, 25665

3299	zinc finger protein 64 homolog (mouse)	546083	3454	445665	7156	10858, 14560, 18262, 21964, 25666
3300	zinc finger protein 642	372705	3455	361790	7157	10859, 14561, 18263, 21965, 25667
3301	zinc finger protein 642	372706	3456	361791	7158	10860, 14562, 18264, 21966, 25668
3302	zinc finger protein 643	361584	3457	354547	7159	10861, 14563, 18265, 21967, 25669
3303	zinc finger protein 643	411995	3458	399664	7160	10862, 14564, 18266, 21968, 25670
3304	zinc finger protein 643	431552	3459	400051	7161	10863, 14565, 18267, 21969, 25671
3305	zinc finger protein 646	300850	3460	300850	7162	10864, 14566, 18268, 21970, 25672
3306	zinc finger protein 646	394979	3461	378429	7163	10865, 14567, 18269, 21971, 25673
3307	zinc finger protein 646	428260	3462	391271	7164	10866, 14568, 18270, 21972, 25674
3308	zinc finger protein 646	439353	3463	392743	7165	10867, 14569, 18271, 21973, 25675

3309	zinc finger protein 648	339948	3464	344129	7166	10868, 14570, 18272, 21974, 25676
3310	zinc finger protein 652	362063	3465	354686	7167	10869, 14571, 18273, 21975, 25677
3311	zinc finger protein 652	430262	3466	416305	7168	10870, 14572, 18274, 21976, 25678
3312	zinc finger protein 652	508237	3467	424848	7169	10871, 14573, 18275, 21977, 25679
3313	zinc finger protein 653	293771	3468	293771	7170	10872, 14574, 18276, 21978, 25680
3314	zinc finger protein 654	309495	3469	312141	7171	10873, 14575, 18277, 21979, 25681
3315	zinc finger protein 658	377626	3470	366853	7172	10874, 14576, 18278, 21980, 25682
3316	zinc finger protein 658	441795	3471	408462	7173	10875, 14577, 18279, 21981, 25683
3317	zinc finger protein 660	322734	3472	324605	7174	10876, 14578, 18280, 21982, 25684
3318	zinc finger protein 660	416644	3473	405284	7175	10877, 14579, 18281, 21983, 25685

3319	zinc finger protein 660	441021	3474	411996	7176	10878, 14580, 18282, 21984, 25686
3320	zinc finger protein 662	328199	3475	329264	7177	10879, 14581, 18283, 21985, 25687
3321	zinc finger protein 662	440367	3476	405047	7178	10880, 14582, 18284, 21986, 25688
3322	zinc finger protein 662	541208	3477	446208	7179	10881, 14583, 18285, 21987, 25689
3323	zinc finger protein 664	337815	3478	337320	7180	10882, 14584, 18286, 21988, 25690
3324	zinc finger protein 664	392404	3479	376205	7181	10883, 14585, 18287, 21989, 25691
3325	zinc finger protein 664	535937	3480	444775	7182	10884, 14586, 18288, 21990, 25692
3326	zinc finger protein 664	538932	3481	440645	7183	10885, 14587, 18289, 21991, 25693
3327	zinc finger protein 664	539644	3482	441405	7184	10886, 14588, 18290, 21992, 25694
3328	zinc finger protein 665	396424	3483	379702	7185	10887, 14589, 18291, 21993, 25695

3329	zinc finger protein 668	300849	3484	300849	7186	10888, 14590, 18292, 21994, 25696
3330	zinc finger protein 668	394983	3485	378434	7187	10889, 14591, 18293, 21995, 25697
3331	zinc finger protein 668	414399	3486	412340	7188	10890, 14592, 18294, 21996, 25698
3332	zinc finger protein 668	417935	3487	390671	7189	10891, 14593, 18295, 21997, 25699
3333	zinc finger protein 668	426488	3488	403975	7190	10892, 14594, 18296, 21998, 25700
3334	zinc finger protein 668	442862	3489	416853	7191	10893, 14595, 18297, 21999, 25701
3335	zinc finger protein 668	535577	3490	441349	7192	10894, 14596, 18298, 22000, 25702
3336	zinc finger protein 668	538906	3491	440149	7193	10895, 14597, 18299, 22001, 25703
3337	zinc finger protein 668	539836	3492	442573	7194	10896, 14598, 18300, 22002, 25704
3338	zinc finger protein 669	343381	3493	342818	7195	10897, 14599, 18301, 22003, 25705

3339	zinc finger protein 669	358785	3494	351636	7196	10898, 14600, 18302, 22004, 25706
3340	zinc finger protein 669	366500	3495	355456	7197	10899, 14601, 18303, 22005, 25707
3341	zinc finger protein 669	366501	3496	355457	7198	10900, 14602, 18304, 22006, 25708
3342	zinc finger protein 669	448299	3497	404370	7199	10901, 14603, 18305, 22007, 25709
3343	zinc finger protein 669	535105	3498	442717	7200	10902, 14604, 18306, 22008, 25710
3344	zinc finger protein 670	366503	3499	355459	7201	10903, 14605, 18307, 22009, 25711
3345	zinc finger protein 670	474541	3500	428036	7202	10904, 14606, 18308, 22010, 25712
3346	zinc finger protein 671	317398	3501	321848	7203	10905, 14607, 18309, 22011, 25713
3347	zinc finger protein 671	335820	3502	338670	7204	10906, 14608, 18310, 22012, 25714
3348	zinc finger protein 672	306562	3503	421915	7205	10907, 14609, 18311, 22013, 25715

3349	zinc finger protein 672	306576	3504	307022	7206	10908, 14610, 18312, 22014, 25716
3350	zinc finger protein 672	423362	3505	426199	7207	10909, 14611, 18313, 22015, 25717
3351	zinc finger protein 672	428515	3506	427021	7208	10910, 14612, 18314, 22016, 25718
3352	zinc finger protein 672	505503	3507	422534	7209	10911, 14613, 18315, 22017, 25719
3353	zinc finger protein 676	397121	3508	380310	7210	10912, 14614, 18316, 22018, 25720
3354	zinc finger protein 677	333952	3509	334394	7211	10913, 14615, 18317, 22019, 25721
3355	zinc finger protein 677	416063	3510	408179	7212	10914, 14616, 18318, 22020, 25722
3356	zinc finger protein 678	343776	3511	344828	7213	10915, 14617, 18319, 22021, 25723
3357	zinc finger protein 678	397097	3512	440403	7214	10916, 14618, 18320, 22022, 25724
3358	zinc finger protein 678	440339	3513	394651	7215	10917, 14619, 18321, 22023, 25725

3359	zinc finger protein 679	255746	3514	255746	7216	10918, 14620, 18322, 22024, 25726
3360	zinc finger protein 679	421025	3515	416809	7217	10919, 14621, 18323, 22025, 25727
3361	zinc finger protein 680	309683	3516	309330	7218	10920, 14622, 18324, 22026, 25728
3362	zinc finger protein 680	447137	3517	393506	7219	10921, 14623, 18325, 22027, 25729
3363	zinc finger protein 681	395385	3518	378783	7220	10922, 14624, 18326, 22028, 25730
3364	zinc finger protein 681	402377	3519	384000	7221	10923, 14625, 18327, 22029, 25731
3365	zinc finger protein 682	341262	3520	340236	7222	10924, 14626, 18328, 22030, 25732
3366	zinc finger protein 682	358523	3521	351324	7223	10925, 14627, 18329, 22031, 25733
3367	zinc finger protein 682	397162	3522	380348	7224	10926, 14628, 18330, 22032, 25734
3368	zinc finger protein 682	397165	3523	380351	7225	10927, 14629, 18331, 22033, 25735

3369	zinc finger protein 683	349618	3524	344095	7226	10928, 14630, 18332, 22034, 25736
3370	zinc finger protein 683	374203	3525	363319	7227	10929, 14631, 18333, 22035, 25737
3371	zinc finger protein 683	374204	3526	363320	7228	10930, 14632, 18334, 22036, 25738
3372	zinc finger protein 683	403843	3527	384782	7229	10931, 14633, 18335, 22037, 25739
3373	zinc finger protein 683	416125	3528	401961	7230	10932, 14634, 18336, 22038, 25740
3374	zinc finger protein 683	436292	3529	388792	7231	10933, 14635, 18337, 22039, 25741
3375	zinc finger protein 683	451801	3530	411290	7232	10934, 14636, 18338, 22040, 25742
3376	zinc finger protein 684	372696	3531	361781	7233	10935, 14637, 18339, 22041, 25743
3377	zinc finger protein 684	372697	3532	361782	7234	10936, 14638, 18340, 22042, 25744
3378	zinc finger protein 684	372699	3533	361784	7235	10937, 14639, 18341, 22043, 25745

3379	zinc finger protein 688	223459	3534	223459	7236	10938, 14640, 18342, 22044, 25746
3380	zinc finger protein 688	395219	3535	378645	7237	10939, 14641, 18343, 22045, 25747
3381	zinc finger protein 689	287461	3536	287461	7238	10940, 14642, 18344, 22046, 25748
3382	zinc finger protein 689	443190	3537	393914	7239	10941, 14643, 18345, 22047, 25749
3383	zinc finger protein 691	372502	3538	361580	7240	10942, 14644, 18346, 22048, 25750
3384	zinc finger protein 691	372503	3539	361581	7241	10943, 14645, 18347, 22049, 25751
3385	zinc finger protein 691	372504	3540	361582	7242	10944, 14646, 18348, 22050, 25752
3386	zinc finger protein 691	372506	3541	361584	7243	10945, 14647, 18349, 22051, 25753
3387	zinc finger protein 691	372507	3542	361585	7244	10946, 14648, 18350, 22052, 25754
3388	zinc finger protein 691	372508	3543	361586	7245	10947, 14649, 18351, 22053, 25755

3389	zinc finger protein 691	397034	3544	380228	7246	10948, 14650, 18352, 22054, 25756
3390	zinc finger protein 691	397044	3545	380237	7247	10949, 14651, 18353, 22055, 25757
3391	zinc finger protein 692	306601	3546	305483	7248	10950, 14652, 18354, 22056, 25758
3392	zinc finger protein 692	366470	3547	355426	7249	10951, 14653, 18355, 22057, 25759
3393	zinc finger protein 692	366471	3548	355427	7250	10952, 14654, 18356, 22058, 25760
3394	zinc finger protein 692	391820	3549	375696	7251	10953, 14655, 18357, 22059, 25761
3395	zinc finger protein 692	427146	3550	390044	7252	10954, 14656, 18358, 22060, 25762
3396	zinc finger protein 692	451251	3551	391200	7253	10955, 14657, 18359, 22061, 25763
3397	zinc finger protein 692	496231	3552	432300	7254	10956, 14658, 18360, 22062, 25764
3398	zinc finger protein 695	339986	3553	341236	7255	10957, 14659, 18361, 22063, 25765

3399	zinc finger protein 695	391780	3554	375659	7256	10958, 14660, 18362, 22064, 25766
3400	zinc finger protein 695	487338	3555	429736	7257	10959, 14661, 18363, 22065, 25767
3401	zinc finger protein 696	330143	3556	328515	7258	10960, 14662, 18364, 22066, 25768
3402	zinc finger protein 696	518432	3557	428856	7259	10961, 14663, 18365, 22067, 25769
3403	zinc finger protein 696	518575	3558	427857	7260	10962, 14664, 18366, 22068, 25770
3404	zinc finger protein 697	421812	3559	396857	7261	10963, 14665, 18367, 22069, 25771
3405	zinc finger protein 699	308650	3560	311596	7262	10964, 14666, 18368, 22070, 25772
3406	zinc finger protein 700	254321	3561	254321	7263	10965, 14667, 18369, 22071, 25773
3407	zinc finger protein 701	301093	3562	301093	7264	10966, 14668, 18370, 22072, 25774
3408	zinc finger protein 701	391785	3563	375662	7265	10967, 14669, 18371, 22073, 25775

3409	zinc finger protein 701	540331	3564	444339	7266	10968, 14670, 18372, 22074, 25776
3410	zinc finger protein 705A	359286	3565	352233	7267	10969, 14671, 18373, 22075, 25777
3411	zinc finger protein 705A	396570	3566	379816	7268	10970, 14672, 18374, 22076, 25778
3412	zinc finger protein 705A	402465	3567	384896	7269	10971, 14673, 18375, 22077, 25779
3413	zinc finger protein 705D	400085	3568	382957	7270	10972, 14674, 18376, 22078, 25780
3414	zinc finger protein 707	358656	3569	351482	7271	10973, 14675, 18377, 22079, 25781
3415	zinc finger protein 707	418203	3570	413215	7272	10974, 14676, 18378, 22080, 25782
3416	zinc finger protein 707	454097	3571	409029	7273	10975, 14677, 18379, 22081, 25783
3417	zinc finger protein 707	526970	3572	436634	7274	10976, 14678, 18380, 22082, 25784
3418	zinc finger protein 707	529833	3573	434503	7275	10977, 14679, 18381, 22083, 25785

3419	zinc finger protein 707	532158	3574	436250	7276	10978, 14680, 18382, 22084, 25786
3420	zinc finger protein 707	532205	3575	436212	7277	10979, 14681, 18383, 22085, 25787
3421	zinc finger protein 707	534303	3576	437134	7278	10980, 14682, 18384, 22086, 25788
3422	zinc finger protein 708	356929	3577	349401	7279	10981, 14683, 18385, 22087, 25789
3423	zinc finger protein 709	397732	3578	380840	7280	10982, 14684, 18386, 22088, 25790
3424	Zinc finger protein 709	428311	3579	404127	7281	10983, 14685, 18387, 22089, 25791
3425	zinc finger protein 710	268154	3580	268154	7282	10984, 14686, 18388, 22090, 25792
3426	zinc finger protein 710	559419	3581	452993	7283	10985, 14687, 18389, 22091, 25793
3427	zinc finger protein 713	429591	3582	416662	7284	10986, 14688, 18390, 22092, 25794
3428	zinc finger protein 721	338977	3583	340524	7285	10987, 14689, 18391, 22093, 25795

3429	zinc finger protein 721	506646	3584	423586	7286	10988, 14690, 18392, 22094, 25796
3430	zinc finger protein 721	511833	3585	428878	7287	10989, 14691, 18393, 22095, 25797
3431	zinc finger protein 726	322487	3586	317125	7288	10990, 14692, 18394, 22096, 25798
3432	zinc finger protein 726	334589	3587	334762	7289	10991, 14693, 18395, 22097, 25799
3433	zinc finger protein 726	525354	3588	433319	7290	10992, 14694, 18396, 22098, 25800
3434	zinc finger protein 726	531821	3589	432583	7291	10993, 14695, 18397, 22099, 25801
3435	zinc finger protein 726	594466	3590	471516	7292	10994, 14696, 18398, 22100, 25802
3436	zinc finger protein 729	601693	3591	469582	7293	10995, 14697, 18399, 22101, 25803
3437	zinc finger protein 730	327867	3592	329365	7294	10996, 14698, 18400, 22102, 25804
3438	zinc finger protein 732	419098	3593	415774	7295	10997, 14699, 18401, 22103, 25805

3439	zinc finger protein 736	355095	3594	347210	7296	10998, 14700, 18402, 22104, 25806
3440	zinc finger protein 736	423484	3595	400852	7297	10999, 14701, 18403, 22105, 25807
3441	zinc finger protein 738	311015	3596	311957	7298	11000, 14702, 18404, 22106, 25808
3442	zinc finger protein 738	380870	3597	370252	7299	11001, 14703, 18405, 22107, 25809
3443	zinc finger protein 740	416904	3598	409463	7300	11002, 14704, 18406, 22108, 25810
3444	zinc finger protein 749	334181	3599	333980	7301	11003, 14705, 18407, 22109, 25811
3445	zinc finger protein 763	343949	3600	369774	7302	11004, 14706, 18408, 22110, 25812
3446	zinc finger protein 763	358987	3601	402017	7303	11005, 14707, 18409, 22111, 25813
3447	zinc finger protein 763	538752	3602	438117	7304	11006, 14708, 18410, 22112, 25814
3448	zinc finger protein 763	545530	3603	446166	7305	11007, 14709, 18411, 22113, 25815

3449	zinc finger protein 764	252797	3604	252797	7306	11008, 14710, 18412, 22114, 25816
3450	zinc finger protein 764	395091	3605	378526	7307	11009, 14711, 18413, 22115, 25817
3451	zinc finger protein 765	340310	3606	340432	7308	11010, 14712, 18414, 22116, 25818
3452	zinc finger protein 765	396408	3607	379689	7309	11011, 14713, 18415, 22117, 25819
3453	zinc finger protein 765	505866	3608	421579	7310	11012, 14714, 18416, 22118, 25820
3454	zinc finger protein 766	359102	3609	352005	7311	11013, 14715, 18417, 22119, 25821
3455	zinc finger protein 766	439461	3610	409652	7312	11014, 14716, 18418, 22120, 25822
3456	zinc finger protein 768	380412	3611	369777	7313	11015, 14717, 18419, 22121, 25823
3457	zinc finger protein 768	538507	3612	438517	7314	11016, 14718, 18420, 22122, 25824
3458	zinc finger protein 770	356321	3613	348673	7315	11017, 14719, 18421, 22123, 25825

3459	zinc finger protein 770	559564	3614	453474	7316	11018, 14720, 18422, 22124, 25826
3460	zinc finger protein 771	319296	3615	323945	7317	11019, 14721, 18423, 22125, 25827
3461	zinc finger protein 771	434417	3616	416197	7318	11020, 14722, 18424, 22126, 25828
3462	zinc finger protein 772	291809	3617	291809	7319	11021, 14723, 18425, 22127, 25829
3463	zinc finger protein 772	319969	3618	321015	7320	11022, 14724, 18426, 22128, 25830
3464	zinc finger protein 772	343280	3619	341165	7321	11023, 14725, 18427, 22129, 25831
3465	zinc finger protein 772	356584	3620	348992	7322	11024, 14726, 18428, 22130, 25832
3466	zinc finger protein 772	427512	3621	395967	7323	11025, 14727, 18429, 22131, 25833
3467	zinc finger protein 773	282292	3622	282292	7324	11026, 14728, 18430, 22132, 25834
3468	zinc finger protein 773	332030	3623	329020	7325	11027, 14729, 18431, 22133, 25835

3469	zinc finger protein 774	354377	3624	346348	7326	11028, 14730, 18432, 22134, 25836
3470	zinc finger protein 774	558586	3625	454184	7327	11029, 14731, 18433, 22135, 25837
3471	zinc finger protein 775	329630	3626	330838	7328	11030, 14732, 18434, 22136, 25838
3472	zinc finger protein 775	478789	3627	419336	7329	11031, 14733, 18435, 22137, 25839
3473	zinc finger protein 775	490973	3628	417483	7330	11032, 14734, 18436, 22138, 25840
3474	zinc finger protein 776	317178	3629	321812	7331	11033, 14735, 18437, 22139, 25841
3475	zinc finger protein 778	306502	3630	305203	7332	11034, 14736, 18438, 22140, 25842
3476	zinc finger protein 778	433976	3631	405289	7333	11035, 14737, 18439, 22141, 25843
3477	zinc finger protein 780A	340963	3632	341507	7334	11036, 14738, 18440, 22142, 25844
3478	zinc finger protein 780A	414720	3633	416294	7335	11037, 14739, 18441, 22143, 25845

3479	zinc finger protein 780A	443072	3634	409816	7336	11038, 14740, 18442, 22144, 25846
3480	zinc finger protein 780A	450241	3635	387705	7337	11039, 14741, 18443, 22145, 25847
3481	zinc finger protein 780A	455521	3636	400997	7338	11040, 14742, 18444, 22146, 25848
3482	zinc finger protein 780A	595687	3637	472189	7339	11041, 14743, 18445, 22147, 25849
3483	zinc finger protein 780B	221355	3638	221355	7340	11042, 14744, 18446, 22148, 25850, 26084, 26099
3484	zinc finger protein 780B	434248	3639	391641	7341	11043, 14745, 18447, 22149, 25851
3485	zinc finger protein 782	478850	3640	417577	7342	11044, 14746, 18448, 22150, 25852
3486	zinc finger protein 782	481138	3641	419397	7343	11045, 14747, 18449, 22151, 25853
3487	zinc finger protein 782	535338	3642	440624	7344	11046, 14748, 18450, 22152, 25854
3488	zinc finger protein 784	325351	3643	320096	7345	11047, 14749, 18451,

						22153, 25855
3489	zinc finger protein 785	395216	3644	378642	7346	11048, 14750, 18452, 22154, 25856
3490	zinc finger protein 785	395222	3645	378648	7347	11049, 14751, 18453, 22155, 25857
3491	zinc finger protein 785	470110	3646	420340	7348	11050, 14752, 18454, 22156, 25858
3492	zinc finger protein 786	451334	3647	404984	7349	11051, 14753, 18455, 22157, 25859
3493	zinc finger protein 786	491431	3648	417470	7350	11052, 14754, 18456, 22158, 25860
3494	zinc finger protein 786	538412	3649	445080	7351	11053, 14755, 18457, 22159, 25861
3495	zinc finger protein 787	270459	3650	270459	7352	11054, 14756, 18458, 22160, 25862
3496	Zinc finger protein 788	339302	3651	342021	7353	11055, 14757, 18459, 22161, 25863
3497	Zinc finger protein 788	397759	3652	380866	7354	11056, 14758, 18460, 22162, 25864
3498	zinc finger protein 789	331410	3653	331927	7355	11057, 14759, 18461,

						22163, 25865
3499	zinc finger protein 789	379724	3654	369047	7356	11058, 14760, 18462, 22164, 25866
3500	zinc finger protein 790	356725	3655	349161	7357	11059, 14761, 18463, 22165, 25867
3501	zinc finger protein 790	525288	3656	433389	7358	11060, 14762, 18464, 22166, 25868
3502	zinc finger protein 790	527645	3657	434537	7359	11061, 14763, 18465, 22167, 25869
3503	zinc finger protein 790	528994	3658	435944	7360	11062, 14764, 18466, 22168, 25870
3504	zinc finger protein 791	343325	3659	342974	7361	11063, 14765, 18467, 22169, 25871
3505	zinc finger protein 791	393303	3660	376980	7362	11064, 14766, 18468, 22170, 25872
3506	zinc finger protein 791	458122	3661	441761	7363	11065, 14767, 18469, 22171, 25873
3507	zinc finger protein 791	540038	3662	441038	7364	11066, 14768, 18470, 22172, 25874
3508	zinc finger protein 792	379189	3663	368487	7365	11067, 14769, 18471,

						22173, 25875
3509	zinc finger protein 792	404801	3664	385099	7366	11068, 14770, 18472, 22174, 25876
3510	zinc finger protein 799	419318	3665	415278	7367	11069, 14771, 18473, 22175, 25877
3511	zinc finger protein 799	430385	3666	411084	7368	11070, 14772, 18474, 22176, 25878
3512	zinc finger protein 800	265827	3667	265827	7369	11071, 14773, 18475, 22177, 25879
3513	zinc finger protein 800	393312	3668	376988	7370	11072, 14774, 18476, 22178, 25880
3514	zinc finger protein 800	393313	3669	376989	7371	11073, 14775, 18477, 22179, 25881
3515	zinc finger protein 800	434602	3670	403945	7372	11074, 14776, 18478, 22180, 25882
3516	zinc finger protein 800	436992	3671	401109	7373	11075, 14777, 18479, 22181, 25883
3517	zinc finger protein 800	439506	3672	389776	7374	11076, 14778, 18480, 22182, 25884
3518	zinc finger protein 805	354309	3673	365414	7375	11077, 14779, 18481,

						22183, 25885
3519	zinc finger protein 805	414468	3674	412999	7376	11078, 14780, 18482, 22184, 25886
3520	zinc finger protein 805	535550	3675	440067	7377	11079, 14781, 18483, 22185, 25887
3521	zinc finger protein 805	541238	3676	437632	7378	11080, 14782, 18484, 22186, 25888
3522	zinc finger protein 808	359798	3677	352846	7379	11081, 14783, 18485, 22187, 25889
3523	zinc finger protein 813	396403	3678	379684	7380	11082, 14784, 18486, 22188, 25890
3524	zinc finger protein 813	396421	3679	379699	7381	11083, 14785, 18487, 22189, 25891
3525	zinc finger protein 816	357666	3680	350295	7382	11084, 14786, 18488, 22190, 25892
3526	zinc finger protein 816	434371	3681	438519	7383	11085, 14787, 18489, 22191, 25893
3527	zinc finger protein 816	444460	3682	403266	7384	11086, 14788, 18490, 22192, 25894
3528	zinc finger protein 816	457013	3683	408965	7385	11087, 14789, 18491,

						22193, 25895
3529	zinc finger protein 816	549216	3684	449832	7386	11088, 14790, 18492, 22194, 25896
3530	zinc finger protein 82 homolog (mouse)	392161	3685	431265	7387	11089, 14791, 18493, 22195, 25897
3531	zinc finger protein 82 homolog (mouse)	392171	3686	446080	7388	11090, 14792, 18494, 22196, 25898
3532	zinc finger protein 823	341191	3687	340683	7389	11091, 14793, 18495, 22197, 25899
3533	zinc finger protein 823	431998	3688	410654	7390	11092, 14794, 18496, 22198, 25900
3534	zinc finger protein 823	545749	3689	440162	7391	11093, 14795, 18497, 22199, 25901
3535	zinc finger protein 827	281318	3690	281318	7392	11094, 14796, 18498, 22200, 25902
3536	zinc finger protein 827	440280	3691	405136	7393	11095, 14797, 18499, 22201, 25903
3537	zinc finger protein 827	508784	3692	421863	7394	11096, 14798, 18500, 22202, 25904
3538	zinc finger protein 827	513320	3693	423130	7395	11097, 14799, 18501,

						22203, 25905
3539	zinc finger protein 827	379448	3694	368761	7396	11098, 14800, 18502, 22204, 25906
3540	zinc finger protein 829	391711	3695	429266	7397	11099, 14801, 18503, 22205, 25907
3541	zinc finger protein 829	520965	3696	428679	7398	11100, 14802, 18504, 22206, 25908
3542	zinc finger protein 836	322146	3697	325038	7399	11101, 14803, 18505, 22207, 25909
3543	zinc finger protein 836	396443	3698	379720	7400	11102, 14804, 18506, 22208, 25910
3544	zinc finger protein 837	427624	3699	405699	7401	11103, 14805, 18507, 22209, 25911
3545	zinc finger protein 837	597582	3700	471478	7402	11104, 14806, 18508, 22210, 25912
3546	zinc finger protein 84	327668	3701	331465	7403	11105, 14807, 18509, 22211, 25913
3547	zinc finger protein 84	392319	3702	376133	7404	11106, 14808, 18510, 22212, 25914
3548	zinc finger protein 84	438628	3703	387416	7405	11107, 14809, 18511,

