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(54) **53 PROTEINES SECRETEES HUMAINES**  
(54) **53 HUMAN SECRETED PROTEINS**

(57) La présente invention concerne de nouvelles protéines sécrétées humaines et des acides nucléiques isolés contenant les régions codantes des gènes codant pour ces protéines. L'invention concerne également des vecteurs, des cellules hôtes, des anticorps, et des procédés de recombinaison permettant de produire des protéines sécrétées humaines. L'invention se rapporte enfin à des procédés diagnostiques et thérapeutiques utilisés pour diagnostiquer et traiter des affections liées à ces nouvelles protéines sécrétées humaines.

(57) The present invention relates to novel human secreted proteins and isolated nucleic acids containing the coding regions of the genes encoding such proteins. Also provided are vectors, host cells, antibodies, and recombinant methods for producing human secreted proteins. The invention further relates to diagnostic and therapeutic methods useful for diagnosing and treating disorders related to these novel human secreted proteins.



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

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| <b>(21) International Application Number:</b> PCT/US98/21142<br><b>(22) International Filing Date:</b> 8 October 1998 (08.10.98)<br><b>(30) Priority Data:</b> <table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">60/061,463</td> <td style="width: 30%;">9 October 1997 (09.10.97)</td> <td style="width: 40%;">US</td> </tr> <tr> <td>60/061,529</td> <td>9 October 1997 (09.10.97)</td> <td>US</td> </tr> <tr> <td>60/071,498</td> <td>9 October 1997 (09.10.97)</td> <td>US</td> </tr> <tr> <td>60/061,527</td> <td>9 October 1997 (09.10.97)</td> <td>US</td> </tr> <tr> <td>60/061,536</td> <td>9 October 1997 (09.10.97)</td> <td>US</td> </tr> <tr> <td>60/061,532</td> <td>9 October 1997 (09.10.97)</td> <td>US</td> </tr> </table> <b>(71) Applicant (for all designated States except US):</b> HUMAN GENOME SCIENCES, INC. [US/US]; 9410 Key West Avenue, Rockville, MD 20850 (US).<br><b>(72) Inventors; and</b><br><b>(75) Inventors/Applicants (for US only):</b> BREWER, Laurie, A. [US/US]; Apartment 115, 410 Van Dyke Street, St. Paul, MN 55119-4321 (US). OLSEN, Henrik, S. [DK/US]; 182 Kendrick Place No. 24, Gaithersburg, MD 20878 (US). DUAN, Roxanne [US/US]; 5515 Northfield Place, Bethesda, MD 20817 (US). EBNER, Reinhard [DE/US]; 9906 Shelburne Terrace No. 316, Gaithersburg, MD 20878 (US). ROSEN, Craig, A. [US/US]; 22400 Rolling Hill Road, Laytonsville, MD 20882 (US). RUBEN, Steven, M. [US/US]; |                           | 60/061,463                                                                                                                               | 9 October 1997 (09.10.97) | US | 60/061,529 | 9 October 1997 (09.10.97) | US | 60/071,498 | 9 October 1997 (09.10.97) | US | 60/061,527 | 9 October 1997 (09.10.97) | US | 60/061,536 | 9 October 1997 (09.10.97) | US | 60/061,532 | 9 October 1997 (09.10.97) | US | 18528 Heritage Hills Drive, Olney, MD 20832 (US). FLORENCE, Kimberly, A. [US/US]; 12805 Atlantic Avenue, Rockville, MD 20851 (US). YOUNG, Paul, E. [US/US]; 122 Beckwith Street, Gaithersburg, MD 20878 (US). GREENE, John, M. [US/US]; 872 Diamond Drive, Gaithersburg, MD 20878 (US). YU, Guo-Liang [CN/US]; 1714-C Marina Court, San Mateo, CA 94403 (US). FERRIE, Ann, M. [US/US]; 120 Fox Run Drive, Tewksbury, MA 01876 (US). FLORENCE, Charles [US/US]; 12805 Atlantic Avenue, Rockville, MD 20851 (US).<br><b>(74) Agents:</b> BROOKES, A., Anders et al.; Human Genome Sciences, Inc., 9410 Key West Avenue, Rockville, MD 20850 (US).<br><b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).<br><b>Published</b><br><i>With international search report.</i> |
| 60/061,463                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 9 October 1997 (09.10.97) | US                                                                                                                                       |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| 60/061,536                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 9 October 1997 (09.10.97) | US                                                                                                                                       |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 60/061,532                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 9 October 1997 (09.10.97) | US                                                                                                                                       |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>(54) Title:</b> 53 HUMAN SECRETED PROTEINS<br><b>(57) Abstract</b><br><p>The present invention relates to novel human secreted proteins and isolated nucleic acids containing the coding regions of the genes encoding such proteins. Also provided are vectors, host cells, antibodies, and recombinant methods for producing human secreted proteins. The invention further relates to diagnostic and therapeutic methods useful for diagnosing and treating disorders related to these novel human secreted proteins.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |                                                                                                                                          |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |            |                           |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 53 Human Secreted Proteins

### *Field of the Invention*

This invention relates to newly identified polynucleotides and the polypeptides encoded by these polynucleotides, uses of such polynucleotides and polypeptides, and  
5 their production.

### *Background of the Invention*

Unlike bacterium, which exist as a single compartment surrounded by a membrane, human cells and other eucaryotes are subdivided by membranes into many functionally distinct compartments. Each membrane-bounded compartment, or  
10 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.

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  
15 (ER). The ER separates the membrane-bounded proteins from all other types of proteins. Once localized to the ER, both groups of proteins can be further directed to another organelle called the Golgi apparatus. Here, the Golgi distributes the proteins to vesicles, including secretory vesicles, the cell membrane, lysosomes, and the other organelles.

20 Proteins targeted to the ER by a signal sequence can be released into the extracellular space as a secreted protein. For example, vesicles containing secreted proteins can fuse with the cell membrane and release their contents into the extracellular space - a process called exocytosis. Exocytosis can occur constitutively or after receipt of a triggering signal. In the latter case, the proteins are stored in secretory vesicles (or  
25 secretory granules) until exocytosis is triggered. 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.

Despite the great progress made in recent years, only a small number of genes encoding human secreted proteins have been identified. These secreted proteins include  
30 the commercially valuable human insulin, interferon, Factor VIII, human growth hormone, tissue plasminogen activator, and erythropoietin. Thus, in light of the pervasive role of secreted proteins in human physiology, a need exists for identifying and characterizing novel human secreted proteins and the genes that encode them. This knowledge will allow one to detect, to treat, and to prevent medical disorders by using  
35 secreted proteins or the genes that encode them.

### *Summary of the Invention*

The present invention relates to novel polynucleotides and the encoded polypeptides. Moreover, the present invention relates to vectors, host cells, antibodies, and recombinant methods for producing the polypeptides and polynucleotides. Also provided are diagnostic methods for detecting disorders related to the polypeptides, and therapeutic methods for treating such disorders. The invention further relates to screening methods for identifying binding partners of the polypeptides.

### *Detailed Description*

#### **Definitions**

The following definitions are provided to facilitate understanding of certain terms used throughout this specification.

In the present invention, "isolated" refers to material removed from its original environment (e.g., the natural environment if it is naturally occurring), and thus is altered "by the hand of man" from its natural state. For example, an isolated polynucleotide could be part of a vector or a composition of matter, or could be contained within a cell, and still be "isolated" because that vector, composition of matter, or particular cell is not the original environment of the polynucleotide.

In the present invention, a "secreted" protein refers to those proteins capable of being directed to the ER, secretory vesicles, or the extracellular space as a result of a signal sequence, as well as those proteins released into the extracellular space without necessarily containing a signal sequence. If the secreted protein is released into the extracellular space, the secreted protein can undergo extracellular processing to produce a "mature" protein. Release into the extracellular space can occur by many mechanisms, including exocytosis and proteolytic cleavage.

As used herein, a "polynucleotide" refers to a molecule having a nucleic acid sequence contained in SEQ ID NO:X or the cDNA contained within the clone deposited with the ATCC. For example, the polynucleotide can contain the nucleotide sequence of the full length cDNA sequence, including the 5' and 3' untranslated sequences, the coding region, with or without the signal sequence, the secreted protein coding region, as well as fragments, epitopes, domains, and variants of the nucleic acid sequence. Moreover, as used herein, a "polypeptide" refers to a molecule having the translated amino acid sequence generated from the polynucleotide as broadly defined.

In the present invention, the full length sequence identified as SEQ ID NO:X was often generated by overlapping sequences contained in multiple clones (contig

analysis). A representative clone containing all or most of the sequence for SEQ ID NO:X was deposited with the American Type Culture Collection ("ATCC"). As shown in Table 1, each clone is identified by a cDNA Clone ID (Identifier) and the ATCC Deposit Number. The ATCC is located at 10801 University Boulevard,  
5 Manassas, Virginia 20110-2209, USA. The ATCC deposit was made pursuant to the terms of the Budapest Treaty on the international recognition of the deposit of microorganisms for purposes of patent procedure.

A "polynucleotide" of the present invention also includes those polynucleotides capable of hybridizing, under stringent hybridization conditions, to sequences contained  
10 in SEQ ID NO:X, the complement thereof, or the cDNA within the clone deposited with the ATCC. "Stringent hybridization conditions" refers to an overnight incubation at 42°C in a solution comprising 50% formamide, 5x SSC (750 mM NaCl, 75 mM sodium citrate), 50 mM sodium phosphate (pH 7.6), 5x Denhardt's solution, 10% dextran sulfate, and 20 µg/ml denatured, sheared salmon sperm DNA, followed by washing the  
15 filters in 0.1x SSC at about 65°C.

Also contemplated are nucleic acid molecules that hybridize to the polynucleotides of the present invention at lower stringency hybridization conditions. Changes in the stringency of hybridization and signal detection are primarily accomplished through the manipulation of formamide concentration (lower percentages  
20 of formamide result in lowered stringency); salt conditions, or temperature. For example, lower stringency conditions include an overnight incubation at 37°C in a solution comprising 6X SSPE (20X SSPE = 3M NaCl; 0.2M NaH<sub>2</sub>PO<sub>4</sub>; 0.02M EDTA, pH 7.4), 0.5% SDS, 30% formamide, 100 µg/ml salmon sperm blocking DNA; followed by washes at 50°C with 1XSSPE, 0.1% SDS. In addition, to achieve even  
25 lower stringency, washes performed following stringent hybridization can be done at higher salt concentrations (e.g. 5X SSC).

Note that variations in the above conditions may be accomplished through the inclusion and/or substitution of alternate blocking reagents used to suppress background in hybridization experiments. Typical blocking reagents include  
30 Denhardt's reagent, BLOTTO, heparin, denatured salmon sperm DNA, and commercially available proprietary formulations. The inclusion of specific blocking reagents may require modification of the hybridization conditions described above, due to problems with compatibility.

Of course, a polynucleotide which hybridizes only to polyA<sup>+</sup> sequences (such  
35 as any 3' terminal polyA<sup>+</sup> tract of a cDNA shown in the sequence listing), or to a

complementary stretch of T (or U) residues, would not be included in the definition of "polynucleotide," since such a polynucleotide would hybridize to any nucleic acid molecule containing a poly (A) stretch or the complement thereof (e.g., practically any double-stranded cDNA clone).

5           The polynucleotide of the present invention can be composed of any polyribonucleotide or polydeoxribonucleotide, which may be unmodified RNA or DNA or modified RNA or DNA. For example, polynucleotides can be composed of single- and double-stranded DNA, DNA that is a mixture of single- and double-stranded regions, single- and double-stranded RNA, and RNA that is mixture of single- and double-stranded regions, hybrid molecules comprising DNA and RNA that may be  
10           single-stranded or, more typically, double-stranded or a mixture of single- and double-stranded regions. In addition, the polynucleotide can be composed of triple-stranded regions comprising RNA or DNA or both RNA and DNA. A polynucleotide may also contain one or more modified bases or DNA or RNA backbones modified for stability  
15           or for other reasons. "Modified" bases include, for example, tritylated bases and unusual bases such as inosine. A variety of modifications can be made to DNA and RNA; thus, "polynucleotide" embraces chemically, enzymatically, or metabolically modified forms.

          The polypeptide of the present invention can be composed of amino acids joined  
20           to each other by peptide bonds or modified peptide bonds, i.e., peptide isosteres, and may contain amino acids other than the 20 gene-encoded amino acids. The polypeptides may be modified by either natural processes, such as posttranslational processing, or by chemical modification techniques which are well known in the art. Such modifications are well described in basic texts and in more detailed monographs,  
25           as well as in a voluminous research literature. Modifications can occur anywhere in a polypeptide, including the peptide backbone, the amino acid side-chains and the amino or carboxyl termini. It will be appreciated that the same type of modification may be present in the same or varying degrees at several sites in a given polypeptide. Also, a given polypeptide may contain many types of modifications. Polypeptides may be  
30           branched, for example, as a result of ubiquitination, and they may be cyclic, with or without branching. Cyclic, branched, and branched cyclic polypeptides may result from posttranslation natural processes or may be made by synthetic methods. Modifications include acetylation, acylation, ADP-ribosylation, amidation, covalent attachment of flavin, covalent attachment of a heme moiety, covalent attachment of a  
35           nucleotide or nucleotide derivative, covalent attachment of a lipid or lipid derivative, covalent attachment of phosphatidylinositol, cross-linking, cyclization, disulfide bond formation, demethylation, formation of covalent cross-links, formation of cysteine,

formation of pyroglutamate, formylation, gamma-carboxylation, glycosylation, GPI anchor formation, hydroxylation, iodination, methylation, myristoylation, oxidation, pegylation, proteolytic processing, phosphorylation, prenylation, racemization, selenoylation, sulfation, transfer-RNA mediated addition of amino acids to proteins  
 5 such as arginylation, and ubiquitination. (See, for instance, PROTEINS - STRUCTURE AND MOLECULAR PROPERTIES, 2nd Ed., T. E. Creighton, W. H. Freeman and Company, New York (1993); POSTTRANSLATIONAL COVALENT MODIFICATION OF PROTEINS, B. C. Johnson, Ed., Academic Press, New York, pgs. 1-12 (1983); Seifter et al., Meth Enzymol 182:626-646 (1990);  
 10 Rattan et al., Ann NY Acad Sci 663:48-62 (1992).)

"SEQ ID NO:X" refers to a polynucleotide sequence while "SEQ ID NO:Y" refers to a polypeptide sequence, both sequences identified by an integer specified in Table 1.

"A polypeptide having biological activity" refers to polypeptides exhibiting  
 15 activity similar, but not necessarily identical to, an activity of a polypeptide of the present invention, including mature forms, as measured in a particular biological assay, with or without dose dependency. In the case where dose dependency does exist, it need not be identical to that of the polypeptide, but rather substantially similar to the dose-dependence in a given activity as compared to the polypeptide of the present  
 20 invention (i.e., the candidate polypeptide will exhibit greater activity or not more than about 25-fold less and, preferably, not more than about tenfold less activity, and most preferably, not more than about three-fold less activity relative to the polypeptide of the present invention.)

## 25 Polynucleotides and Polypeptides of the Invention

### FEATURES OF PROTEIN ENCODED BY GENE NO: 1

30 The translation product of this gene shares sequence homology with rabbit renal cortical Na/Pa-i-contransporter which is thought to be important in cellular metabolism and kidney function.

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

35 HELGGLLADFLLSRKILRLITIRKLFTAIGVLFPSVILVSLPWVRSSHSM TMTFLV  
 LSSAISSFCESGALVNFLDIAPRYTGFLKGLLQVFAHIAGAISPTAAGFFISQDSE  
 FG WRNVFLLSAAVNISGLVFYLIFGRAD VQDWAKEQTFTHL (SEQ ID

NO:119), and/or LMKNPAAVGEMAPAMCAKTCNSPLRKPVYRGAISKKLT RAPDSQKLLMAEDSTKKVMVMLWDLTQGRDTRITD GKRTPM AVKSFLMV MSLR IFLERRKSASRPPSSC (SEQ ID NO:120). Polynucleotides encoding these polypeptides are also encompassed by the invention.

5 This gene is expressed primarily in human adult small intestine.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, renal and gastrointestinal disorders, or other disorders where ion homeostasis is aberrant. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the renal system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. renal, neural, 10 gastrointestinal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, bile, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

20 Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 65 as residues: Thr-27 to Arg-45.

The tissue distribution in intestinal tissue combined with the homology to a conserved Na/Pa-i-contransporter suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis and treatment of renal and gastrointestinal disorders and/or diseases. The secreted protein can also be used to determine biological activity, to raise antibodies, as tissue markers, to isolate cognate ligands or receptors, to identify agents that modulate their interactions and as nutritional supplements. It may also have a very wide range of biological activities. Typical of these are cytokine, cell proliferation/differentiation modulating activity or induction of 25 other cytokines; immunostimulating/immunosuppressant activities (e.g. for treating human immunodeficiency virus infection, cancer, autoimmune diseases and allergy); regulation of hematopoiesis (e.g. for treating anaemia or as adjunct to chemotherapy); stimulation or growth of bone, cartilage, tendons, ligaments and/or nerves (e.g. for treating wounds, stimulation of follicle stimulating hormone (for control of fertility); 30 chemotactic and chemokinetic activities (e.g. for treating infections, tumors); hemostatic or thrombolytic activity (e.g. for treating haemophilia, cardiac infarction etc.); anti-inflammatory activity (e.g. for treating septic shock, Crohn's disease); as

antimicrobials; for treating psoriasis or other hyperproliferative diseases; for regulation of metabolism, and behaviour. Also contemplated is the use of the corresponding nucleic acid in gene therapy procedures. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the  
 5 above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:11 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the  
 10 scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 666 of SEQ ID NO:11, b is an integer of 15 to 680, where both a and b correspond to the positions of nucleotide residues shown in  
 15 SEQ ID NO:11, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 2

20 The translation product of this gene shares sequence homology with a chromaffin granule ATPase, in addition to the putative E1-E2 ATPase from Mus musculus, which are thought to be important in phagocytosis, blood clotting, and cellular metabolism (See Genbank Accession No.gil2895095 (AF011337)). The polynucleotide sequence of this clone may have a frame shift. Therefore the preferred  
 25 signal peptide may reside in a frame other than the associated polynucleotides of the above referenced gene.

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

30 EYSTPDTVHLRKTILFSVKVPVLSEKMYCICPKSSVMFRARHCSCESVSSSY  
 NCMSWLMKYTWHALTISMEXYKEMGSKPAELYHVKNELTAAVTGDKEL  
 PSDLGT (SEQ ID NO:121), NQGSAEQQWAPLQAXKLERQ (SEQ ID NO:122),  
 and/or IRHETLRNTDAXXGIVIIYAGHETKALLNNSGPRYKRXSWRGR (SEQ ID  
 NO:123). Polynucleotides encoding these polypeptides are also encompassed by the  
 invention.

35 The gene encoding the disclosed cDNA is believed to reside on chromosome 15. Accordingly, polynucleotides related to this invention are useful as a marker in linkage analysis for chromosome 15.

This gene is expressed primarily in human prostate.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, reproductive or cellular metabolism disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, reproductive, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, seminal fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in prostate tissue combined with the homology to a conserved ATPase suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of reproductive, metabolic, or haemopoietic disorders, such as congenital afflictions or proliferative conditions, including cancers. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:12 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 727 of SEQ ID NO:12, b is an integer of 15 to 741, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:12, and where b is greater than or equal to a + 14.

### FEATURES OF PROTEIN ENCODED BY GENE NO: 3

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence: HELGPVCLHAIMLAELIFLFRSLHGILASAGTIGAVAAWL

(SEQ ID NO:124). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in human testes.

Therefore, polynucleotides and polypeptides of the invention are useful as  
5 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, reproductive disorders, particularly of the testes. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of  
10 disorders of the above tissues or cells, particularly of the male reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. reproductive, testes, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, seminal fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a  
15 disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 67 as residues: Glu-32 to Asn-54, His-98 to Arg-106, Ser-126 to Ser-134.