						22213, 25915
3549	Zinc finger protein 84	451927	3704	394086	7406	11108, 14810, 18512, 22214, 25916
3550	zinc finger protein 84	536123	3705	445958	7407	11109, 14811, 18513, 22215, 25917
3551	zinc finger protein 84	539354	3706	445549	7408	11110, 14812, 18514, 22216, 25918
3552	zinc finger protein 84	540031	3707	445820	7409	11111, 14813, 18515, 22217, 25919
3553	zinc finger protein 84	542874	3708	442963	7410	11112, 14814, 18516, 22218, 25920
3554	zinc finger protein 84	543310	3709	438982	7411	11113, 14815, 18517, 22219, 25921
3555	zinc finger protein 84	543758	3710	437949	7412	11114, 14816, 18518, 22220, 25922
3556	zinc finger protein 84	545299	3711	437636	7413	11115, 14817, 18519, 22221, 25923
3557	zinc finger protein 841	359973	3712	353060	7414	11116, 14818, 18520, 22222, 25924
3558	zinc finger protein 841	389534	3713	374185	7415	11117, 14819, 18521,

						22223, 25925
3559	zinc finger protein 841	426391	3714	415453	7416	11118, 14820, 18522, 22224, 25926
3560	zinc finger protein 844	439326	3715	392024	7417	11119, 14821, 18523, 22225, 25927
3561	zinc finger protein 844	535505	3716	438249	7418	11120, 14822, 18524, 22226, 25928
3562	zinc finger protein 844	541708	3717	445845	7419	11121, 14823, 18525, 22227, 25929
3563	zinc finger protein 845	359916	3718	352990	7420	11122, 14824, 18526, 22228, 25930
3564	zinc finger protein 845	427984	3719	412086	7421	11123, 14825, 18527, 22229, 25931
3565	zinc finger protein 845	458035	3720	388311	7422	11124, 14826, 18528, 22230, 25932
3566	zinc finger protein 846	397902	3721	380999	7423	11125, 14827, 18529, 22231, 25933
3567	zinc finger protein 860	360311	3722	373274	7424	11126, 14828, 18530, 22232, 25934
3568	zinc finger protein 862	223210	3723	223210	7425	11127, 14829, 18531,

						22233, 25935
3569	zinc finger protein 879	444149	3724	414887	7426	11128, 14830, 18532, 22234, 25936
3570	zinc finger protein 879	521285	3725	431043	7427	11129, 14831, 18533, 22235, 25937
3571	zinc finger protein 879	522442	3726	428477	7428	11130, 14832, 18534, 22236, 25938
3572	zinc finger protein 91 homolog (mouse)	316059	3727	339030	7429	11131, 14833, 18535, 22237, 25939
3573	zinc finger protein 91 homolog (mouse)	389918	3728	374568	7430	11132, 14834, 18536, 22238, 25940
3574	zinc finger protein interacting with K protein 1 homolog (mouse)	307468	3729	303820	7431	11133, 14835, 18537, 22239, 25941
3575	zinc finger protein interacting with K protein 1 homolog (mouse)	356724	3730	349160	7432	11134, 14836, 18538, 22240, 25942
3576	zinc finger protein interacting with K protein 1 homolog (mouse)	536878	3731	438487	7433	11135, 14837, 18539, 22241, 25943
3577	zinc finger protein interacting with K protein 1 homolog (mouse)	597850	3732	472867	7434	11136, 14838, 18540, 22242, 25944
3578	zinc finger with KRAB and SCAN domains 1	324306	3733	323148	7435	11137, 14839, 18541,

						22243, 25945
3579	zinc finger with KRAB and SCAN domains 1	426572	3734	409172	7436	11138, 14840, 18542, 22244, 25946
3580	zinc finger with KRAB and SCAN domains 1	432317	3735	394445	7437	11139, 14841, 18543, 22245, 25947
3581	zinc finger with KRAB and SCAN domains 1	535170	3736	443508	7438	11140, 14842, 18544, 22246, 25948
3582	zinc finger with KRAB and SCAN domains 2	328086	3737	331626	7439	11141, 14843, 18545, 22247, 25949
3583	zinc finger with KRAB and SCAN domains 2	536768	3738	441720	7440	11142, 14844, 18546, 22248, 25950
3584	zinc finger with KRAB and SCAN domains 5	326775	3739	322872	7441	11143, 14845, 18547, 22249, 25951
3585	zinc finger with KRAB and SCAN domains 5	394170	3740	377725	7442	11144, 14846, 18548, 22250, 25952
3586	zinc finger with KRAB and SCAN domains 5	439985	3741	392643	7443	11145, 14847, 18549, 22251, 25953
3587	zinc finger with KRAB and SCAN domains 5	451158	3742	392104	7444	11146, 14848, 18550, 22252, 25954
3588	zinc finger with KRAB and SCAN domains 5	537357	3743	445364	7445	11147, 14849, 18551,

						22253, 25955
3589	zinc finger, C3HC-type containing 1	311873	3744	309301	7446	11148, 14850, 18552, 22254, 25956
3590	zinc finger, C3HC-type containing 1	358303	3745	351052	7447	11149, 14851, 18553, 22255, 25957
3591	zinc finger, C3HC-type containing 1	360708	3746	353933	7448	11150, 14852, 18554, 22256, 25958
3592	zinc finger, CCCH-type with G patch domain	328969	3747	332013	7449	11151, 14853, 18555, 22257, 25959
3593	zinc finger, CCCH-type with G patch domain	355969	3748	348242	7450	11152, 14854, 18556, 22258, 25960
3594	zinc finger, CCCH-type with G patch domain	357119	3749	349634	7451	11153, 14855, 18557, 22259, 25961
3595	zinc finger, CCCH-type with G patch domain	369967	3750	358984	7452	11154, 14856, 18558, 22260, 25962
3596	zinc finger, CCCH-type with G patch domain	431125	3751	403966	7453	11155, 14857, 18559, 22261, 25963
3597	zinc finger, CCCH-type with G patch domain	448100	3752	391176	7454	11156, 14858, 18560, 22262, 25964
3598	zinc finger, imprinted 3	269834	3753	269834	7455	11157, 14859, 18561,

						22263, 25965
3599	zinc finger, matrin-type 1	372782	3754	361868	7456	11158, 14860, 18562, 22264, 25966
3600	zinc finger, matrin-type 1	458570	3755	413044	7457	11159, 14861, 18563, 22265, 25967
3601	zinc finger, matrin-type 1	540921	3756	437529	7458	11160, 14862, 18564, 22266, 25968
3602	zinc finger, matrin-type 2	274712	3757	274712	7459	11161, 14863, 18565, 22267, 25969
3603	zinc finger, matrin-type 3	311417	3758	311221	7460	11162, 14864, 18566, 22268, 25970
3604	zinc finger, matrin-type 3	414084	3759	398920	7461	11163, 14865, 18567, 22269, 25971
3605	zinc finger, matrin-type 3	432729	3760	396506	7462	11164, 14866, 18568, 22270, 25972
3606	zinc finger, matrin-type 4	297737	3761	297737	7463	11165, 14867, 18569, 22271, 25973
3607	zinc finger, matrin-type 4	315769	3762	319785	7464	11166, 14868, 18570, 22272, 25974
3608	zinc finger, matrin-type 4	519406	3763	428423	7465	11167, 14869, 18571,

						22273, 25975
3609	zinc finger, MIZ-type containing 2	265346	3764	265346	7466	11168, 14870, 18572, 22274, 25976
3610	zinc finger, MIZ-type containing 2	309315	3765	311778	7467	11169, 14871, 18573, 22275, 25977
3611	zinc finger, MIZ-type containing 2	414051	3766	412848	7468	11170, 14872, 18574, 22276, 25978
3612	zinc finger, MIZ-type containing 2	441627	3767	414723	7469	11171, 14873, 18575, 22277, 25979
3613	zinc finger, MIZ-type containing 2	457123	3768	415501	7470	11172, 14874, 18576, 22278, 25980
3614	zinc finger, MYM-type 1	359858	3769	352920	7471	11173, 14875, 18577, 22279, 25981
3615	zinc finger, MYM-type 1	373329	3770	362426	7472	11174, 14876, 18578, 22280, 25982
3616	zinc finger, MYM-type 1	373330	3771	362427	7473	11175, 14877, 18579, 22281, 25983
3617	zinc finger, MYM-type 1	417119	3772	394233	7474	11176, 14878, 18580, 22282, 25984
3618	zinc finger, MYM-type 5	337963	3773	337034	7475	11177, 14879, 18581,

						22283, 25985
3619	zinc finger, MYM-type 5	382905	3774	372361	7476	11178, 14880, 18582, 22284, 25986
3620	zinc finger, MYM-type 5	382907	3775	372364	7477	11179, 14881, 18583, 22285, 25987
3621	zinc finger, MYM-type 6	317538	3776	326695	7478	11180, 14882, 18584, 22286, 25988
3622	zinc finger, MYM-type 6	357182	3777	349708	7479	11181, 14883, 18585, 22287, 25989
3623	zinc finger, MYM-type 6	373333	3778	362430	7480	11182, 14884, 18586, 22288, 25990
3624	zinc finger, MYM-type 6	373340	3779	362437	7481	11183, 14885, 18587, 22289, 25991
3625	zinc finger, MYM-type 6	415531	3780	391337	7482	11184, 14886, 18588, 22290, 25992
3626	zinc finger, MYND-type containing 11	309776	3781	309992	7483	11185, 14887, 18589, 22291, 25993
3627	zinc finger, MYND-type containing 11	381584	3782	370996	7484	11186, 14888, 18590, 22292, 25994
3628	zinc finger, MYND-type containing 11	381591	3783	371003	7485	11187, 14889, 18591,

						22293, 25995
3629	zinc finger, MYND-type containing 11	381602	3784	371015	7486	11188, 14890, 18592, 22294, 25996
3630	zinc finger, MYND-type containing 11	381604	3785	371017	7487	11189, 14891, 18593, 22295, 25997
3631	zinc finger, MYND-type containing 11	381607	3786	371020	7488	11190, 14892, 18594, 22296, 25998
3632	zinc finger, MYND-type containing 11	397959	3787	381050	7489	11191, 14893, 18595, 22297, 25999
3633	zinc finger, MYND-type containing 11	397962	3788	381053	7490	11192, 14894, 18596, 22298, 26000
3634	zinc finger, MYND-type containing 11	403354	3789	385484	7491	11193, 14895, 18597, 22299, 26001
3635	zinc finger, MYND-type containing 11	509513	3790	424205	7492	11194, 14896, 18598, 22300, 26002
3636	zinc finger, MYND-type containing 11	535374	3791	439587	7493	11195, 14897, 18599, 22301, 26003
3637	zinc finger, MYND-type containing 11	545619	3792	438461	7494	11196, 14898, 18600, 22302, 26004
3638	zinc finger, MYND-type containing 8	262975	3793	262975	7495	11197, 14899, 18601,

						22303, 26005
3639	zinc finger, MYND-type containing 8	311275	3794	312237	7496	11198, 14900, 18602, 22304, 26006
3640	zinc finger, MYND-type containing 8	352431	3795	335537	7497	11199, 14901, 18603, 22305, 26007
3641	zinc finger, MYND-type containing 8	355972	3796	348246	7498	11200, 14902, 18604, 22306, 26008
3642	zinc finger, MYND-type containing 8	360911	3797	354166	7499	11201, 14903, 18605, 22307, 26009
3643	zinc finger, MYND-type containing 8	372023	3798	361093	7500	11202, 14904, 18606, 22308, 26010
3644	zinc finger, MYND-type containing 8	396281	3799	379577	7501	11203, 14905, 18607, 22309, 26011
3645	zinc finger, MYND-type containing 8	441977	3800	393806	7502	11204, 14906, 18608, 22310, 26012
3646	zinc finger, MYND-type containing 8	446894	3801	394379	7503	11205, 14907, 18609, 22311, 26013
3647	zinc finger, MYND-type containing 8	446994	3802	396725	7504	11206, 14908, 18610, 22312, 26014
3648	zinc finger, MYND-type containing 8	461685	3803	418210	7505	11207, 14909, 18611,

						22313, 26015
3649	zinc finger, MYND-type containing 8	467200	3804	418495	7506	11208, 14910, 18612, 22314, 26016
3650	zinc finger, MYND-type containing 8	536340	3805	439800	7507	11209, 14911, 18613, 22315, 26017
3651	zinc finger, MYND-type containing 8	540497	3806	443086	7508	11210, 14912, 18614, 22316, 26018
3652	zinc finger, NFX1-type containing 1	371744	3807	360809	7509	11211, 14913, 18615, 22317, 26019
3653	zinc finger, NFX1-type containing 1	371752	3808	360817	7510	11212, 14914, 18616, 22318, 26020
3654	zinc finger, NFX1-type containing 1	371754	3809	360819	7511	11213, 14915, 18617, 22319, 26021
3655	zinc finger, NFX1-type containing 1	396105	3810	379412	7512	11214, 14916, 18618, 22320, 26022
3656	zinc finger, NFX1-type containing 1	396106	3811	379413	7513	11215, 14917, 18619, 22321, 26023
3657	zinc finger, NFX1-type containing 1	455070	3812	413800	7514	11216, 14918, 18620, 22322, 26024
3658	zinc finger, NFX1-type containing 1	537431	3813	444627	7515	11217, 14919, 18621,

						22323, 26025
3659	zinc finger, RAN-binding domain containing 2	254821	3814	254821	7516	11218, 14920, 18622, 22324, 26026
3660	zinc finger, RAN-binding domain containing 2	370920	3815	359958	7517	11219, 14921, 18623, 22325, 26027
3661	zinc finger, SWIM-type containing 1	372520	3816	361598	7518	11220, 14922, 18624, 22326, 26028
3662	zinc finger, SWIM-type containing 1	372523	3817	361601	7519	11221, 14923, 18625, 22327, 26029
3663	zinc finger, SWIM-type containing 7	399277	3818	382218	7520	11222, 14924, 18626, 22328, 26030
3664	zinc finger, SWIM-type containing 7	472495	3819	419138	7521	11223, 14925, 18627, 22329, 26031
3665	zinc finger, ZZ-type containing 3	370798	3820	359834	7522	11224, 14926, 18628, 22330, 26032
3666	zinc finger, ZZ-type containing 3	370801	3821	359837	7523	11225, 14927, 18629, 22331, 26033
3667	zinc finger, ZZ-type containing 3	414381	3822	392408	7524	11226, 14928, 18630, 22332, 26034
3668	zinc finger, ZZ-type containing 3	433749	3823	393779	7525	11227, 14929, 18631,

						22333, 26035
3669	zinc ribbon domain containing 1	332435	3824	331111	7526	11228, 14930, 18632, 22334, 26036
3670	zinc ribbon domain containing 1	359374	3825	352333	7527	11229, 14931, 18633, 22335, 26037
3671	zinc ribbon domain containing 1	376782	3826	365978	7528	11230, 14932, 18634, 22336, 26038
3672	zinc ribbon domain containing 1	376785	3827	365981	7529	11231, 14933, 18635, 22337, 26039
3673	zinc ribbon domain containing 1	383613	3828	373108	7530	11232, 14934, 18636, 22338, 26040
3674	zinc ribbon domain containing 1	400659	3829	383500	7531	11233, 14935, 18637, 22339, 26041
3675	zinc ribbon domain containing 1	400660	3830	383501	7532	11234, 14936, 18638, 22340, 26042
3676	zinc ribbon domain containing 1	400662	3831	383503	7533	11235, 14937, 18639, 22341, 26043
3677	zinc ribbon domain containing 1	412396	3832	396922	7534	11236, 14938, 18640, 22342, 26044
3678	zinc ribbon domain containing 1	417275	3833	397636	7535	11237, 14939, 18641,

						22343, 26045
3679	zinc ribbon domain containing 1	417738	3834	407715	7536	11238, 14940, 18642, 22344, 26046
3680	zinc ribbon domain containing 1	420100	3835	410530	7537	11239, 14941, 18643, 22345, 26047
3681	zinc ribbon domain containing 1	428913	3836	414110	7538	11240, 14942, 18644, 22346, 26048
3682	zinc ribbon domain containing 1	429558	3837	410954	7539	11241, 14943, 18645, 22347, 26049
3683	zinc ribbon domain containing 1	431032	3838	416599	7540	11242, 14944, 18646, 22348, 26050
3684	zinc ribbon domain containing 1	431416	3839	395065	7541	11243, 14945, 18647, 22349, 26051
3685	zinc ribbon domain containing 1	432227	3840	399302	7542	11244, 14946, 18648, 22350, 26052
3686	zinc ribbon domain containing 1	432545	3841	405264	7543	11245, 14947, 18649, 22351, 26053
3687	zinc ribbon domain containing 1	432904	3842	414720	7544	11246, 14948, 18650, 22352, 26054
3688	zinc ribbon domain containing 1	433264	3843	393236	7545	11247, 14949, 18651,

						22353, 26055
3689	zinc ribbon domain containing 1	437373	3844	410127	7546	11248, 14950, 18652, 22354, 26056
3690	zinc ribbon domain containing 1	437507	3845	412369	7547	11249, 14951, 18653, 22355, 26057
3691	zinc ribbon domain containing 1	441251	3846	413265	7548	11250, 14952, 18654, 22356, 26058
3692	zinc ribbon domain containing 1	442585	3847	394779	7549	11251, 14953, 18655, 22357, 26059
3693	zinc ribbon domain containing 1	443142	3848	391809	7550	11252, 14954, 18656, 22358, 26060
3694	zinc ribbon domain containing 1	443494	3849	395397	7551	11253, 14955, 18657, 22359, 26061
3695	zinc ribbon domain containing 1	444027	3850	396661	7552	11254, 14956, 18658, 22360, 26062
3696	zinc ribbon domain containing 1	444794	3851	407364	7553	11255, 14957, 18659, 22361, 26063
3697	zinc ribbon domain containing 1	446493	3852	399966	7554	11256, 14958, 18660, 22362, 26064
3698	zinc ribbon domain containing 1	451875	3853	387914	7555	11257, 14959, 18661,

						22363, 26065
3699	zinc ribbon domain containing 1	453694	3854	405636	7556	11258, 14960, 18662, 22364, 26066
3700	zinc ribbon domain containing 1	455948	3855	402198	7557	11259, 14961, 18663, 22365, 26067
3701	ZXD family zinc finger C	336332	3856	337694	7558	11260, 14962, 18664, 22366, 26068
3702	ZXD family zinc finger C	389709	3857	374359	7559	11261, 14963, 18665, 22367, 26069

Protein Cleavage Signals and Sites

[000230] In one embodiment, the polypeptides of the present invention may include at least one protein cleavage signal containing at least one protein cleavage site. The protein cleavage site may be located at the N-terminus, the C-terminus, at any space between the N- and the C- termini such as, but not limited to, half-way between the N- and C-termini, between the N-terminus and the half way point, between the half way point and the C-terminus, and combinations thereof.

[000231] The polypeptides of the present invention may include, but is not limited to, a proprotein convertase (or prohormone convertase), thrombin or Factor Xa protein cleavage signal. Proprotein convertases are a family of nine proteinases, comprising seven basic amino acid-specific subtilisin-like serine proteinases related to yeast kexin, known as prohormone convertase 1/3 (PC1/3), PC2, furin, PC4, PC5/6, paired basic amino-acid cleaving enzyme 4 (PACE4) and PC7, and two other subtilases that cleave at non-basic residues, called subtilisin kexin isozyme 1 (SKI-1) and proprotein convertase subtilisin kexin 9 (PCSK9). Non-limiting examples of protein cleavage signal amino acid sequences are listing in Table 7. In Table 7, "X" refers to any amino acid, "n" may

be 0, 2, 4 or 6 amino acids and “*” refers to the protein cleavage site. In Table 7, SEQ ID NO: 26156 refers to when n=4 and SEQ ID NO: 26157 refers to when n=6.

Table 7. Protein Cleavage Site Sequences

Protein Cleavage Signal	Amino Acid Cleavage Sequence	SEQ ID NO
Proprotein convertase	R-X-X-R*	26154
	R-X-K/R-R*	26155
	K/R-X _n -K/R*	26156 or 26157
Thrombin	L-V-P-R*-G-S	26158
	L-V-P-R*	26159
	A/F/G/I/L/T/V/M-A/F/G/I/L/T/V/W-P-R*	26160
Factor Xa	I-E-G-R*	26161
	I-D-G-R*	26162
	A-E-G-R*	26163
	A/F/G/I/L/T/V/M-D/E-G-R*	26164

[000232] In one embodiment, the primary constructs and the mmRNA of the present invention may be engineered such that the primary construct or mmRNA contains at least one encoded protein cleavage signal. The encoded protein cleavage signal may be located before the start codon, after the start codon, before the coding region, within the coding region such as, but not limited to, half way in the coding region, between the start codon and the half way point, between the half way point and the stop codon, after the coding region, before the stop codon, between two stop codons, after the stop codon and combinations thereof.

[000233] In one embodiment, the primary constructs or mmRNA of the present invention may include at least one encoded protein cleavage signal containing at least one protein cleavage site. The encoded protein cleavage signal may include, but is not limited to, a proprotein convertase (or prohormone convertase), thrombin and/or Factor Xa protein cleavage signal. One of skill in the art may use Table 1 above or other known methods to determine the appropriate encoded protein cleavage signal to include in the primary constructs or mmRNA of the present invention. For example, starting with the signal of Table 7 and considering the codons of Table 1 one can design a signal for the primary construct which can produce a protein signal in the resulting polypeptide.

[000234] In one embodiment, the polypeptides of the present invention include at least one protein cleavage signal and/or site.

[000235] As a non-limiting example, U.S. Pat. No. 7,374,930 and U.S. Pub. No. 20090227660, herein incorporated by reference in their entireties, use a furin cleavage site to cleave the N-terminal methionine of GLP-1 in the expression product from the Golgi apparatus of the cells. In one embodiment, the polypeptides of the present invention include at least one protein cleavage signal and/or site with the proviso that the polypeptide is not GLP-1.

[000236] In one embodiment, the primary constructs or mmRNA of the present invention includes at least one encoded protein cleavage signal and/or site.

[000237] In one embodiment, the primary constructs or mmRNA of the present invention includes at least one encoded protein cleavage signal and/or site with the proviso that the primary construct or mmRNA does not encode GLP-1.

[000238] In one embodiment, the primary constructs or mmRNA of the present invention may include more than one coding region. Where multiple coding regions are present in the primary construct or mmRNA of the present invention, the multiple coding regions may be separated by encoded protein cleavage sites. As a non-limiting example, the primary construct or mmRNA may be signed in an ordered pattern. On such pattern follows AXBY form where A and B are coding regions which may be the same or different coding regions and/or may encode the same or different polypeptides, and X and Y are encoded protein cleavage signals which may encode the same or different protein cleavage signals. A second such pattern follows the form AXYBZ where A and B are coding regions which may be the same or different coding regions and/or may encode the same or different polypeptides, and X, Y and Z are encoded protein cleavage signals which may encode the same or different protein cleavage signals. A third pattern follows the form ABXCY where A, B and C are coding regions which may be the same or different coding regions and/or may encode the same or different polypeptides, and X and Y are encoded protein cleavage signals which may encode the same or different protein cleavage signals.

[000239] In one embodiment, the polypeptides, primary constructs and mmRNA can also contain sequences that encode protein cleavage sites so that the polypeptides,

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CECI EST LE TOME 1 DE 3
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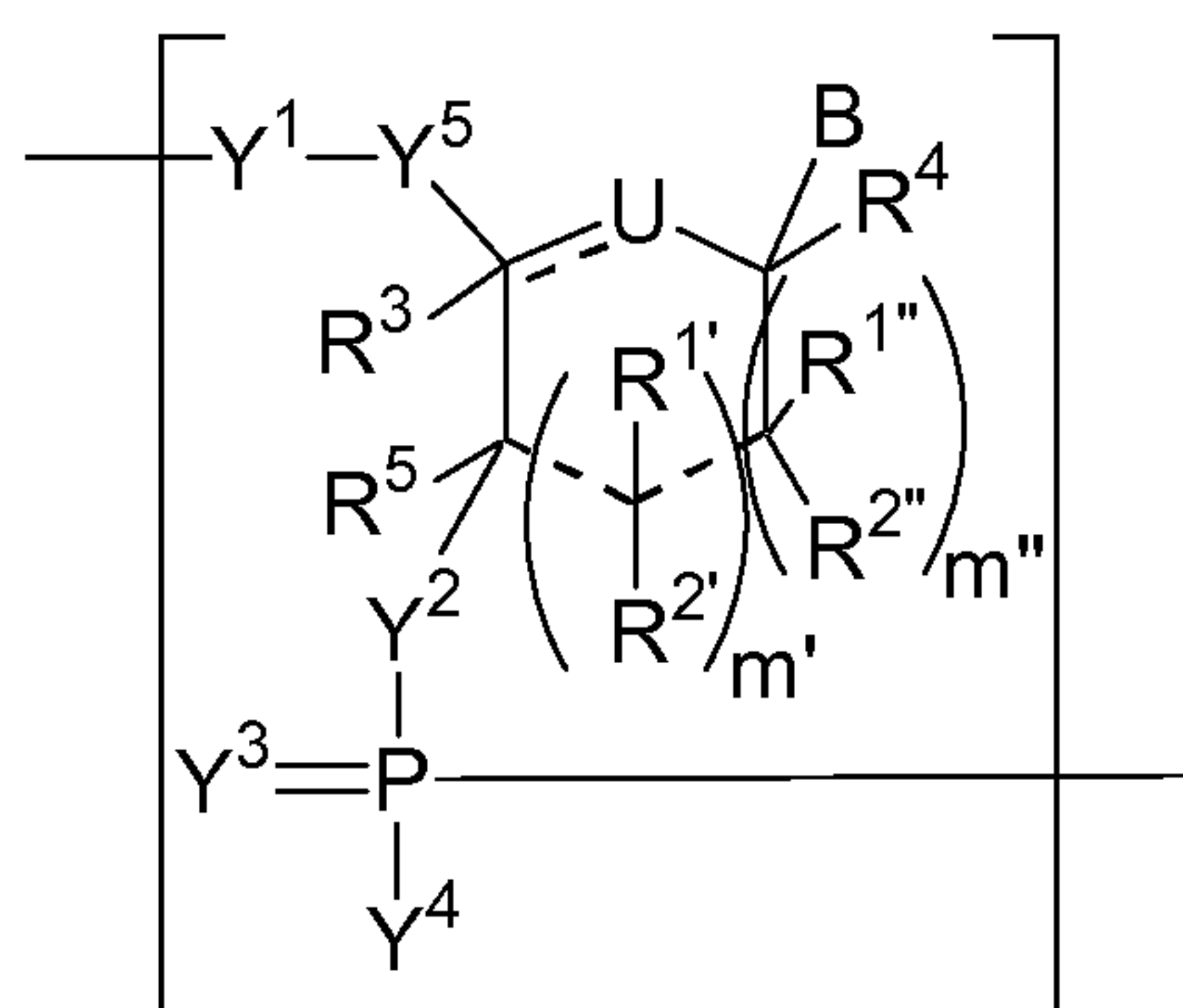
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Claims

We claim:

1. An isolated polynucleotide comprising;
 - (a) a first region of linked nucleosides, said first region encoding a polypeptide of interest, said polypeptide of interest selected from the group consisting of SEQ ID NOs 3858-7559;
 - (b) a first flanking region located at the 5' terminus of said first region comprising;
 - (i) a sequence of linked nucleosides selected from the group consisting of the native 5' UTR of any of the nucleic acids that encode any of SEQ ID NOs 3858-7559, SEQ ID NOs: 1-4 and functional variants thereof; and
 - (ii) at least one 5' terminal cap;
 - (c) a second flanking region located at the 3' terminus of said first region comprising;
 - (i') a sequence of linked nucleosides selected from the group consisting of the native 3' UTR of any of the nucleic acids that encode any of SEQ ID NOs 3858-7559, SEQ ID NOs 5-21 and functional variants thereof; and
 - (ii') a 3' tailing sequence of linked nucleosides.
2. The isolated polynucleotide of claim 1 wherein the first region of linked nucleosides comprises at least an open reading frame of a nucleic acid sequence, wherein the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7560-26153.
3. The isolated polynucleotide of claim 1, wherein the 3'tailing sequence of linked nucleosides is selected from the group consisting of a poly-A tail of approximately 160 nucleotides and a polyA-G quartet.
4. The isolated polynucleotide of any one of claims 1-3 which is purified.