The tissue distribution in testes suggests that polynucleotides and polypeptides  
20 corresponding to this gene are useful for the diagnosis and treatment of various reproductive or endocrine disorders, such as male infertility and hormone imbalances. The secreted protein may also be used as a contraceptive. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

25 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:13 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.  
30 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 605 of SEQ ID NO:13, b is an integer of 15 to 619, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:13, and where b is greater than or equal to a + 14.

35

**FEATURES OF PROTEIN ENCODED BY GENE NO: 4**

The translation product of this clone has been shown to have homology to the Y isoform of the conserved human TPR motif which is thought to be important in  
 5 maintaining cellular metabolism in addition to a possible connection in increasing an individual's susceptibility to male infertility (See Genbank Accession No.gil2580574 (AF000994)).

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

10 DFGTXSDPKLFEMIKYCLLKILKQYQTLREALVAAGKEVIWHGRTNDEPAH  
 YCSICEVEVFNLLFVTNESNTQKTYIVHCHDCARKTSKSLENFVVLEQYKMED  
 LIQVYDQFTLASPWPPMDQSAFTSSLLRPIKALGSGRAEQTSGDQLQKGATH  
 SRASSLLRAAEMTRRPASREELPDPGLFCHSIKLLFVLL (SEQ ID NO:125).

Polynucleotides encoding these polypeptides are also encompassed by the invention.

15 This gene is expressed primarily in activated human neutrophils and synovium.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune or hematopoietic disorders, particularly inflammatory  
 20 conditions, and/or autoimmune disorders, such as arthritis. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the inflammatory and immune systems, expression of this gene at significantly higher or lower levels may be routinely detected  
 25 in certain tissues or cell types (e.g.immune, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

30 The tissue distribution in neutrophils and synovium suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of inflammatory and immune disorders. Moreover, the protein may be useful for the detection and/or treatment of disorders and conditions affecting the skeletal system, in particular osteoporosis, bone cancer, as well as, disorders  
 35 afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as

dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:14 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 597 of SEQ ID NO:14, b is an integer of 15 to 611, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:14, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 5

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence: LPGNFRPPRVILTFQWRFYLSFRKL (SEQ ID NO:126), and/or YLLLPCGLLSFWMCGALVVSPFVQNGQGQRLREARSLCLLKGT WIFLMLSLP HFLVQELKFSNNFFSTVVIFSTSGFLQPTLIFLKLSWKSTHL (SEQ ID NO:127). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in anergic T-cells.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune or hematopoietic disorders, particularly inflammatory or immunodeficiency conditions. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample

taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 5 69 as residues: Thr-32 to Leu-43.

The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of immune defects. More specifically, the gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene product may be involved in immune functions. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, 15 sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-host diseases, or autoimmunity disorders, such as autoimmune infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, 20 scleroderma and tissues. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

25 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:15 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. 30 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 571 of SEQ ID NO:15, b is an integer of 15 to 585, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:15, and where b is greater than or equal to a + 14.

**FEATURES OF PROTEIN ENCODED BY GENE NO: 6**

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

- 5 YMMVHCKYSVYNLLNKWIGFSIFPHWTWIDLEIGGLNLQVEIKGPNNCRVAG  
EG RYKCSKGGSR (SEQ ID NO:128). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in anergic T-cells.

- Therefore, polynucleotides and polypeptides of the invention are useful as  
10 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune and hemopoietic disorders, particularly inflammatory or immunodeficiency conditions. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification  
15 of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample  
20 taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

- The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of inflammation, and  
25 other immune and hematopoietic disorders. Specifically, the gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene product may be involved in immune functions. Therefore it may be also  
30 used as an agent for immunological disorders including arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-  
35 host diseases, or autoimmunity disorders, such as autoimmune infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, scleroderma and tissues. In addition, this gene

product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

- 5 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:16 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.
- 10 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 1026 of SEQ ID NO:16, b is an integer of 15 to 1040, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:16, and where b is greater than or equal to a + 14.

15

#### FEATURES OF PROTEIN ENCODED BY GENE NO: 7

- In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:
- 20 MSAALWTYMRFLACLNHSSGSMYLSVNSTPVLLLLLVNSARARAEFLQPG  
GXTSSRAAXXAVELQLLFPLXXG (SEQ ID NO:129), FRQARNLMYVHNAAD  
IHSSLPQHITVISPRELCHTFSLKLPATDLLCSLSVGNLFRIS ERQCKH (SEQ ID  
NO:130), and/or RVNVSSIMDIHEVPGLSKSQLWFNVPVCQLHTCVAVAARAEF  
25 GTSSCRIPAARGXH (SEQ ID NO:131). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in prostate cancer.

- Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, reproductive disorders, particular prostate cancer or infertility. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the cancer, especially
- 30 of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.reproductive, prostate, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, seminal

fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 71 as residues: Gln-51 to Thr-61, Ser-65 to Thr-71, Pro-85 to Gln-91.

The tissue distribution in prostate suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of disorders of the reproductive system, particular proliferative conditions such as cancer.  
10 Protein, as well as, antibodies directed against the protein may show utility as a tissue-specific marker and/or immunotherapy target for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:17 and may have been publicly available prior to conception of the present  
15 invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 611 of SEQ ID NO:17, b is an integer of 15 to  
20 625, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:17, and where b is greater than or equal to a + 14.

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 8**

25

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence: IRHEGNSCTNKTAHAVLTASYTECSC (SEQ ID NO:132). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in prostate.

30

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, disorders of the reproductive system, particularly cancer. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing  
35 immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely

detected in certain tissues or cell types (e.g.reproductive, prostate, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, seminal fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the  
5 expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in prostate suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of disorders of the reproductive system, such as proliferative conditions, including, but  
10 not limited to, prostate cancer.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:18 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the  
15 scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 805 of SEQ ID NO:18, b is an integer of 15 to 819, where both a and b correspond to the positions of nucleotide residues shown in  
20 SEQ ID NO:18, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 9

25 This gene is expressed primarily in anergic T-cells.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune and blood disorders, particularly inflammatory or  
30 immunodeficiency conditions. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.immune,  
35 hematopoietic, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene

expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of immune and inflammatory disorders. Moreover, the gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene product may be involved in immune functions. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-host diseases, or autoimmunity disorders, such as autoimmune infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, scleroderma and tissues. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:19 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 768 of SEQ ID NO:19, b is an integer of 15 to 782, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:19, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 10

This gene is expressed primarily in anergic T-cells.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune or hematopoietic disorders, particularly inflammatory  
5 conditions. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, and  
10 cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

15 The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of immune and blood disorders. Moreover, This gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is  
20 expressed in cells of lymphoid origin, the natural gene product may be involved in immune functions. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell  
25 mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-host diseases, or autoimmunity disorders, such as autoimmune infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, scleroderma and tissues. In addition, this gene product may have commercial utility in  
30 the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available  
35 and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:20 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the

scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 641 of SEQ ID NO:20, b is an integer of 15 to 655, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:20, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 11

10

When tested against K562 cell lines, supernatants removed from cells containing this gene activated the ISRE (interferon-sensitive responsive element) pathway. Thus, it is likely that this gene activates leukemia cells through the Jak-STAT signal transduction pathway. ISRE is a promoter element found upstream in many genes which are involved in the Jak-STAT pathway. The Jak-STAT pathway is a large, signal transduction pathway involved in the differentiation and proliferation of cells. Therefore, activation of the Jak-STAT pathway, reflected by the binding of the ISRE element, can be used to indicate proteins involved in the proliferation and differentiation of cells.

20

This gene is expressed primarily in smooth muscle.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, vascular disorders, particularly microvascular disease, atherosclerosis, aneurysm, and stroke. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the vascular and smooth muscle tissues, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. vascular tissue, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

35

The tissue distribution in smooth muscle, combined with the detected ISRE biological activity, suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of vascular disorders. Protein,

as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:21 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 784 of SEQ ID NO:21, b is an integer of 15 to 798, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:21, and where b is greater than or equal to a + 14.

## 15 FEATURES OF PROTEIN ENCODED BY GENE NO: 12

The translation product of this gene shares sequence homology with the human IL-8 receptor (PF4AR), which is thought to be important in inflammatory disorders.

This gene is expressed primarily in synovial sarcoma.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, inflammatory disorders such as rheumatoid arthritis. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder. Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 76 as residues: Thr-17 to Leu-22.

The tissue distribution in synovial sarcoma, combined with the homology to an IL-8 receptor (PF4AR), suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of inflammatory disorders such as rheumatoid arthritis. Similarly, this gene product may also be useful for the detection

and treatment of osteoporosis, bone cancer, as well as, disorders afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:22 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 632 of SEQ ID NO:22, b is an integer of 15 to 646, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:22, and where b is greater than or equal to a + 14.

### FEATURES OF PROTEIN ENCODED BY GENE NO: 13

When tested against PC12 cell lines, supernatants removed from cells containing this gene activated the EGR1 (early growth response gene 1) promoter element. Thus, it is likely that this gene activates sensory neuron cells through the EGR1 signal transduction pathway. EGR1 is a separate signal transduction pathway from Jak-STAT, genes containing the EGR1 promoter are induced in various tissues and cell types upon activation, leading the cells to undergo differentiation and proliferation.

This gene is expressed primarily in human testes.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, reproductive disorders, particularly afflictions of the testes, such as male infertility. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s)

or cell type(s). For a number of disorders of the above tissues or cells, particularly of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. reproductive, testes, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, seminal fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 77 as residues: Glu-33 to Arg-45.

The tissue distribution in testes combined with the detected EGR1 biological activity suggests that polynucleotides and polypeptides corresponding to this gene are useful for various reproductive disorders such as male infertility or associated endocrine disorders. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:23 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 738 of SEQ ID NO:23, b is an integer of 15 to 752, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:23, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 14

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:  
 YKVVLVWREDQSSHKIHLSTLIQNKALTLFNSMKAERGEE AXGKNVSS  
 (SEQ ID NO:133), and/or DGELSKCCMCSDYTIDCYFPISLPLLGRPYLRHNEI  
 RPYINHTMASKGSSKRMGCTSFTLTQKLEIILSEKGMWKAIEIGQK LGXLHHS  
 (SEQ ID NO:134). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in fetal bone and testical tumors.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, developmental, skeletal, or reproductive disorders, particularly proliferative conditions such as testicular cancer. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the male reproductive systems, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. reproductive, skeletal, testes, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in testes suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of testicular cancer. Moreover, this gene product may be useful in the detection and treatment of disorders and conditions afflicting the skeletal system, in particular osteoporosis, bone cancer, as well as, disorders afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Expression within fetal tissue and other cellular sources marked by proliferating cells suggests that this protein may play a role in the regulation of cellular division, and may show utility in the diagnosis and treatment of cancer and other proliferative disorders. Similarly, developmental tissues rely on decisions involving cell differentiation and/or apoptosis in pattern formation. Thus this protein may also be involved in apoptosis or tissue differentiation and could again be useful in cancer therapy. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:24 and may have been publicly available prior to conception of the present

invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 801 of SEQ ID NO:24, b is an integer of 15 to 815, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:24, and where b is greater than or equal to a + 14.

## 10 FEATURES OF PROTEIN ENCODED BY GENE NO: 15

This gene is expressed primarily in stomach.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, gastrointestinal and digestive disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the gastrointestinal system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.gastrointestinal, stomach, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, bile, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 79 as residues: Ser-14 to Gln-23, Pro-32 to Lys-39.

The tissue distribution in stomach tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of gastrointestinal, digestive, and general metabolic disorders. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:25 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.

Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 864 of SEQ ID NO:25, b is an integer of 15 to 878, where both a and b correspond to the positions of nucleotide residues shown in  
5 SEQ ID NO:25, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 16

10 In specific embodiments, polypeptides of the invention comprise the following amino acid sequence: MLCINVQTHVYECA (SEQ ID NOP:135). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in anergic T-cells and CD34 depleted cord blood.

15 Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, hemopoietic, immune, or reproductive conditions. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing  
20 immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. hemopoietic, immune, or reproductive, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, amniotic fluid, serum,  
25 plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in T-cells suggests that polynucleotides and polypeptides  
30 corresponding to this gene are useful for the study and treatment of immune, inflammatory and other hematopoietic disorders. In addition, polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of hematopoietic related disorders such as anemia, pancytopenia, leukopenia, thrombocytopenia or leukemia since stromal cells are important in the production of  
35 cells of hematopoietic lineages. The uses include bone marrow cell ex vivo culture, bone marrow transplantation, bone marrow reconstitution, radiotherapy or chemotherapy of neoplasia. The gene product may also be involved in lymphopoiesis,

therefore, it can be used in immune disorders such as infection, inflammation, allergy, immunodeficiency etc. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies  
 5 directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:26 and may have been publicly available prior to conception of the present  
 10 invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 836 of SEQ ID NO:26, b is an integer of 15 to  
 15 850, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:26, and where b is greater than or equal to a + 14.

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 17**

20

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

LCCPGWSAVVRSWLTATLASWVQAILMDSASQVAGITSVHHQAQLSFVFLVEM  
 GLCHV GQAGLKLLASSDLPASASQSAGITGMSHHSWPERTSFIFKI (SEQ ID  
 25 NO:136). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in human adult small intestine.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a  
 30 biological sample and for diagnosis of diseases and conditions which include, but are not limited to, gastrointestinal disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the gastrointestinal system, expression of this gene at  
 35 significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.gastrointestinal, metabolic, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another

tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 The tissue distribution in small intestine suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of gastrointestinal disorders. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

10 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:27 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
15 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 774 of SEQ ID NO:27, b is an integer of 15 to 788, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:27, and where b is greater than or equal to a + 14.

20

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 18**

The translation product of this gene was shown to have homology to the F33H2.2 protein from *Caenorhabditis elegans* (See Genbank Accession  
25 No.gnllPID1297838). Considering the homology to a *C.elegans* protein, an important and vital function may be attributed to this clone based upon its conservation. In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

FGRGNTILFLRH NKDLVAQTAQPDQP NYGFPLDLLRCESLLGLDPATCSRVLN  
30 KNYTLLVSMAPLTNEIRPVSSCTPQHIGPAIPEVSSVWFKLYTYHVTGQGPPSLL  
LSKGTRLRKLPDIFQSYDRLXITSWGHDPGVVPTSNVLTMLNDALTHSAVLIQ  
GHGLHGIGETVHVPPFDETELQGEFTRVNMGVH KALQILRNRVXLQHLCG  
YVTMLNASSQLADRKLSDASDERGEPDLASGSDVNGSTESFEMVIEEATIDSAT  
KQTSGATTEADWVPLV (SEQ ID NO:137). Polynucleotides encoding these  
35 polypeptides are also encompassed by the invention.

This gene is expressed primarily in healing groin wound, and to a lesser extent, in synovium.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, developmental, wound healing, and synovial disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the synovium and epithelium, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. developmental, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in wounded tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of disorders involving the synovium and epithelium. Specifically, polynucleotides and polypeptides corresponding to this gene are useful for the treatment, diagnosis, and/or prevention of various skin disorders including congenital disorders (i.e. nevi, moles, freckles, Mongolian spots, hemangiomas, port-wine syndrome), integumentary tumors (i.e. keratoses, Bowen's disease, basal cell carcinoma, squamous cell carcinoma, malignant melanoma, Paget's disease, mycosis fungoides, and Kaposi's sarcoma), injuries and inflammation of the skin (i.e. wounds, rashes, prickly heat disorder, psoriasis, dermatitis), atherosclerosis, urticaria, eczema, photosensitivity, autoimmune disorders (i.e. lupus erythematosus, vitiligo, dermatomyositis, morphea, scleroderma, pemphigoid, and pemphigus), keloids, striae, erythema, petechiae, purpura, and xanthelasma. In addition, such disorders may predispose increased susceptibility to viral and bacterial infections of the skin (i.e. cold sores, warts, chickenpox, molluscum contagiosum, herpes zoster, boils, cellulitis, erysipelas, impetigo, tinea, athlete's foot, and ringworm). Moreover, the protein product of this clone may also be useful for the treatment or diagnosis of various connective tissue disorders such as arthritis, trauma, tendonitis, chondromalacia and inflammation, autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (i.e. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the

protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:28 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 834 of SEQ ID NO:28, b is an integer of 15 to 848, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:28, and where b is greater than or equal to a + 14.

## 15 FEATURES OF PROTEIN ENCODED BY GENE NO: 19

This gene is expressed primarily in ovarian cancer.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, disorders of the reproductive system, particularly proliferative disorders of the ovary, such as cancer and cysts. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.reproductive, ovarian tissue, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, amniotic fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in ovarian tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of disorders of the reproductive system and cancers. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:29 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 741 of SEQ ID NO:29, b is an integer of 15 to 755, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:29, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 20

This gene is expressed primarily in prostate cancer.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, reproductive disorders, particularly proliferative conditions of the prostate, such as cancer. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the reproductive disorders and cancer, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. reproductive, prostate, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, amniotic fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 84 as residues: Lys-16 to Ser-21, Gly-36 to Asp-41.

The tissue distribution in prostate suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of disorders of the reproductive organs and cancers, such as male infertility. Protein may also be useful as a contraceptive. The protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:30 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 799 of SEQ ID NO:30, b is an integer of 15 to 813, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:30, and where b is greater than or equal to a + 14.

### FEATURES OF PROTEIN ENCODED BY GENE NO: 21

This gene is expressed primarily in B-cells and rhabdomyosarcoma.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune, hematopoietic, or muscular disorders, particularly proliferative conditions such as cancer or fibroids. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the haemopoietic and muscular system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, muscular, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in immune and muscle tissues or cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of a variety of disorders, such as for the detection, and/or prevention of muscular dystrophy, cardiomyopathy, fibroids, myomas, and rhabdomyosarcomas. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ

ID NO:31 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
5 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 499 of SEQ ID NO:31, b is an integer of 15 to 513, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:31, and where b is greater than or equal to a + 14.

10

### **FEATURES OF PROTEIN ENCODED BY GENE NO: 22**

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence: GTRSINLLFFRCILEGGKSVEEQLCNSYKFS (SEQ ID  
15 NO:138). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in anergic T-cells.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a  
20 biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune and blood conditions, particularly inflammatory or immunodeficiency disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells,  
25 particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene  
30 expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of inflammation and immune disorders. More specifically, the gene product may be involved in the  
35 regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene

product may be involved in immune functions. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-host diseases, or autoimmunity disorders, such as autoimmune infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, scleroderma and tissues. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:32 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 562 of SEQ ID NO:32, b is an integer of 15 to 576, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:32, and where b is greater than or equal to a + 14.

25

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 23**

The translation product of this gene was shown to have homology to the gil2501808 brain digoxin carrier protein of Rattus norvegicus which is thought to serve the role as a sodium-independent organic anion transporter. This gene may also play a role in hormone transport. When tested against U937 cell lines, supernatants removed from cells containing this gene activated the GAS (gamma activating sequence) promoter element. Thus, it is likely that this gene activates promyelocytic cells through the Jak-STAT signal transduction pathway. GAS is a promoter element found upstream of many genes which are involved in the Jak-STAT pathway. The Jak-STAT pathway is a large, signal transduction pathway involved in the differentiation and proliferation of cells. Therefore, activation of the Jak-STAT pathway, reflected by the binding of the

GAS element, can be used to indicate proteins involved in the proliferation and differentiation of cells.

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

5 LTVPRRCPAATETNVDGQKVYRDCSCIPQNLSSGFGHATAGXMHFNLSEKAPP  
SGFHIRCEFSLSXSSIPALTATLRCVRDPQRSFALGIQWIVVRILGGIPGPIAFG  
W VIDKACLLWQXQCGQXGSLVYQXRP (SEQ ID NO:139). Polynucleotides  
encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in retina.

10 Therefore, polynucleotides and polypeptides of the invention are useful as  
reagents for differential identification of the tissue(s) or cell type(s) present in a  
biological sample and for diagnosis of diseases and conditions which include, but are  
not limited to, visual disorders. Similarly, polypeptides and antibodies directed to these  
polypeptides are useful in providing immunological probes for differential identification  
15 of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells,  
particularly of the eye, expression of this gene at significantly higher or lower levels  
may be routinely detected in certain tissues or cell types (e.g.ophthalmic tissue, retinal  
tissue, cancerous and wounded tissues) or bodily fluids (e.g.lymph, vitreous humor,  
aqueous humor, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue  
20 or cell sample taken from an individual having such a disorder, relative to the standard  
gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an  
individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO.  
87 as residues: Gln-27 to Arg-36.

25 The tissue distribution in retinal tissue combined with the detected GAS  
biological activity suggests that polynucleotides and polypeptides corresponding to this  
gene are useful for the diagnosis and treatment of visual disorders of the eye. Protein,  
as well as, antibodies directed against the protein may show utility as a tumor marker  
and/or immunotherapy targets for the above listed tissues.

30 Many polynucleotide sequences, such as EST sequences, are publicly available  
and accessible through sequence databases. Some of these sequences are related to SEQ  
ID NO:33 and may have been publicly available prior to conception of the present  
invention. Preferably, such related polynucleotides are specifically excluded from the  
scope of the present invention. To list every related sequence would be cumbersome.  
35 Accordingly, preferably excluded from the present invention are one or more  
polynucleotides comprising a nucleotide sequence described by the general formula of  
a-b, where a is any integer between 1 to 1005 of SEQ ID NO:33, b is an integer of 15

to 1019, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:33, and where b is greater than or equal to a + 14.

## 5 FEATURES OF PROTEIN ENCODED BY GENE NO: 24

This gene is expressed primarily in synovial fluid of a patient with chronic synovitis.

Therefore, polynucleotides and polypeptides of the invention are useful as  
10 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune or skeletal disorders, particularly inflammatory disorders such as arthritis. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s)  
15 or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune, hematopoietic, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken  
20 from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in synovial fluid suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of  
25 inflammatory disorders such as arthritis. Moreover, the expression of this gene product in synovium would suggest a role in the detection and treatment of disorders and conditions affecting the skeletal system, in particular osteoporosis, bone cancer, as well as, disorders afflicting connective tissues (e.g. trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders  
30 such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or  
35 immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ

ID NO:34 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more

5 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 419 of SEQ ID NO:34, b is an integer of 15 to 433, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:34, and where b is greater than or equal to a + 14.

10

### **FEATURES OF PROTEIN ENCODED BY GENE NO: 25**

The polynucleotide sequence of this clone may have a frame shift. Therefore the preferred signal peptide may reside in a frame other its associated polynucleotides. In

15 specific embodiments, polypeptides of the invention comprise the following amino acid sequence: LVMQCLGQVLSPLRTSVCLPIERGRWPGMVPHTTSALGG (SEQ ID NO:140), and/or QNTIHSLLPQGRMTKSLVLEEQKRKAGRSEMKLELLMRVSL WYSGQALVLLGLITN LSCSVLGKSFHLSGPLSVSL (SEQ ID NO:141). Polynucleotides encoding these polypeptides are also encompassed by the invention.

20 This gene is expressed primarily in human synovium.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune and inflammatory disorders, such as arthritis. Similarly,

25 polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune and inflammatory systems, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g.skeletal, synovium, and

30 cancerous and wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

35 The tissue distribution in synovium suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of immune and inflammatory disorders. In addition, the gene product may

play a role in the detection and treatment of disorders and conditions affecting the skeletal system, in particular osteoporosis, bone cancer, as well as, disorders afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders  
5 such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or  
10 immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:35 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the  
15 scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 628 of SEQ ID NO:35, b is an integer of 15 to 642, where both a and b correspond to the positions of nucleotide residues shown in  
20 SEQ ID NO:35, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 26

25 This gene is expressed primarily in synovial fluid of a patient with chronic synovitis.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are  
30 not limited to, immune or skeletal disorders, particularly inflammatory disorders such as arthritis. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may  
35 be routinely detected in certain tissues or cell types (e.g. immune, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual

having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 5 90 as residues: Pro-29 to Ser-35.

The tissue distribution in synovium suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of inflammatory disorders such as arthritis. In addition, the gene product may play a role in the detection and treatment of disorders and conditions affecting the skeletal system, 10 in particular osteoporosis, bone cancer, as well as, disorders afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. 15 spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available 20 and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:36 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more 25 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 653 of SEQ ID NO:36, b is an integer of 15 to 667, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:36, and where b is greater than or equal to a + 14.

30

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 27**

When tested against K562 cell lines, supernatants removed from cells containing this gene activated the ISRE (interferon-sensitive responsive element ) 35 promoter element. Thus, it is likely that this gene activates leukemia cells through the Jak-STAT signal transduction pathway. ISRE is a promoter element found upstream in many genes which are involved in the Jak-STAT pathway. The Jak-STAT pathway is a

large, signal transduction pathway involved in the differentiation and proliferation of cells. Therefore, activation of the Jak-STAT pathway, reflected by the binding of the ISRE element, can be used to indicate proteins involved in the proliferation and differentiation of cells.

5           This gene is expressed primarily in anergic T-cells.

          Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune and blood disorders, particularly inflammatory or  
10   immunodeficiency disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. immune,  
15   hematopoietic, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

20           Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 91 as residues: Gly-31 to Phe-36.

          The tissue distribution in T-cells, combined with the detected ISRE biological activity suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study and treatment of immune and blood diseases. More specifically, the  
25   gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene product may be involved in immune functions. Therefore it may be also used as an agent for immunological disorders including  
30   arthritis, asthma, immunodeficiency diseases such as AIDS, leukemia, rheumatoid arthritis, granulomatous disease, inflammatory bowel disease, sepsis, acne, neutropenia, neutrophilia, psoriasis, hypersensitivities, such as T-cell mediated cytotoxicity; immune reactions to transplanted organs and tissues, such as host-versus-graft and graft-versus-host diseases, or autoimmunity disorders, such as autoimmune  
35   infertility, lense tissue injury, demyelination, systemic lupus erythematosus, drug induced hemolytic anemia, rheumatoid arthritis, Sjogren's disease, scleroderma and tissues. In addition, this gene product may have commercial utility in the expansion of

stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

5 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:37 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.  
10 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 640 of SEQ ID NO:37, b is an integer of 15 to 654, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:37, and where b is greater than or equal to a + 14.

15

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 28**

When tested against K562 cell lines, supernatants removed from cells  
20 containing this gene activated the ISRE (interferon-sensitive responsive element ) promoter element. Thus, it is likely that this gene activates leukemia cells through the Jak-STAT signal transduction pathway. ISRE is a promoter element found upstream in many genes which are involved in the Jak-STAT pathway. The Jak-STAT pathway is a large, signal transduction pathway involved in the differentiation and proliferation of  
25 cells. Therefore, activation of the Jak-STAT pathway, reflected by the binding of the ISRE element, can be used to indicate proteins involved in the proliferation and differentiation of cells.

This gene is expressed primarily in human fibrosarcoma.

Therefore, polynucleotides and polypeptides of the invention are useful as  
30 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, muscle disorders, particularly proliferative conditions such as cancer or fibroids. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s)  
35 or cell type(s). For a number of disorders of the above tissues or cells, particularly of the metabolic system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g. muscle, and cancerous and

wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 92 as residues: Asn-12 to Thr-18.

The tissue distribution in fibrosarcoma, combined with the detected ISRE biological activity, suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and/or treatment of various cancers. Protein,  
10 as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:38 and may have been publicly available prior to conception of the present  
15 invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 717 of SEQ ID NO:38, b is an integer of 15 to  
20 731, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:38, and where b is greater than or equal to a + 14.

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 29**

25

This gene is expressed primarily in salivary gland.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are  
30 not limited to, epithelial, immune, and digestive disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the epithelial, digestive, and immune systems, expression of this gene at significantly higher or lower levels may be routinely  
35 detected in certain tissues or cell types (e.g.epithelial, immune, digestive tissues, and cancerous and wounded tissues) or bodily fluids (e.g.lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual

having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 The tissue distribution in salivary tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the study, diagnosis, and treatment of various disorders of the immune, digestive and epithelial systems. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

10 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:39 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
15 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 364 of SEQ ID NO:39, b is an integer of 15 to 378, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:39, and where b is greater than or equal to a + 14.

20

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 30**

This gene is expressed primarily in spongy brain tissue obtained from Alzheimer's patients.

25 Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, Alzheimer's disease; neurodegenerative disorders including, but not restricted to Alzheimer's, such as schizophrenia, ALS, etc. Similarly, polypeptides and  
30 antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the brain and nervous system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g., neural, cancerous and wounded tissues) or bodily fluids  
35 (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard

gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 94 as residues: Leu-69 to Leu-74.

5       The tissue distribution suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and/or treatment of neurodegenerative disorders, particularly Alzheimer's disease. Specific expression of this gene product in the brain tissue of Alzheimer's patients suggests that it may play a deleterious role in the progression of the disease. Alternately, it may represent an  
10 attempted response by the body to combat the progression of Alzheimer's. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ  
15 ID NO:40 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of  
20 a-b, where a is any integer between 1 to 628 of SEQ ID NO:40, b is an integer of 15 to 642, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:40, and where b is greater than or equal to a + 14.

## 25   **FEATURES OF PROTEIN ENCODED BY GENE NO: 31**

This gene is expressed primarily in epididymus, and to a lesser extent, in colon tissue.

Therefore, polynucleotides and polypeptides of the invention are useful as  
30 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, infertility; sperm developmental/survival disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a  
35 number of disorders of the above tissues or cells, particularly of the reproductive system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. reproductive, cancerous and

wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 95 as residues: Lys-35 to Glu-41, Ala-62 to Asn-67.

The tissue distribution in epididymus suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and/or treatment of male infertility. Specific expression of this gene product within the epididymus  
10 suggests that it plays key roles in the development and/or survival of sperm. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ  
15 ID NO:41 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of  
20 a-b, where a is any integer between 1 to 428 of SEQ ID NO:41, b is an integer of 15 to 442, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:41, and where b is greater than or equal to a + 14.

## 25 FEATURES OF PROTEIN ENCODED BY GENE NO: 32

The gene encoding the disclosed cDNA is thought to reside on chromosome 4. Accordingly, polynucleotides related to this invention are useful as a marker in linkage analysis for chromosome 4.

30 This gene is expressed primarily in resting T-cells, and to a lesser extent, in healing groin wound library.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are  
35 not limited to, immunological disorders and wound healing. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of

disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or  
 5 another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 96 as residues: Lys-29 to Val-34, Cys-94 to Asp-99, Ser-102 to Val-107, Gln-133 to  
 10 Lys-139.

The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for modulating the immune response during wound repair. The translation product of this gene may function as a stimulator for the growth of bone, cartilage, tendons, ligaments and/or nerves, which would be useful for  
 15 the treatment of wounds. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ  
 20 ID NO:42 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of  
 25 a-b, where a is any integer between 1 to 1720 of SEQ ID NO:42, b is an integer of 15 to 1734, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:42, and where b is greater than or equal to a + 14.

### 30 **FEATURES OF PROTEIN ENCODED BY GENE NO: 33**

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

MPRPSPLSSPGSPVTSQLCSPMPSLNPALPWGLLLALPGLSLHTPFQTLTAASP  
 35 HQPSGDSAHLAHSFLLDSH (SEQ ID NO: 142). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in neutrophils.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune-related diseases. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 97 as residues: Pro-46 to Pro-53, His-55 to Cys-63.

The tissue distribution in neutrophils suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treating immune related diseases. Expression of this gene product in neutrophils suggests a role in the regulation of the proliferation; survival; differentiation; and/or activation of potentially all hematopoietic cell lineages, including blood stem cells. This gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene or protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immune deficiency diseases such as AIDS, leukemia, rheumatoid arthritis, inflammatory bowel disease, sepsis, acne, and psoriasis. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:43 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the

scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 503 of SEQ ID NO:43, b is an integer of 15 to 517, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:43, and where b is greater than or equal to a + 14.

### FEATURES OF PROTEIN ENCODED BY GENE NO: 34

10

This gene is expressed primarily in 12 week-old human embryos.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, developmental abnormalities; cancer. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the embryo, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. embryonic, cancerous and wounded tissues) or bodily fluids (e.g. lymph, amniotic fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

25

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 98 as residues: Ser-37 to Tyr-43.

30

The tissue distribution in embryonic tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis, detection, and/or treatment of developmental disorders. The relatively specific expression of this gene product during embryogenesis suggests that it may be a key player in the proliferation, maintenance, and/or differentiation of various cell types during development. It may also act as a morphogen to control cell and tissue type specification. Expression within embryonic tissue and other cellular sources marked by proliferating cells suggests that this protein may play a role in the regulation of cellular division. Because of potential roles in proliferation and differentiation, this gene product may have applications in the adult for tissue regeneration and the treatment of cancers.

35

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:44 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 472 of SEQ ID NO:44, b is an integer of 15 to 486, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:44, and where b is greater than or equal to a + 14.

### FEATURES OF PROTEIN ENCODED BY GENE NO: 35

This gene is expressed primarily in CD34 depleted buffy coat (cord blood).

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, blood and immune disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 99 as residues: Pro-26 to Arg-40, Pro-43 to Lys-49.

The tissue distribution in CD34 depleted buffy coat cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment of haemopoietic and immune disorders. Expression of this gene product in CD34 depleted buffy coat (cord blood) suggests a role in the regulation of the proliferation; survival; differentiation; and/or activation of potentially all hematopoietic cell lineages, including blood stem cells. This gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a

usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the natural gene or protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immune deficiency diseases such as AIDS, leukemia, rheumatoid arthritis, inflammatory bowel disease, sepsis, acne, and psoriasis. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:45 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 812 of SEQ ID NO:45, b is an integer of 15 to 826, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:45, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 36

This gene is expressed primarily in adipose tissue, and to a lesser extent, in placental tissue.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, metabolic or reproductive disorders, particularly obesity. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the metabolic system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. adipose, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal

fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5 The tissue distribution in adipose tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment of obesity by targeting adipose cells. Protein, as well as, antibodies directed against the protein may show utility as a tissue-specific marker and/or immunotherapy target for the above listed tissues.

10 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:46 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
15 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 680 of SEQ ID NO:46, b is an integer of 15 to 694, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:46, and where b is greater than or equal to a + 14.

20

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 37**

This gene is expressed primarily in adult pulmonary tissue.

25 Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, pulmonary disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential  
30 identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the pulmonary system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. lung, cancerous and wounded tissues) or bodily fluids (e.g. lymph, pulmonary surfactant or sputum, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a  
35 disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in pulmonary tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of certain pulmonary disorders, such as lung cancer, ARDS, and emphysema. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:47 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 842 of SEQ ID NO:47, b is an integer of 15 to 856, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:47, and where b is greater than or equal to a + 14.

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 38**

This gene is expressed primarily in amygdala of the brain, and to a lesser extent, in infant brain tissues.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, developmental and neurodegenerative diseases of the brain and nervous system. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the central nervous system (CNS), expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. brain, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder. Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 102 as residues: Pro-30 to Gln-35, Pro-44 to Leu-50.

The tissue distribution in neural tissues suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of behavioral or nervous system disorders, such as depression, schizophrenia, Alzheimer's disease, dementia, paranoia, autism, and addictive behavior. The amygdala processes sensory information and relays this to other areas of the brain including the endocrine and autonomic domains of the hypothalamus and the brain stem. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:48 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 1629 of SEQ ID NO:48, b is an integer of 15 to 1643, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:48, and where b is greater than or equal to a + 14.

20

## **FEATURES OF PROTEIN ENCODED BY GENE NO: 39**

This gene is expressed primarily in synovial hypoxia.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, connective tissue disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the connective tissue system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types (e.g., skeletal, connective, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 103 as residues: Asn-30 to Gly-37.

The tissue distribution in skeletal tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of diseases of connective tissue, particularly synovia, including but not limited to inflammation, rheumatoid arthritis, osteoarthritis, and cartilage tears and physical injury, as well as osteoporosis, tendonitis, chondromalacia and inflammation. Furthermore, the translation product of this gene may be useful in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:49 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 695 of SEQ ID NO:49, b is an integer of 15 to 709, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:49, and where b is greater than or equal to a + 14.

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 40**

This gene is expressed primarily in synovial cells stimulated with IL-1 and TNF.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, inflammation of connective tissue. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of

the above tissues or cells, particularly of connective tissue, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. connective, skeletal, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another  
5 tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 104 as residues: Gln-31 to Pro-39.

10 The tissue distribution in synovial cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of inflammation of connective tissues, particularly the synovium, in diseases such as rheumatoid arthritis, sepsis, infection of the joint, and tissue damage from physical injury. Furthermore, the expression of this gene product may be useful in the diagnosis  
15 or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the  
20 protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:50 and may have been publicly available prior to conception of the present  
25 invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 527 of SEQ ID NO:50, b is an integer of 15 to  
30 541, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:50, and where b is greater than or equal to a + 14.

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 41**

35

When tested against U937 myeloid cell lines as well as Jurkat T-cell cell lines, supernatants removed from cells containing this gene activated the GAS assay.

Therefore, it is likely that this gene activates immune cells through the Jak-STAT signal transduction pathway. Gamma activating sequence (GAS) is a promoter element found upstream of many genes involved in the Jak-STAT pathway. The Jak-STAT pathway is a large, signal transduction pathway involved in the differentiation and proliferation of cells. Therefore, activation of the Jak-STAT pathway, reflected by the binding of the GAS element, can be used to indicate proteins involved in the proliferation and differentiation of cells.

This gene is expressed primarily in melanocytes, and to a lesser extent, in the synovium and CD34 cells.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, from the discoloration of the skin to arthritis. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the skeletal/ muscle system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. bone, cartilage, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 105 as residues: Arg-35 to Ala-41.

The tissue distribution in synovium suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment or diagnosis of diseases affecting the skeletal system, in particular osteoporosis, as well as disorders afflicting connective tissues (e.g. arthritis, trauma, tendonitis, chondromalacia and inflammation), such as in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ

ID NO:51 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more

5 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 706 of SEQ ID NO:51, b is an integer of 15 to 720, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:51, and where b is greater than or equal to a + 14.

10

## FEATURES OF PROTEIN ENCODED BY GENE NO: 42

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

15 MDTYTFLIKICKIFCSFLKCHIQVCGHLLFLIFTSIKWARKQHHCSRCKAIGLSS  
(SEQ ID NO: 143). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in synovial tissue and neutrophils.

Therefore, polynucleotides and polypeptides of the invention are useful as

20 reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, immune diseases. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above

25 tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, skeletal, and cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to

30 the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in synovium and neutrophils suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of immune diseases, particularly inflammatory conditions such as

35 arthritis. Expression of this gene product in neutrophils suggests a role in the regulation of the proliferation; survival; differentiation; and/or activation of potentially all hematopoietic cell lineages, including blood stem cells. This gene product may be

involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the gene or protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immune deficiency diseases such as AIDS, leukemia, rheumatoid arthritis, inflammatory bowel disease, sepsis, acne, and psoriasis. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:52 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 965 of SEQ ID NO:52, b is an integer of 15 to 979, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:52, and where b is greater than or equal to a + 14.

## 25 FEATURES OF PROTEIN ENCODED BY GENE NO: 43

This gene is expressed primarily in CD34 depleted buffy coat (cord blood).

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, blood, developmental, and immune disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or

another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO.  
5 107 as residues: Ser-41 to Lys-49.

The tissue distribution in CD34 depleted buffy coat suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of haemopoietic and immune disorders. Furthermore, expression of this gene product in CD34 depleted buffy coat (cord blood) suggests a  
10 role in the regulation of the proliferation; survival; differentiation; and/or activation of potentially all hematopoietic cell lineages, including blood stem cells. This gene product may be involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin,  
15 the gene or protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immune deficiency diseases such as AIDS, leukemia, rheumatoid arthritis, inflammatory bowel disease, sepsis, acne, and psoriasis. In addition, this gene product  
20 may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available  
25 and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:53 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
30 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 366 of SEQ ID NO:53, b is an integer of 15 to 380, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:53, and where b is greater than or equal to a + 14.