5. The isolated polynucleotide of any one of claims 1-4, wherein the at least one 5' terminal cap is selected from the group consisting of Cap0, Cap1, ARCA, inosine, N1-methyl-guanosine, 2'fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine, LNA-guanosine, and 2-azido-guanosine.
6. The isolated polynucleotide of any preceding claim, wherein at least one of said linked nucleosides comprises at least one modification as compared to the chemical structure of an A, G, U or C ribonucleotide.
7. The isolated polynucleotide of claim 6, wherein at least one said modification is located in a nucleoside base and/or sugar portion.
8. The isolated polynucleotide of any one of claims 1-7, wherein said first region comprises n number of linked nucleosides having Formula (Ia):



(Ia), or a pharmaceutically acceptable salt or

stereoisomer thereof,

wherein

U is O, S, N(R^U)_{nu}, or C(R^U)_{nu}, wherein nu is an integer from 0 to 2 and each R^U is, independently, H, halo, or optionally substituted alkyl;

== is a single or double bond;

--- is a single bond or absent;

each of R^{1'}, R^{2'}, R^{1''}, R^{2''}, R³, R⁴, and R⁵ is, independently, H, halo, hydroxy, thiol, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted aminoalkoxy, optionally substituted alkoxyalkoxy, optionally substituted hydroxyalkoxy, optionally

substituted amino, azido, optionally substituted aryl, optionally substituted aminoalkyl, or absent; wherein the combination of R³ with one or more of R^{1'}, R^{1''}, R^{2'}, R^{2''}, or R⁵ can join together to form optionally substituted alkylene or optionally substituted heteroalkylene and, taken together with the carbons to which they are attached, provide an optionally substituted heterocyclyl; wherein the combination of R⁵ with one or more of R^{1'}, R^{1''}, R^{2'}, or R^{2''} can join together to form optionally substituted alkylene or optionally substituted heteroalkylene and, taken together with the carbons to which they are attached, provide an optionally substituted heterocyclyl; and wherein the combination of R⁴ and one or more of R^{1'}, R^{1''}, R^{2'}, R^{2''}, R³, or R⁵ can join together to form optionally substituted alkylene or optionally substituted heteroalkylene and, taken together with the carbons to which they are attached, provide an optionally substituted heterocyclyl;

each of Y¹, Y², and Y³, is, independently, O, S, -NR^{N1}-, optionally substituted alkylene, or optionally substituted heteroalkylene, wherein R^{N1} is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, or absent;

each Y⁴ is, independently, H, hydroxy, thiol, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted thioalkoxy, optionally substituted alkoxyalkoxy, or optionally substituted amino;

each Y⁵ is, independently, O, S, optionally substituted alkylene, or optionally substituted heteroalkylene;

n is an integer from 1 to 100,000; and

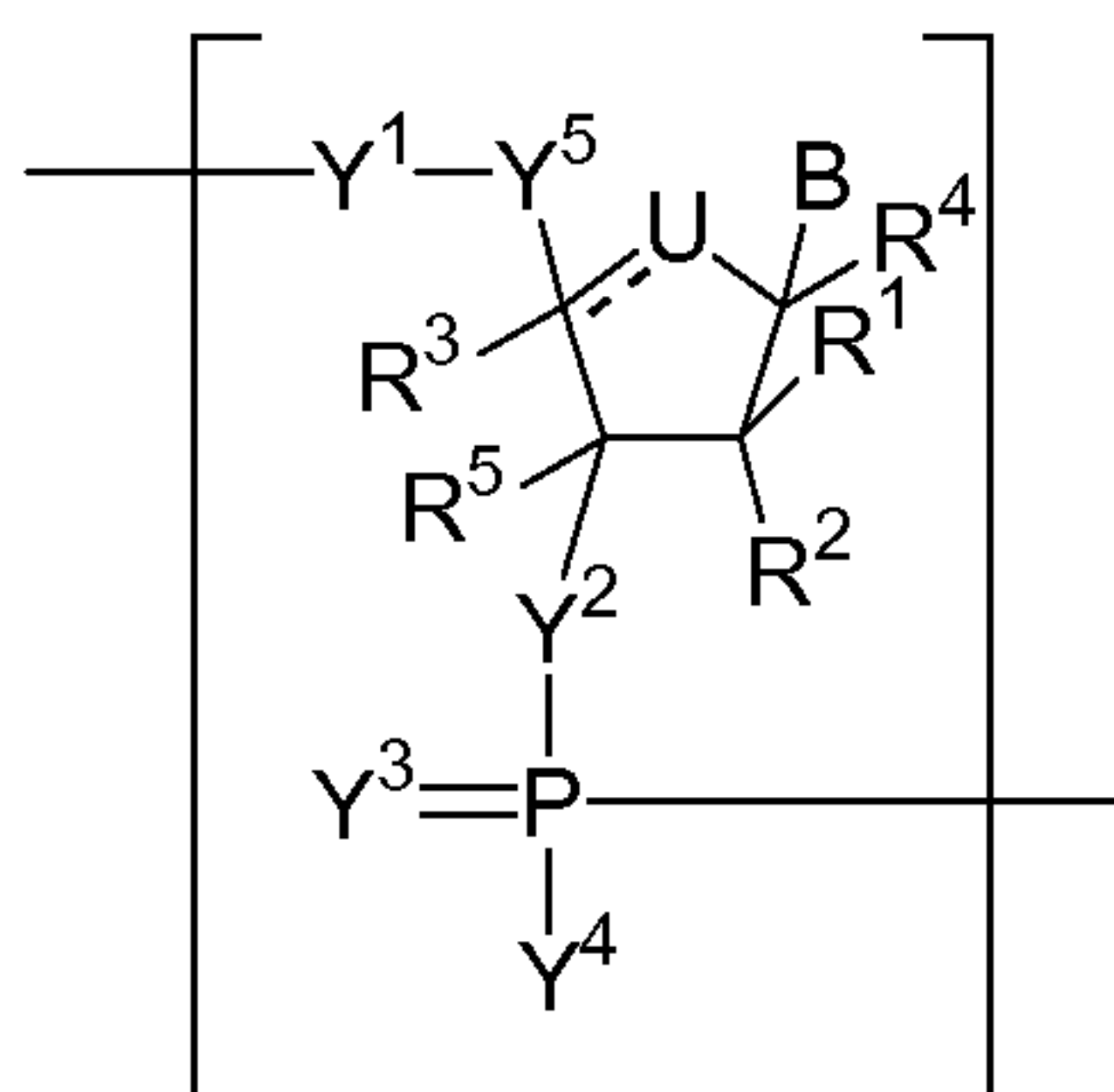
B is a nucleobase, wherein the combination of B and R^{1'}, the combination of B and R^{2'}, the combination of B and R^{1''}, or the combination of B and R^{2''} can, taken together with the carbons to which they are attached, optionally form a bicyclic group or wherein the combination of B, R^{1''}, and R³ or the combination of B, R^{2''}, and R³ can optionally form a tricyclic or tetracyclic group.

9. The isolated polynucleotide of claim 8, wherein B is not pseudouridine (ψ) or 5-methyl-cytidine (m⁵C).

10. The isolated polynucleotide of any one of claims 8-9, wherein
 U is O or C(R^U)_{nu}, wherein nu is an integer from 1 to 2 and each R^U is,
 independently, H, halo, or optionally substituted alkyl;
 each of R¹, R^{1'}, R^{1''}, R², R^{2'}, and R^{2''}, if present, is, independently, H, halo,
 hydroxy, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted
 alkenyloxy, optionally substituted alkynyloxy, optionally substituted aminoalkoxy,
 optionally substituted alkoxyalkoxy, optionally substituted amino, azido, optionally
 substituted aryl, or optionally substituted aminoalkyl;
 each of R³ and R⁴ is, independently, H, halo, hydroxy, optionally substituted
 alkyl, or optionally substituted alkoxyalkoxy;
 each of Y¹, Y², and Y³, is, independently, O, S, -NR^{N1}-, optionally substituted
 alkylene, or optionally substituted heteroalkylene, wherein R^{N1} is H, optionally
 substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl;
 each Y⁴ is, independently, H, hydroxy, thiol, optionally substituted alkyl,
 optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted
 alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally
 substituted thioalkoxy, or optionally substituted amino;
 each Y⁵ is, independently, O or optionally substituted alkylene; and
 n is an integer from 10 to 10,000.
11. The isolated polynucleotide of claim 10, wherein each of R¹, R^{1'}, and R^{1''}, if
 present, is H.
12. The isolated polynucleotide of claim 11, wherein each of R², R^{2'}, and R^{2''}, if
 present, is, independently, H, halo, hydroxy, optionally substituted alkoxy, or optionally
 substituted alkoxyalkoxy.
13. The isolated polynucleotide of claim 10, wherein each of R², R^{2'}, and R^{2''}, if
 present, is H.

14. The isolated polynucleotide of claim 13, wherein each of R^1 , $R^{1'}$, and $R^{1''}$, if present, is, independently, H, halo, hydroxy, optionally substituted alkoxy, or optionally substituted alkoxyalkoxy.

15. The isolated polynucleotide of claim 8, wherein said first region comprises n number of linked nucleotides having Formula (IIa):

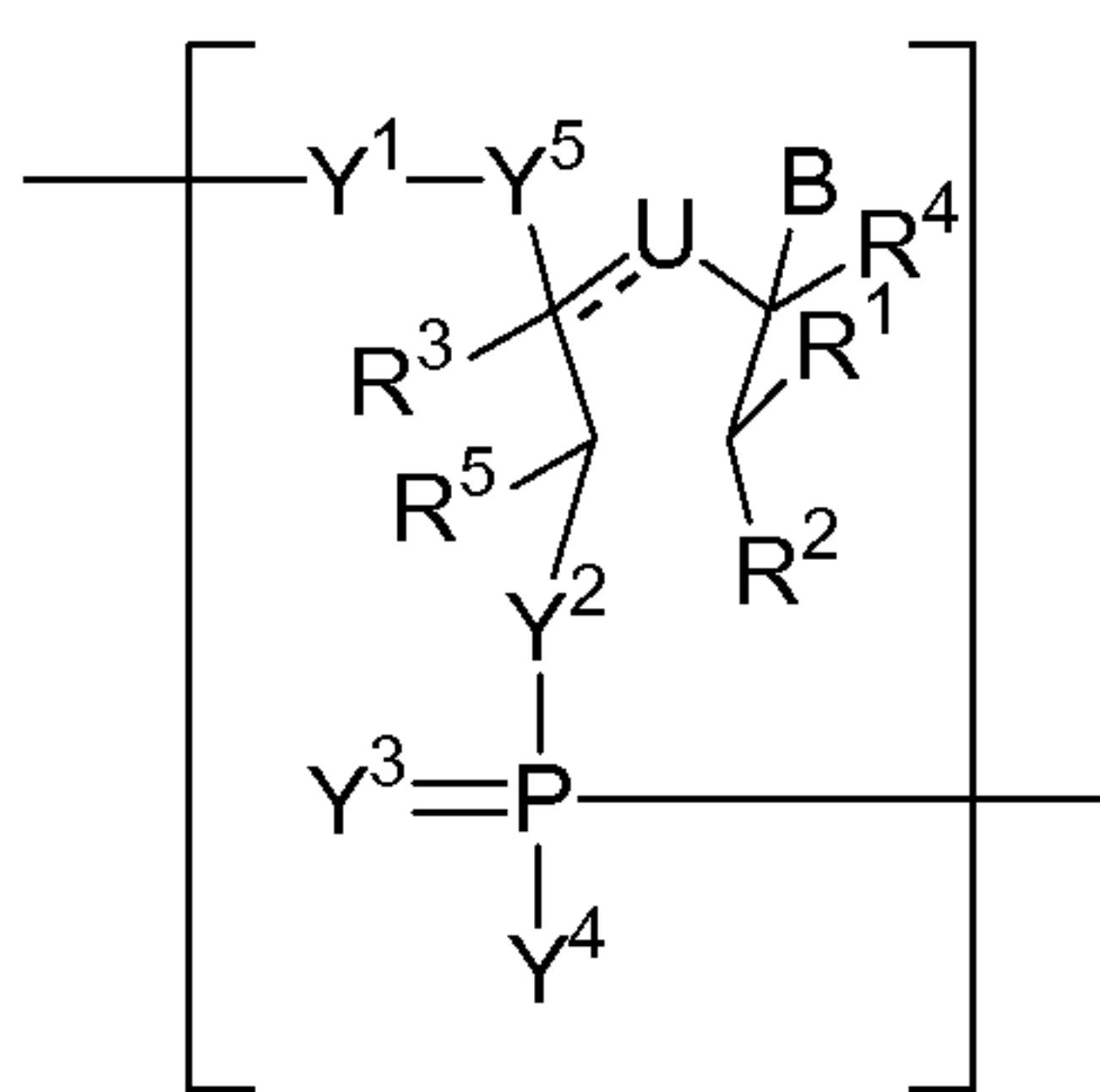


(IIa), or a pharmaceutically acceptable salt or stereoisomer thereof.

thereof.

16. isolated The polypeptide of claim 15, wherein said first region comprises n number of linked nucleosides having Formula (IIb) or (IIc), or a pharmaceutically acceptable salt thereof.

17. The isolated polynucleotide of claim 8, wherein said first region comprises n number of linked nucleosides having Formula (IId):

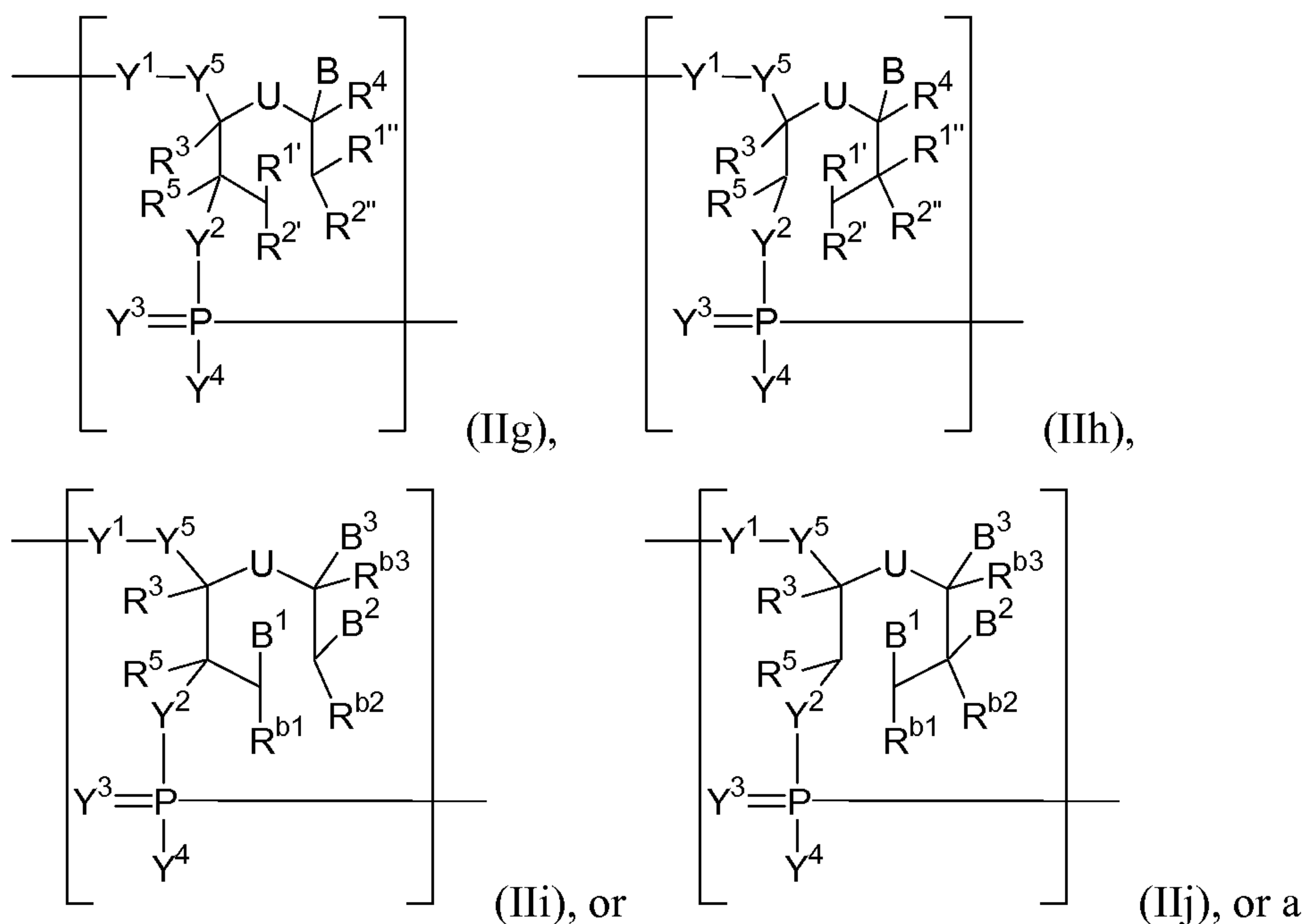


(IId), or a pharmaceutically acceptable salt or stereoisomer thereof.

thereof.

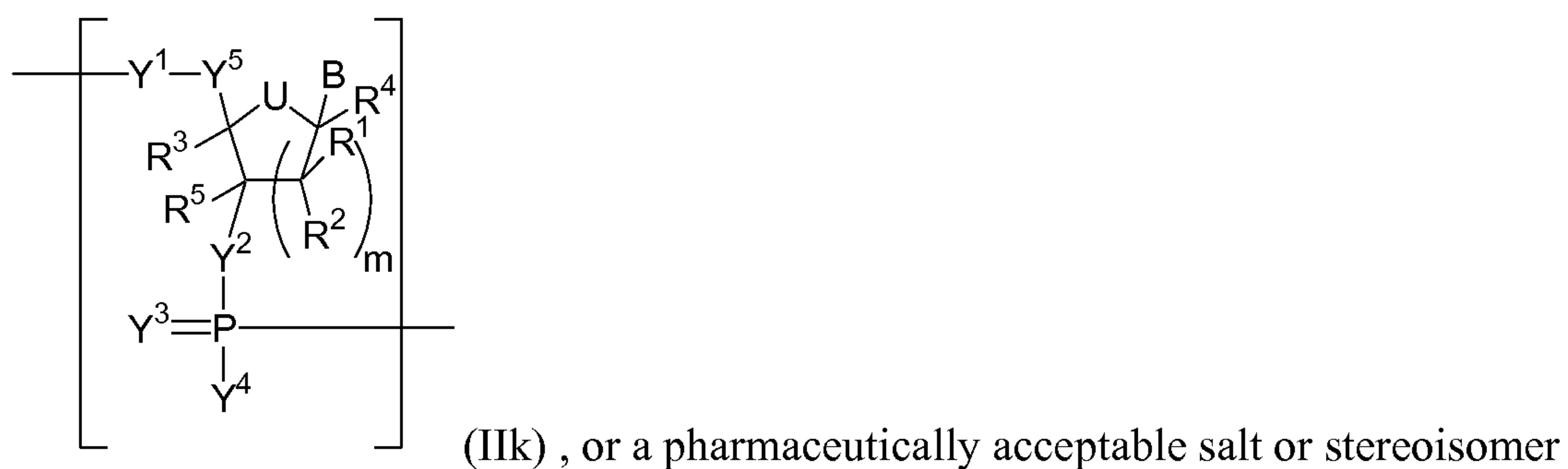
18. The isolated polypeptide of claim 17, wherein said first region comprises n number of linked nucleosides having Formula (IIe) or (IIf), or a pharmaceutically acceptable salt thereof.

19. The isolated polynucleotide of claim 8, wherein said first region comprises n number of linked nucleotides, each of said linked nucleotides independently having one of Formulas (IIg)-(IIj):



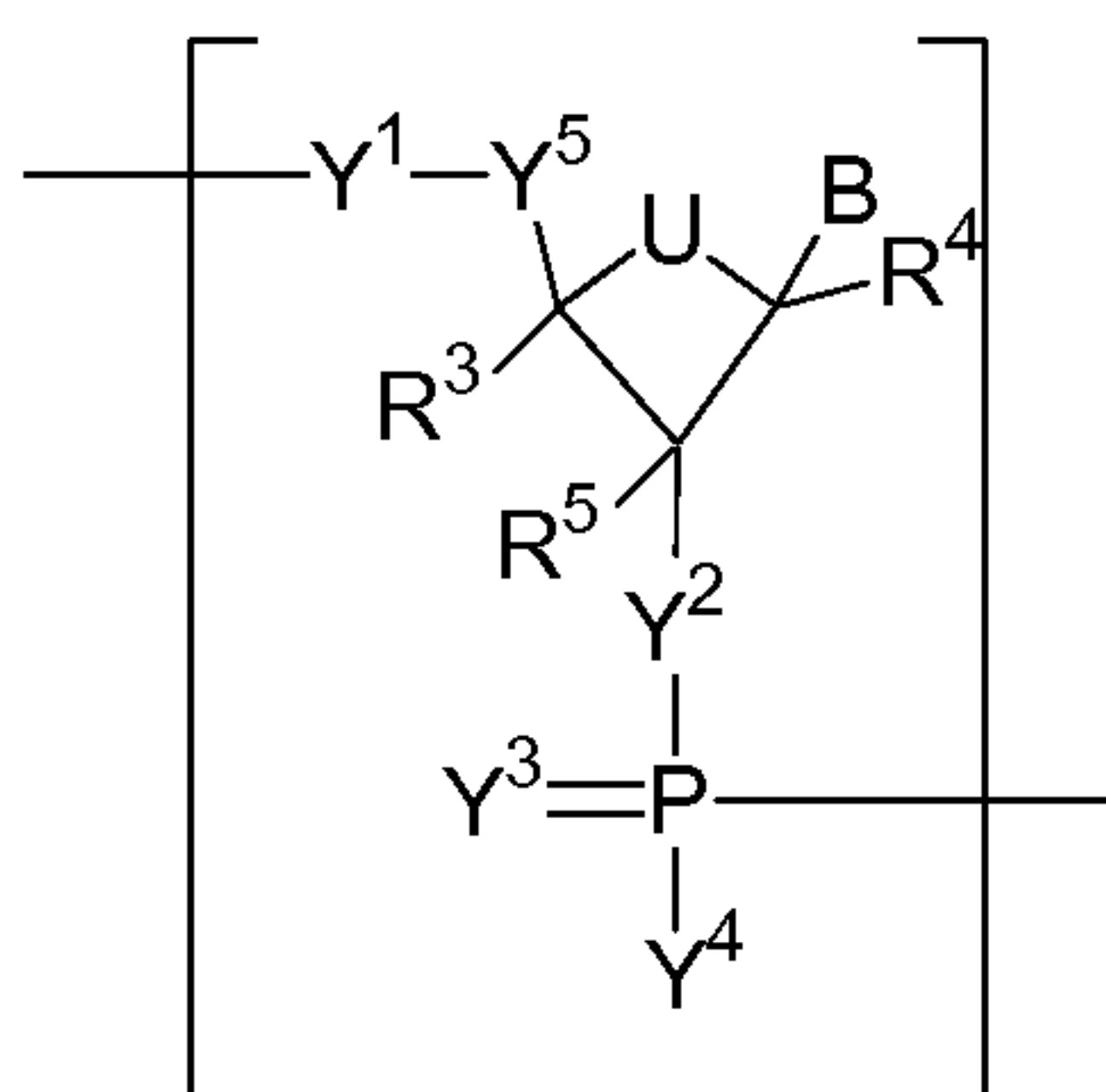
pharmaceutically acceptable salt or stereoisomer thereof.

20. The isolated polynucleotide of claim 8, wherein said first region comprises n number of linked nucleosides having Formula (IIk):



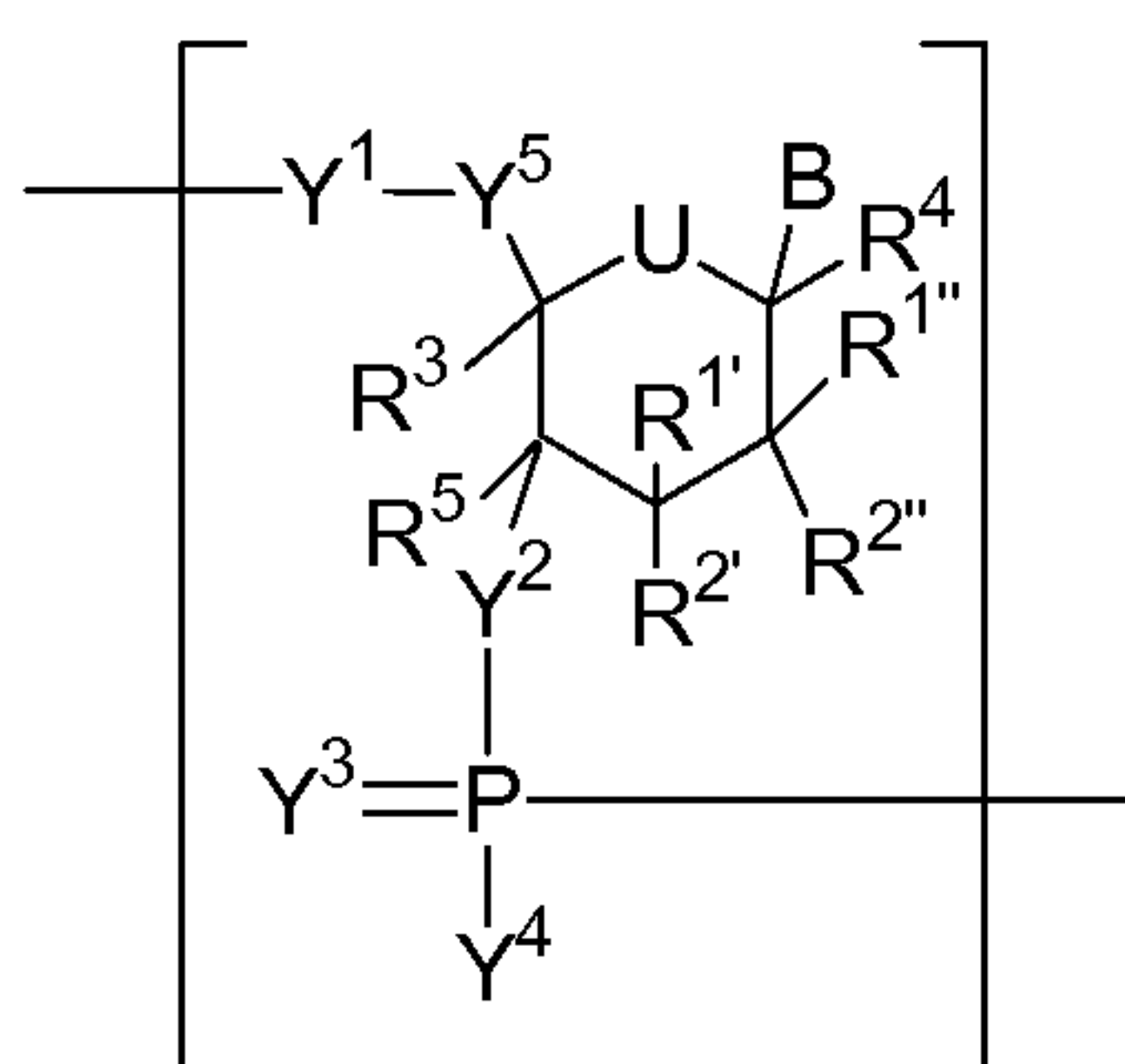
thereof.

21. The isolated polynucleotide of claim 20, wherein said first region comprises n number of linked nucleosides having Formula (III):



(III), or a pharmaceutically acceptable salt or stereoisomer thereof.

22. The isolated polynucleotide of claim 20, wherein said first region comprises n number of linked nucleosides having Formula (IIIm):



(IIIm), or a pharmaceutically acceptable salt or stereoisomer thereof,

wherein

each of $R^{1'}$, $R^{1''}$, $R^{2'}$, and $R^{2''}$ is, independently, H, halo, hydroxy, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted aminoalkoxy, optionally substituted alkoxyalkoxy, or absent; and wherein the combination of $R^{2'}$ and R^3 or the combination of $R^{2''}$ and R^3 can be taken together to form optionally substituted alkylene or optionally substituted heteroalkylene.

23. The isolated polynucleotide of any one of claims 11-22, wherein

U is O or $C(R^U)_{nu}$, wherein nu is an integer from 1 to 2 and each R^U is, independently, H, halo, or optionally substituted alkyl;

each of R^1 and R^2 is, independently, H, halo, hydroxy, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted aminoalkoxy, optionally substituted

alkoxyalkoxy, optionally substituted amino, azido, optionally substituted aryl, or optionally substituted aminoalkyl;

each of R^3 and R^4 is, independently, H or optionally substituted alkyl;

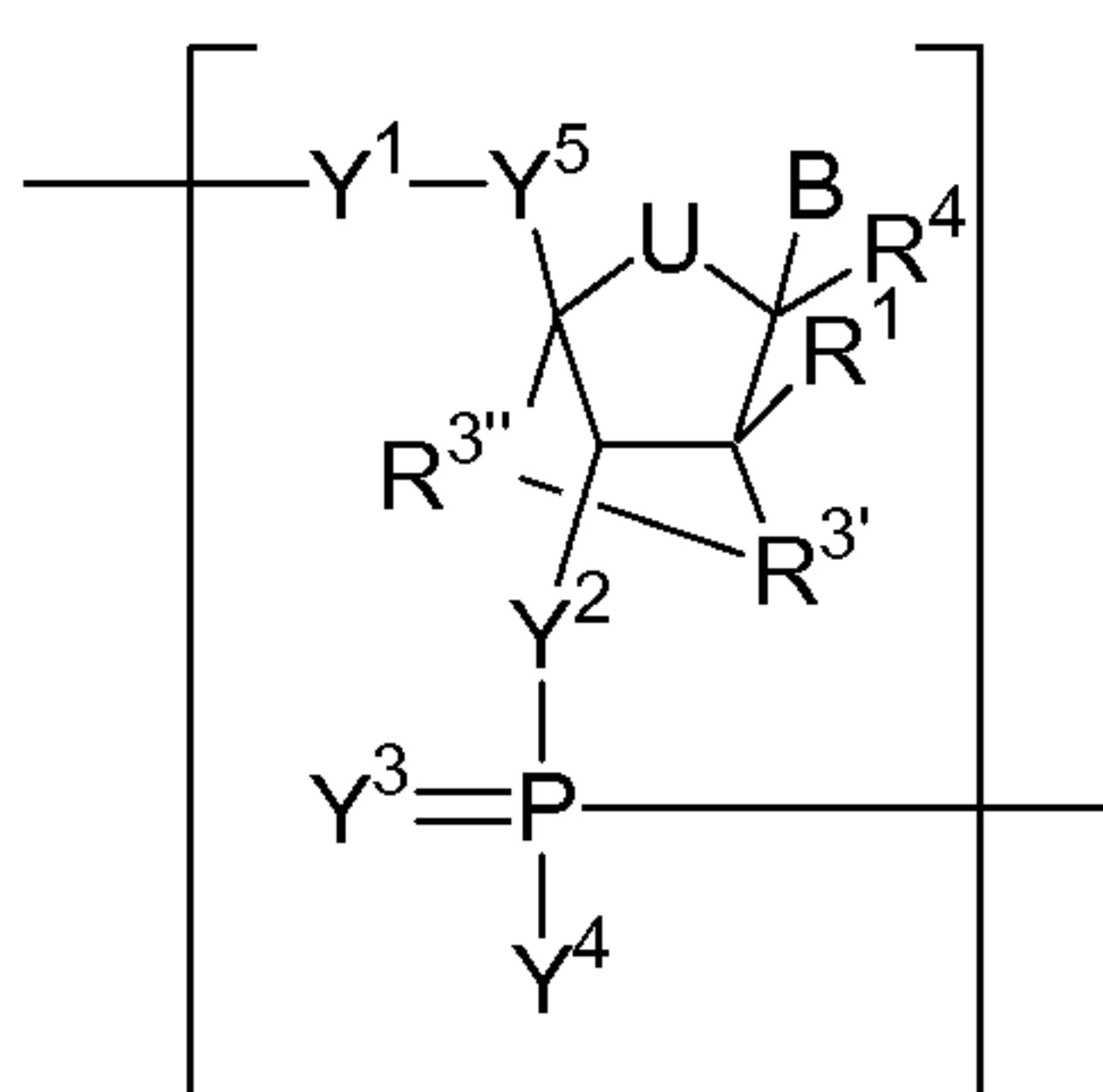
each of Y^1 , Y^2 , and Y^3 , is, independently, O, S, $-NR^{N1}$ -, optionally substituted alkylene, or optionally substituted heteroalkylene, wherein R^{N1} is H, optionally substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl;

each Y^4 is, independently, H, hydroxy, thiol, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted thioalkoxy, or optionally substituted amino;

each Y^5 is, independently, O or optionally substituted alkylene; and

n is an integer from 10 to 10,000.

24. The isolated polynucleotide of claim 8, wherein said first region comprises n number of linked nucleosides having Formula (II_n):



(II_n), or a pharmaceutically acceptable salt or stereoisomer

thereof,

wherein

U is O or $C(R^U)_{nu}$, wherein nu is an integer from 1 to 2 and each R^U is, independently, H, halo, or optionally substituted alkyl;

each of R^1 and R^4 is, independently, H, halo, hydroxy, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted aminoalkoxy, optionally substituted alkoxyalkoxy, optionally substituted amino, azido, optionally substituted aryl, or optionally substituted aminoalkyl;

$R^{3'}$ is O, S, or $-NR^{N1}-$, wherein R^{N1} is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, or optionally substituted aryl;

$R^{3''}$ is optionally substituted alkylene or optionally substituted heteroalkylene;

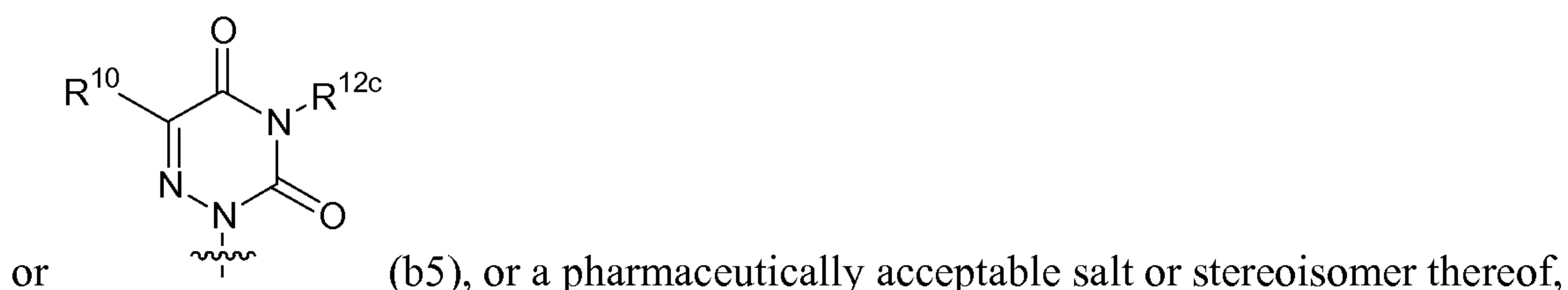
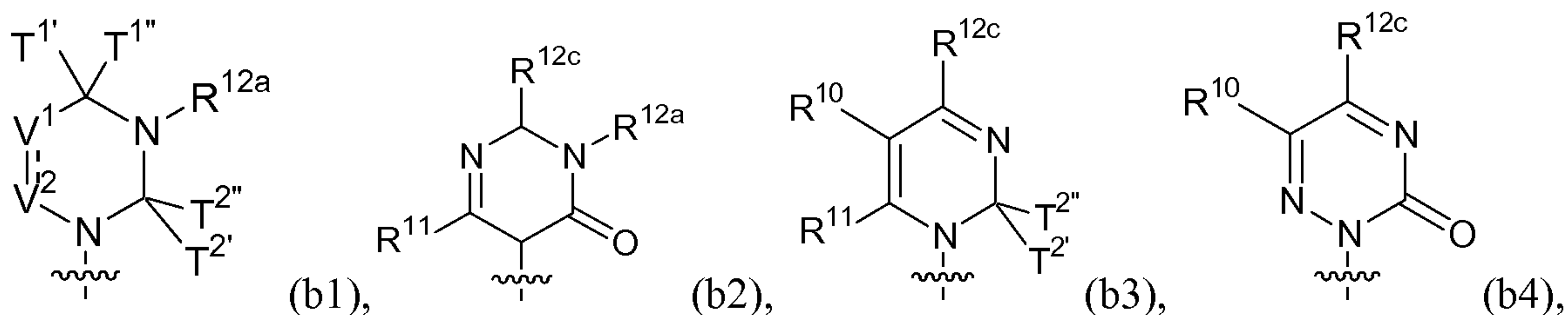
each of Y^1 , Y^2 , and Y^3 , is, independently, O, S, $-NR^{N1}-$, optionally substituted alkylene, or optionally substituted heteroalkylene, wherein R^{N1} is H, optionally substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl;

each Y^4 is, independently, H, hydroxy, thiol, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy, optionally substituted thioalkoxy, or optionally substituted amino;

each Y^5 is, independently, O, S, optionally substituted alkylene (e.g., methylene), or optionally substituted heteroalkylene; and

n is an integer from 10 to 10,000.

25. The isolated polynucleotide of any one of claims 8-24, wherein in said n number of B has, each B independently has a formula selected from Formula (b1)-(b5):



wherein

--- connecting V^1 and V^2 in formula (b1) is a single or double bond;

each of T^1 , $T^{1''}$, $T^{2'}$, and $T^{2''}$ is, independently, H, optionally substituted alkyl, optionally substituted alkoxy, or optionally substituted thioalkoxy, or the combination of

$T^{1'}$ and $T^{1''}$ or the combination of $T^{2'}$ and $T^{2''}$ join together to form O (oxo), S (thio), or Se (seleno);

each of V^1 and V^2 is, independently, O, S, $N(R^{Vb})_{nv}$, or $C(R^{Vb})_{nv}$, wherein nv is an integer from 0 to 2 and each R^{Vb} is, independently, H, halo, optionally substituted amino acid, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, or optionally substituted alkynyloxy;

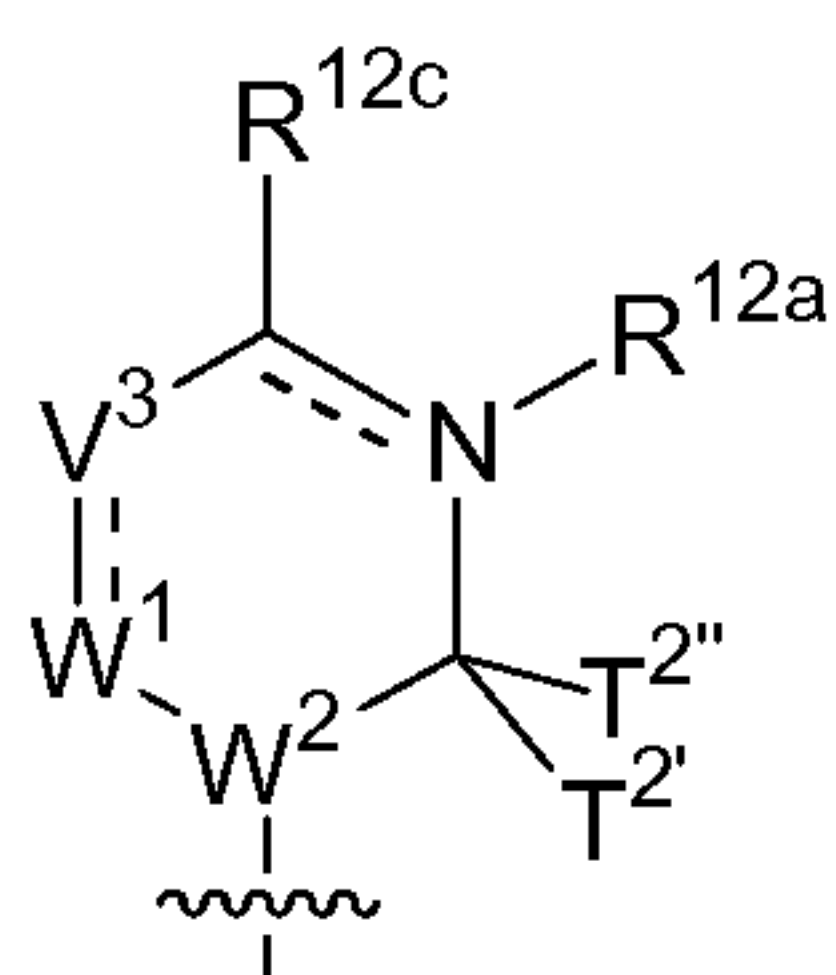
R^{10} is H, halo, optionally substituted amino acid, hydroxy, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aminoalkyl, optionally substituted alkoxy, optionally substituted alkoxy carbonylalkyl, optionally substituted alkoxy carbonylalkoxy, optionally substituted carboxyalkoxy, optionally substituted carboxyalkyl, or optionally substituted carbamoylalkyl;

R^{11} is H or optionally substituted alkyl;

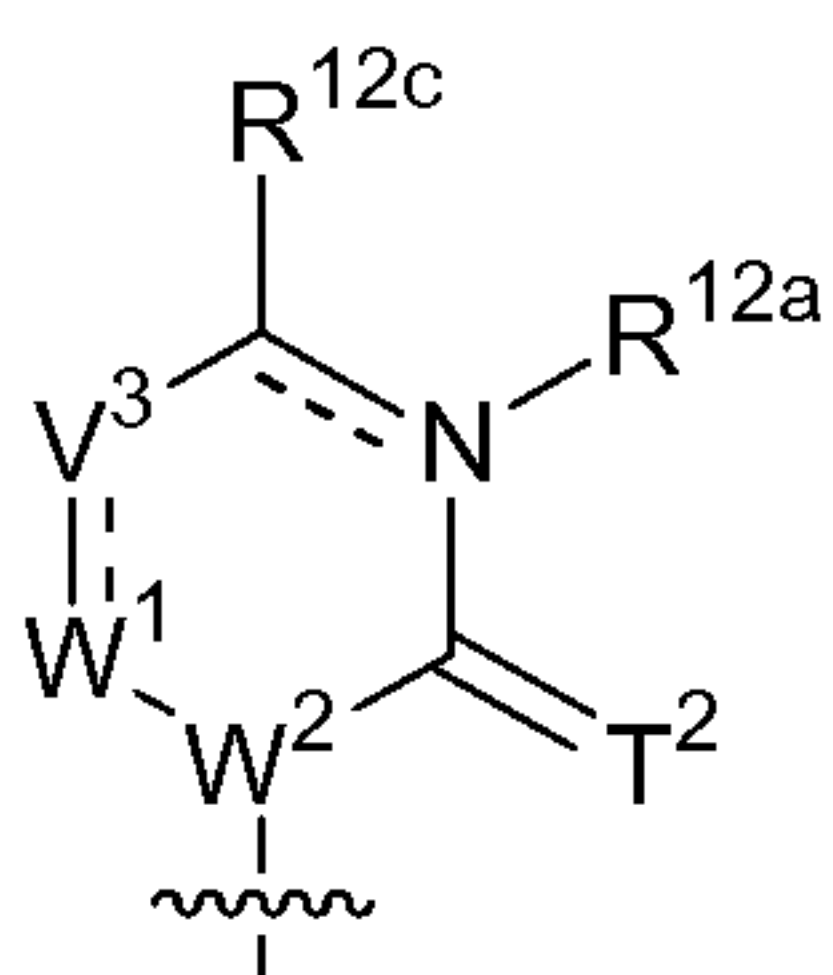
R^{12a} is H, optionally substituted alkyl, or optionally substituted aminoalkyl; and

R^{12c} is H, halo, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted thioalkoxy, optionally substituted amino, or optionally substituted aminoalkyl.

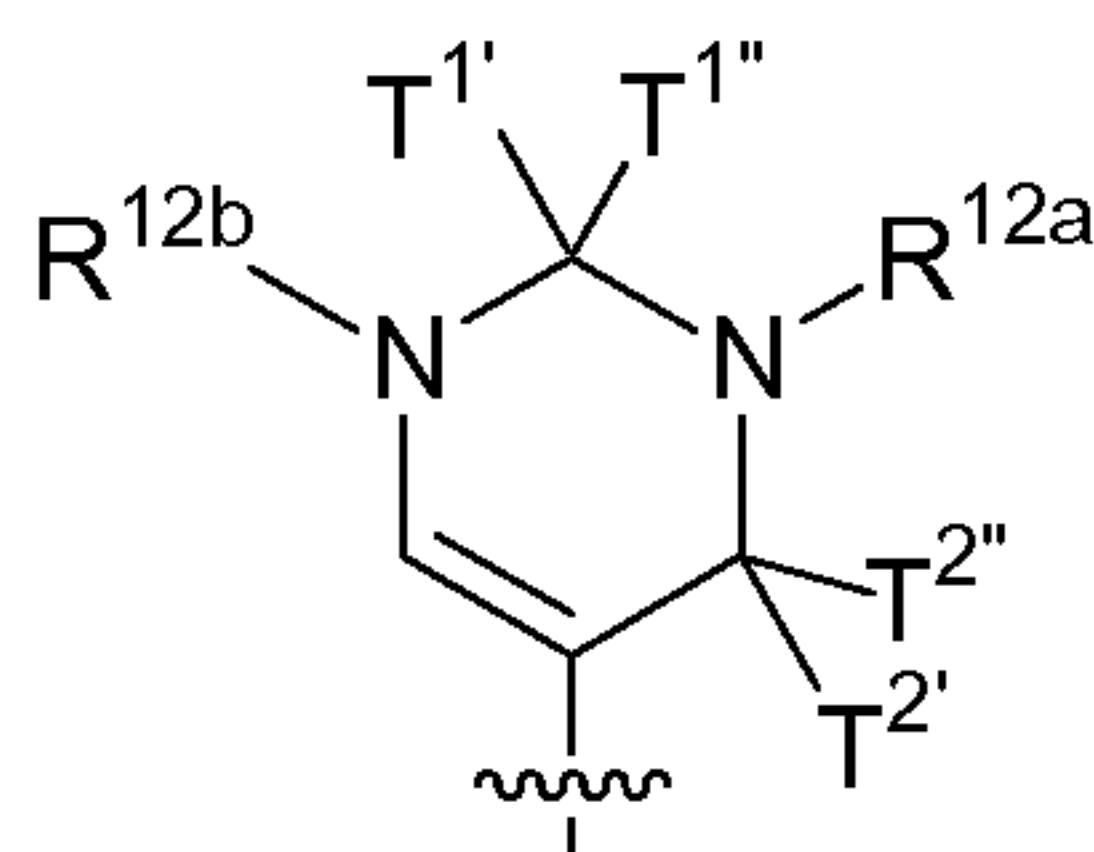
26. The isolated polynucleotide of any one of claims 8-25, wherein n number of B has Formula (b6)-(b9):



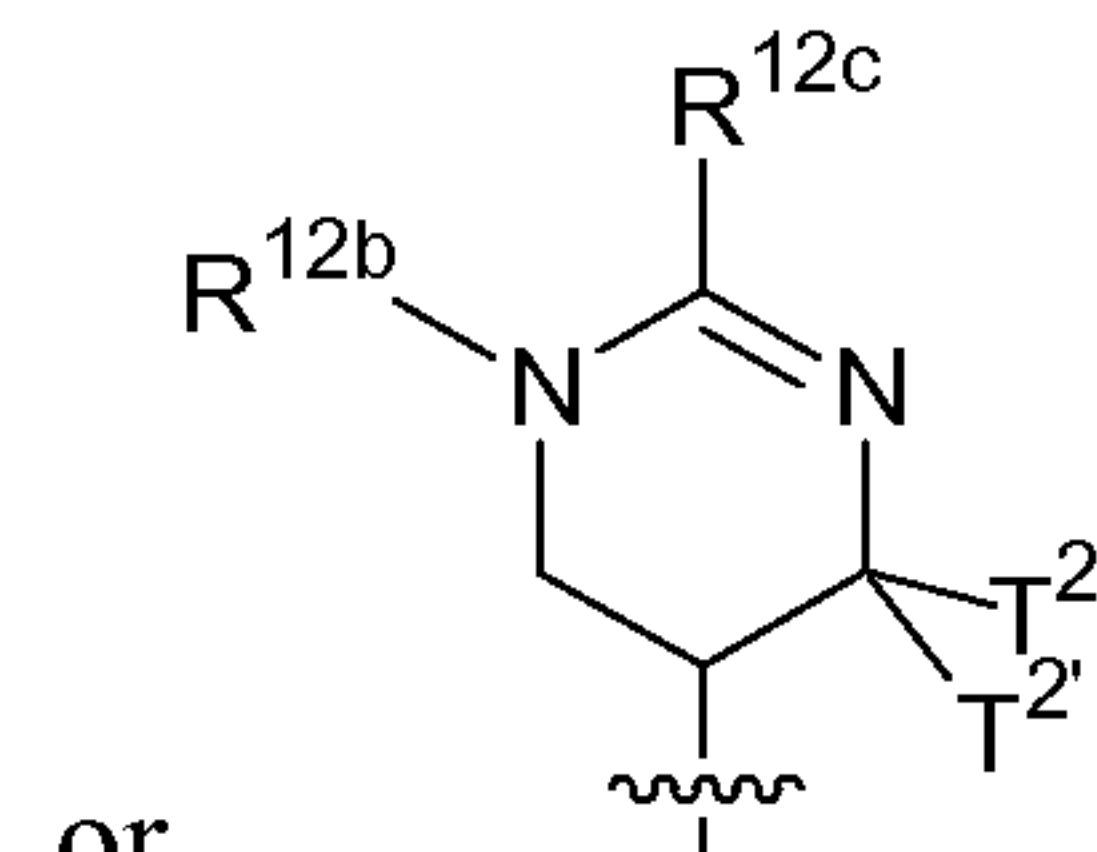
(b6),



(b7),




(b8),



or

(b9), or a pharmaceutically acceptable salt or stereoisomer thereof,

wherein

 is a single or double bond;

each of $T^{1'}$, $T^{1''}$, $T^{2'}$, and $T^{2''}$ is, independently, H, optionally substituted alkyl, optionally substituted alkoxy, or optionally substituted thioalkoxy, or the combination of

T^{1'} and T^{1''} or the combination of T^{2'} and T^{2''} join together to form O (oxo), S (thio), or Se (seleno);

each of W¹ and W² is, independently, N(R^{Wa})_{nw} or C(R^{Wa})_{nw}, wherein nw is an integer from 0 to 2 and each R^{Wa} is, independently, H, optionally substituted alkyl, or optionally substituted alkoxy;

each V³ is, independently, O, S, N(R^{Va})_{nv}, or C(R^{Va})_{nv}, wherein nv is an integer from 0 to 2 and each R^{Va} is, independently, H, halo, optionally substituted amino acid, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted heterocyclyl, optionally substituted alkheterocyclyl, optionally substituted alkoxy, optionally substituted alkenyloxy, or optionally substituted alkynyloxy, and wherein R^{Va} and R^{12c} taken together with the carbon atoms to which they are attached can form optionally substituted cycloalkyl, optionally substituted aryl, or optionally substituted heterocyclyl;

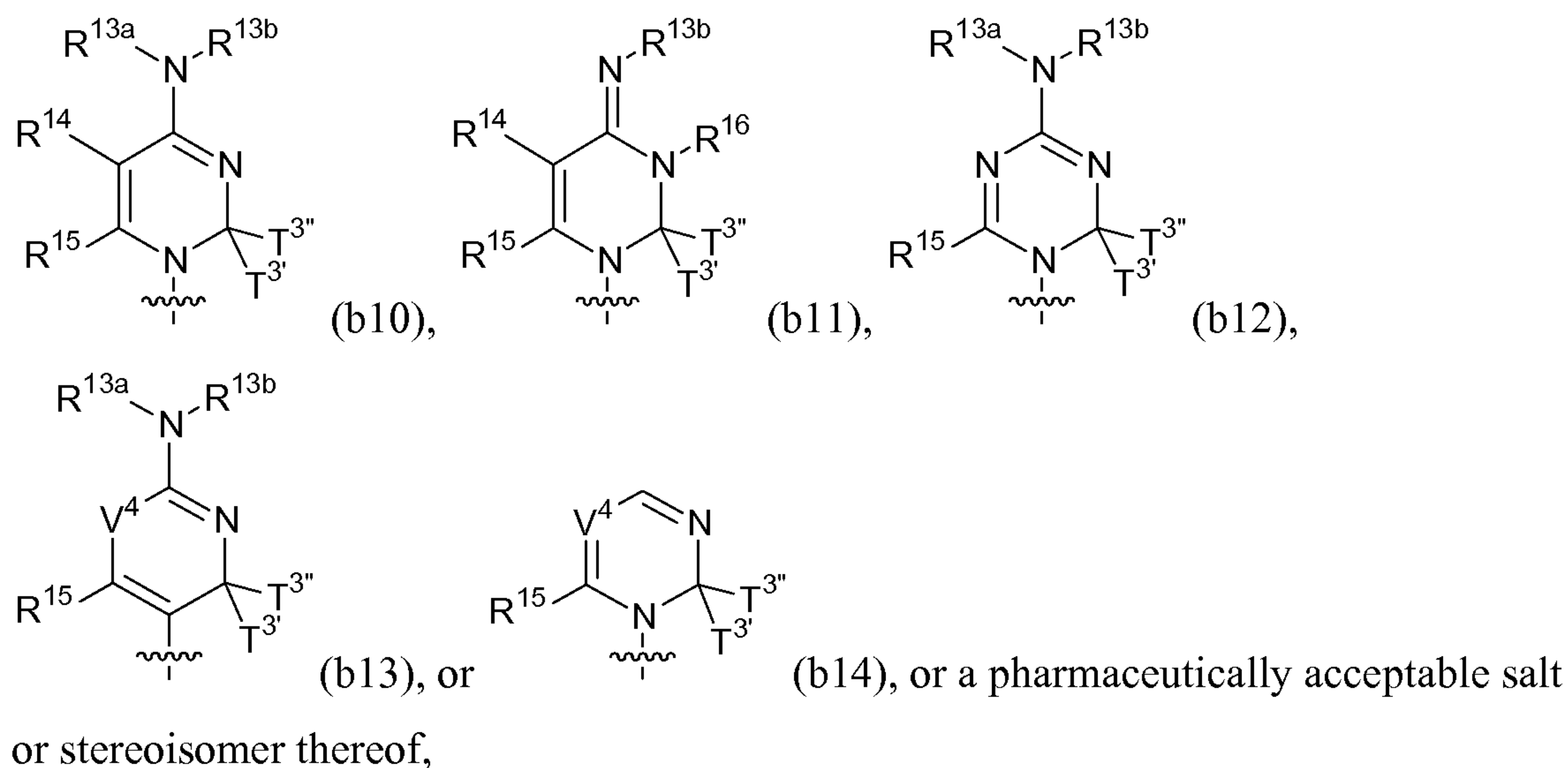
R^{12a} is H, optionally substituted alkyl, optionally substituted aminoalkyl, or absent;

R^{12b} is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkaryl, optionally substituted heterocyclyl, optionally substituted alkheterocyclyl, or optionally substituted amino acid, wherein the combination of R^{12b} and T^{1'} or the combination of R^{12b} and R^{12c} can join together to form optionally substituted heterocyclyl; and

R^{12c} is H, halo, optionally substituted alkyl, optionally substituted alkoxy, optionally substituted thioalkoxy, optionally substituted amino, or optionally substituted aminoalkyl.