**FEATURES OF PROTEIN ENCODED BY GENE NO: 44**

The translation product of this gene shares sequence homology with the  
5 conserved NADH-isocitrate dehydrogenase which is thought to be important in the  
proliferation of lymphocytes. When tested against Jurkat T-cell cell lines, supernatants  
removed from cells containing this gene activated the GAS assay. Therefore, it is likely  
that this gene activates immune cells through the Jak-STAT signal transduction  
pathway. Gamma activating sequence (GAS) is a promoter element found upstream of  
10 many genes involved in the Jak-STAT pathway. The Jak-STAT pathway is a large,  
signal transduction pathway involved in the differentiation and proliferation of cells.  
Therefore, activation of the Jak-STAT pathway, reflected by the binding of the GAS  
element, can be used to indicate proteins involved in the proliferation and differentiation  
of cells. It is likely that a frame shift or shifts occur in the translation of the sequence,  
15 which can be easily corrected by those individuals skilled in the art of molecular  
biology.

This gene is expressed primarily in T-cells and B-cells and to a lesser extent in  
breast cancer.

Therefore, polynucleotides and polypeptides of the invention are useful as  
20 reagents for differential identification of the tissue(s) or cell type(s) present in a  
biological sample and for diagnosis of diseases and conditions which include, but are  
not limited to, breast cancer, leukemia, HIV, and tonsillitis. Similarly, polypeptides and  
antibodies directed to these polypeptides are useful in providing immunological probes  
for differential identification of the tissue(s) or cell type(s). For a number of disorders  
25 of the above tissues or cells, particularly of the immune/lymphoid system, expression  
of this gene at significantly higher or lower levels may be routinely detected in certain  
tissues or cell types (e.g., immune, reproductive, breast, cancerous and wounded  
tissues) or bodily fluids (e.g. lymph, breast milk, serum, plasma, urine, synovial fluid  
and spinal fluid) or another tissue or cell sample taken from an individual having such a  
30 disorder, relative to the standard gene expression level, i.e., the expression level in  
healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO.  
108 as residues: Cys-31 to Trp-36.

The tissue distribution in immune cells, combined with the detected gas  
35 biological activity, and its homology to the NADH-isocitrate dehydrogenase suggests  
that polynucleotides and polypeptides corresponding to this gene are useful for the  
treatment or diagnosis of diseases related to the proliferation of lymphoid cells.

Furthermore, it could be especially useful in helping the body produce mature lymphocytes to enhance the immune system. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

- 5 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:54 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.
- 10 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 2009 of SEQ ID NO:54, b is an integer of 15 to 2023, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:54, and where b is greater than or equal to a + 14.

15

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 45**

This gene is expressed primarily in PHA treated T-cells.

- 20 Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, T-cell disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification
- 25 of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an
- 30 individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

- The tissue distribution in T-cells suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of immune
- 35 disorders involving T-cells. Furthermore, the gene product may play a role in the regulation of the proliferation; survival; differentiation; and/or activation of potentially all hematopoietic cell lineages, including blood stem cells. This gene product may be

involved in the regulation of cytokine production, antigen presentation, or other processes that may also suggest a usefulness in the treatment of cancer (e.g. by boosting immune responses). Since the gene is expressed in cells of lymphoid origin, the gene or protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues. Therefore it may be also used as an agent for immunological disorders including arthritis, asthma, immune deficiency diseases such as AIDS, leukemia, rheumatoid arthritis, inflammatory bowel disease, sepsis, acne, and psoriasis. In addition, this gene product may have commercial utility in the expansion of stem cells and committed progenitors of various blood lineages, and in the differentiation and/or proliferation of various cell types. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:55 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 871 of SEQ ID NO:55, b is an integer of 15 to 885, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:55, and where b is greater than or equal to a + 14.

## **25 FEATURES OF PROTEIN ENCODED BY GENE NO: 46**

This gene is expressed primarily in fetal heart.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, mitrovalve prolapse, congenital heart diseases or arrhythmic heartbeats. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the cardiovascular system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. cardiac, developmental, cancerous and wounded tissues) or bodily fluids (e.g. lymph, amniotic

fluid, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

5           The tissue distribution in fetal heart suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment or diagnosis of heart diseases especially in the developing fetus. The sequence itself could be used in genetic therapy, in utero, to correct defects in the developing fetus. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or  
10 immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:56 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the  
15 scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 1092 of SEQ ID NO:56, b is an integer of 15 to 1106, where both a and b correspond to the positions of nucleotide residues shown  
20 in SEQ ID NO:56, and where b is greater than or equal to a + 14.

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 47**

25           This gene is expressed primarily in spleen tissue of chronic lymphocytic leukemia patient.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are  
30 not limited to, leukemia. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g.  
35 immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e.,

the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 111 as residues: Pro-42 to Lys-49.

5 The tissue distribution in spleen suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment or diagnosis of patients with leukemia. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available  
10 and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:57 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more  
15 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 750 of SEQ ID NO:57, b is an integer of 15 to 764, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:57, and where b is greater than or equal to a + 14.

20

#### **FEATURES OF PROTEIN ENCODED BY GENE NO: 48**

This gene is expressed primarily in liver cancer tissue, and to a lesser extent in bone marrow, neutrophils, and CD34 cells.

25 Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, liver cancer, scerosis of the liver. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for  
30 differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the lymphatic system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. liver, immune, hematopoiectic, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal  
35 fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in liver tissue suggests that polynucleotides and polypeptides corresponding to this gene are useful for the treatment and diagnosis of liver cancer, possibly before the onset of symptoms. Similarly, this gene would be useful for the detection and treatment of liver disorders and cancers (e.g. hepatoblastoma, jaundice, hepatitis, liver metabolic diseases and conditions that are attributable to the differentiation of hepatocyte progenitor cells). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:58 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 724 of SEQ ID NO:58, b is an integer of 15 to 738, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:58, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 49

This gene is expressed primarily in synovial hypoxia.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, connective tissue and joint disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of connective tissue, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. connective, skeletal, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in synovial hypoxia suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of diseases of connective tissue, particularly synovia, including but not limited to inflammation, rheumatoid arthritis, osteoarthritis, and cartilage tears and physical injury. Furthermore, polynucleotides and polypeptides corresponding to this gene are useful in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:59 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 427 of SEQ ID NO:59, b is an integer of 15 to 441, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:59, and where b is greater than or equal to a + 14.

## 25 FEATURES OF PROTEIN ENCODED BY GENE NO: 50

In specific embodiments, polypeptides of the invention comprise the following amino acid sequence:

MIMGYKSQKTFGLFDLXXVKGKTSVLEFDWVQIPVASLLALWLNRLLSVK  
30 WALKXCVIHSVAVNX (SEQ ID NO: 144). Polynucleotides encoding these polypeptides are also encompassed by the invention.

This gene is expressed primarily in B-cell lymphoma.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, B-cell lymphoma. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential

identification of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells, particularly of the immune system, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. immune, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 114 as residues: Arg-32 to Gly-40.

The tissue distribution in B-cell lymphoma suggests that polynucleotides and polypeptides corresponding to this gene are useful for the diagnosis and treatment of immune or hematopoietic disorders, particularly those involving proliferative cells or tissues such as in cancers. Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:60 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 770 of SEQ ID NO:60, b is an integer of 15 to 784, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:60, and where b is greater than or equal to a + 14.

## FEATURES OF PROTEIN ENCODED BY GENE NO: 51

30

This gene is expressed primarily in synovial hypoxia.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a biological sample and for diagnosis of diseases and conditions which include, but are not limited to, connective tissue disorders. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders of

the above tissues or cells, particularly of connective tissue, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. connective, skeletal, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another  
 5 tissue or cell sample taken from an individual having such a disorder, relative to the standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

The tissue distribution in synovial hypoxia suggests that polynucleotides and polypeptides corresponding to this gene are useful for treatment and diagnosis of  
 10 diseases of connective tissue, particularly synovia, including but not limited to inflammation, rheumatoid arthritis, osteoarthritis, and cartilage tears and physical injury. Furthermore, polynucleotides and polypeptides corresponding to this gene are useful in the diagnosis or treatment of various autoimmune disorders such as rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism,  
 15 spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets for the above listed tissues.

20 Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:61 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome.  
 25 Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 525 of SEQ ID NO:61, b is an integer of 15 to 539, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:61, and where b is greater than or equal to a + 14.

30

## FEATURES OF PROTEIN ENCODED BY GENE NO: 52

This gene is expressed primarily in synovial cells stimulated with IL-1 and TNF  
 35 and also in neutrophils.

Therefore, polynucleotides and polypeptides of the invention are useful as reagents for differential identification of the tissue(s) or cell type(s) present in a

biological sample and for diagnosis of diseases and conditions which include, but are not limited to, inflammation of connective tissue and joints. Similarly, polypeptides and antibodies directed to these polypeptides are useful in providing immunological probes for differential identification of the tissue(s) or cell type(s). For a number of disorders  
5 of the above tissues or cells, particularly of connective tissue, expression of this gene at significantly higher or lower levels may be routinely detected in certain tissues or cell types or cell types (e.g. connective, skeletal, cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine, synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual having such a disorder, relative to the  
10 standard gene expression level, i.e., the expression level in healthy tissue or bodily fluid from an individual not having the disorder.

Preferred epitopes include those comprising a sequence shown in SEQ ID NO. 116 as residues: Val-4 to Glu-9, Lys-42 to Lys-47.

The tissue distribution in synovial cells suggests that polynucleotides and  
15 polypeptides corresponding to this gene are useful for treatment and diagnosis of inflammation of connective tissues, particularly the synovium, in diseases such as rheumatoid arthritis, sepsis, infection of the joint, and tissue damage from physical injury. Furthermore, polynucleotides and polypeptides corresponding to this gene are useful in the diagnosis or treatment of various autoimmune disorders such as  
20 rheumatoid arthritis, lupus, scleroderma, and dermatomyositis as well as dwarfism, spinal deformation, and specific joint abnormalities as well as chondrodysplasias (ie. spondyloepiphyseal dysplasia congenita, familial osteoarthritis, Atelosteogenesis type II, metaphyseal chondrodysplasia type Schmid). Protein, as well as, antibodies directed against the protein may show utility as a tumor marker and/or immunotherapy targets  
25 for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available and accessible through sequence databases. Some of these sequences are related to SEQ ID NO:62 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the  
30 scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 590 of SEQ ID NO:62, b is an integer of 15 to 604, where both a and b correspond to the positions of nucleotide residues shown in  
35 SEQ ID NO:62, and where b is greater than or equal to a + 14.

**FEATURES OF PROTEIN ENCODED BY GENE NO: 53**

In specific embodiments, polypeptides of the invention comprise the following  
5 amino acid sequence:  
MKSFPSTYFKSSSFQNTKYQTGVISVLISYEIEYAAFYHLSCKITLPSSVSRNCFI  
SEXLVASQCLDT (SEQ ID NO: 145). Polynucleotides encoding these polypeptides  
are also encompassed by the invention.

10 This gene is expressed primarily in frontal cortex sampled from an epileptic  
patient.

Therefore, polynucleotides and polypeptides of the invention are useful as  
reagents for differential identification of the tissue(s) or cell type(s) present in a  
biological sample and for diagnosis of diseases and conditions which include, but are  
not limited to, epilepsy. Similarly, polypeptides and antibodies directed to these  
15 polypeptides are useful in providing immunological probes for differential identification  
of the tissue(s) or cell type(s). For a number of disorders of the above tissues or cells,  
particularly of the nervous system, expression of this gene at significantly higher or  
lower levels may be routinely detected in certain tissues or cell types (e.g. brain,  
cancerous and wounded tissues) or bodily fluids (e.g. lymph, serum, plasma, urine,  
20 synovial fluid and spinal fluid) or another tissue or cell sample taken from an individual  
having such a disorder, relative to the standard gene expression level, i.e., the  
expression level in healthy tissue or bodily fluid from an individual not having the  
disorder.

The tissue distribution in frontal cortex suggests that polynucleotides and  
25 polypeptides corresponding to this gene are useful for the treatment and diagnosis of  
epilepsy and related brain disorders. Additionally, the tissue distribution suggests that  
polynucleotides and polypeptides corresponding to this gene are useful for the  
diagnosis and/or treatment of disorders of the brain and nervous system. Elevated  
expression of this gene product within the frontal cortex of the brain suggests that it  
30 may be involved in neuronal survival; synapse formation; conductance; neural  
differentiation, etc. Such involvement may impact many processes, such as learning  
and cognition. It may also be useful in the treatment of such neurodegenerative  
disorders as schizophrenia; ALS; or Alzheimer's. Protein, as well as, antibodies  
directed against the protein may show utility as a tumor marker and/or immunotherapy  
35 targets for the above listed tissues.

Many polynucleotide sequences, such as EST sequences, are publicly available  
and accessible through sequence databases. Some of these sequences are related to SEQ

ID NO:63 and may have been publicly available prior to conception of the present invention. Preferably, such related polynucleotides are specifically excluded from the scope of the present invention. To list every related sequence would be cumbersome. Accordingly, preferably excluded from the present invention are one or more

5 polynucleotides comprising a nucleotide sequence described by the general formula of a-b, where a is any integer between 1 to 738 of SEQ ID NO:63, b is an integer of 15 to 752, where both a and b correspond to the positions of nucleotide residues shown in SEQ ID NO:63, and where b is greater than or equal to a + 14.

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector             | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|--------------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 1        | HSIDU19       | 209244<br>09/12/97       | Uni-ZAP XR         | 11              | 680           | 1                   | 680                 | 352                  | 352                       | 65              | 1                   | 21                 | 22                           | 73             |
| 2        | HPRSB76       | 209244<br>09/12/97       | pBluescript        | 12              | 741           | 1                   | 741                 | 127                  | 127                       | 66              | 1                   | 22                 | 23                           | 59             |
| 3        | HTEIL66       | 209244<br>09/12/97       | Uni-ZAP XR         | 13              | 619           | 1                   | 619                 | 123                  | 123                       | 67              | 1                   | 24                 | 25                           | 134            |
| 4        | HSNAY92       | 209244<br>09/12/97       | Uni-ZAP XR         | 14              | 611           | 1                   | 611                 | 127                  | 127                       | 68              | 1                   | 29                 | 30                           | 35             |
| 5        | HSABG21       | 209244<br>09/12/97       | pBluescript<br>SK- | 15              | 585           | 1                   | 585                 | 96                   | 96                        | 69              | 1                   | 24                 | 25                           | 125            |
| 6        | HSAXB32       | 209244<br>09/12/97       | Uni-ZAP XR         | 16              | 1040          | 1                   | 1040                | 97                   | 97                        | 70              | 1                   | 36                 | 37                           | 51             |
| 7        | HPEAD48       | 209244<br>09/12/97       | Uni-ZAP XR         | 17              | 625           | 1                   | 625                 | 203                  | 203                       | 71              | 1                   | 18                 | 19                           | 97             |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector     | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of First AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 8        | HPVAB94       | 209244<br>09/12/97       | Uni-ZAP XR | 18              | 819           | 1                   | 819                 | 80                   | 80                              | 72              | 1                   | 25                 | 26                           | 44             |
| 9        | HSAXB81       | 209244<br>09/12/97       | Uni-ZAP XR | 19              | 782           | 1                   | 782                 | 143                  | 143                             | 73              | 1                   | 20                 | 21                           | 47             |
| 10       | HSAYC21       | 209244<br>09/12/97       | Uni-ZAP XR | 20              | 655           | 1                   | 655                 | 155                  | 155                             | 74              | 1                   |                    |                              | 26             |
| 11       | HSLCU73       | 209244<br>09/12/97       | Uni-ZAP XR | 21              | 798           | 1                   | 798                 | 7                    | 7                               | 75              | 1                   | 22                 | 23                           | 41             |
| 12       | HSSFZ70       | 209244<br>09/12/97       | Uni-ZAP XR | 22              | 646           | 1                   | 646                 | 212                  | 212                             | 76              | 1                   | 22                 | 23                           | 22             |
| 13       | HTEIP36       | 209244<br>09/12/97       | Uni-ZAP XR | 23              | 752           | 1                   | 752                 | 22                   | 22                              | 77              | 1                   | 19                 | 20                           | 58             |
| 14       | HYBAY77       | 209244<br>09/12/97       | Uni-ZAP XR | 24              | 815           | 60                  | 815                 | 157                  | 157                             | 78              | 1                   | 44                 | 45                           | 47             |
| 15       | HROAE78       | 209244<br>09/12/97       | Uni-ZAP XR | 25              | 878           | 1                   | 878                 | 132                  | 132                             | 79              | 1                   | 16                 | 17                           | 52             |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector     | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 16       | HSAVP17       | 209244<br>09/12/97       | Uni-ZAP XR | 26              | 850           | 1                   | 850                 | 69                   | 69                        | 80              | 1                   | 18                 | 19                           | 44             |
| 17       | HSIEA14       | 209244<br>09/12/97       | Uni-ZAP XR | 27              | 788           | 1                   | 788                 | 141                  | 141                       | 81              | 1                   | 22                 | 23                           | 60             |
| 18       | HSNAQ47       | 209244<br>09/12/97       | Uni-ZAP XR | 28              | 848           | 1                   | 848                 | 85                   | 85                        | 82              | 1                   | 21                 | 22                           | 24             |
| 19       | HODDN65       | 209244<br>09/12/97       | Uni-ZAP XR | 29              | 755           | 1                   | 755                 | 251                  | 251                       | 83              | 1                   | 14                 | 15                           | 20             |
| 20       | HPEAD79       | 209244<br>09/12/97       | Uni-ZAP XR | 30              | 813           | 1                   | 813                 | 51                   | 51                        | 84              | 1                   | 15                 | 16                           | 41             |
| 21       | HRDED19       | 209244<br>09/12/97       | Uni-ZAP XR | 31              | 513           | 1                   | 513                 | 75                   | 75                        | 85              | 1                   | 20                 | 21                           | 47             |
| 22       | HSAYS89       | 209244<br>09/12/97       | Uni-ZAP XR | 32              | 576           | 1                   | 576                 | 94                   | 94                        | 86              | 1                   | 15                 | 16                           | 43             |
| 23       | HTODK73       | 209244<br>09/12/97       | Uni-ZAP XR | 33              | 1019          | 4                   | 1019                | 43                   | 43                        | 87              | 1                   | 23                 | 24                           | 59             |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector     | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of First AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 24       | HSVAM10       | 209244<br>09/12/97       | Uni-ZAP XR | 34              | 433           | 1                   | 433                 | 46                   | 46                              | 88              | 1                   | 27                 | 28                           | 51             |
| 25       | HSNBN57       | 209244<br>09/12/97       | Uni-ZAP XR | 35              | 642           | 1                   | 642                 | 198                  | 198                             | 89              | 1                   | 20                 | 21                           | 31             |
| 26       | HSVBD22       | 209244<br>09/12/97       | Uni-ZAP XR | 36              | 667           | 1                   | 667                 | 61                   | 61                              | 90              | 1                   | 24                 | 25                           | 35             |
| 27       | HSAWA27       | 209244<br>09/12/97       | Uni-ZAP XR | 37              | 654           | 1                   | 654                 | 319                  | 319                             | 91              | 1                   | 29                 | 30                           | 49             |
| 28       | HSFAH43       | 209244<br>09/12/97       | Uni-ZAP XR | 38              | 731           | 1                   | 731                 | 191                  | 191                             | 92              | 1                   | 22                 | 23                           | 24             |
| 29       | HSPAA60       | 209244<br>09/12/97       | pSport1    | 39              | 378           | 1                   | 378                 | 198                  | 198                             | 93              | 1                   | 45                 | 46                           | 46             |
| 30       | HFAEF57       | 209277<br>09/18/97       | Uni-ZAP XR | 40              | 642           | 1                   | 642                 | 232                  | 232                             | 94              | 1                   | 42                 | 43                           | 86             |
| 31       | HEGAH43       | 209277<br>09/18/97       | Uni-ZAP XR | 41              | 442           | 1                   | 442                 | 29                   | 29                              | 95              | 1                   | 20                 | 21                           | 111            |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector      | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|-------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 32       | HAGDGS9       | 209277<br>09/18/97       | Uni-ZAP XR  | 42              | 1734          | 44                  | 1717                | 124                  | 124                       | 96              | 1                   | 18                 | 19                           | 300            |
| 33       | HNGBX63       | 209277<br>09/18/97       | Uni-ZAP XR  | 43              | 517           | 1                   | 517                 | 120                  | 120                       | 97              | 1                   | 15                 | 16                           | 104            |
| 34       | HE2AG50       | 209277<br>09/18/97       | Uni-ZAP XR  | 44              | 486           | 1                   | 486                 | 19                   | 19                        | 98              | 1                   | 32                 | 33                           | 43             |
| 35       | HCUIN80       | 209277<br>09/18/97       | ZAP Express | 45              | 826           | 1                   | 826                 | 106                  | 106                       | 99              | 1                   | 16                 | 17                           | 49             |
| 36       | HADCL29       | 209277<br>09/18/97       | pSport1     | 46              | 694           | 1                   | 694                 | 248                  | 248                       | 100             | 1                   | 16                 | 17                           | 47             |
| 37       | HAPPS89       | 209277<br>09/18/97       | Uni-ZAP XR  | 47              | 856           | 1                   | 856                 | 54                   | 54                        | 101             | 1                   | 29                 | 30                           | 99             |
| 38       | HFGAH44       | 209277<br>09/18/97       | Uni-ZAP XR  | 48              | 1643          | 1                   | 1643                | 34                   | 34                        | 102             | 1                   | 20                 | 21                           | 58             |
| 39       | HFIHZ96       | 209277<br>09/18/97       | pSport1     | 49              | 709           | 1                   | 709                 | 39                   | 39                        | 103             | 1                   | 24                 | 25                           | 64             |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector        | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|---------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 40       | HFIUR10       | 209277<br>09/18/97       | pSport1       | 50              | 541           | 1                   | 541                 | 50                   | 50                        | 104             | 1                   | 22                 | 23                           | 44             |
| 41       | HLDNA86       | 209277<br>09/18/97       | pCMVSPORT 3.0 | 51              | 720           | 1                   | 717                 | 45                   | 45                        | 105             | 1                   | 31                 | 32                           | 92             |
| 42       | HNGAN75       | 209277<br>09/18/97       | Uni-ZAP XR    | 52              | 979           | 1                   | 979                 | 41                   | 41                        | 106             | 1                   | 25                 | 26                           | 25             |
| 43       | HCUIO20       | 209277<br>09/18/97       | ZAP Express   | 53              | 380           | 1                   | 380                 | 43                   | 43                        | 107             | 1                   | 19                 | 20                           | 67             |
| 44       | HLTEF12       | 209277<br>09/18/97       | Uni-ZAP XR    | 54              | 2023          | 624                 | 1498                | 686                  | 686                       | 108             | 1                   | 21                 | 22                           | 44             |
| 45       | HCFBJ91       | 209277<br>09/18/97       | pSport1       | 55              | 885           | 1                   | 885                 | 61                   | 61                        | 109             | 1                   | 20                 | 21                           | 52             |
| 46       | HHFHP90       | 209277<br>09/18/97       | Uni-ZAP XR    | 56              | 1106          | 1                   | 1106                | 42                   | 42                        | 110             | 1                   | 14                 | 15                           | 43             |
| 47       | HLYCQ48       | 209277<br>09/18/97       | pSport1       | 57              | 764           | 1                   | 764                 | 58                   | 58                        | 111             | 1                   | 40                 | 41                           | 64             |