27. The isolated polynucleotide of claim 26, wherein R^{12a}, R^{12b}, R^{12c}, or R^{Va} is substituted with -(CH₂)_{s2}(OCH₂CH₂)_{s1}(CH₂)_{s3}OR', wherein s1 is an integer from 1 to 10, each of s2 and s3, independently, is an integer from 0 to 10, and R' is H or C₁₋₂₀ alkyl); or -NR^{N1}(CH₂)_{s2}(CH₂CH₂O)_{s1}(CH₂)_{s3}NR^{N1}, wherein s1 is an integer from 1 to 10, each of s2 and s3, independently, is an integer from 0 to 10, and each R^{N1} is, independently, hydrogen or optionally substituted C₁₋₆ alkyl.

28. The isolated polynucleotide of any one of claims 8-27, wherein n number of B has Formula (b10)-(b14):



wherein

each of T^{3'} and T^{3''} is, independently, H, optionally substituted alkyl, optionally substituted alkoxy, or optionally substituted thioalkoxy, or the combination of T^{3'} and T^{3''} join together to form O (oxo), S (thio), or Se (seleno);

each V⁴ is, independently, O, S, N(R^{Vc})_{nv}, or C(R^{Vc})_{nv}, wherein nv is an integer from 0 to 2 and each R^{Vc} is, independently, H, halo, optionally substituted amino acid, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted heterocyclyl, optionally substituted alkheterocyclyl, or optionally substituted alkynyloxy, wherein the combination of R^{13b} and R^{Vc} can be taken together to form optionally substituted heterocyclyl;

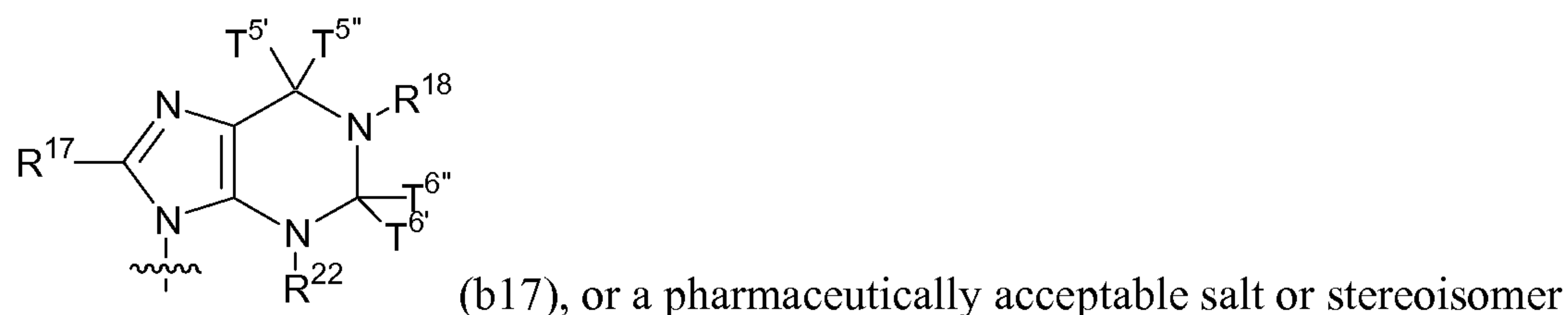
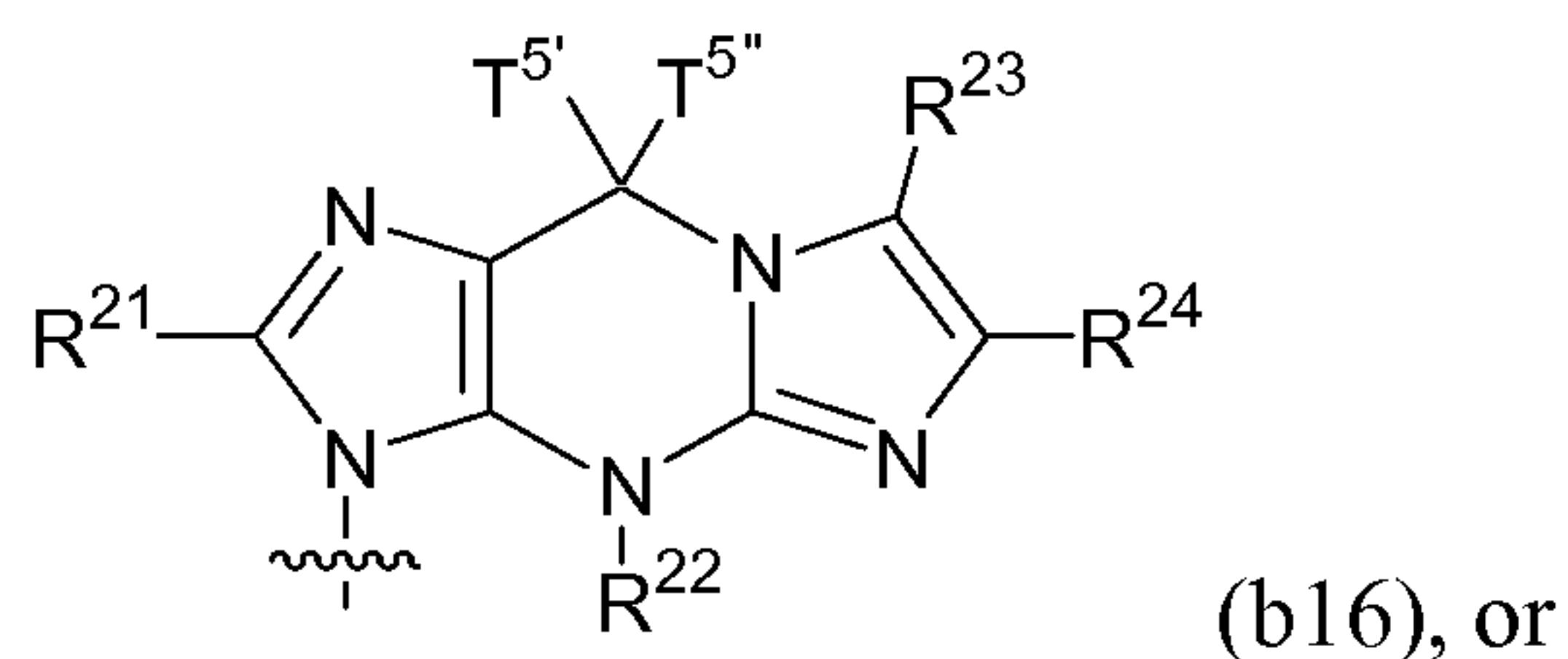
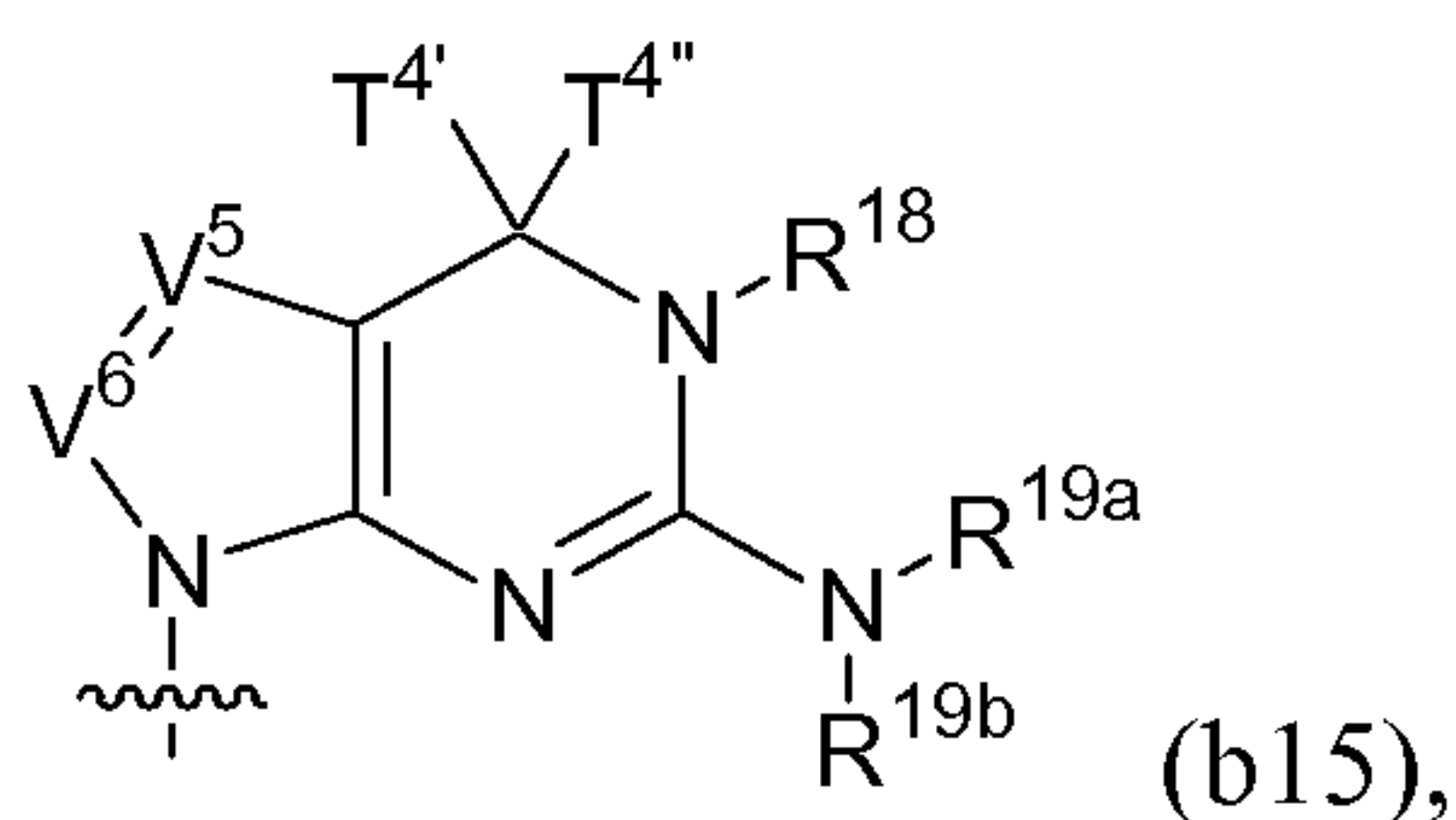
each of R^{13a} and R^{13b} is, independently, H, optionally substituted acyl, optionally substituted alkyl, or optionally substituted alkoxy, wherein the combination of R^{13b} and R¹⁴ can be taken together to form optionally substituted heterocyclyl;

each R¹⁴ is, independently, H, halo, hydroxy, thiol, optionally substituted acyl, optionally substituted amino acid, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted hydroxyalkyl, optionally substituted alkoxy, optionally substituted alkenyloxy, optionally substituted alkynyloxy,

optionally substituted aminoalkoxy, optionally substituted alkoxyalkoxy, optionally substituted amino, azido, optionally substituted aryl, optionally substituted heterocyclyl, optionally substituted alkheterocyclyl, or optionally substituted aminoalkyl; and

each of R^{15} and R^{16} is, independently, H, optionally substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl.

29. The isolated polynucleotide of any one of claims 7-27, wherein n number of B has Formula (b15)-(b17):



thereof,

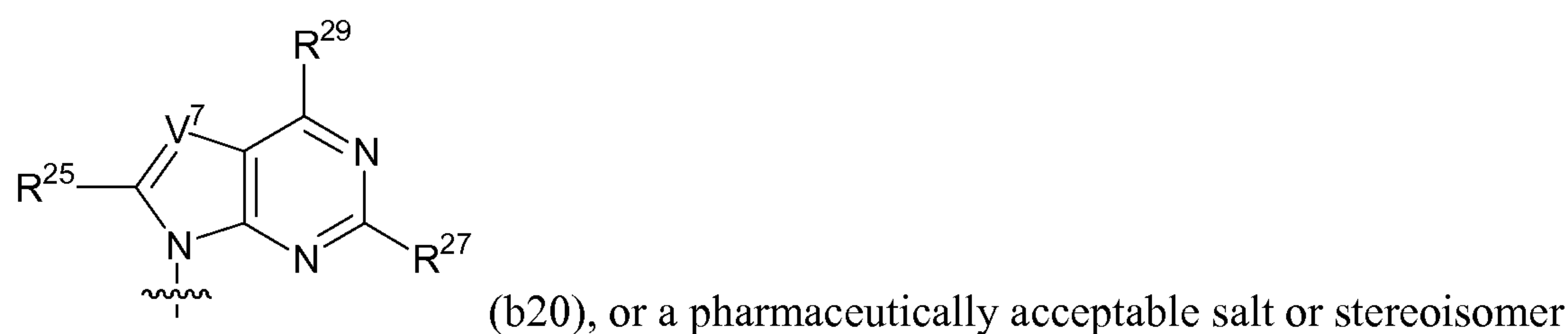
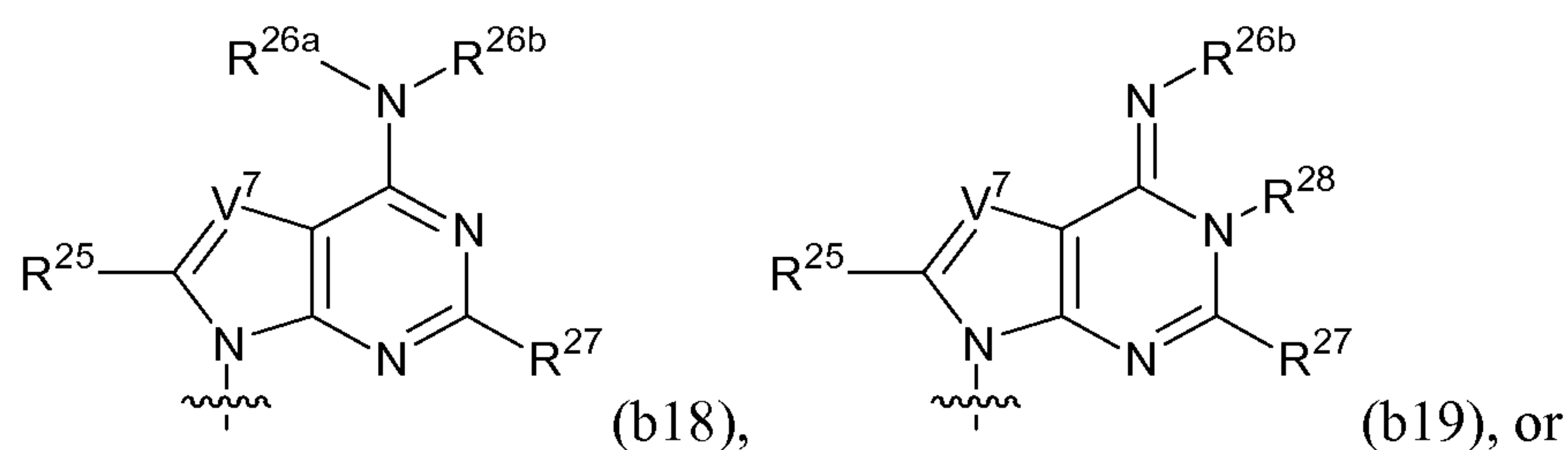
wherein

each of $T^{4'}$, $T^{4''}$, $T^{5'}$, $T^{5''}$, $T^{6'}$, and $T^{6''}$ is, independently, H, optionally substituted alkyl, or optionally substituted alkoxy, and wherein the combination of $T^{4'}$ and $T^{4''}$ or the combination of $T^{5'}$ and $T^{5''}$ or the combination of $T^{6'}$ and $T^{6''}$ together form O, S, or Se;

each of V^5 and V^6 is, independently, O, S, $N(R^{Vd})_{nv}$, or $C(R^{Vd})_{nv}$, wherein nv is an integer from 0 to 2 and each R^{Vd} is, independently, H, halo, optionally substituted amino acid, cyano, amidine, optionally substituted aminoalkyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, or optionally substituted alkynyloxy; and

each of R^{17} , R^{18} , R^{19a} , R^{19b} , R^{21} , R^{22} , R^{23} , and R^{24} is, independently, H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, or optionally substituted amino acid.

30. The polynucleotide of any one of claims 8-29, wherein n number of B has Formula (b18)-(b20):



wherein

each V^7 is, independently, O, S, $N(R^{Ve})_{nv}$, or $C(R^{Ve})_{nv}$, wherein nv is an integer from 0 to 2 and each R^{Ve} is, independently, H, halo, optionally substituted amino acid, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, optionally substituted alkenyloxy, or optionally substituted alkynyloxy;

each R^{25} is, independently, H, optionally substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl;

each of R^{26a} and R^{26b} is, independently, H, optionally substituted acyl, optionally substituted amino acid, optionally substituted carbamoylalkyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted hydroxyalkyl, optionally substituted hydroxyalkenyl, or optionally substituted alkoxy;

each R^{27} is, independently, H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted alkoxy, or optionally substituted amino;

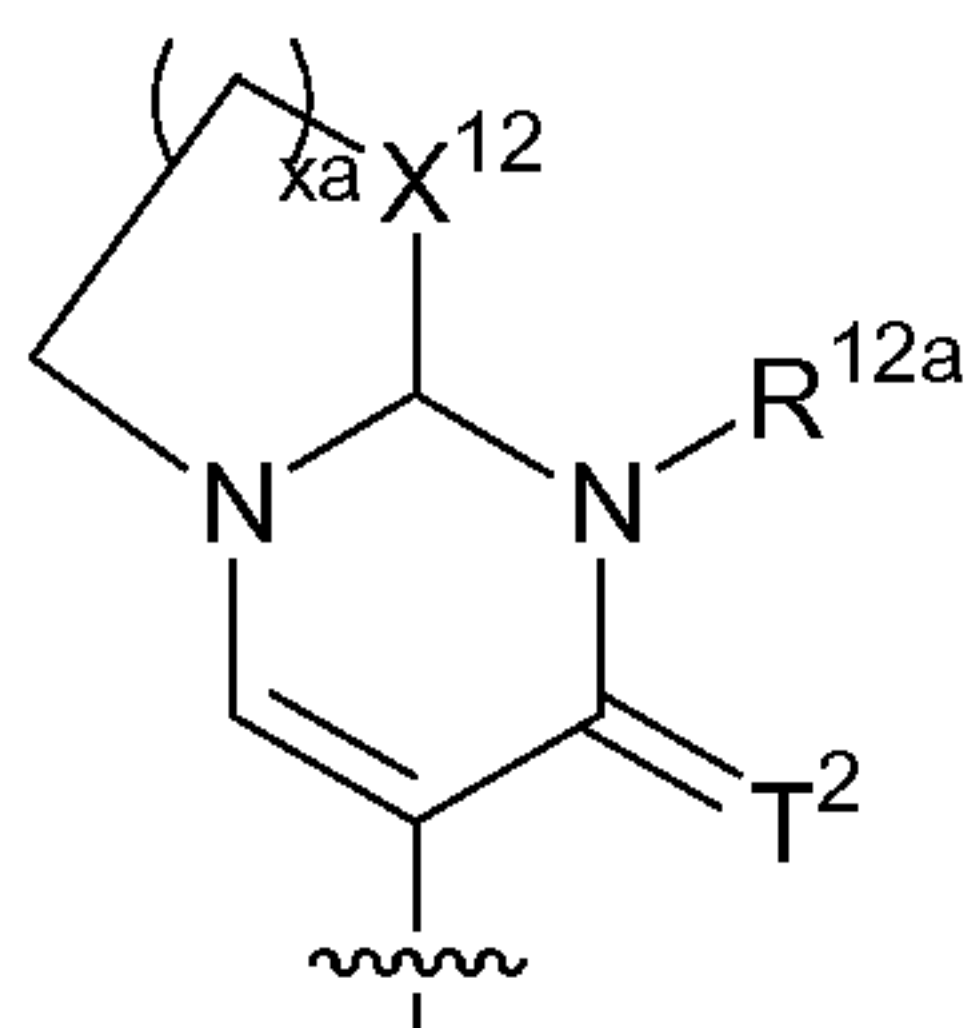
each R^{28} is, independently, H, optionally substituted alkyl, optionally substituted alkenyl, or optionally substituted alkynyl; and

each R^{29} is, independently, H, optionally substituted acyl, optionally substituted amino acid, optionally substituted carbamoylalkyl, optionally substituted alkyl, optionally

substituted alkenyl, optionally substituted alkynyl, optionally substituted hydroxyalkyl, optionally substituted hydroxyalkenyl, optionally substituted alkoxy, or optionally substituted amino.

31. The isolated polynucleotide of claim 30, wherein R^{26a} , R^{26b} , or R^{29} is substituted with $-(CH_2)_{s2}(OCH_2CH_2)_{s1}(CH_2)_{s3}OR'$, wherein $s1$ is an integer from 1 to 10, each of $s2$ and $s3$, independently, is an integer from 0 to 10, and R' is H or C_{1-20} alkyl); or $-NR^{N1}(CH_2)_{s2}(CH_2CH_2O)_{s1}(CH_2)_{s3}NR^{N1}$, wherein $s1$ is an integer from 1 to 10, each of $s2$ and $s3$, independently, is an integer from 0 to 10, and each R^{N1} is, independently, hydrogen or optionally substituted C_{1-6} alkyl.

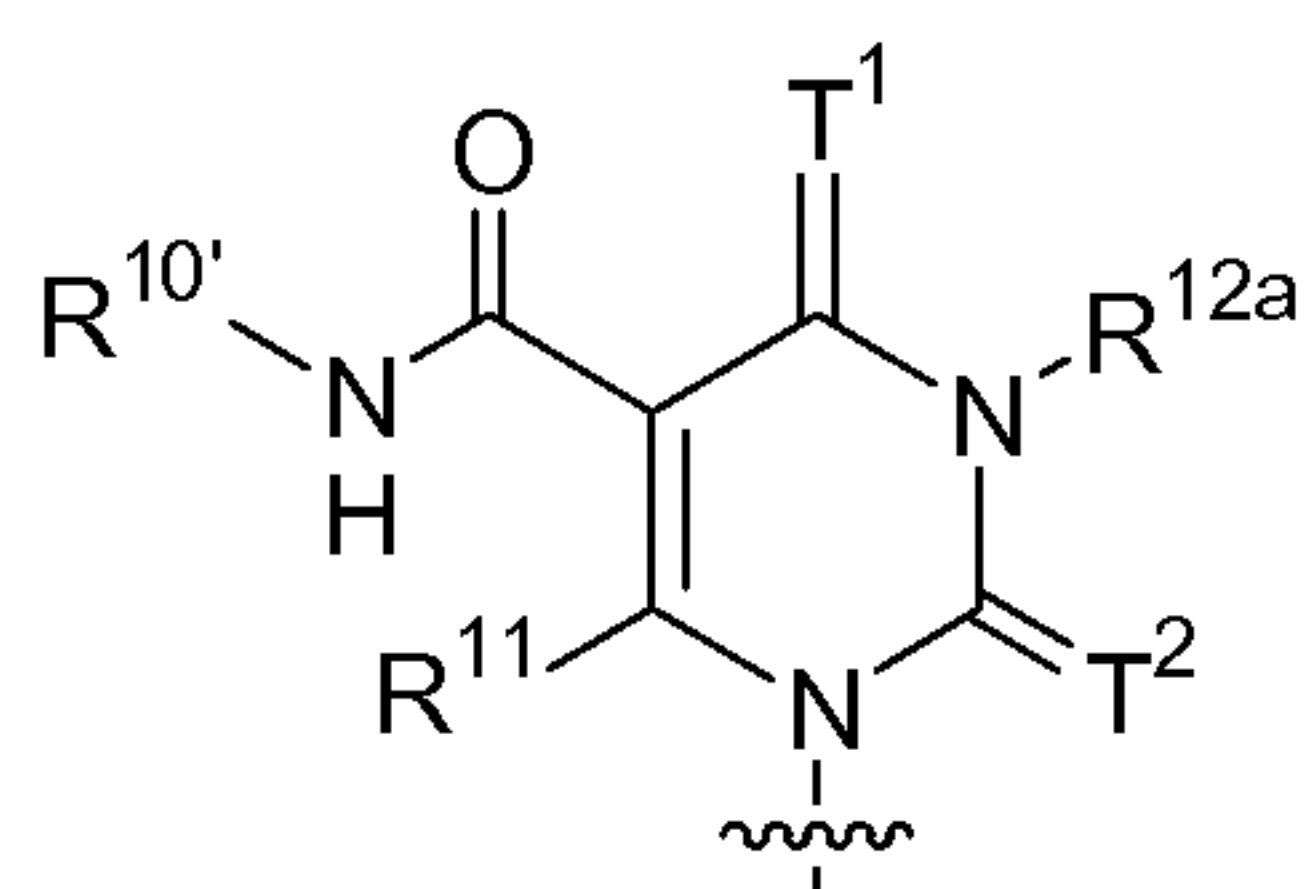
32. The isolated polynucleotide of any one of claims 8-31, wherein n number of B has Formula (b21):



(b21), or a pharmaceutically acceptable salt or stereoisomer thereof,

wherein X^{12} is, independently, O, S, optionally substituted alkylene, or optionally substituted heteroalkylene; xa is an integer from 0 to 3; R^{12a} is H, optionally substituted alkyl, optionally substituted aminoalkyl, or absent; and T^2 is O, S, or Se.