| Gene No. | cDNA Clone ID | ATCC Deposit Nr and Date | Vector          | NT SEQ ID NO: X | Total NT Seq. | 5' NT of Clone Seq. | 3' NT of Clone Seq. | 5' NT of Start Codon | 5' NT of First AA of Signal Pep | AA SEQ ID NO: Y | First AA of Sig Pep | Last AA of Sig Pep | First AA of Secreted Portion | Last AA of ORF |
|----------|---------------|--------------------------|-----------------|-----------------|---------------|---------------------|---------------------|----------------------|---------------------------------|-----------------|---------------------|--------------------|------------------------------|----------------|
| 48       | HHLAB07       | 209277<br>09/18/97       | pBluescript SK- | 58              | 738           | 1                   | 738                 | 108                  | 108                             | 112             | 1                   | 34                 | 35                           | 69             |
| 49       | HFOXEX30      | 209277<br>09/18/97       | pSport1         | 59              | 441           | 1                   | 441                 | 38                   | 38                              | 113             | 1                   | 18                 | 19                           | 53             |
| 50       | HBJEL68       | 209277<br>09/18/97       | Uni-ZAP XR      | 60              | 784           | 1                   | 784                 | 109                  | 109                             | 114             | 1                   | 33                 | 34                           | 41             |
| 50       | HBJEL68       | 209277<br>09/18/97       | Uni-ZAP XR      | 64              | 769           | 1                   | 769                 | 111                  | 111                             | 118             | 1                   |                    |                              | 26             |
| 51       | HFOXA73       | 209277<br>09/18/97       | pSport1         | 61              | 539           | 1                   | 539                 | 15                   | 15                              | 115             | 1                   |                    |                              | 17             |
| 52       | HFIUR35       | 209277<br>09/18/97       | pSport1         | 62              | 604           | 1                   | 604                 | 42                   | 42                              | 116             | 1                   | 31                 | 32                           | 70             |
| 53       | HFPDE86       | 209277<br>09/18/97       | Uni-ZAP XR      | 63              | 752           | 1                   | 752                 | 300                  | 300                             | 117             | 1                   |                    |                              | 16             |

Table 1 summarizes the information corresponding to each "Gene No." described above. The nucleotide sequence identified as "NT SEQ ID NO:X" was assembled from partially homologous ("overlapping") sequences obtained from the "cDNA clone ID" identified in Table 1 and, in some cases, from additional related DNA clones. The overlapping sequences were assembled into a single contiguous sequence of high redundancy (usually three to five overlapping sequences at each nucleotide position), resulting in a final sequence identified as SEQ ID NO:X.

The cDNA Clone ID was deposited on the date and given the corresponding deposit number listed in "ATCC Deposit No:Z and Date." Some of the deposits contain multiple different clones corresponding to the same gene. "Vector" refers to the type of vector contained in the cDNA Clone ID.

"Total NT Seq." refers to the total number of nucleotides in the contig identified by "Gene No." The deposited clone may contain all or most of these sequences, reflected by the nucleotide position indicated as "5' NT of Clone Seq." and the "3' NT of Clone Seq." of SEQ ID NO:X. The nucleotide position of SEQ ID NO:X of the putative start codon (methionine) is identified as "5' NT of Start Codon." Similarly, the nucleotide position of SEQ ID NO:X of the predicted signal sequence is identified as "5' NT of First AA of Signal Pep."

The translated amino acid sequence, beginning with the methionine, is identified as "AA SEQ ID NO:Y," although other reading frames can also be easily translated using known molecular biology techniques. The polypeptides produced by these alternative open reading frames are specifically contemplated by the present invention.

The first and last amino acid position of SEQ ID NO:Y of the predicted signal peptide is identified as "First AA of Sig Pep" and "Last AA of Sig Pep." The predicted first amino acid position of SEQ ID NO:Y of the secreted portion is identified as "Predicted First AA of Secreted Portion." Finally, the amino acid position of SEQ ID NO:Y of the last amino acid in the open reading frame is identified as "Last AA of ORF."

SEQ ID NO:X and the translated SEQ ID NO:Y are sufficiently accurate and otherwise suitable for a variety of uses well known in the art and described further below. For instance, SEQ ID NO:X is useful for designing nucleic acid hybridization probes that will detect nucleic acid sequences contained in SEQ ID NO:X or the cDNA contained in the deposited clone. These probes will also hybridize to nucleic acid molecules in biological samples, thereby enabling a variety of forensic and diagnostic methods of the invention. Similarly, polypeptides identified from SEQ ID NO:Y may be used to generate antibodies which bind specifically to the secreted proteins encoded by the cDNA clones identified in Table 1.

Nevertheless, DNA sequences generated by sequencing reactions can contain sequencing errors. The errors exist as misidentified nucleotides, or as insertions or deletions of nucleotides in the generated DNA sequence. The erroneously inserted or deleted nucleotides cause frame shifts in the reading frames of the predicted amino acid  
5 sequence. In these cases, the predicted amino acid sequence diverges from the actual amino acid sequence, even though the generated DNA sequence may be greater than 99.9% identical to the actual DNA sequence (for example, one base insertion or deletion in an open reading frame of over 1000 bases).

Accordingly, for those applications requiring precision in the nucleotide  
10 sequence or the amino acid sequence, the present invention provides not only the generated nucleotide sequence identified as SEQ ID NO:X and the predicted translated amino acid sequence identified as SEQ ID NO:Y, but also a sample of plasmid DNA containing a human cDNA of the invention deposited with the ATCC, as set forth in Table 1. The nucleotide sequence of each deposited clone can readily be determined by  
15 sequencing the deposited clone in accordance with known methods. The predicted amino acid sequence can then be verified from such deposits. Moreover, the amino acid sequence of the protein encoded by a particular clone can also be directly determined by peptide sequencing or by expressing the protein in a suitable host cell containing the deposited human cDNA, collecting the protein, and determining its  
20 sequence.

The present invention also relates to the genes corresponding to SEQ ID NO:X, SEQ ID NO:Y, or the deposited clone. The corresponding gene can be isolated in accordance with known methods using the sequence information disclosed herein. Such methods include preparing probes or primers from the disclosed sequence and  
25 identifying or amplifying the corresponding gene from appropriate sources of genomic material.

Also provided in the present invention are species homologs. Species homologs may be isolated and identified by making suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source for the desired  
30 homologue.

The polypeptides of the invention can be prepared in any suitable manner. Such polypeptides include isolated naturally occurring polypeptides, recombinantly produced polypeptides, synthetically produced polypeptides, or polypeptides produced by a combination of these methods. Means for preparing such polypeptides are well  
35 understood in the art.

The polypeptides may be in the form of the secreted protein, including the mature form, or may be a part of a larger protein, such as a fusion protein (see below).

It is often advantageous to include an additional amino acid sequence which contains secretory or leader sequences, pro-sequences, sequences which aid in purification, such as multiple histidine residues, or an additional sequence for stability during recombinant production.

- 5           The polypeptides of the present invention are preferably provided in an isolated form, and preferably are substantially purified. A recombinantly produced version of a polypeptide, including the secreted polypeptide, can be substantially purified by the one-step method described in Smith and Johnson, *Gene* 67:31-40 (1988). Polypeptides of the invention also can be purified from natural or recombinant sources using antibodies of the invention raised against the secreted protein in methods which are well known in the art.
- 10

### **Signal Sequences**

- 15           Methods for predicting whether a protein has a signal sequence, as well as the cleavage point for that sequence, are available. For instance, the method of McGeoch, *Virus Res.* 3:271-286 (1985), uses the information from a short N-terminal charged region and a subsequent uncharged region of the complete (uncleaved) protein. The method of von Heinje, *Nucleic Acids Res.* 14:4683-4690 (1986) uses the information from the residues surrounding the cleavage site, typically residues -13 to +2, where +1 indicates the amino terminus of the secreted protein. The accuracy of predicting the cleavage points of known mammalian secretory proteins for each of these methods is in the range of 75-80%. (von Heinje, *supra.*) However, the two methods do not always produce the same predicted cleavage point(s) for a given protein.
- 20

- 25           In the present case, the deduced amino acid sequence of the secreted polypeptide was analyzed by a computer program called SignalP (Henrik Nielsen et al., *Protein Engineering* 10:1-6 (1997)), which predicts the cellular location of a protein based on the amino acid sequence. As part of this computational prediction of localization, the methods of McGeoch and von Heinje are incorporated. The analysis of the amino acid sequences of the secreted proteins described herein by this program provided the results shown in Table 1.
- 30

- 35           As one of ordinary skill would appreciate, however, cleavage sites sometimes vary from organism to organism and cannot be predicted with absolute certainty. Accordingly, the present invention provides secreted polypeptides having a sequence shown in SEQ ID NO:Y which have an N-terminus beginning within 5 residues (i.e., + or - 5 residues) of the predicted cleavage point. Similarly, it is also recognized that in some cases, cleavage of the signal sequence from a secreted protein is not entirely

uniform, resulting in more than one secreted species. These polypeptides, and the polynucleotides encoding such polypeptides, are contemplated by the present invention.

Moreover, the signal sequence identified by the above analysis may not necessarily predict the naturally occurring signal sequence. For example, the naturally occurring signal sequence may be further upstream from the predicted signal sequence. However, it is likely that the predicted signal sequence will be capable of directing the secreted protein to the ER. These polypeptides, and the polynucleotides encoding such polypeptides, are contemplated by the present invention.

## 10 **Polynucleotide and Polypeptide Variants**

"Variant" refers to a polynucleotide or polypeptide differing from the polynucleotide or polypeptide of the present invention, but retaining essential properties thereof. Generally, variants are overall closely similar, and, in many regions, identical to the polynucleotide or polypeptide of the present invention.

By a polynucleotide having a nucleotide sequence at least, for example, 95% "identical" to a reference nucleotide sequence of the present invention, it is intended that the nucleotide sequence of the polynucleotide is identical to the reference sequence except that the polynucleotide sequence may include up to five point mutations per each 100 nucleotides of the reference nucleotide sequence encoding the polypeptide. In other words, to obtain a polynucleotide having a nucleotide sequence at least 95% identical to a reference nucleotide sequence, up to 5% of the nucleotides in the reference sequence may be deleted or substituted with another nucleotide, or a number of nucleotides up to 5% of the total nucleotides in the reference sequence may be inserted into the reference sequence. The query sequence may be an entire sequence shown in Table 1, the ORF (open reading frame), or any fragment specified as described herein.

As a practical matter, whether any particular nucleic acid molecule or polypeptide is at least 90%, 95%, 96%, 97%, 98% or 99% identical to a nucleotide sequence of the present invention can be determined conventionally using known computer programs. A preferred method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci. (1990) 6:237-245). In a sequence alignment the query and subject sequences are both DNA sequences. An RNA sequence can be compared by converting U's to T's. The result of said global sequence alignment is in percent identity. Preferred parameters used in a FASTDB alignment of DNA sequences to calculate percent identity are: Matrix=Unitary, k-tuple=4, Mismatch Penalty=1, Joining Penalty=30, Randomization

Group Length=0, Cutoff Score=1, Gap Penalty=5, Gap Size Penalty 0.05, Window Size=500 or the length of the subject nucleotide sequence, whichever is shorter.

If the subject sequence is shorter than the query sequence because of 5' or 3' deletions, not because of internal deletions, a manual correction must be made to the results. This is because the FASTDB program does not account for 5' and 3' truncations of the subject sequence when calculating percent identity. For subject sequences truncated at the 5' or 3' ends, relative to the query sequence, the percent identity is corrected by calculating the number of bases of the query sequence that are 5' and 3' of the subject sequence, which are not matched/aligned, as a percent of the total bases of the query sequence. Whether a nucleotide is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This corrected score is what is used for the purposes of the present invention. Only bases outside the 5' and 3' bases of the subject sequence, as displayed by the FASTDB alignment, which are not matched/aligned with the query sequence, are calculated for the purposes of manually adjusting the percent identity score.

For example, a 90 base subject sequence is aligned to a 100 base query sequence to determine percent identity. The deletions occur at the 5' end of the subject sequence and therefore, the FASTDB alignment does not show a matched/alignment of the first 10 bases at 5' end. The 10 unpaired bases represent 10% of the sequence (number of bases at the 5' and 3' ends not matched/total number of bases in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 bases were perfectly matched the final percent identity would be 90%. In another example, a 90 base subject sequence is compared with a 100 base query sequence. This time the deletions are internal deletions so that there are no bases on the 5' or 3' of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only bases 5' and 3' of the subject sequence which are not matched/aligned with the query sequence are manually corrected for. No other manual corrections are to be made for the purposes of the present invention.

By a polypeptide having an amino acid sequence at least, for example, 95% "identical" to a query amino acid sequence of the present invention, it is intended that the amino acid sequence of the subject polypeptide is identical to the query sequence except that the subject polypeptide sequence may include up to five amino acid alterations per each 100 amino acids of the query amino acid sequence. In other words, to obtain a polypeptide having an amino acid sequence at least 95% identical to a query

amino acid sequence, up to 5% of the amino acid residues in the subject sequence may be inserted, deleted, (indels) or substituted with another amino acid. These alterations of the reference sequence may occur at the amino or carboxy terminal positions of the reference amino acid sequence or anywhere between those terminal positions,  
5 interspersed either individually among residues in the reference sequence or in one or more contiguous groups within the reference sequence.

As a practical matter, whether any particular polypeptide is at least 90%, 95%, 96%, 97%, 98% or 99% identical to, for instance, the amino acid sequences shown in Table 1 or to the amino acid sequence encoded by deposited DNA clone can be  
10 determined conventionally using known computer programs. A preferred method for determining the best overall match between a query sequence (a sequence of the present invention) and a subject sequence, also referred to as a global sequence alignment, can be determined using the FASTDB computer program based on the algorithm of Brutlag et al. (Comp. App. Biosci. (1990) 6:237-245). In a sequence alignment the query and  
15 subject sequences are either both nucleotide sequences or both amino acid sequences. The result of said global sequence alignment is in percent identity. Preferred parameters used in a FASTDB amino acid alignment are: Matrix=PAM 0, k-tuple=2, Mismatch Penalty=1, Joining Penalty=20, Randomization Group Length=0, Cutoff Score=1, Window Size=sequence length, Gap Penalty=5, Gap Size Penalty=0.05, Window  
20 Size=500 or the length of the subject amino acid sequence, whichever is shorter.

If the subject sequence is shorter than the query sequence due to N- or C-terminal deletions, not because of internal deletions, a manual correction must be made to the results. This is because the FASTDB program does not account for N- and C-terminal truncations of the subject sequence when calculating global percent identity.  
25 For subject sequences truncated at the N- and C-termini, relative to the the query sequence, the percent identity is corrected by calculating the number of residues of the query sequence that are N- and C-terminal of the subject sequence, which are not matched/aligned with a corresponding subject residue, as a percent of the total bases of the query sequence. Whether a residue is matched/aligned is determined by results of the FASTDB sequence alignment. This percentage is then subtracted from the percent  
30 identity, calculated by the above FASTDB program using the specified parameters, to arrive at a final percent identity score. This final percent identity score is what is used for the purposes of the present invention. Only residues to the N- and C-termini of the subject sequence, which are not matched/aligned with the query sequence, are  
35 considered for the purposes of manually adjusting the percent identity score. That is, only query residue positions outside the farthest N- and C-terminal residues of the subject sequence.

For example, a 90 amino acid residue subject sequence is aligned with a 100 residue query sequence to determine percent identity. The deletion occurs at the N-terminus of the subject sequence and therefore, the FASTDB alignment does not show a matching/alignment of the first 10 residues at the N-terminus. The 10 unpaired  
5 residues represent 10% of the sequence (number of residues at the N- and C- termini not matched/total number of residues in the query sequence) so 10% is subtracted from the percent identity score calculated by the FASTDB program. If the remaining 90 residues were perfectly matched the final percent identity would be 90%. In another example, a 90 residue subject sequence is compared with a 100 residue query sequence.  
10 This time the deletions are internal deletions so there are no residues at the N- or C-termini of the subject sequence which are not matched/aligned with the query. In this case the percent identity calculated by FASTDB is not manually corrected. Once again, only residue positions outside the N- and C-terminal ends of the subject sequence, as displayed in the FASTDB alignment, which are not matched/aligned with the query  
15 sequence are manually corrected for. No other manual corrections are to be made for the purposes of the present invention.