33. The isolated polynucleotide of any one of claims 8-32, wherein n number of B has Formula (b22):

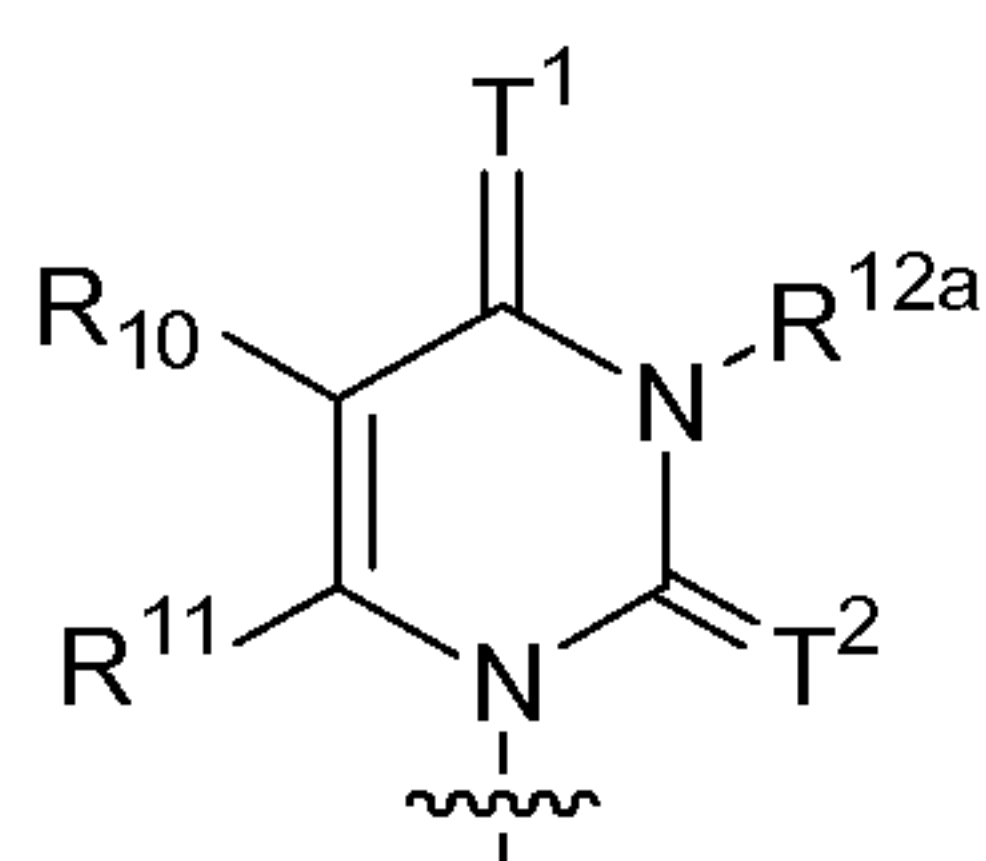


(b22), or a pharmaceutically acceptable salt or

stereoisomer thereof, wherein $R^{10'}$ is, independently, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heterocyclyl, optionally substituted aminoalkyl, optionally

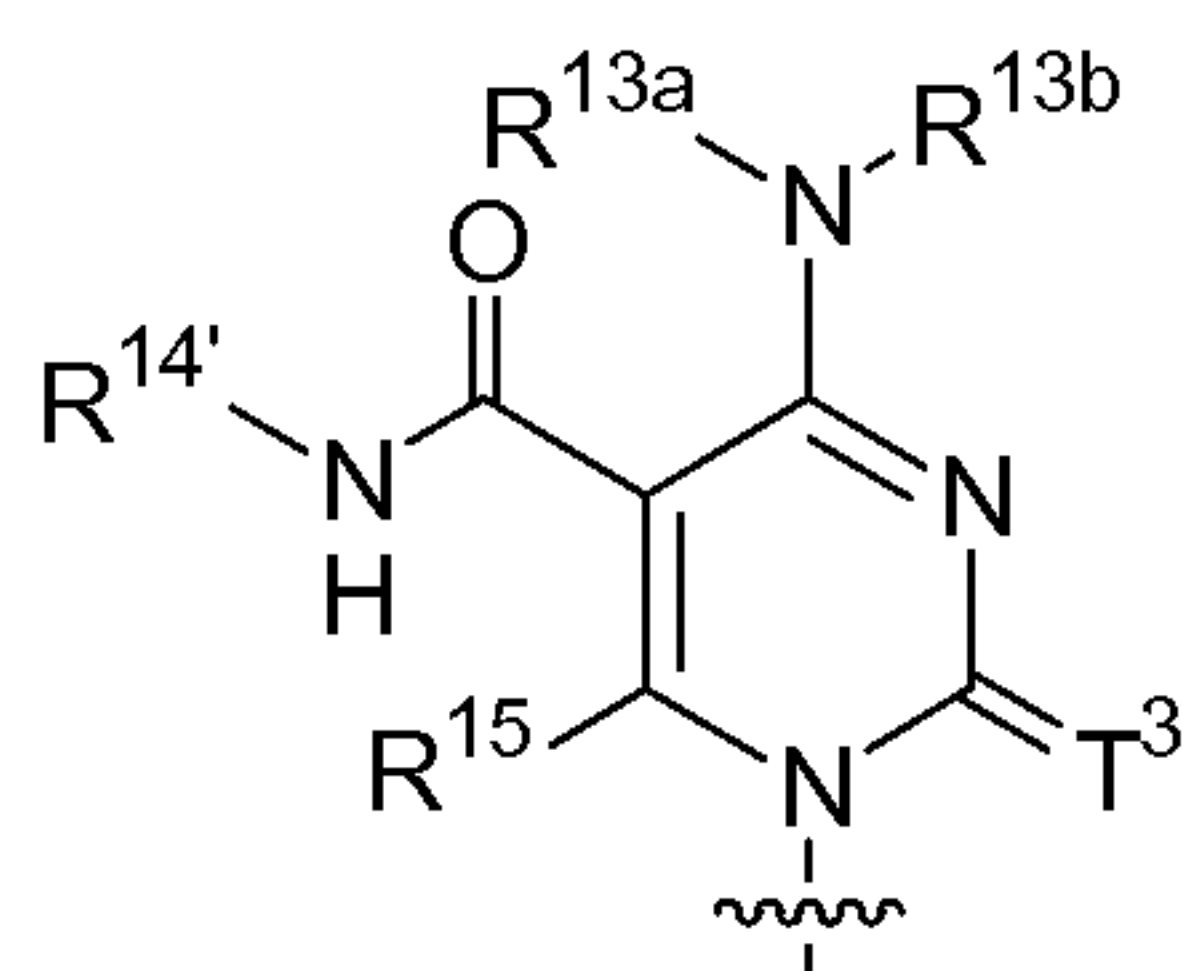
substituted alkoxy, optionally substituted alkoxyalkyl, optionally substituted alkoxyalkoxy, optionally substituted carboxyalkoxy, optionally substituted carboxyalkyl, or optionally substituted carbamoylalkyl; R^{11} is H or optionally substituted alkyl; R^{12a} is H, optionally substituted alkyl, optionally substituted aminoalkyl, or absent; and each of T^1 and T^2 is, independently, O, S, or Se.

34. The isolated polynucleotide of any one of claims 8-33, wherein n number of B has Formula (b23):



(b23), wherein R^{10} is optionally substituted heterocyclyl or optionally substituted aryl; R^{11} is H or optionally substituted alkyl; R^{12a} is H, optionally substituted alkyl, optionally substituted aminoalkyl, or absent; and each of T^1 and T^2 is, independently, O, S, or Se.

35. The isolated polynucleotide of any one of claims 8-34, wherein n number of B has Formula (b24):



(b24), wherein

T^3 is O, S, or Se;

each of R^{13a} and R^{13b} is, independently, H, optionally substituted acyl, optionally substituted alkyl, or optionally substituted alkoxy, wherein the combination of R^{13b} and R^{14} can be taken together to form optionally substituted heterocyclyl;

$R^{14'}$ is, independently, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heterocyclyl, optionally substituted alkheterocyclyl, optionally substituted alkaryl,

41. The pharmaceutical composition of claim 40, where the pharmaceutical composition comprises a lipid and wherein said lipid is selected from DLin-DMA, DLin-K-DMA, DLin-KC2-DMA, 98N12-5, C12-200, DLin-MC3-DMA, DODMA, DSDMA, DLenDMA, reLNPs, PLGA and PEGylated lipids and mixtures thereof.
42. A method of producing a polypeptide of interest in a mammalian cell, tissue or organism comprising administering to said cell, tissue or organism the isolated polynucleotide of any one of claims 1-37 or the pharmaceutical composition of any of claims 38-41.
43. The method of claim 42, wherein the isolated polynucleotide is formulated.
44. The method of claim 43, wherein the formulation comprises a lipid which is selected from one of DLin-DMA, DLin-K-DMA, DLin-KC2-DMA, 98N12-5, C12-200, DLin-MC3-DMA, DODMA, DSDMA, DLenDMA, reLNPs, PLGA, PEGylated lipids and mixtures or combinations thereof.
45. The method of claim 44, wherein the isolated polynucleotide is administered at a total daily dose of between 1 ug and 150 ug.
46. The method of claim 45, wherein administration is by injection.
47. The method of claim 46, wherein administration is intradermal or subcutaneous or intramuscular or intravitreal.
48. The method of claim 45, wherein levels of the polypeptide of interest in the serum of the mammal are at least 50 pg/mL at least two hours after administration.
49. The method of claim 45, wherein the levels of the polypeptide of interest in the serum of the mammal remain above 50 pg/mL for at least 72 hours after administration.

50. The method of claim 49, wherein the levels of the polypeptide of interest in the serum of the mammal remain above 60 pg/mL for at least 72 hours after administration.

51. The method of claim 44, wherein the resulting polynucleotide formulation has a mean particle size of 80 nm-160 nm, a PDI of between 0.02 and 0.20 and a lipid to polynucleotide ratio (wt/wt) of between 10-20.

52. A method for producing an increased level of a polypeptide of interest selected from the group consisting of SEQ ID NOs 3858-7559 in a mammalian cell, tissue or organism, comprising administering to said cell, tissue or organism a total daily dose of the isolated polynucleotide of any one of claims 4-37 or the pharmaceutical composition of any one of claims 38-41 in two or more equal or unequal split doses.

53. The method of claim 52, wherein the level of the polypeptide produced in response to said administration is greater than the levels produced by administering the same total daily dose of the isolated polynucleotide or pharmaceutical composition as a single administration.

54. The method of claim 52, wherein the mammalian organism is a human patient in need of an increased level of the polypeptide of interest.

55. The method of claim 54, wherein the increased level of the polypeptide of interest is detectable in a bodily fluid of said patient.

56. The method of claim 55, wherein the bodily fluid is selected from the group consisting of peripheral blood, serum, plasma, ascites, urine, cerebrospinal fluid (CSF), sputum, saliva, bone marrow, synovial fluid, aqueous humor, amniotic fluid, cerumen, breast milk, bronchoalveolar lavage fluid, semen, prostatic fluid, cowper's fluid or pre-ejaculatory fluid, sweat, fecal matter, hair, tears, cyst fluid, pleural and peritoneal fluid, pericardial fluid, lymph, chyme, chyle, bile, interstitial fluid, menses, pus, sebum, vomit, vaginal secretions, mucosal secretion, stool water, pancreatic juice, lavage fluids from

sinus cavities, bronchopulmonary aspirates, blastocyl cavity fluid, and umbilical cord blood.

57. The method of claim 56, wherein the bodily fluid is serum and the polypeptide per unit drug (PUD) is greater than 1.

58. The method of claim 57, wherein the dose splitting factor (DSF) is greater than 4.

59. The method of claim 55, wherein administration is transdermal.

60. The method of claim 59, wherein transdermal administration comprises utilization of one or more members selected from the group consisting of a patch, cream, ointment, mechanical device, needle, sponge, depot and fabric.

61. The method of claim 59, wherein administration is according to a dosing regimen which occurs over the course of hours, days, weeks, months, or years.

62. The method of claim 52, wherein said two or more split doses comprise a first dose of the polynucleotide or pharmaceutical composition administered at a time T1 followed by a second dose of the polynucleotide or pharmaceutical composition administered at a time T2, wherein said time T1 and said time T2 are separated by no more than 1 minute and wherein said first dose and said second dose are administered in amounts that result in higher levels of the polypeptide of interest in said subject than if the amounts of polynucleotide or pharmaceutical composition were administered together in a single unit dose.

63. The method of claim 62, further comprising administering a plurality of doses of said polynucleotide or pharmaceutical composition, Nx at times Tn, wherein x and n are independently selected from 3 to about 1000 and where the time between Tn and Tn+1 is separated by increments of no more than 10 seconds.

64. The method of claim 63, wherein administration occurs by direct injection.
65. The method of claim 64, wherein direct injection is selected from the group consisting of intravenous, intradermal, subcutaneous, intramuscular and intravitreal.
66. The method of claim 64, wherein said first dose is administered proximal to said second or plurality of doses.
67. The method of claim 64, wherein said first dose is administered distal to said second or plurality of doses.
68. The method of claim 64, wherein the distance between the site of injection of said first dose and the site of injection of any second or plurality of doses is from about 1mm to about 10 cm.
69. The method of claim 64, wherein injection is made at a depth of from 0.1mm to about 1cm.
70. The method of claim 65, wherein direct injection is achieved by using one or more devices selected from multineedle injection systems, catheter or lumen systems, and ultrasound, electrical or radiation based systems.
71. The method of claim 63, wherein the amount polynucleotide or pharmaceutical composition administered in any dose is substantially equal.
72. The method of claim 63, wherein time T1 and time T2 are separated by no more than 30 seconds.
73. The method of claim 63, wherein time T1 and time T2 are separated by no more than 10 seconds.

74. The method of claim 63, wherein the first dose, the second dose and any of a plurality of doses are administered at substantially the same time.
75. The method of claim 63, wherein the single unit dose is between about 10 mg/kg and about 500 mg/kg.
76. The method of claim 63, wherein the single unit dose is between about 1.0 mg/kg and about 10 mg/kg.
77. The method of claim 63, wherein the single unit dose is between about 0.001 mg/kg and about 1.0 mg/kg.
78. A method of preparing a lipid nanoparticle formulation of a polynucleotide encoding a polypeptide of interest comprising rapidly injecting a first ethanolic solution into a second aqueous solution wherein,
- (a) said first ethanolic solution comprises a mixture of lipid:DSPC: Cholesterol: PEG-c-DOMG to yield a molar ratio of 50:10:38.5:1.5 and having a final lipid concentration of approximately 25mM, and
 - (b) said second aqueous solution comprises a sodium citrate buffered solution of the polynucleotide encoding the polypeptide of interest having a concentration of 1-2 mg/mL and a pH of approximately 3,
- wherein the rapid injection results in a suspension containing 33% ethanol and a total lipid to polynucleotide weight ratio of at least 10:1.
79. The method of claim 78, wherein the rapid injection is performed either manually (MI) or by the aid of a syringe pump (SP).
80. The method of claim 79, further comprising dialyzing the resultant suspension against phosphate buffered saline (PBS) at pH 7.4.

81. The method of claim 80, wherein dialysis is performed more than once.
82. The method of claim 81, further comprising filtering the dialyzed suspension through a 0.2 μm sterile filter.
83. The method of any of claims 78-82, wherein the lipid is selected from the group consisting of DLin-DMA, DLin-K-DMA, DLin-KC2-DMA, 98N12-5, C12-200, DLin-MC3-DMA, DODMA, DSDMA, DLenDMA, reLNPs, PLGA and PEGylated lipids.
84. The method of any of claims 78-83, wherein the polynucleotide is selected from the polynucleotide of any of claims 1-37.
85. A lipid nanoparticle formulation of a polynucleotide encoding a polypeptide of interest produced by the method of any of claims 78-84 and having a particle size of 80 nm-160 nm, a PDI of between 0.02 and 0.20 and a lipid to polynucleotide ratio (wt/wt) of between 10-30.
86. A lipid nanoparticle formulation of claim 85, wherein the polynucleotide is selected from the polynucleotide of any of claims 1-37.
87. A reLNP formulation of a polynucleotide said polynucleotide encoding a polypeptide of interest.
88. A reLNP formulation of claim 87, wherein the polynucleotide is selected from the polynucleotide of any of claims 1-36.
89. A sustained release formulation of a polynucleotide said polynucleotide encoding a polypeptide of interest.
90. A sustained release formulation of claim 89, wherein the polynucleotide is selected from the polynucleotide of any of claims 1-36.

91. A polynucleotide encoding a fusion protein said fusion protein comprising a first polypeptide and a second polypeptide.

92. The polynucleotide of claim 91 where the first polypeptide is selected from the group consisting of Fc receptor, Fab fragment, Fab' fragment, F(ab')₂ fragment, Fv fragment, IgA domain, IgD domain, IgE domain, IgD domain, IgM domain, IgV domain, IgC1 domain, IgC2 domain and IgI domain and the second polypeptide is a polypeptide of interest.

FIGURE 1

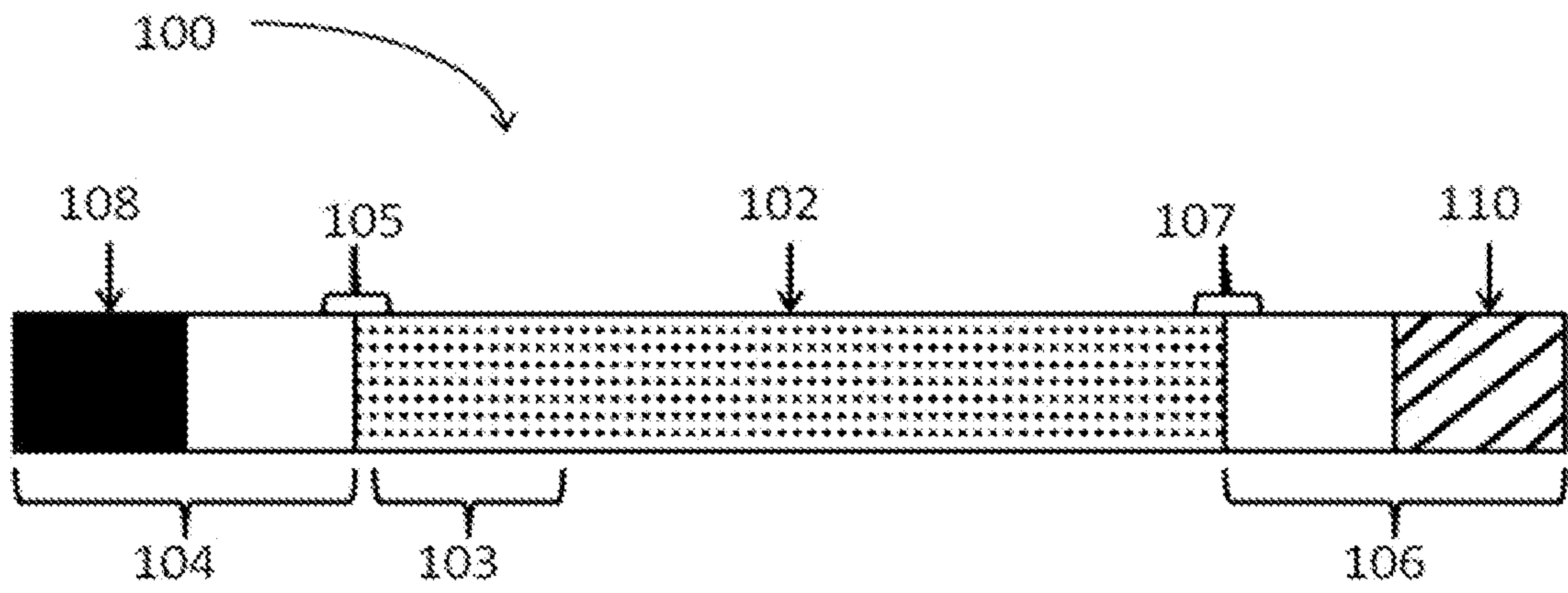
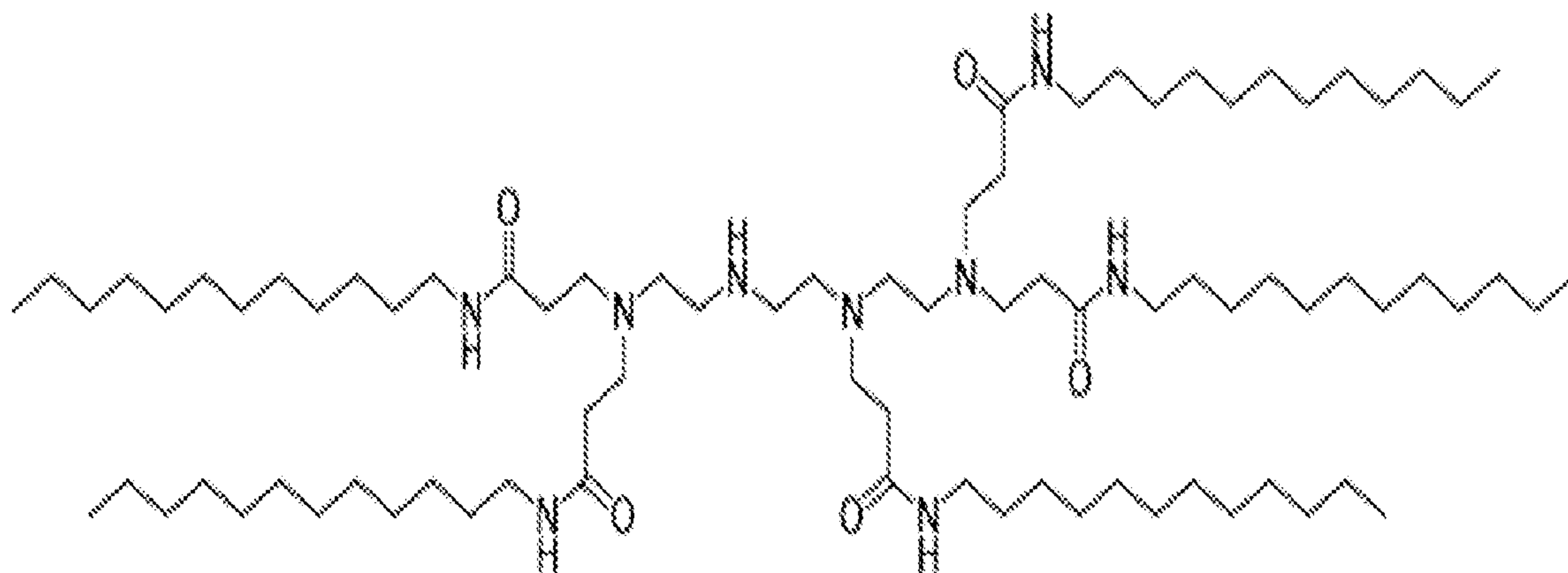
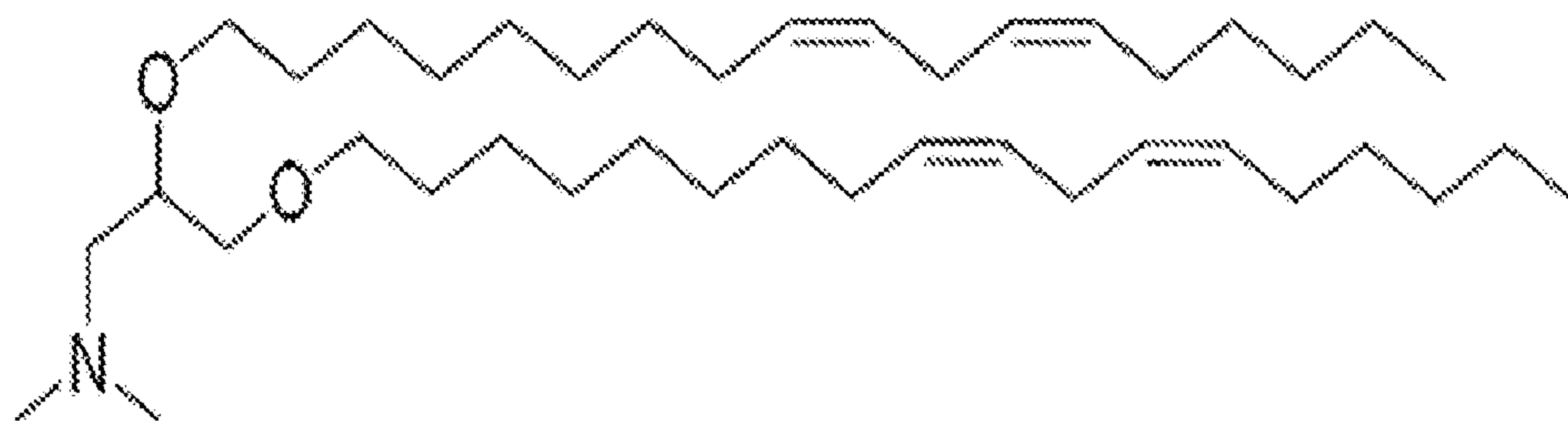