The variants may contain alterations in the coding regions, non-coding regions, or both. Especially preferred are polynucleotide variants containing alterations which produce silent substitutions, additions, or deletions, but do not alter the properties or  
20 activities of the encoded polypeptide. Nucleotide variants produced by silent substitutions due to the degeneracy of the genetic code are preferred. Moreover, variants in which 5-10, 1-5, or 1-2 amino acids are substituted, deleted, or added in any combination are also preferred. Polynucleotide variants can be produced for a variety of reasons, e.g., to optimize codon expression for a particular host (change codons in  
25 the human mRNA to those preferred by a bacterial host such as *E. coli*).

Naturally occurring variants are called "allelic variants," and refer to one of several alternate forms of a gene occupying a given locus on a chromosome of an organism. (Genes II, Lewin, B., ed., John Wiley & Sons, New York (1985).) These allelic variants can vary at either the polynucleotide and/or polypeptide level.  
30 Alternatively, non-naturally occurring variants may be produced by mutagenesis techniques or by direct synthesis.

Using known methods of protein engineering and recombinant DNA technology, variants may be generated to improve or alter the characteristics of the polypeptides of the present invention. For instance, one or more amino acids can be  
35 deleted from the N-terminus or C-terminus of the secreted protein without substantial loss of biological function. The authors of Ron et al., J. Biol. Chem. 268: 2984-2988 (1993), reported variant KGF proteins having heparin binding activity even after

deleting 3, 8, or 27 amino-terminal amino acid residues. Similarly, Interferon gamma exhibited up to ten times higher activity after deleting 8-10 amino acid residues from the carboxy terminus of this protein. (Dobeli et al., J. Biotechnology 7:199-216 (1988).)

Moreover, ample evidence demonstrates that variants often retain a biological activity similar to that of the naturally occurring protein. For example, Gayle and coworkers (J. Biol. Chem 268:22105-22111 (1993)) conducted extensive mutational analysis of human cytokine IL-1a. They used random mutagenesis to generate over 3,500 individual IL-1a mutants that averaged 2.5 amino acid changes per variant over the entire length of the molecule. Multiple mutations were examined at every possible amino acid position. The investigators found that "[m]ost of the molecule could be altered with little effect on either [binding or biological activity]." (See, Abstract.) In fact, only 23 unique amino acid sequences, out of more than 3,500 nucleotide sequences examined, produced a protein that significantly differed in activity from wild-type.

Furthermore, even if deleting one or more amino acids from the N-terminus or C-terminus of a polypeptide results in modification or loss of one or more biological functions, other biological activities may still be retained. For example, the ability of a deletion variant to induce and/or to bind antibodies which recognize the secreted form will likely be retained when less than the majority of the residues of the secreted form are removed from the N-terminus or C-terminus. Whether a particular polypeptide lacking N- or C-terminal residues of a protein retains such immunogenic activities can readily be determined by routine methods described herein and otherwise known in the art.

Thus, the invention further includes polypeptide variants which show substantial biological activity. Such variants include deletions, insertions, inversions, repeats, and substitutions selected according to general rules known in the art so as to have little effect on activity. For example, guidance concerning how to make phenotypically silent amino acid substitutions is provided in Bowie, J. U. et al., Science 247:1306-1310 (1990), wherein the authors indicate that there are two main strategies for studying the tolerance of an amino acid sequence to change.

The first strategy exploits the tolerance of amino acid substitutions by natural selection during the process of evolution. By comparing amino acid sequences in different species, conserved amino acids can be identified. These conserved amino acids are likely important for protein function. In contrast, the amino acid positions where substitutions have been tolerated by natural selection indicates that these positions are not critical for protein function. Thus, positions tolerating amino acid substitution could be modified while still maintaining biological activity of the protein.

The second strategy uses genetic engineering to introduce amino acid changes at specific positions of a cloned gene to identify regions critical for protein function. For example, site directed mutagenesis or alanine-scanning mutagenesis (introduction of single alanine mutations at every residue in the molecule) can be used. (Cunningham  
5 and Wells, Science 244:1081-1085 (1989).) The resulting mutant molecules can then be tested for biological activity.

As the authors state, these two strategies have revealed that proteins are surprisingly tolerant of amino acid substitutions. The authors further indicate which amino acid changes are likely to be permissive at certain amino acid positions in the  
10 protein. For example, most buried (within the tertiary structure of the protein) amino acid residues require nonpolar side chains, whereas few features of surface side chains are generally conserved. Moreover, tolerated conservative amino acid substitutions involve replacement of the aliphatic or hydrophobic amino acids Ala, Val, Leu and Ile; replacement of the hydroxyl residues Ser and Thr; replacement of the acidic residues  
15 Asp and Glu; replacement of the amide residues Asn and Gln, replacement of the basic residues Lys, Arg, and His; replacement of the aromatic residues Phe, Tyr, and Trp, and replacement of the small-sized amino acids Ala, Ser, Thr, Met, and Gly.

Besides conservative amino acid substitution, variants of the present invention include (i) substitutions with one or more of the non-conserved amino acid residues,  
20 where the substituted amino acid residues may or may not be one encoded by the genetic code, or (ii) substitution with one or more of amino acid residues having a substituent group, or (iii) fusion of the mature polypeptide with another compound, such as a compound to increase the stability and/or solubility of the polypeptide (for example, polyethylene glycol), or (iv) fusion of the polypeptide with additional amino  
25 acids, such as an IgG Fc fusion region peptide, or leader or secretory sequence, or a sequence facilitating purification. Such variant polypeptides are deemed to be within the scope of those skilled in the art from the teachings herein.

For example, polypeptide variants containing amino acid substitutions of charged amino acids with other charged or neutral amino acids may produce proteins  
30 with improved characteristics, such as less aggregation. Aggregation of pharmaceutical formulations both reduces activity and increases clearance due to the aggregate's immunogenic activity. (Pinckard et al., Clin. Exp. Immunol. 2:331-340 (1967); Robbins et al., Diabetes 36: 838-845 (1987); Cleland et al., Crit. Rev. Therapeutic Drug Carrier Systems 10:307-377 (1993).)

35

### **Polynucleotide and Polypeptide Fragments**

In the present invention, a "polynucleotide fragment" refers to a short polynucleotide having a nucleic acid sequence contained in the deposited clone or shown in SEQ ID NO:X. The short nucleotide fragments are preferably at least about 15 nt, and more preferably at least about 20 nt, still more preferably at least about 30 nt, and even more preferably, at least about 40 nt in length. A fragment "at least 20 nt in length," for example, is intended to include 20 or more contiguous bases from the cDNA sequence contained in the deposited clone or the nucleotide sequence shown in SEQ ID NO:X. These nucleotide fragments are useful as diagnostic probes and primers as discussed herein. Of course, larger fragments (e.g., 50, 150, 500, 600, 2000 nucleotides) are preferred.

Moreover, representative examples of polynucleotide fragments of the invention, include, for example, fragments having a sequence from about nucleotide number 1-50, 51-100, 101-150, 151-200, 201-250, 251-300, 301-350, 351-400, 401-450, 451-500, 501-550, 551-600, 651-700, 701-750, 751-800, 800-850, 851-900, 901-950, 951-1000, 1001-1050, 1051-1100, 1101-1150, 1151-1200, 1201-1250, 1251-1300, 1301-1350, 1351-1400, 1401-1450, 1451-1500, 1501-1550, 1551-1600, 1601-1650, 1651-1700, 1701-1750, 1751-1800, 1801-1850, 1851-1900, 1901-1950, 1951-2000, or 2001 to the end of SEQ ID NO:X or the cDNA contained in the deposited clone. In this context "about" includes the particularly recited ranges, larger or smaller by several (5, 4, 3, 2, or 1) nucleotides, at either terminus or at both termini. Preferably, these fragments encode a polypeptide which has biological activity. More preferably, these polynucleotides can be used as probes or primers as discussed herein.

In the present invention, a "polypeptide fragment" refers to a short amino acid sequence contained in SEQ ID NO:Y or encoded by the cDNA contained in the deposited clone. Protein fragments may be "free-standing," or comprised within a larger polypeptide of which the fragment forms a part or region, most preferably as a single continuous region. Representative examples of polypeptide fragments of the invention, include, for example, fragments from about amino acid number 1-20, 21-40, 41-60, 61-80, 81-100, 102-120, 121-140, 141-160, or 161 to the end of the coding region. Moreover, polypeptide fragments can be about 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, or 150 amino acids in length. In this context "about" includes the particularly recited ranges, larger or smaller by several (5, 4, 3, 2, or 1) amino acids, at either extreme or at both extremes.

Preferred polypeptide fragments include the secreted protein as well as the mature form. Further preferred polypeptide fragments include the secreted protein or the mature form having a continuous series of deleted residues from the amino or the carboxy terminus, or both. For example, any number of amino acids, ranging from 1-

60, can be deleted from the amino terminus of either the secreted polypeptide or the mature form. Similarly, any number of amino acids, ranging from 1-30, can be deleted from the carboxy terminus of the secreted protein or mature form. Furthermore, any combination of the above amino and carboxy terminus deletions are preferred.

5 Similarly, polynucleotide fragments encoding these polypeptide fragments are also preferred.

Also preferred are polypeptide and polynucleotide fragments characterized by structural or functional domains, such as fragments that comprise alpha-helix and alpha-helix forming regions, beta-sheet and beta-sheet-forming regions, turn and turn-  
10 forming regions, coil and coil-forming regions, hydrophilic regions, hydrophobic regions, alpha amphipathic regions, beta amphipathic regions, flexible regions, surface-forming regions, substrate binding region, and high antigenic index regions. Polypeptide fragments of SEQ ID NO:Y falling within conserved domains are specifically contemplated by the present invention. Moreover, polynucleotide  
15 fragments encoding these domains are also contemplated.

Other preferred fragments are biologically active fragments. Biologically active fragments are those exhibiting activity similar, but not necessarily identical, to an activity of the polypeptide of the present invention. The biological activity of the fragments may include an improved desired activity, or a decreased undesirable activity.

20

### **Epitopes & Antibodies**

In the present invention, "epitopes" refer to polypeptide fragments having antigenic or immunogenic activity in an animal, especially in a human. A preferred embodiment of the present invention relates to a polypeptide fragment comprising an  
25 epitope, as well as the polynucleotide encoding this fragment. A region of a protein molecule to which an antibody can bind is defined as an "antigenic epitope." In contrast, an "immunogenic epitope" is defined as a part of a protein that elicits an antibody response. (See, for instance, Geysen et al., Proc. Natl. Acad. Sci. USA 81:3998- 4002 (1983).)

30 Fragments which function as epitopes may be produced by any conventional means. (See, e.g., Houghten, R. A., Proc. Natl. Acad. Sci. USA 82:5131-5135 (1985) further described in U.S. Patent No. 4,631,211.)

In the present invention, antigenic epitopes preferably contain a sequence of at least seven, more preferably at least nine, and most preferably between about 15 to  
35 about 30 amino acids. Antigenic epitopes are useful to raise antibodies, including monoclonal antibodies, that specifically bind the epitope. (See, for instance, Wilson et al., Cell 37:767-778 (1984); Sutcliffe, J. G. et al., Science 219:660-666 (1983).)

Similarly, immunogenic epitopes can be used to induce antibodies according to methods well known in the art. (See, for instance, Sutcliffe et al., supra; Wilson et al., supra; Chow, M. et al., Proc. Natl. Acad. Sci. USA 82:910-914; and Bittle, F. J. et al., J. Gen. Virol. 66:2347-2354 (1985).) A preferred immunogenic epitope includes  
5 the secreted protein. The immunogenic epitopes may be presented together with a carrier protein, such as an albumin, to an animal system (such as rabbit or mouse) or, if it is long enough (at least about 25 amino acids), without a carrier. However, immunogenic epitopes comprising as few as 8 to 10 amino acids have been shown to be sufficient to raise antibodies capable of binding to, at the very least, linear epitopes in a  
10 denatured polypeptide (e.g., in Western blotting.)

As used herein, the term "antibody" (Ab) or "monoclonal antibody" (Mab) is meant to include intact molecules as well as antibody fragments (such as, for example, Fab and F(ab')<sub>2</sub> fragments) which are capable of specifically binding to protein. Fab and F(ab')<sub>2</sub> fragments lack the Fc fragment of intact antibody, clear more rapidly from  
15 the circulation, and may have less non-specific tissue binding than an intact antibody. (Wahl et al., J. Nucl. Med. 24:316-325 (1983).) Thus, these fragments are preferred, as well as the products of a FAB or other immunoglobulin expression library. Moreover, antibodies of the present invention include chimeric, single chain, and  
humanized antibodies.

20

### **Fusion Proteins**

Any polypeptide of the present invention can be used to generate fusion proteins. For example, the polypeptide of the present invention, when fused to a second protein, can be used as an antigenic tag. Antibodies raised against the  
25 polypeptide of the present invention can be used to indirectly detect the second protein by binding to the polypeptide. Moreover, because secreted proteins target cellular locations based on trafficking signals, the polypeptides of the present invention can be used as targeting molecules once fused to other proteins.

Examples of domains that can be fused to polypeptides of the present invention  
30 include not only heterologous signal sequences, but also other heterologous functional regions. The fusion does not necessarily need to be direct, but may occur through linker sequences.

Moreover, fusion proteins may also be engineered to improve characteristics of the polypeptide of the present invention. For instance, a region of additional amino  
35 acids, particularly charged amino acids, may be added to the N-terminus of the polypeptide to improve stability and persistence during purification from the host cell or subsequent handling and storage. Also, peptide moieties may be added to the

polypeptide to facilitate purification. Such regions may be removed prior to final preparation of the polypeptide. The addition of peptide moieties to facilitate handling of polypeptides are familiar and routine techniques in the art.

Moreover, polypeptides of the present invention, including fragments, and specifically epitopes, can be combined with parts of the constant domain of immunoglobulins (IgG), resulting in chimeric polypeptides. These fusion proteins facilitate purification and show an increased half-life in vivo. One reported example describes chimeric proteins consisting of the first two domains of the human CD4-polypeptide and various domains of the constant regions of the heavy or light chains of mammalian immunoglobulins. (EP A 394,827; Traunecker et al., *Nature* 331:84-86 (1988).) Fusion proteins having disulfide-linked dimeric structures (due to the IgG) can also be more efficient in binding and neutralizing other molecules, than the monomeric secreted protein or protein fragment alone. (Fountoulakis et al., *J. Biochem.* 270:3958-3964 (1995).)

Similarly, EP-A-O 464 533 (Canadian counterpart 2045869) discloses fusion proteins comprising various portions of constant region of immunoglobulin molecules together with another human protein or part thereof. In many cases, the Fc part in a fusion protein is beneficial in therapy and diagnosis, and thus can result in, for example, improved pharmacokinetic properties. (EP-A 0232 262.) Alternatively, deleting the Fc part after the fusion protein has been expressed, detected, and purified, would be desired. For example, the Fc portion may hinder therapy and diagnosis if the fusion protein is used as an antigen for immunizations. In drug discovery, for example, human proteins, such as hIL-5, have been fused with Fc portions for the purpose of high-throughput screening assays to identify antagonists of hIL-5. (See, D. Bennett et al., *J. Molecular Recognition* 8:52-58 (1995); K. Johanson et al., *J. Biol. Chem.* 270:9459-9471 (1995).)

Moreover, the polypeptides of the present invention can be fused to marker sequences, such as a peptide which facilitates purification of the fused polypeptide. In preferred embodiments, the marker amino acid sequence is a hexa-histidine peptide, such as the tag provided in a pQE vector (QIAGEN, Inc., 9259 Eton Avenue, Chatsworth, CA, 91311), among others, many of which are commercially available. As described in Gentz et al., *Proc. Natl. Acad. Sci. USA* 86:821-824 (1989), for instance, hexa-histidine provides for convenient purification of the fusion protein. Another peptide tag useful for purification, the "HA" tag, corresponds to an epitope derived from the influenza hemagglutinin protein. (Wilson et al., *Cell* 37:767 (1984).)

Thus, any of these above fusions can be engineered using the polynucleotides or the polypeptides of the present invention.

### **Vectors, Host Cells, and Protein Production**

The present invention also relates to vectors containing the polynucleotide of the present invention, host cells, and the production of polypeptides by recombinant techniques. The vector may be, for example, a phage, plasmid, viral, or retroviral vector. Retroviral vectors may be replication competent or replication defective. In the latter case, viral propagation generally will occur only in complementing host cells.

The polynucleotides may be joined to a vector containing a selectable marker for propagation in a host. Generally, a plasmid vector is introduced in a precipitate, such as a calcium phosphate precipitate, or in a complex with a charged lipid. If the vector is a virus, it may be packaged in vitro using an appropriate packaging cell line and then transduced into host cells.

The polynucleotide insert should be operatively linked to an appropriate promoter, such as the phage lambda PL promoter, the E. coli lac, trp, phoA and tac promoters, the SV40 early and late promoters and promoters of retroviral LTRs, to name a few. Other suitable promoters will be known to the skilled artisan. The expression constructs will further contain sites for transcription initiation, termination, and, in the transcribed region, a ribosome binding site for translation. The coding portion of the transcripts expressed by the constructs will preferably include a translation initiating codon at the beginning and a termination codon (UAA, UGA or UAG) appropriately positioned at the end of the polypeptide to be translated.

As indicated, the expression vectors will preferably include at least one selectable marker. Such markers include dihydrofolate reductase, G418 or neomycin resistance for eukaryotic cell culture and tetracycline, kanamycin or ampicillin resistance genes for culturing in E. coli and other bacteria. Representative examples of appropriate hosts include, but are not limited to, bacterial cells, such as E. coli, Streptomyces and Salmonella typhimurium cells; fungal cells, such as yeast cells; insect cells such as Drosophila S2 and Spodoptera Sf9 cells; animal cells such as CHO, COS, 293, and Bowes melanoma cells; and plant cells. Appropriate culture mediums and conditions for the above-described host cells are known in the art.

Among vectors preferred for use in bacteria include pQE70, pQE60 and pQE-9, available from QIAGEN, Inc.; pBluescript vectors, Phagescript vectors, pNH8A, pNH16a, pNH18A, pNH46A, available from Stratagene Cloning Systems, Inc.; and ptrc99a, pKK223-3, pKK233-3, pDR540, pRIT5 available from Pharmacia Biotech, Inc. Among preferred eukaryotic vectors are pWLNEO, pSV2CAT, pOG44, pXT1 and pSG available from Stratagene; and pSVK3, pBPV, pMSG and pSVL available from Pharmacia. Other suitable vectors will be readily apparent to the skilled artisan.

Introduction of the construct into the host cell can be effected by calcium phosphate transfection, DEAE-dextran mediated transfection, cationic lipid-mediated transfection, electroporation, transduction, infection, or other methods. Such methods are described in many standard laboratory manuals, such as Davis et al., Basic Methods  
5 In Molecular Biology (1986). It is specifically contemplated that the polypeptides of the present invention may in fact be expressed by a host cell lacking a recombinant vector.

A polypeptide of this invention can be recovered and purified from recombinant cell cultures by well-known methods including ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography,  
10 phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography and lectin chromatography. Most preferably, high performance liquid chromatography ("HPLC") is employed for purification.

Polypeptides of the present invention, and preferably the secreted form, can also  
15 be recovered from: products purified from natural sources, including bodily fluids, tissues and cells, whether directly isolated or cultured; products of chemical synthetic procedures; and products produced by recombinant techniques from a prokaryotic or eukaryotic host, including, for example, bacterial, yeast, higher plant, insect, and mammalian cells. Depending upon the host employed in a recombinant production  
20 procedure, the polypeptides of the present invention may be glycosylated or may be non-glycosylated. In addition, polypeptides of the invention may also include an initial modified methionine residue, in some cases as a result of host-mediated processes. Thus, it is well known in the art that the N-terminal methionine encoded by the translation initiation codon generally is removed with high efficiency from any protein  
25 after translation in all eukaryotic cells. While the N-terminal methionine on most proteins also is efficiently removed in most prokaryotes, for some proteins, this prokaryotic removal process is inefficient, depending on the nature of the amino acid to which the N-terminal methionine is covalently linked.

### 30 Uses of the Polynucleotides

Each of the polynucleotides identified herein can be used in numerous ways as reagents. The following description should be considered exemplary and utilizes known techniques.

The polynucleotides of the present invention are useful for chromosome  
35 identification. There exists an ongoing need to identify new chromosome markers, since few chromosome marking reagents, based on actual sequence data (repeat

polymorphisms), are presently available. Each polynucleotide of the present invention can be used as a chromosome marker.

Briefly, sequences can be mapped to chromosomes by preparing PCR primers (preferably 15-25 bp) from the sequences shown in SEQ ID NO:X. Primers can be  
5 selected using computer analysis so that primers do not span more than one predicted exon in the genomic DNA. These primers are then used for PCR screening of somatic cell hybrids containing individual human chromosomes. Only those hybrids containing the human gene corresponding to the SEQ ID NO:X will yield an amplified fragment.

Similarly, somatic hybrids provide a rapid method of PCR mapping the  
10 polynucleotides to particular chromosomes. Three or more clones can be assigned per day using a single thermal cycler. Moreover, sublocalization of the polynucleotides can be achieved with panels of specific chromosome fragments. Other gene mapping strategies that can be used include in situ hybridization, prescreening with labeled flow-sorted chromosomes, and preselection by hybridization to construct chromosome  
15 specific-cDNA libraries.

Precise chromosomal location of the polynucleotides can also be achieved using fluorescence in situ hybridization (FISH) of a metaphase chromosomal spread. This technique uses polynucleotides as short as 500 or 600 bases; however, polynucleotides 2,000-4,000 bp are preferred. For a review of this technique, see Verma et al.,  
20 "Human Chromosomes: a Manual of Basic Techniques," Pergamon Press, New York (1988).

For chromosome mapping, the polynucleotides can be used individually (to mark a single chromosome or a single site on that chromosome) or in panels (for marking multiple sites and/or multiple chromosomes). Preferred polynucleotides  
25 correspond to the noncoding regions of the cDNAs because the coding sequences are more likely conserved within gene families, thus increasing the chance of cross hybridization during chromosomal mapping.

Once a polynucleotide has been mapped to a precise chromosomal location, the physical position of the polynucleotide can be used in linkage analysis. Linkage  
30 analysis establishes coinheritance between a chromosomal location and presentation of a particular disease. (Disease mapping data are found, for example, in V. McKusick, Mendelian Inheritance in Man (available on line through Johns Hopkins University Welch Medical Library) .) Assuming 1 megabase mapping resolution and one gene per 20 kb, a cDNA precisely localized to a chromosomal region associated with the disease  
35 could be one of 50-500 potential causative genes.

Thus, once coinheritance is established, differences in the polynucleotide and the corresponding gene between affected and unaffected individuals can be examined.

First, visible structural alterations in the chromosomes, such as deletions or translocations, are examined in chromosome spreads or by PCR. If no structural alterations exist, the presence of point mutations are ascertained. Mutations observed in some or all affected individuals, but not in normal individuals, indicates that the  
5 mutation may cause the disease. However, complete sequencing of the polypeptide and the corresponding gene from several normal individuals is required to distinguish the mutation from a polymorphism. If a new polymorphism is identified, this polymorphic polypeptide can be used for further linkage analysis.

Furthermore, increased or decreased expression of the gene in affected  
10 individuals as compared to unaffected individuals can be assessed using polynucleotides of the present invention. Any of these alterations (altered expression, chromosomal rearrangement, or mutation) can be used as a diagnostic or prognostic marker.

In addition to the foregoing, a polynucleotide can be used to control gene  
15 expression through triple helix formation or antisense DNA or RNA. Both methods rely on binding of the polynucleotide to DNA or RNA. For these techniques, preferred polynucleotides are usually 20 to 40 bases in length and complementary to either the region of the gene involved in transcription (triple helix - see Lee et al., Nucl. Acids Res. 6:3073 (1979); Cooney et al., Science 241:456 (1988); and Dervan et al., Science  
20 251:1360 (1991) ) or to the mRNA itself (antisense - Okano, J. Neurochem. 56:560 (1991); Oligodeoxy-nucleotides as Antisense Inhibitors of Gene Expression, CRC Press, Boca Raton, FL (1988).) Triple helix formation optimally results in a shut-off of RNA transcription from DNA, while antisense RNA hybridization blocks translation of an mRNA molecule into polypeptide. Both techniques are effective in model  
25 systems, and the information disclosed herein can be used to design antisense or triple helix polynucleotides in an effort to treat disease.

Polynucleotides of the present invention are also useful in gene therapy. One goal of gene therapy is to insert a normal gene into an organism having a defective gene, in an effort to correct the genetic defect. The polynucleotides disclosed in the  
30 present invention offer a means of targeting such genetic defects in a highly accurate manner. Another goal is to insert a new gene that was not present in the host genome, thereby producing a new trait in the host cell.

The polynucleotides are also useful for identifying individuals from minute biological samples. The United States military, for example, is considering the use of  
35 restriction fragment length polymorphism (RFLP) for identification of its personnel. In this technique, an individual's genomic DNA is digested with one or more restriction enzymes, and probed on a Southern blot to yield unique bands for identifying

personnel. This method does not suffer from the current limitations of "Dog Tags" which can be lost, switched, or stolen, making positive identification difficult. The polynucleotides of the present invention can be used as additional DNA markers for RFLP.

5           The polynucleotides of the present invention can also be used as an alternative to RFLP, by determining the actual base-by-base DNA sequence of selected portions of an individual's genome. These sequences can be used to prepare PCR primers for amplifying and isolating such selected DNA, which can then be sequenced. Using this technique, individuals can be identified because each individual will have a unique set  
10 of DNA sequences. Once an unique ID database is established for an individual, positive identification of that individual, living or dead, can be made from extremely small tissue samples.

          Forensic biology also benefits from using DNA-based identification techniques as disclosed herein. DNA sequences taken from very small biological samples such as  
15 tissues, e.g., hair or skin, or body fluids, e.g., blood, saliva, semen, etc., can be amplified using PCR. In one prior art technique, gene sequences amplified from polymorphic loci, such as DQa class II HLA gene, are used in forensic biology to identify individuals. (Erlich, H., PCR Technology, Freeman and Co. (1992).) Once these specific polymorphic loci are amplified, they are digested with one or more  
20 restriction enzymes, yielding an identifying set of bands on a Southern blot probed with DNA corresponding to the DQa class II HLA gene. Similarly, polynucleotides of the present invention can be used as polymorphic markers for forensic purposes.

          There is also a need for reagents capable of identifying the source of a particular tissue. Such need arises, for example, in forensics when presented with tissue of  
25 unknown origin. Appropriate reagents can comprise, for example, DNA probes or primers specific to particular tissue prepared from the sequences of the present invention. Panels of such reagents can identify tissue by species and/or by organ type. In a similar fashion, these reagents can be used to screen tissue cultures for contamination.

30           In the very least, the polynucleotides of the present invention can be used as molecular weight markers on Southern gels, as diagnostic probes for the presence of a specific mRNA in a particular cell type, as a probe to "subtract-out" known sequences in the process of discovering novel polynucleotides, for selecting and making oligomers for attachment to a "gene chip" or other support, to raise anti-DNA antibodies using  
35 DNA immunization techniques, and as an antigen to elicit an immune response.

### Uses of the Polypeptides

Each of the polypeptides identified herein can be used in numerous ways. The following description should be considered exemplary and utilizes known techniques.

5 A polypeptide of the present invention can be used to assay protein levels in a biological sample using antibody-based techniques. For example, protein expression in tissues can be studied with classical immunohistological methods. (Jalkanen, M., et al., J. Cell. Biol. 101:976-985 (1985); Jalkanen, M., et al., J. Cell . Biol. 105:3087-3096 (1987).) Other antibody-based methods useful for detecting protein gene expression include immunoassays, such as the enzyme linked immunosorbent assay  
10 (ELISA) and the radioimmunoassay (RIA). Suitable antibody assay labels are known in the art and include enzyme labels, such as, glucose oxidase, and radioisotopes, such as iodine (125I, 121I), carbon (14C), sulfur (35S), tritium (3H), indium (112In), and technetium (99mTc), and fluorescent labels, such as fluorescein and rhodamine, and biotin.

15 In addition to assaying secreted protein levels in a biological sample, proteins can also be detected in vivo by imaging. Antibody labels or markers for in vivo imaging of protein include those detectable by X-radiography, NMR or ESR. For X-radiography, suitable labels include radioisotopes such as barium or cesium, which emit detectable radiation but are not overtly harmful to the subject. Suitable markers for  
20 NMR and ESR include those with a detectable characteristic spin, such as deuterium, which may be incorporated into the antibody by labeling of nutrients for the relevant hybridoma.

A protein-specific antibody or antibody fragment which has been labeled with an appropriate detectable imaging moiety, such as a radioisotope (for example, 131I,  
25 112In, 99mTc), a radio-opaque substance, or a material detectable by nuclear magnetic resonance, is introduced (for example, parenterally, subcutaneously, or intraperitoneally) into the mammal. It will be understood in the art that the size of the subject and the imaging system used will determine the quantity of imaging moiety needed to produce diagnostic images. In the case of a radioisotope moiety, for a human  
30 subject, the quantity of radioactivity injected will normally range from about 5 to 20 millicuries of 99mTc. The labeled antibody or antibody fragment will then preferentially accumulate at the location of cells which contain the specific protein. In vivo tumor imaging is described in S.W. Burchiel et al., "Immunopharmacokinetics of Radiolabeled Antibodies and Their Fragments." (Chapter 13 in Tumor Imaging: The  
35 Radiochemical Detection of Cancer, S.W. Burchiel and B. A. Rhodes, eds., Masson Publishing Inc. (1982).)

Thus, the invention provides a diagnostic method of a disorder, which involves (a) assaying the expression of a polypeptide of the present invention in cells or body fluid of an individual; (b) comparing the level of gene expression with a standard gene expression level, whereby an increase or decrease in the assayed polypeptide gene expression level compared to the standard expression level is indicative of a disorder.

Moreover, polypeptides of the present invention can be used to treat disease. For example, patients can be administered a polypeptide of the present invention in an effort to replace absent or decreased levels of the polypeptide (e.g., insulin), to supplement absent or decreased levels of a different polypeptide (e.g., hemoglobin S for hemoglobin B), to inhibit the activity of a polypeptide (e.g., an oncogene), to activate the activity of a polypeptide (e.g., by binding to a receptor), to reduce the activity of a membrane bound receptor by competing with it for free ligand (e.g., soluble TNF receptors used in reducing inflammation), or to bring about a desired response (e.g., blood vessel growth).

Similarly, antibodies directed to a polypeptide of the present invention can also be used to treat disease. For example, administration of an antibody directed to a polypeptide of the present invention can bind and reduce overproduction of the polypeptide. Similarly, administration of an antibody can activate the polypeptide, such as by binding to a polypeptide bound to a membrane (receptor).

At the very least, the polypeptides of the present invention can be used as molecular weight markers on SDS-PAGE gels or on molecular sieve gel filtration columns using methods well known to those of skill in the art. Polypeptides can also be used to raise antibodies, which in turn are used to measure protein expression from a recombinant cell, as a way of assessing transformation of the host cell. Moreover, the polypeptides of the present invention can be used to test the following biological activities.

### **Biological Activities**

The polynucleotides and polypeptides of the present invention can be used in assays to test for one or more biological activities. If these polynucleotides and polypeptides do exhibit activity in a particular assay, it is likely that these molecules may be involved in the diseases associated with the biological activity. Thus, the polynucleotides and polypeptides could be used to treat the associated disease.

### **Immune Activity**

A polypeptide or polynucleotide of the present invention may be useful in treating deficiencies or disorders of the immune system, by activating or inhibiting the

proliferation, differentiation, or mobilization (chemotaxis) of immune cells. Immune cells develop through a process called hematopoiesis, producing myeloid (platelets, red blood cells, neutrophils, and macrophages) and lymphoid (B and T lymphocytes) cells from pluripotent stem cells. The etiology of these immune deficiencies or disorders  
5 may be genetic, somatic, such as cancer or some autoimmune disorders, acquired (e.g., by chemotherapy or toxins), or infectious. Moreover, a polynucleotide or polypeptide of the present invention can be used as a marker or detector of a particular immune system disease or disorder.

A polynucleotide or polypeptide of the present invention may be useful in  
10 treating or detecting deficiencies or disorders of hematopoietic cells. A polypeptide or polynucleotide of the present invention could be used to increase differentiation and proliferation of hematopoietic cells, including the pluripotent stem cells, in an effort to treat those disorders associated with a decrease in certain (or many) types hematopoietic cells. Examples of immunologic deficiency syndromes include, but are not limited to:  
15 blood protein disorders (e.g. agammaglobulinemia, dysgammaglobulinemia), ataxia telangiectasia, common variable immunodeficiency, Digeorge Syndrome, HIV infection, HTLV-BLV infection, leukocyte adhesion deficiency syndrome, lymphopenia, phagocyte bactericidal dysfunction, severe combined immunodeficiency (SCIDs), Wiskott-Aldrich Disorder, anemia, thrombocytopenia, or hemoglobinuria.

Moreover, a polypeptide or polynucleotide of the present invention could also  
20 be used to modulate hemostatic (the stopping of bleeding) or thrombolytic activity (clot formation). For example, by increasing hemostatic or thrombolytic activity, a polynucleotide or polypeptide of the present invention could be used to treat blood coagulation disorders (e.g., afibrinogenemia, factor deficiencies), blood platelet  
25 disorders (e.g. thrombocytopenia), or wounds resulting from trauma, surgery, or other causes. Alternatively, a polynucleotide or polypeptide of the present invention that can decrease hemostatic or thrombolytic activity could be used to inhibit or dissolve clotting. These molecules could be important in the treatment of heart attacks (infarction), strokes, or scarring.

A polynucleotide or polypeptide of the present invention may also be useful in  
30 treating or detecting autoimmune disorders. Many autoimmune disorders result from inappropriate recognition of self as foreign material by immune cells. This inappropriate recognition results in an immune response leading to the destruction of the host tissue. Therefore, the administration of a polypeptide or polynucleotide of the  
35 present invention that inhibits an immune response, particularly the proliferation, differentiation, or chemotaxis of T-cells, may be an effective therapy in preventing autoimmune disorders.

Examples of autoimmune disorders that can be treated or detected by the present invention include, but are not limited to: Addison's Disease, hemolytic anemia, antiphospholipid syndrome, rheumatoid arthritis, dermatitis, allergic encephalomyelitis, glomerulonephritis, Goodpasture's Syndrome, Graves' Disease, Multiple Sclerosis, 5 Myasthenia Gravis, Neuritis, Ophthalmia, Bullous Pemphigoid, Pemphigus, Polyendocrinopathies, Purpura, Reiter's Disease, Stiff-Man Syndrome, Autoimmune Thyroiditis, Systemic Lupus Erythematosus, Autoimmune Pulmonary Inflammation, Guillain-Barre Syndrome, insulin dependent diabetes mellitus, and autoimmune inflammatory eye disease.

10 Similarly, allergic reactions and conditions, such as asthma (particularly allergic asthma) or other respiratory problems, may also be treated by a polypeptide or polynucleotide of the present invention. Moreover, these molecules can be used to treat anaphylaxis, hypersensitivity to an antigenic molecule, or blood group incompatibility.

A polynucleotide or polypeptide of the present invention may also be used to 15 treat and/or prevent organ rejection or graft-versus-host disease (GVHD). Organ rejection occurs by host immune cell destruction of the transplanted tissue through an immune response. Similarly, an immune response is also involved in GVHD, but, in this case, the foreign transplanted immune cells destroy the host tissues. The administration of a polypeptide or polynucleotide of the present invention that inhibits 20 an immune response, particularly the proliferation, differentiation, or chemotaxis of T-cells, may be an effective therapy in preventing organ rejection or GVHD.

Similarly, a polypeptide or polynucleotide of the present invention may also be used to modulate inflammation. For example, the polypeptide or polynucleotide may inhibit the proliferation and differentiation of cells involved in an inflammatory 25 response. These molecules can be used to treat inflammatory conditions, both chronic and acute conditions, including inflammation associated with infection (e.g., septic shock, sepsis, or systemic inflammatory response syndrome (SIRS)), ischemia-reperfusion injury, endotoxin lethality, arthritis, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine induced lung injury, inflammatory bowel 30 disease, Crohn's disease, or resulting from over production of cytokines (e.g., TNF or IL-1.)

### **Hyperproliferative Disorders**

A polypeptide or polynucleotide can be used to treat or detect hyperproliferative 35 disorders, including neoplasms. A polypeptide or polynucleotide of the present invention may inhibit the proliferation of the disorder through direct or indirect

interactions. Alternatively, a polypeptide or polynucleotide of the present invention may proliferate other cells which can inhibit the hyperproliferative disorder.

For example, by increasing an immune response, particularly increasing antigenic qualities of the hyperproliferative disorder or by proliferating, differentiating, or mobilizing T-cells, hyperproliferative disorders can be treated. This immune response may be increased by either enhancing an existing immune response, or by initiating a new immune response. Alternatively, decreasing an immune response may also be a method of treating hyperproliferative disorders, such as a chemotherapeutic agent.

Examples of hyperproliferative disorders that can be treated or detected by a polynucleotide or polypeptide of the present invention include, but are not limited to neoplasms located in the: abdomen, bone, breast, digestive system, liver, pancreas, peritoneum, endocrine glands (adrenal, parathyroid, pituitary, testicles, ovary, thymus, thyroid), eye, head and neck, nervous (central and peripheral), lymphatic system, pelvic, skin, soft tissue, spleen, thoracic, and urogenital.

Similarly, other hyperproliferative disorders can also be treated or detected by a polynucleotide or polypeptide of the present invention. Examples of such hyperproliferative disorders include, but are not limited to: hypergammaglobulinemia, lymphoproliferative disorders, paraproteinemias, purpura, sarcoidosis, Sezary Syndrome, Waldenstrom's Macroglobulinemia, Gaucher's Disease, histiocytosis, and any other hyperproliferative disease, besides neoplasia, located in an organ system listed above.

### **Infectious Disease**

A polypeptide or polynucleotide of the present invention can be used to treat or detect infectious agents. For example, by increasing the immune response, particularly increasing the proliferation and differentiation of B and/or T cells, infectious diseases may be treated. The immune response may be increased by either enhancing an existing immune response, or by initiating a new immune response. Alternatively, the polypeptide or polynucleotide of the present invention may also directly inhibit the infectious agent, without necessarily eliciting an immune response.

Viruses are one example of an infectious agent that can cause disease or symptoms that can be treated or detected by a polynucleotide or polypeptide of the present invention. Examples of viruses, include, but are not limited to the following DNA and RNA viral families: Arbovirus, Adenoviridae, Arenaviridae, Arterivirus, Birnaviridae, Bunyaviridae, Caliciviridae, Circoviridae, Coronaviridae, Flaviviridae, Hepadnaviridae (Hepatitis), Herpesviridae (such as, Cytomegalovirus, Herpes

Simplex, Herpes Zoster), Mononegavirus (e.g., Paramyxoviridae, Morbillivirus, Rhabdoviridae), Orthomyxoviridae (e.g., Influenza), Papovaviridae, Parvoviridae, Picornaviridae, Poxviridae (such as Smallpox or Vaccinia), Reoviridae (e.g., Rotavirus), Retroviridae (HTLV-I, HTLV-II, Lentivirus), and Togaviridae (e.g., Rubivirus). Viruses falling within these families can cause a variety of diseases or symptoms, including, but not limited to: arthritis, bronchiollitis, encephalitis, eye infections (e.g., conjunctivitis, keratitis), chronic fatigue syndrome, hepatitis (A, B, C, E, Chronic Active, Delta), meningitis, opportunistic infections (e.g., AIDS), pneumonia, Burkitt's Lymphoma, chickenpox, hemorrhagic fever, Measles, Mumps, Parainfluenza, Rabies, the common cold, Polio, leukemia, Rubella, sexually transmitted diseases, skin diseases (e.g., Kaposi's, warts), and viremia. A polypeptide or polynucleotide of the present invention can be used to treat or detect any of these symptoms or diseases.