FIGURE 2

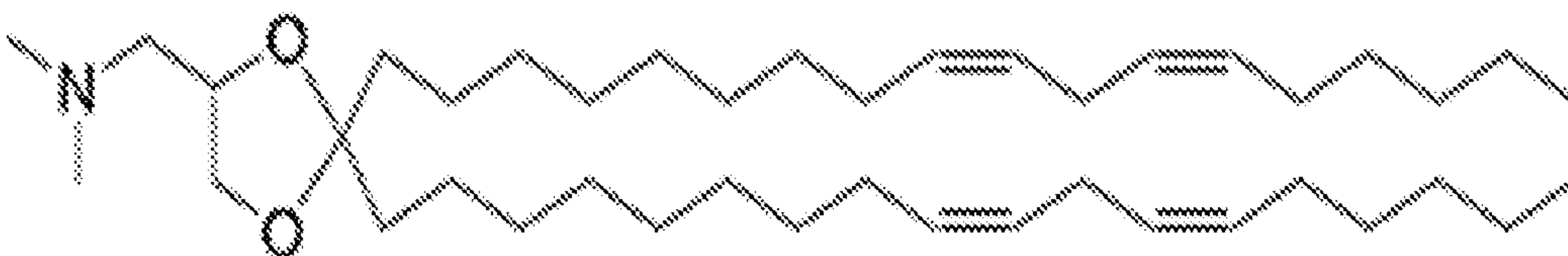
98N12-5 (TETA5-LAP)



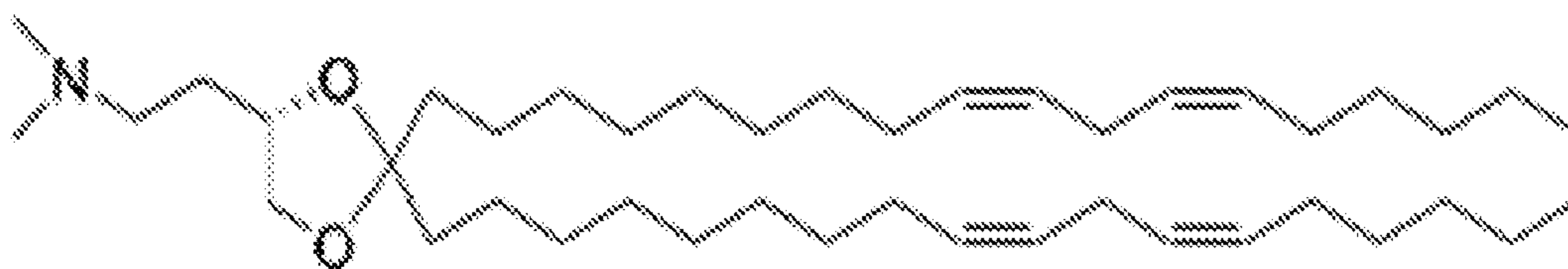
DLin-DMA



DLin-K-DMA (2,2-Dilinoleyl-4-dimethylaminomethyl-[1,3]-dioxolane)



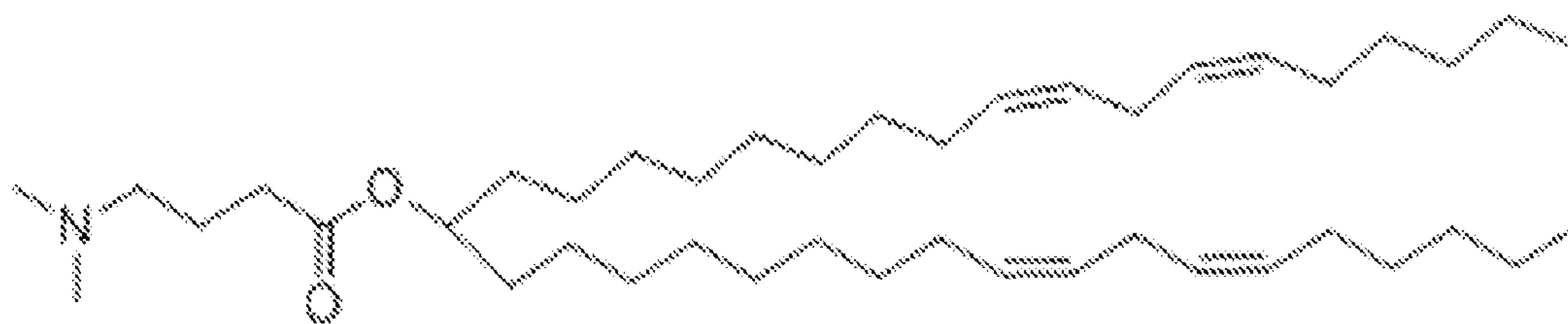
DLin-KC2-DMA



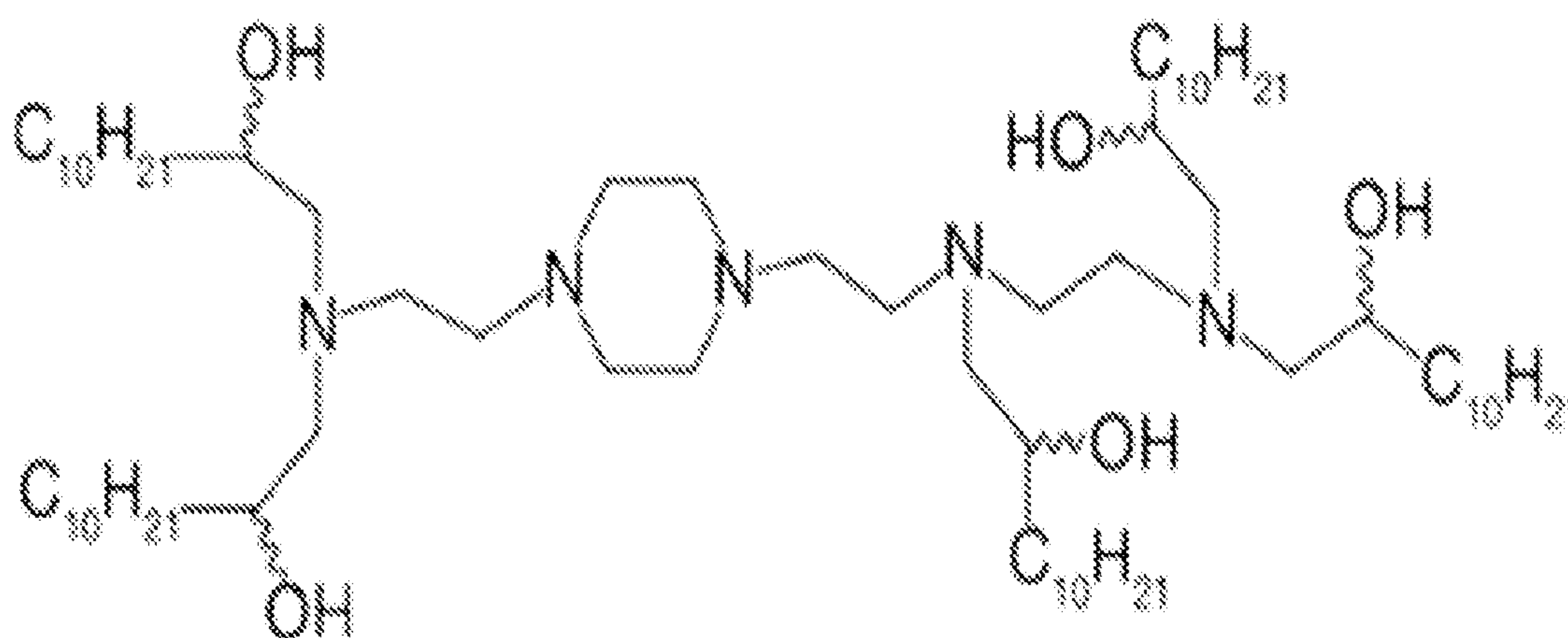
PRIOR ART

FIGURE 2 CONT.

DLin-MC3-DMA



C12-200



PRIOR ART

FIGURE 4

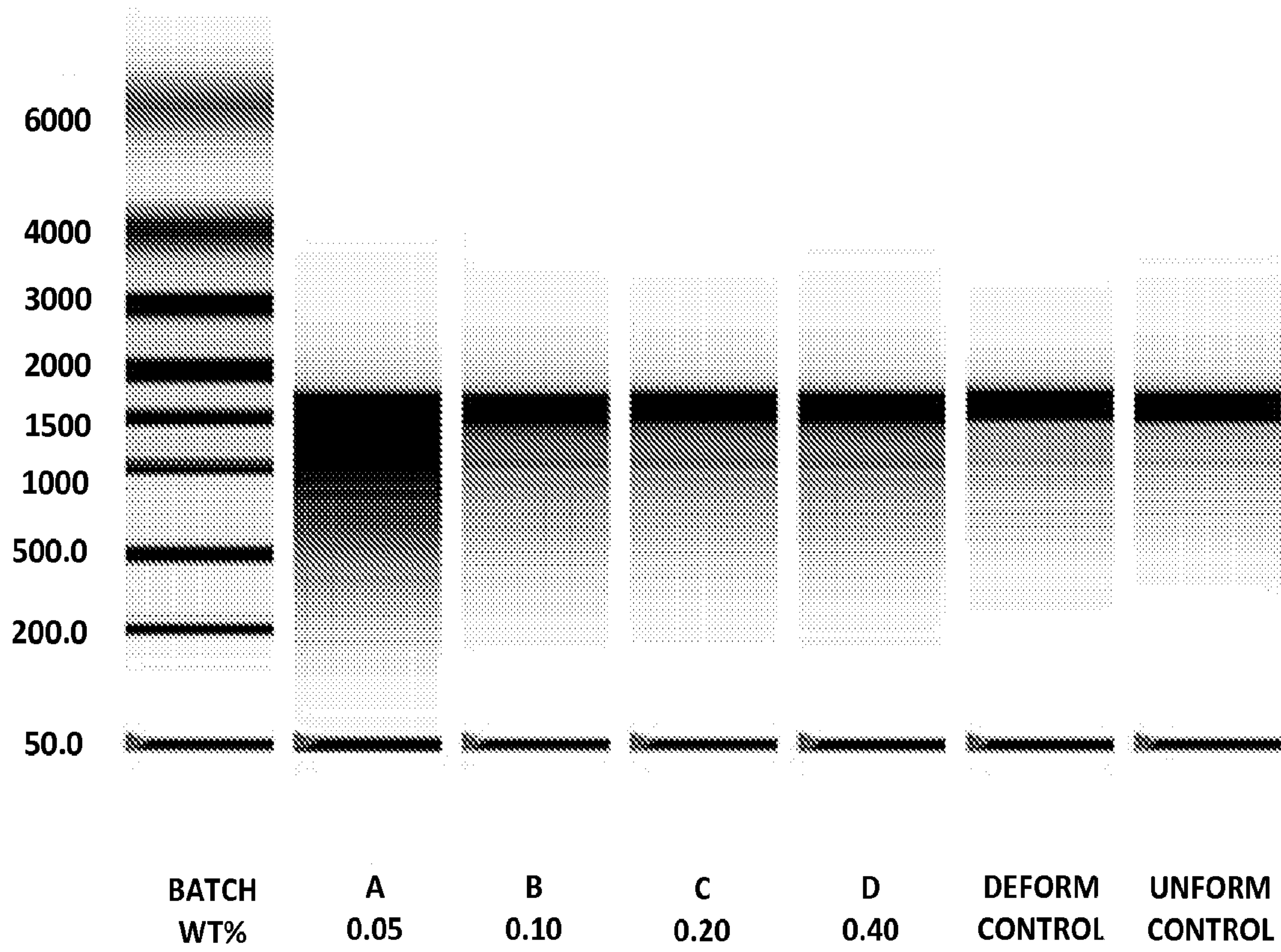


FIGURE 5

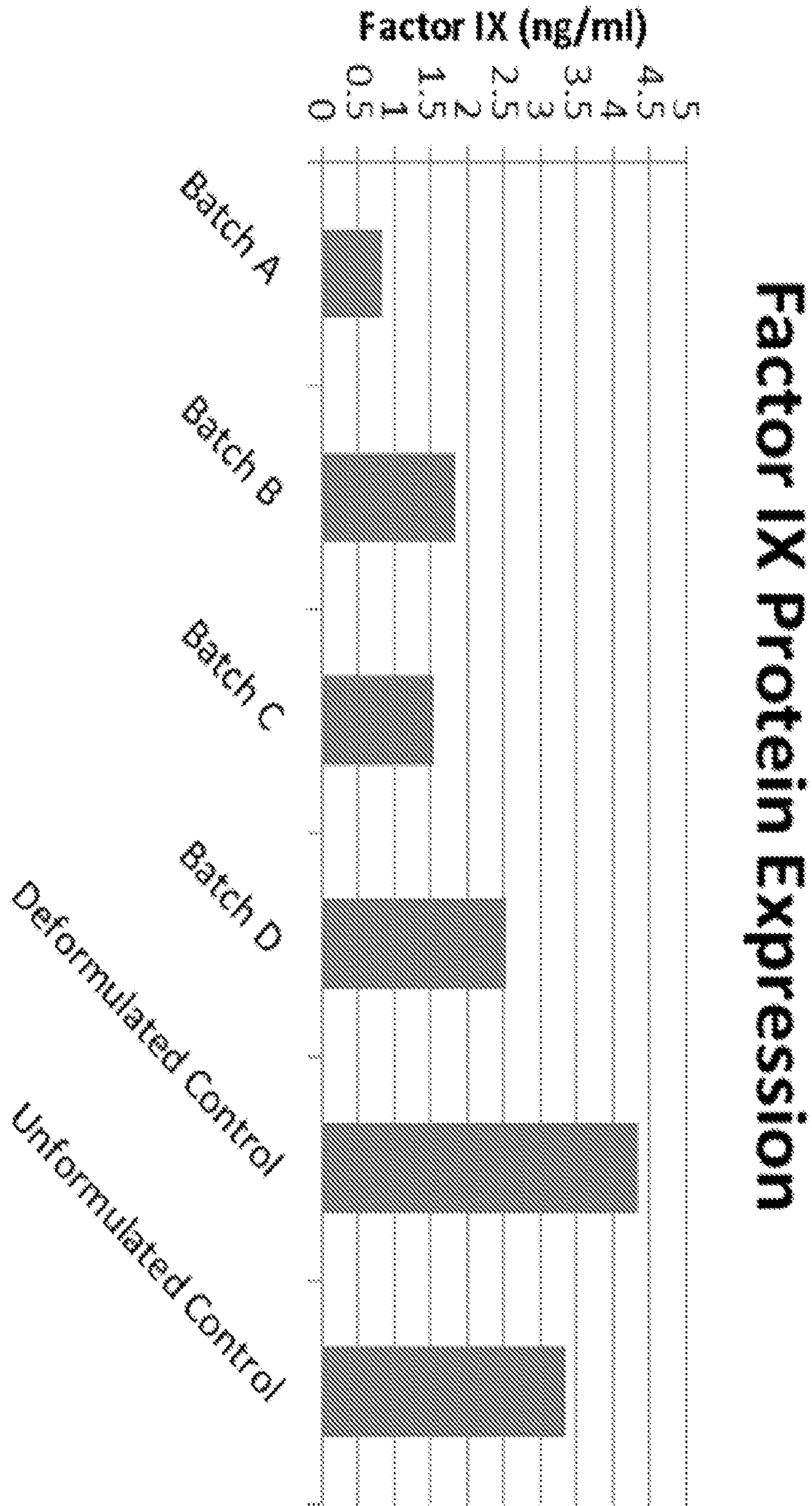


FIGURE 6

A.

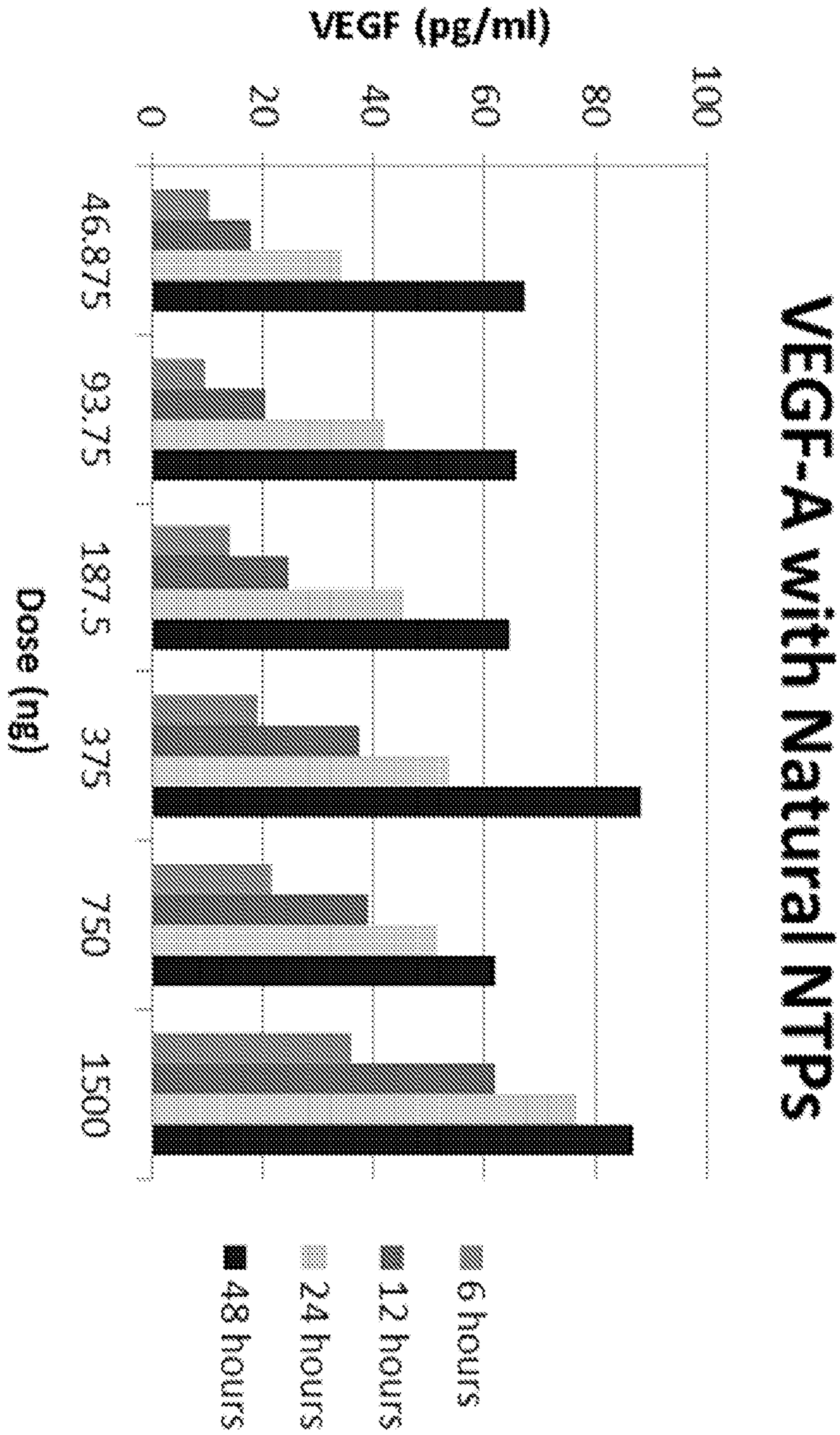


FIGURE 6 CONT.

B.

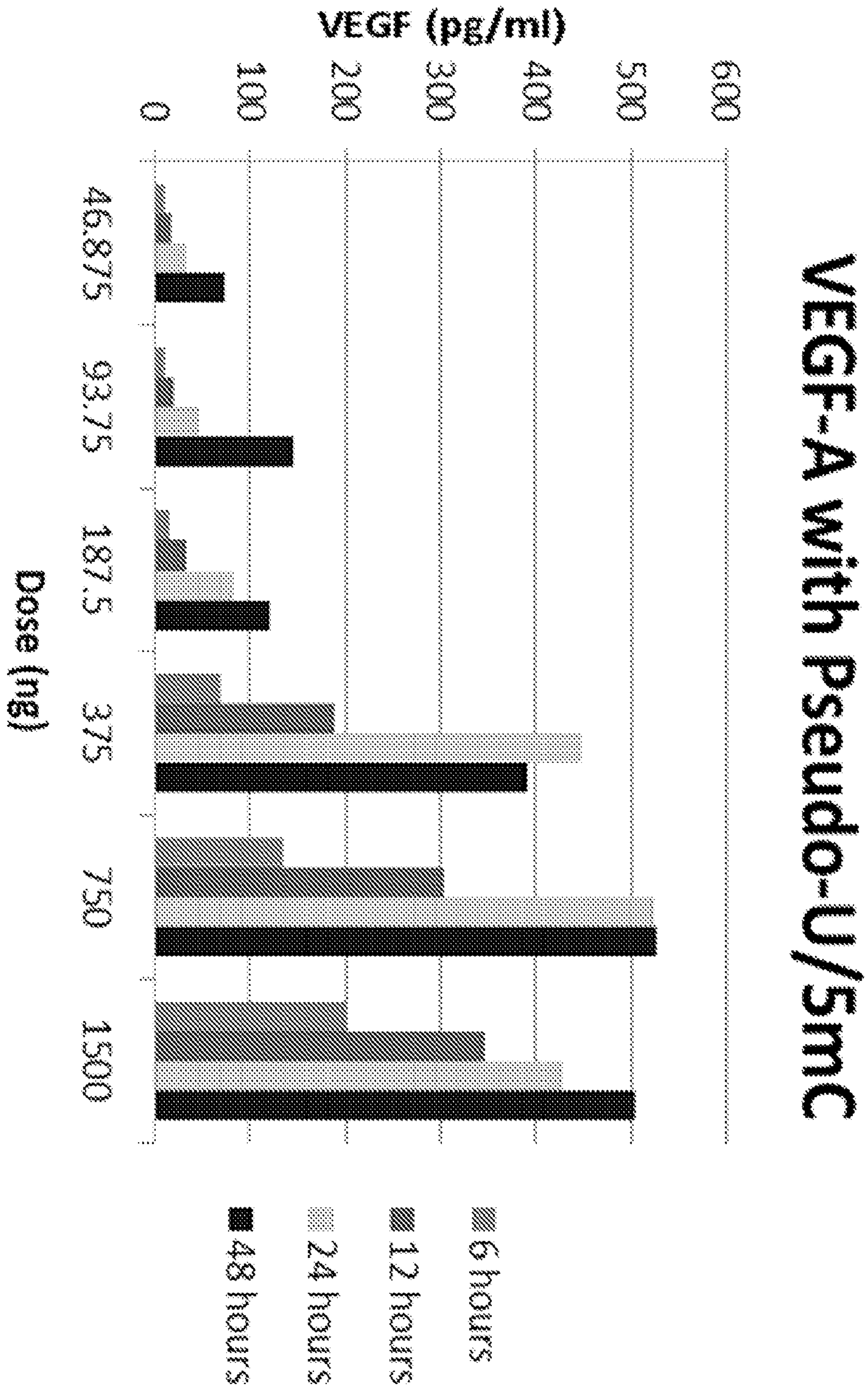


FIGURE 6 CONT.

C.

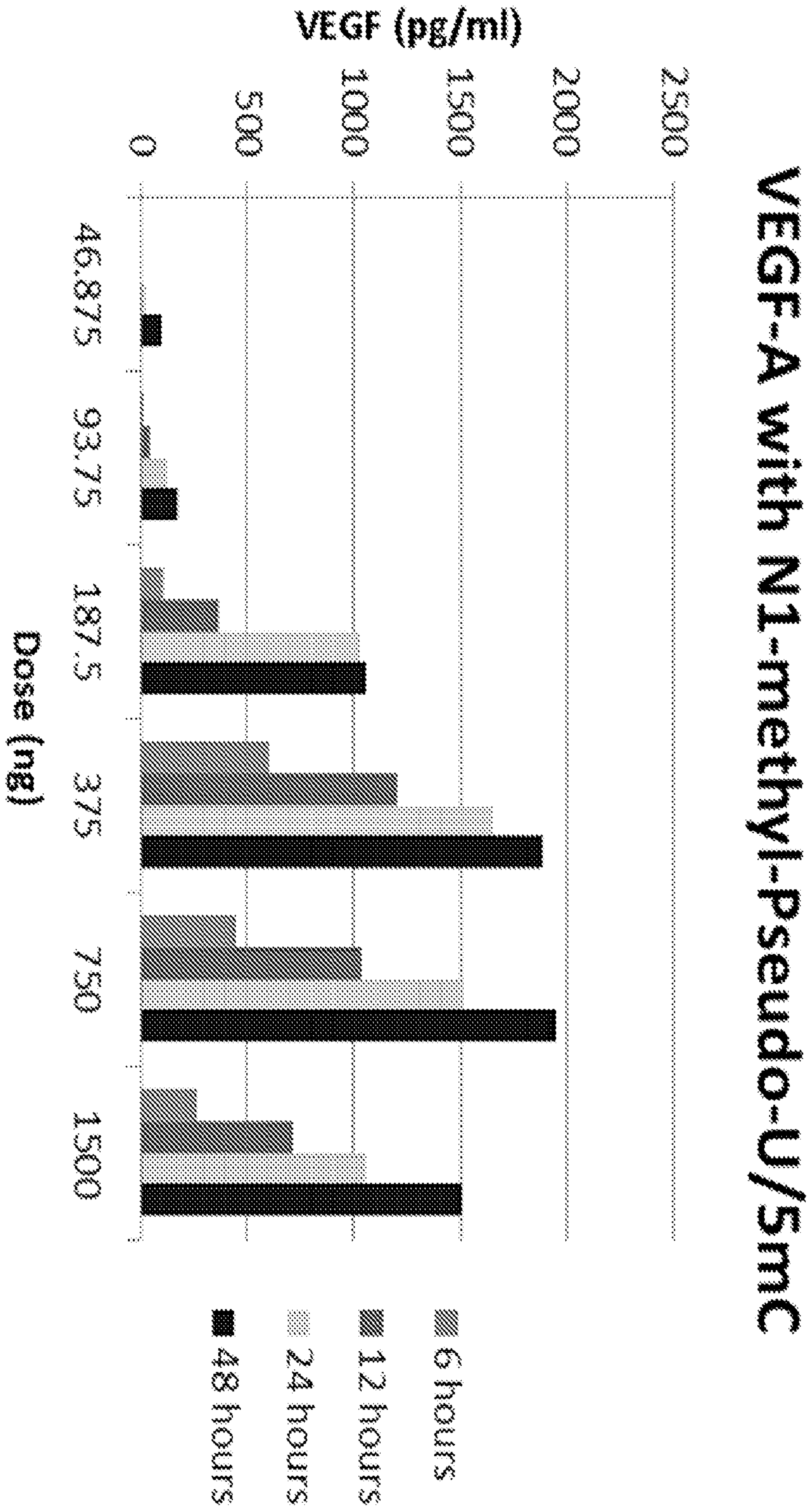


FIGURE 7

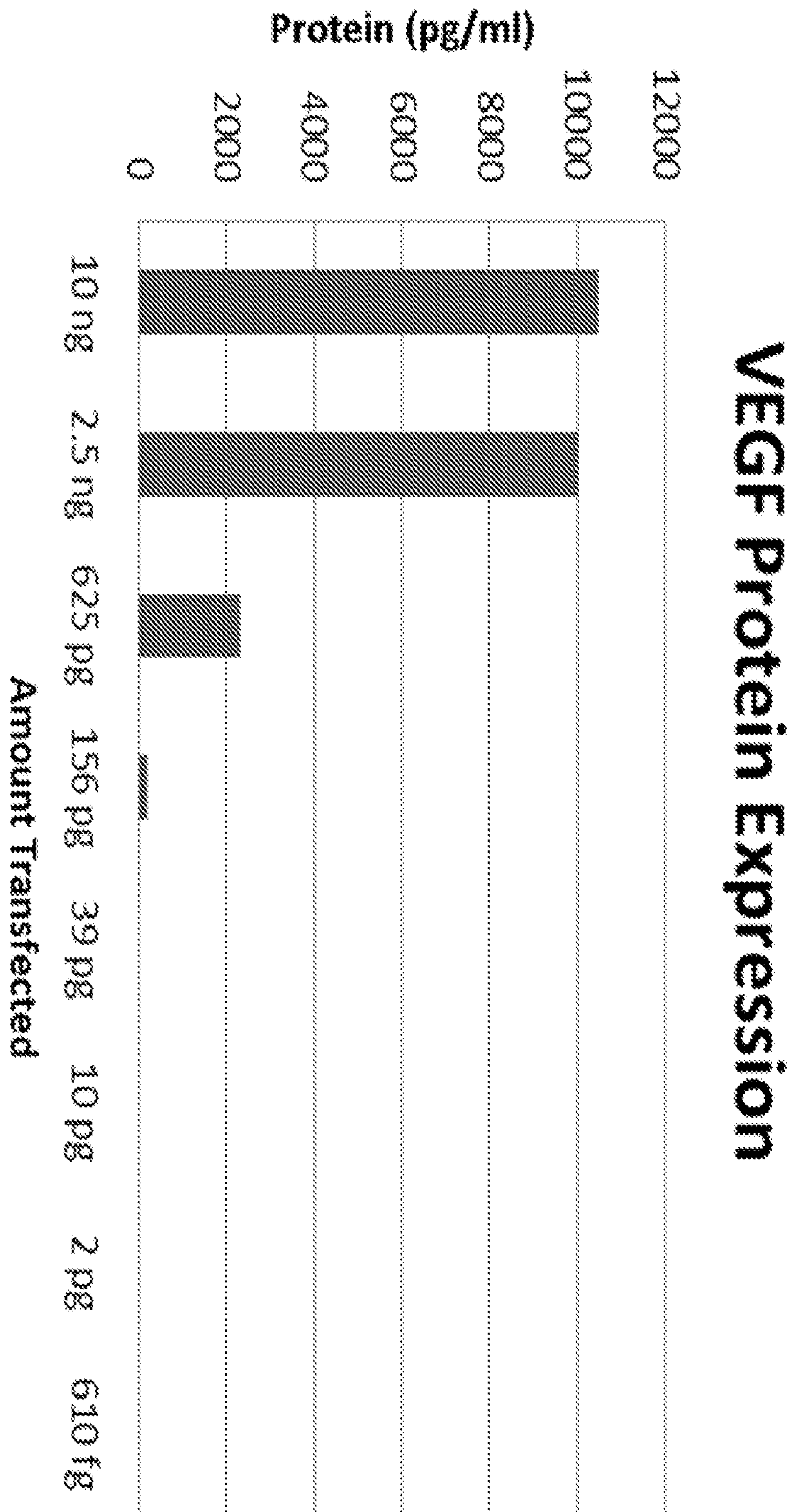


FIGURE 8

A.

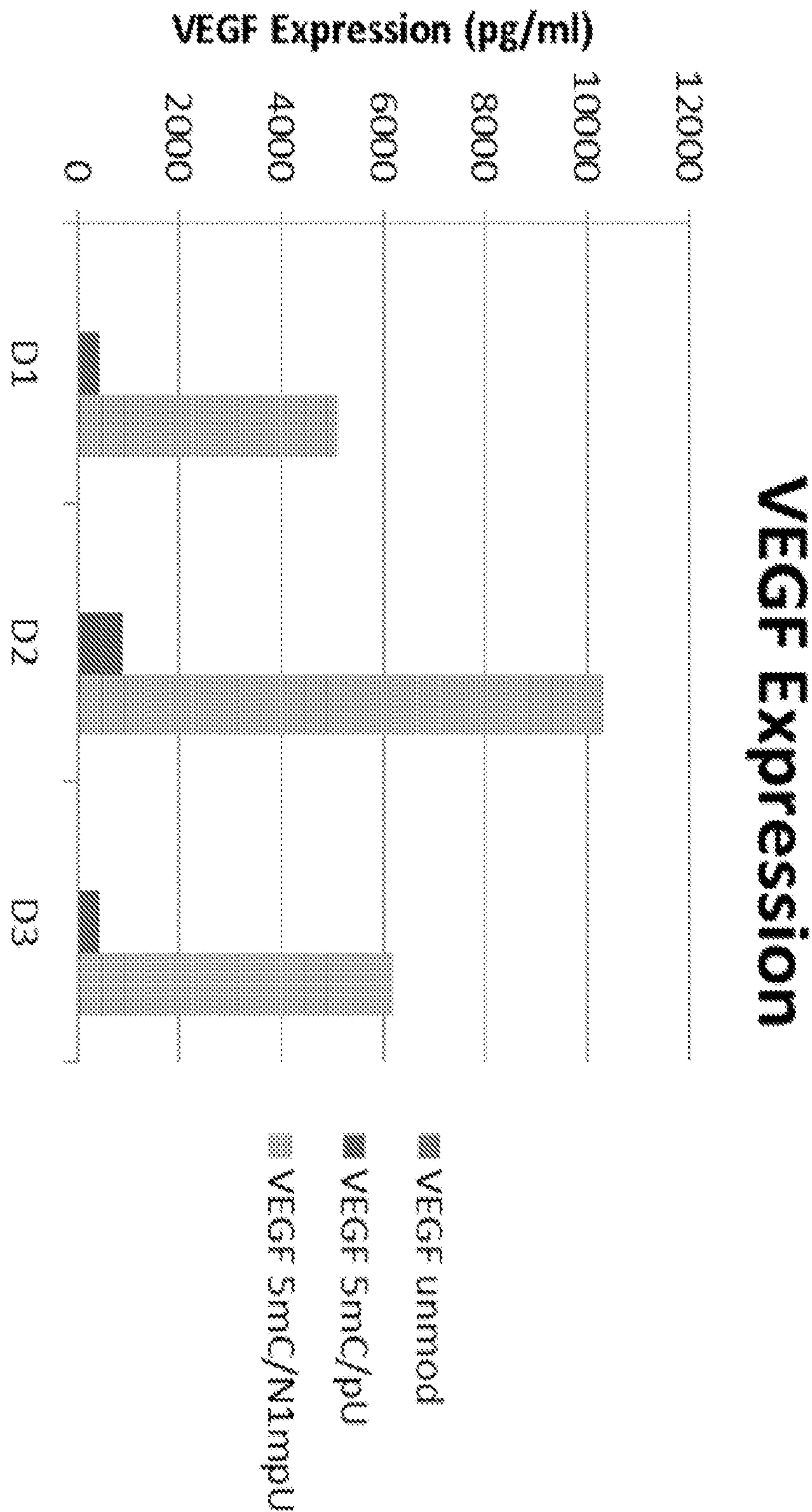


FIGURE 8 CONT.

B.

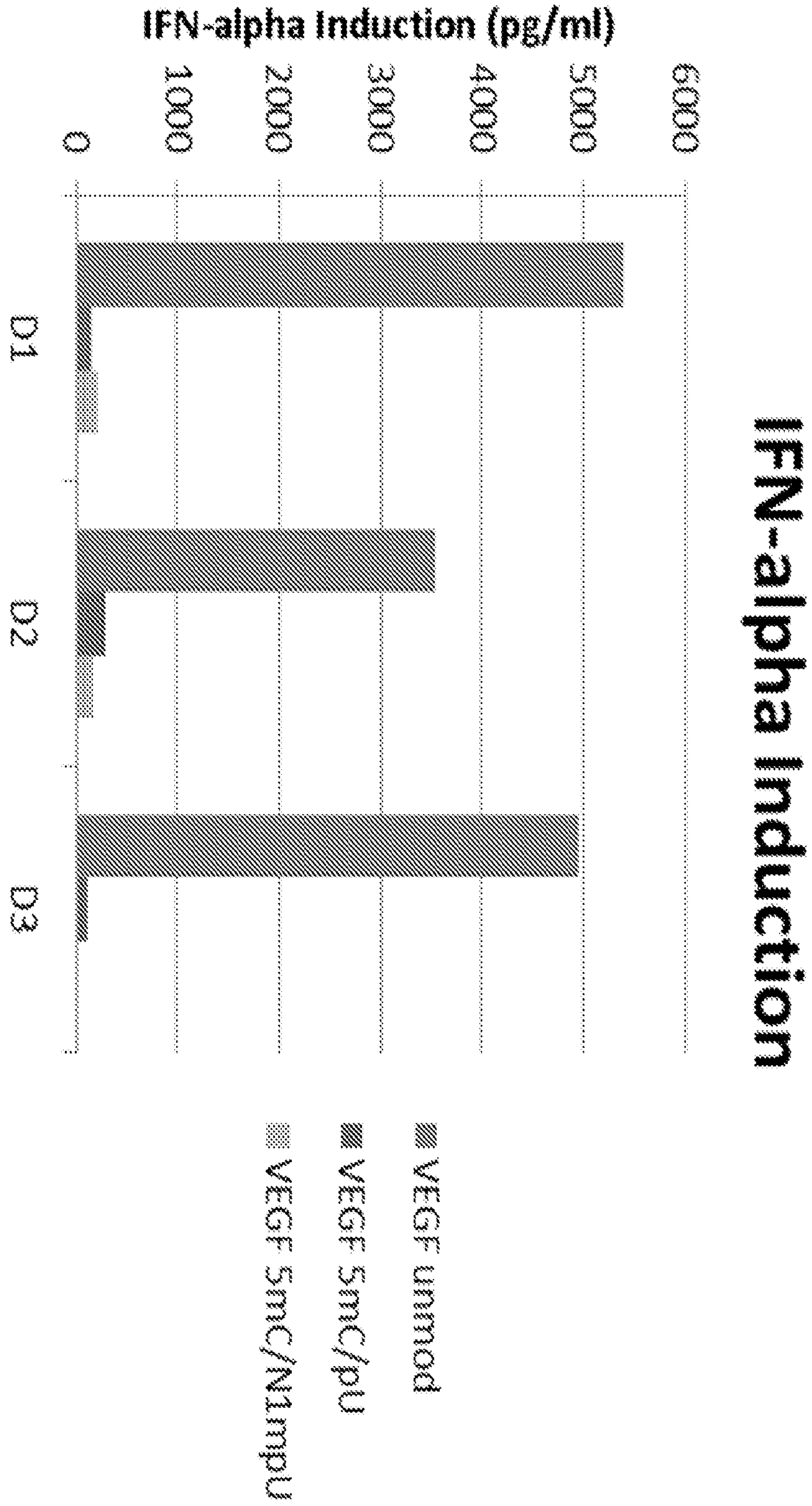


FIGURE 9

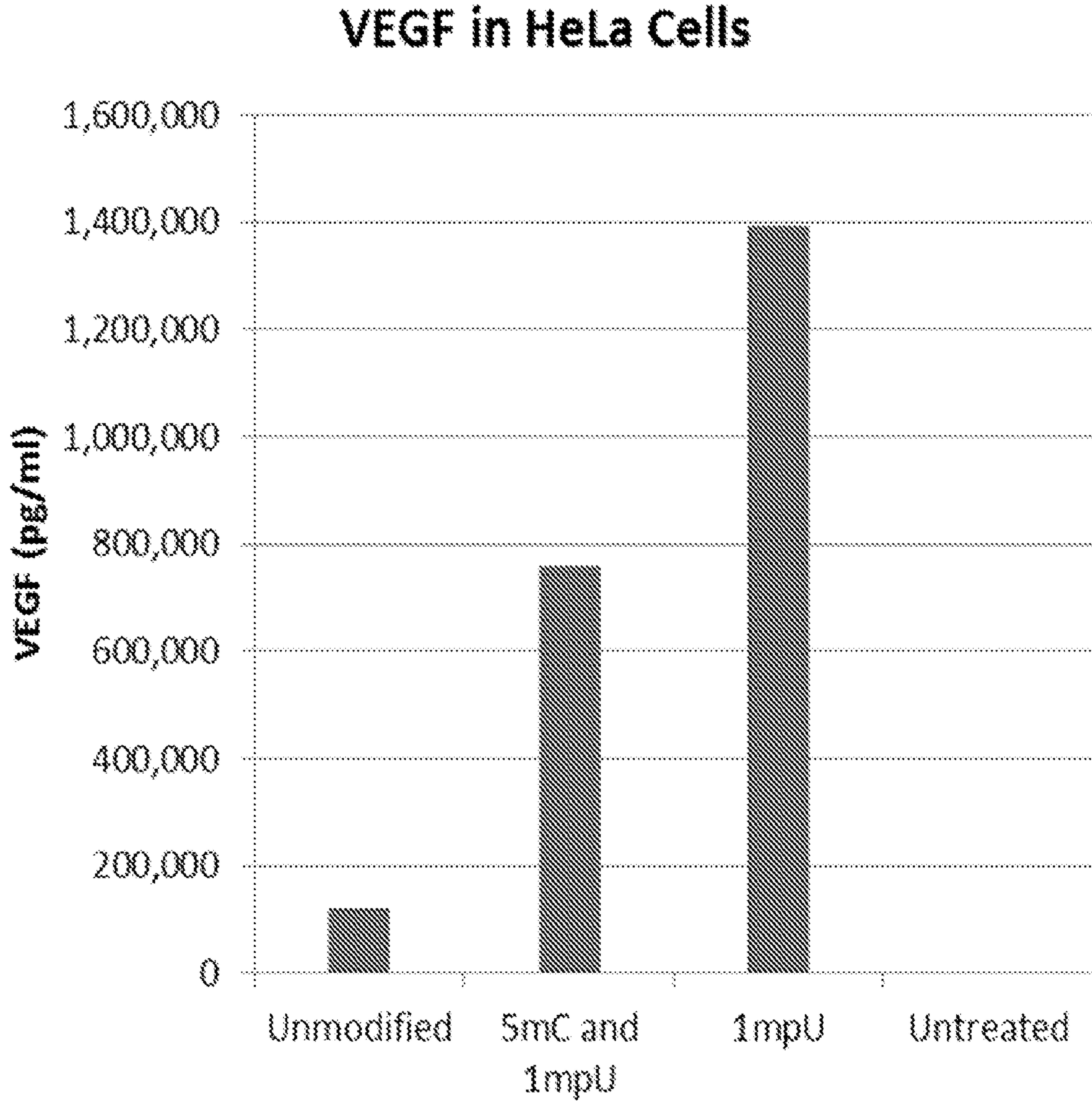


FIGURE 10

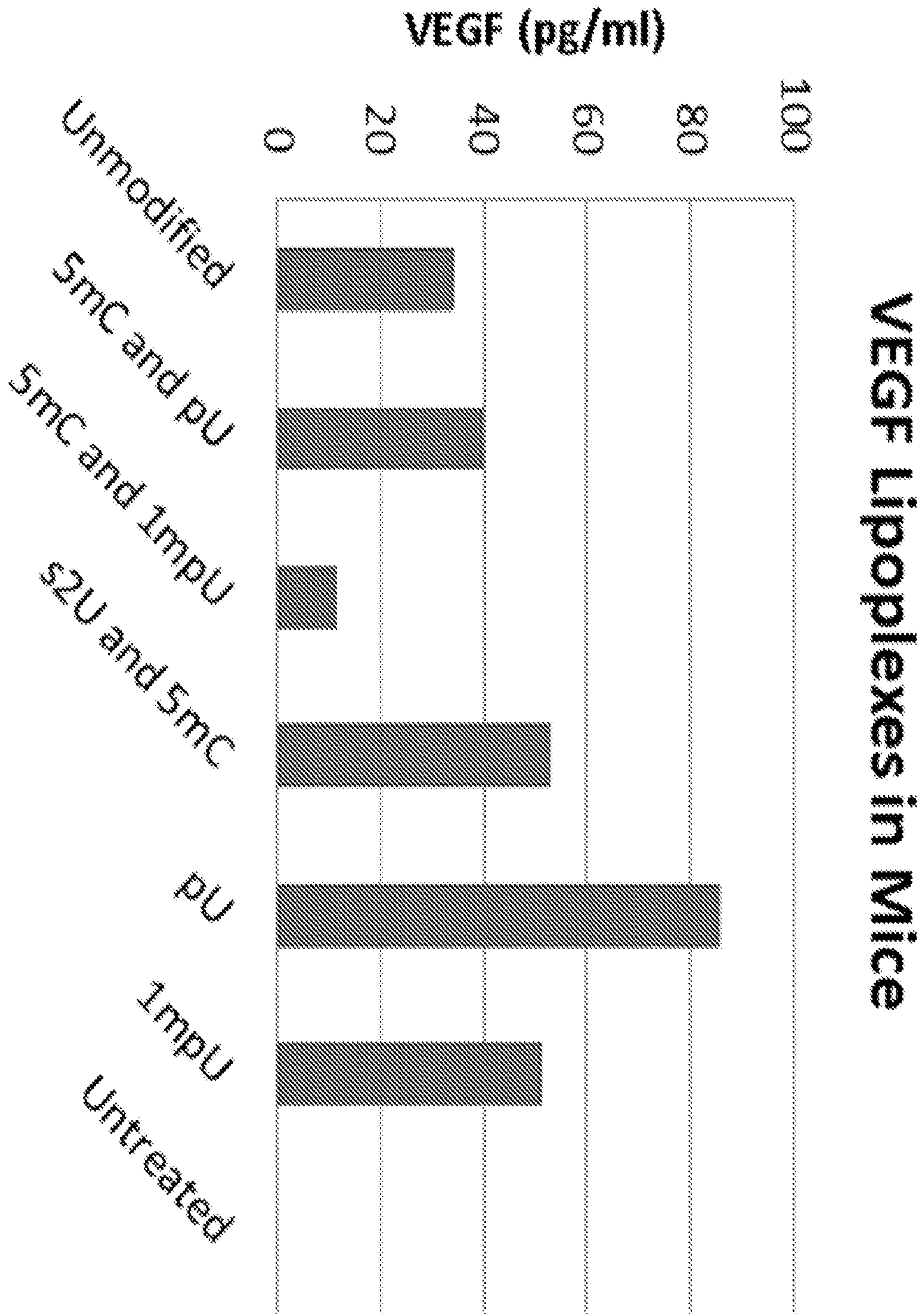


FIGURE 11

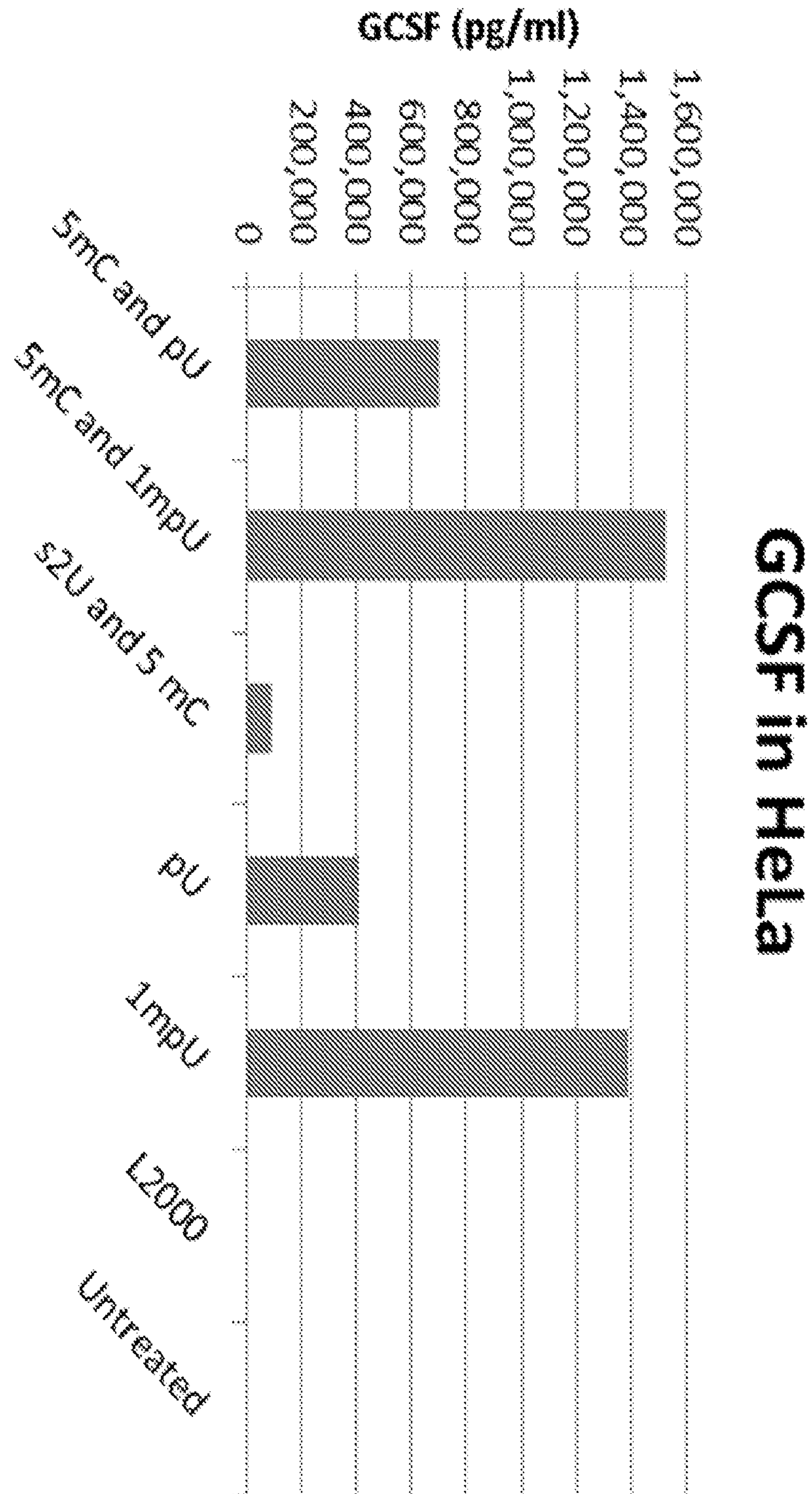


FIGURE 12

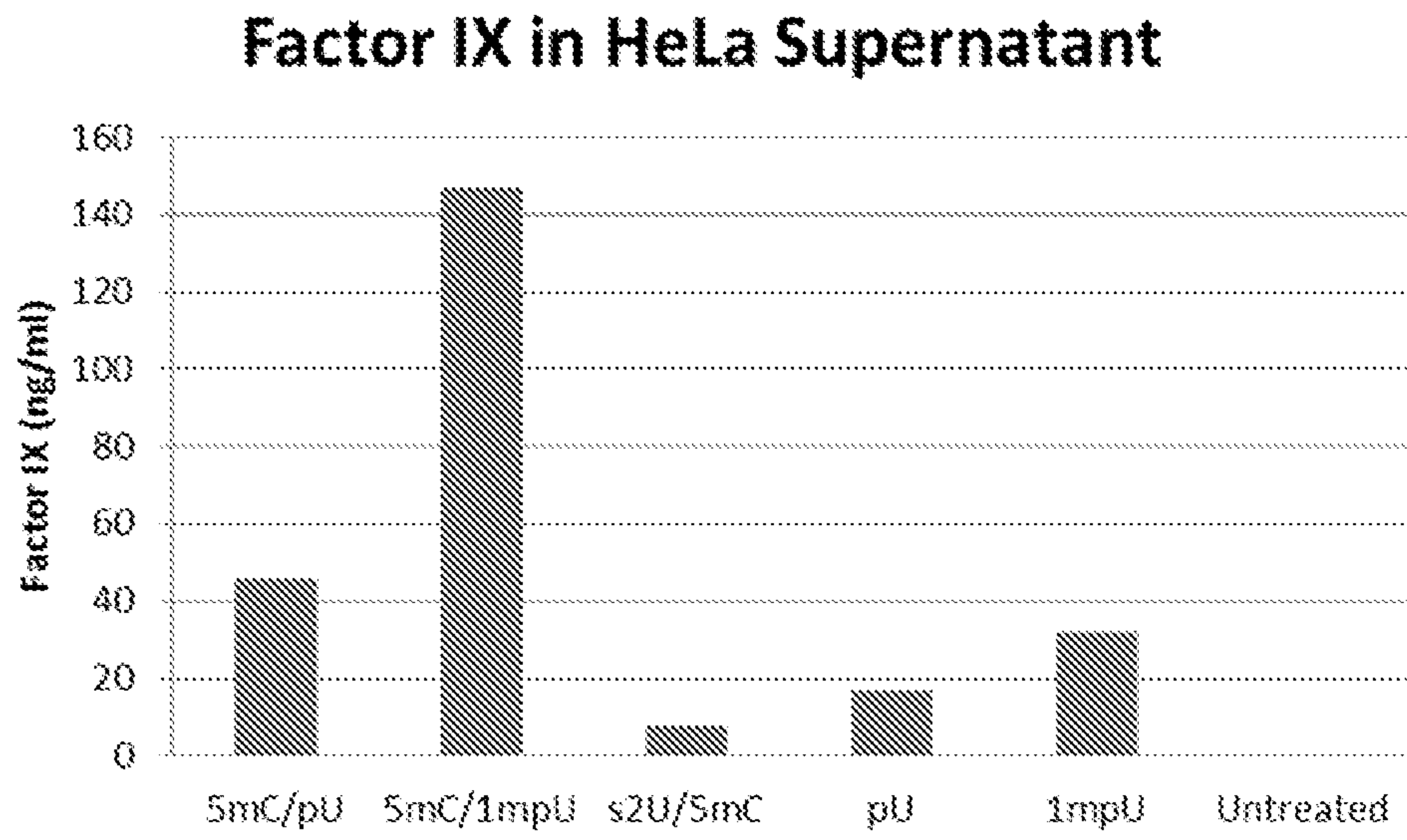


FIGURE 1