Similarly, bacterial or fungal agents that can cause disease or symptoms and that can be treated or detected by a polynucleotide or polypeptide of the present invention include, but not limited to, the following Gram-Negative and Gram-positive bacterial families and fungi: Actinomycetales (e.g., Corynebacterium, Mycobacterium, Norcardia), Aspergillosis, Bacillaceae (e.g., Anthrax, Clostridium), Bacteroidaceae, Blastomycosis, Bordetella, Borrelia, Brucellosis, Candidiasis, Campylobacter, Coccidioidomycosis, Cryptococcosis, Dermatocycoses, Enterobacteriaceae (Klebsiella, Salmonella, Serratia, Yersinia), Erysipelothrix, Helicobacter, Legionellosis, Leptospirosis, Listeria, Mycoplasmatales, Neisseriaceae (e.g., Acinetobacter, Gonorrhea, Meningococcal), Pasteurellaceae Infections (e.g., Actinobacillus, Haemophilus, Pasteurella), Pseudomonas, Rickettsiaceae, Chlamydiaceae, Syphilis, and Staphylococcal. These bacterial or fungal families can cause the following diseases or symptoms, including, but not limited to: bacteremia, endocarditis, eye infections (conjunctivitis, tuberculosis, uveitis), gingivitis, opportunistic infections (e.g., AIDS related infections), paronychia, prosthesis-related infections, Reiter's Disease, respiratory tract infections, such as Whooping Cough or Empyema, sepsis, Lyme Disease, Cat-Scratch Disease, Dysentery, Paratyphoid Fever, food poisoning, Typhoid, pneumonia, Gonorrhea, meningitis, Chlamydia, Syphilis, Diphtheria, Leprosy, Paratuberculosis, Tuberculosis, Lupus, Botulism, gangrene, tetanus, impetigo, Rheumatic Fever, Scarlet Fever, sexually transmitted diseases, skin diseases (e.g., cellulitis, dermatocycoses), toxemia, urinary tract infections, wound infections. A polypeptide or polynucleotide of the present invention can be used to treat or detect any of these symptoms or diseases.

Moreover, parasitic agents causing disease or symptoms that can be treated or detected by a polynucleotide or polypeptide of the present invention include, but not limited to, the following families: Amebiasis, Babesiosis, Coccidiosis, Cryptosporidiosis, Dientamoebiasis, Dourine, Ectoparasitic, Giardiasis, Helminthiasis, Leishmaniasis, Theileriasis, Toxoplasmosis, Trypanosomiasis, and Trichomonas. These parasites can cause a variety of diseases or symptoms, including, but not limited to: Scabies, Trombiculiasis, eye infections, intestinal disease (e.g., dysentery, giardiasis), liver disease, lung disease, opportunistic infections (e.g., AIDS related), Malaria, pregnancy complications, and toxoplasmosis. A polypeptide or polynucleotide of the present invention can be used to treat or detect any of these symptoms or diseases.

Preferably, treatment using a polypeptide or polynucleotide of the present invention could either be by administering an effective amount of a polypeptide to the patient, or by removing cells from the patient, supplying the cells with a polynucleotide of the present invention, and returning the engineered cells to the patient (ex vivo therapy). Moreover, the polypeptide or polynucleotide of the present invention can be used as an antigen in a vaccine to raise an immune response against infectious disease.

### **Regeneration**

A polynucleotide or polypeptide of the present invention can be used to differentiate, proliferate, and attract cells, leading to the regeneration of tissues. (See, Science 276:59-87 (1997).) The regeneration of tissues could be used to repair, replace, or protect tissue damaged by congenital defects, trauma (wounds, burns, incisions, or ulcers), age, disease (e.g. osteoporosis, osteoarthritis, periodontal disease, liver failure), surgery, including cosmetic plastic surgery, fibrosis, reperfusion injury, or systemic cytokine damage.

Tissues that could be regenerated using the present invention include organs (e.g., pancreas, liver, intestine, kidney, skin, endothelium), muscle (smooth, skeletal or cardiac), vascular (including vascular endothelium), nervous, hematopoietic, and skeletal (bone, cartilage, tendon, and ligament) tissue. Preferably, regeneration occurs without or decreased scarring. Regeneration also may include angiogenesis.

Moreover, a polynucleotide or polypeptide of the present invention may increase regeneration of tissues difficult to heal. For example, increased tendon/ligament regeneration would quicken recovery time after damage. A polynucleotide or polypeptide of the present invention could also be used prophylactically in an effort to avoid damage. Specific diseases that could be treated include of tendinitis, carpal tunnel syndrome, and other tendon or ligament defects. A further example of tissue

regeneration of non-healing wounds includes pressure ulcers, ulcers associated with vascular insufficiency, surgical, and traumatic wounds.

Similarly, nerve and brain tissue could also be regenerated by using a polynucleotide or polypeptide of the present invention to proliferate and differentiate  
5 nerve cells. Diseases that could be treated using this method include central and peripheral nervous system diseases, neuropathies, or mechanical and traumatic disorders (e.g., spinal cord disorders, head trauma, cerebrovascular disease, and stroke). Specifically, diseases associated with peripheral nerve injuries, peripheral neuropathy (e.g., resulting from chemotherapy or other medical therapies), localized  
10 neuropathies, and central nervous system diseases (e.g., Alzheimer's disease, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome), could all be treated using the polynucleotide or polypeptide of the present invention.

#### 15 **Chemotaxis**

A polynucleotide or polypeptide of the present invention may have chemotaxis activity. A chemotactic molecule attracts or mobilizes cells (e.g., monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells) to a particular site in the body, such as inflammation, infection, or site of  
20 hyperproliferation. The mobilized cells can then fight off and/or heal the particular trauma or abnormality.

A polynucleotide or polypeptide of the present invention may increase chemotactic activity of particular cells. These chemotactic molecules can then be used to treat inflammation, infection, hyperproliferative disorders, or any immune system  
25 disorder by increasing the number of cells targeted to a particular location in the body. For example, chemotactic molecules can be used to treat wounds and other trauma to tissues by attracting immune cells to the injured location. Chemotactic molecules of the present invention can also attract fibroblasts, which can be used to treat wounds.

It is also contemplated that a polynucleotide or polypeptide of the present  
30 invention may inhibit chemotactic activity. These molecules could also be used to treat disorders. Thus, a polynucleotide or polypeptide of the present invention could be used as an inhibitor of chemotaxis.

#### **Binding Activity**

35 A polypeptide of the present invention may be used to screen for molecules that bind to the polypeptide or for molecules to which the polypeptide binds. The binding of the polypeptide and the molecule may activate (agonist), increase, inhibit

(antagonist), or decrease activity of the polypeptide or the molecule bound. Examples of such molecules include antibodies, oligonucleotides, proteins (e.g., receptors), or small molecules.

Preferably, the molecule is closely related to the natural ligand of the polypeptide, e.g., a fragment of the ligand, or a natural substrate, a ligand, a structural or functional mimetic. (See, Coligan et al., Current Protocols in Immunology 1(2):Chapter 5 (1991).) Similarly, the molecule can be closely related to the natural receptor to which the polypeptide binds, or at least, a fragment of the receptor capable of being bound by the polypeptide (e.g., active site). In either case, the molecule can be rationally designed using known techniques.

Preferably, the screening for these molecules involves producing appropriate cells which express the polypeptide, either as a secreted protein or on the cell membrane. Preferred cells include cells from mammals, yeast, *Drosophila*, or *E. coli*. Cells expressing the polypeptide (or cell membrane containing the expressed polypeptide) are then preferably contacted with a test compound potentially containing the molecule to observe binding, stimulation, or inhibition of activity of either the polypeptide or the molecule.

The assay may simply test binding of a candidate compound to the polypeptide, wherein binding is detected by a label, or in an assay involving competition with a labeled competitor. Further, the assay may test whether the candidate compound results in a signal generated by binding to the polypeptide.

Alternatively, the assay can be carried out using cell-free preparations, polypeptide/molecule affixed to a solid support, chemical libraries, or natural product mixtures. The assay may also simply comprise the steps of mixing a candidate compound with a solution containing a polypeptide, measuring polypeptide/molecule activity or binding, and comparing the polypeptide/molecule activity or binding to a standard.

Preferably, an ELISA assay can measure polypeptide level or activity in a sample (e.g., biological sample) using a monoclonal or polyclonal antibody. The antibody can measure polypeptide level or activity by either binding, directly or indirectly, to the polypeptide or by competing with the polypeptide for a substrate.

All of these above assays can be used as diagnostic or prognostic markers. The molecules discovered using these assays can be used to treat disease or to bring about a particular result in a patient (e.g., blood vessel growth) by activating or inhibiting the polypeptide/molecule. Moreover, the assays can discover agents which may inhibit or enhance the production of the polypeptide from suitably manipulated cells or tissues.

Therefore, the invention includes a method of identifying compounds which bind to a polypeptide of the invention comprising the steps of: (a) incubating a candidate binding compound with a polypeptide of the invention; and (b) determining if binding has occurred. Moreover, the invention includes a method of identifying  
5 agonists/antagonists comprising the steps of: (a) incubating a candidate compound with a polypeptide of the invention, (b) assaying a biological activity, and (b) determining if a biological activity of the polypeptide has been altered.

### **Other Activities**

10 A polypeptide or polynucleotide of the present invention may also increase or decrease the differentiation or proliferation of embryonic stem cells, besides, as discussed above, hematopoietic lineage.

A polypeptide or polynucleotide of the present invention may also be used to modulate mammalian characteristics, such as body height, weight, hair color, eye color,  
15 skin, percentage of adipose tissue, pigmentation, size, and shape (e.g., cosmetic surgery). Similarly, a polypeptide or polynucleotide of the present invention may be used to modulate mammalian metabolism affecting catabolism, anabolism, processing, utilization, and storage of energy.

A polypeptide or polynucleotide of the present invention may be used to change  
20 a mammal's mental state or physical state by influencing biorhythms, circadian rhythms, depression (including depressive disorders), tendency for violence, tolerance for pain, reproductive capabilities (preferably by Activin or Inhibin-like activity), hormonal or endocrine levels, appetite, libido, memory, stress, or other cognitive qualities.

25 A polypeptide or polynucleotide of the present invention may also be used as a food additive or preservative, such as to increase or decrease storage capabilities, fat content, lipid, protein, carbohydrate, vitamins, minerals, cofactors or other nutritional components.

### **Other Preferred Embodiments**

Other preferred embodiments of the claimed invention include an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least about 50 contiguous nucleotides in the nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1.

35 Also preferred is a nucleic acid molecule wherein said sequence of contiguous nucleotides is included in the nucleotide sequence of SEQ ID NO:X in the range of

positions beginning with the nucleotide at about the position of the 5' Nucleotide of the Clone Sequence and ending with the nucleotide at about the position of the 3' Nucleotide of the Clone Sequence as defined for SEQ ID NO:X in Table 1.

Also preferred is a nucleic acid molecule wherein said sequence of contiguous  
5 nucleotides is included in the nucleotide sequence of SEQ ID NO:X in the range of positions beginning with the nucleotide at about the position of the 5' Nucleotide of the Start Codon and ending with the nucleotide at about the position of the 3' Nucleotide of the Clone Sequence as defined for SEQ ID NO:X in Table 1.

Similarly preferred is a nucleic acid molecule wherein said sequence of  
10 contiguous nucleotides is included in the nucleotide sequence of SEQ ID NO:X in the range of positions beginning with the nucleotide at about the position of the 5' Nucleotide of the First Amino Acid of the Signal Peptide and ending with the nucleotide at about the position of the 3' Nucleotide of the Clone Sequence as defined for SEQ ID NO:X in Table 1.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide  
15 sequence which is at least 95% identical to a sequence of at least about 150 contiguous nucleotides in the nucleotide sequence of SEQ ID NO:X.

Further preferred is an isolated nucleic acid molecule comprising a nucleotide  
sequence which is at least 95% identical to a sequence of at least about 500 contiguous  
20 nucleotides in the nucleotide sequence of SEQ ID NO:X.

A further preferred embodiment is a nucleic acid molecule comprising a  
nucleotide sequence which is at least 95% identical to the nucleotide sequence of SEQ  
ID NO:X beginning with the nucleotide at about the position of the 5' Nucleotide of the  
First Amino Acid of the Signal Peptide and ending with the nucleotide at about the  
25 position of the 3' Nucleotide of the Clone Sequence as defined for SEQ ID NO:X in  
Table 1.

A further preferred embodiment is an isolated nucleic acid molecule comprising  
a nucleotide sequence which is at least 95% identical to the complete nucleotide  
sequence of SEQ ID NO:X.

Also preferred is an isolated nucleic acid molecule which hybridizes under  
30 stringent hybridization conditions to a nucleic acid molecule, wherein said nucleic acid molecule which hybridizes does not hybridize under stringent hybridization conditions to a nucleic acid molecule having a nucleotide sequence consisting of only A residues or of only T residues.

Also preferred is a composition of matter comprising a DNA molecule which  
35 comprises a human cDNA clone identified by a cDNA Clone Identifier in Table 1, which DNA molecule is contained in the material deposited with the American Type

Culture Collection and given the ATCC Deposit Number shown in Table 1 for said cDNA Clone Identifier.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least 50 contiguous  
5 nucleotides in the nucleotide sequence of a human cDNA clone identified by a cDNA Clone Identifier in Table 1, which DNA molecule is contained in the deposit given the ATCC Deposit Number shown in Table 1.

Also preferred is an isolated nucleic acid molecule, wherein said sequence of at least 50 contiguous nucleotides is included in the nucleotide sequence of the complete  
10 open reading frame sequence encoded by said human cDNA clone.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to sequence of at least 150 contiguous nucleotides in the nucleotide sequence encoded by said human cDNA clone.

A further preferred embodiment is an isolated nucleic acid molecule comprising  
15 a nucleotide sequence which is at least 95% identical to sequence of at least 500 contiguous nucleotides in the nucleotide sequence encoded by said human cDNA clone.

A further preferred embodiment is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to the complete nucleotide sequence encoded by said human cDNA clone.

20 A further preferred embodiment is a method for detecting in a biological sample a nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1; and a nucleotide sequence encoded by a human cDNA clone  
25 identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1; which method comprises a step of comparing a nucleotide sequence of at least one nucleic acid molecule in said sample with a sequence selected from said group and determining whether the sequence of said nucleic acid molecule in said sample is at least 95%  
30 identical to said selected sequence.

Also preferred is the above method wherein said step of comparing sequences comprises determining the extent of nucleic acid hybridization between nucleic acid molecules in said sample and a nucleic acid molecule comprising said sequence selected from said group. Similarly, also preferred is the above method wherein said step of  
35 comparing sequences is performed by comparing the nucleotide sequence determined from a nucleic acid molecule in said sample with said sequence selected from said group. The nucleic acid molecules can comprise DNA molecules or RNA molecules.

A further preferred embodiment is a method for identifying the species, tissue or cell type of a biological sample which method comprises a step of detecting nucleic acid molecules in said sample, if any, comprising a nucleotide sequence that is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1; and a nucleotide sequence encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

The method for identifying the species, tissue or cell type of a biological sample can comprise a step of detecting nucleic acid molecules comprising a nucleotide sequence in a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from said group.

Also preferred is a method for diagnosing in a subject a pathological condition associated with abnormal structure or expression of a gene encoding a secreted protein identified in Table 1, which method comprises a step of detecting in a biological sample obtained from said subject nucleic acid molecules, if any, comprising a nucleotide sequence that is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1; and a nucleotide sequence encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

The method for diagnosing a pathological condition can comprise a step of detecting nucleic acid molecules comprising a nucleotide sequence in a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from said group.

Also preferred is a composition of matter comprising isolated nucleic acid molecules wherein the nucleotide sequences of said nucleic acid molecules comprise a panel of at least two nucleotide sequences, wherein at least one sequence in said panel is at least 95% identical to a sequence of at least 50 contiguous nucleotides in a sequence selected from the group consisting of: a nucleotide sequence of SEQ ID NO:X wherein X is any integer as defined in Table 1; and a nucleotide sequence encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1. The nucleic acid molecules can comprise DNA molecules or RNA molecules.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 90% identical to a sequence of at least about 10 contiguous amino acids in the amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1.

Also preferred is a polypeptide, wherein said sequence of contiguous amino  
5 acids is included in the amino acid sequence of SEQ ID NO:Y in the range of positions beginning with the residue at about the position of the First Amino Acid of the Secreted Portion and ending with the residue at about the Last Amino Acid of the Open Reading Frame as set forth for SEQ ID NO:Y in Table 1.

Also preferred is an isolated polypeptide comprising an amino acid sequence at  
10 least 95% identical to a sequence of at least about 30 contiguous amino acids in the amino acid sequence of SEQ ID NO:Y.

Further preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence of at least about 100 contiguous amino acids in the amino acid sequence of SEQ ID NO:Y.

Further preferred is an isolated polypeptide comprising an amino acid sequence  
15 at least 95% identical to the complete amino acid sequence of SEQ ID NO:Y.

Further preferred is an isolated polypeptide comprising an amino acid sequence at least 90% identical to a sequence of at least about 10 contiguous amino acids in the complete amino acid sequence of a secreted protein encoded by a human cDNA clone  
20 identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is a polypeptide wherein said sequence of contiguous amino acids is included in the amino acid sequence of a secreted portion of the secreted protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and  
25 contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence of at least about 30 contiguous amino acids in the amino acid sequence of the secreted portion of the protein encoded by a human cDNA  
30 clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence of at least about 100 contiguous amino acids in the amino acid sequence of the secreted portion of the protein encoded by a human cDNA  
35 clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is an isolated polypeptide comprising an amino acid sequence at least 95% identical to the amino acid sequence of the secreted portion of the protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Further preferred is an isolated antibody which binds specifically to a polypeptide comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Further preferred is a method for detecting in a biological sample a polypeptide comprising an amino acid sequence which is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1; which method comprises a step of comparing an amino acid sequence of at least one polypeptide molecule in said sample with a sequence selected from said group and determining whether the sequence of said polypeptide molecule in said sample is at least 90% identical to said sequence of at least 10 contiguous amino acids.

Also preferred is the above method wherein said step of comparing an amino acid sequence of at least one polypeptide molecule in said sample with a sequence selected from said group comprises determining the extent of specific binding of polypeptides in said sample to an antibody which binds specifically to a polypeptide comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is the above method wherein said step of comparing sequences is performed by comparing the amino acid sequence determined from a polypeptide molecule in said sample with said sequence selected from said group.

Also preferred is a method for identifying the species, tissue or cell type of a biological sample which method comprises a step of detecting polypeptide molecules in said sample, if any, comprising an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a secreted protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is the above method for identifying the species, tissue or cell type of a biological sample, which method comprises a step of detecting polypeptide molecules comprising an amino acid sequence in a panel of at least two amino acid sequences, wherein at least one sequence in said panel is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the above group.

Also preferred is a method for diagnosing in a subject a pathological condition associated with abnormal structure or expression of a gene encoding a secreted protein identified in Table 1, which method comprises a step of detecting in a biological sample obtained from said subject polypeptide molecules comprising an amino acid sequence in a panel of at least two amino acid sequences, wherein at least one sequence in said panel is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a secreted protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

In any of these methods, the step of detecting said polypeptide molecules includes using an antibody.

Also preferred is an isolated nucleic acid molecule comprising a nucleotide sequence which is at least 95% identical to a nucleotide sequence encoding a polypeptide wherein said polypeptide comprises an amino acid sequence that is at least 90% identical to a sequence of at least 10 contiguous amino acids in a sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a secreted protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

Also preferred is an isolated nucleic acid molecule, wherein said nucleotide sequence encoding a polypeptide has been optimized for expression of said polypeptide in a prokaryotic host.

Also preferred is an isolated nucleic acid molecule, wherein said polypeptide  
5 comprises an amino acid sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y wherein Y is any integer as defined in Table 1; and a complete amino acid sequence of a secreted protein encoded by a human cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1.

10 Further preferred is a method of making a recombinant vector comprising inserting any of the above isolated nucleic acid molecule into a vector. Also preferred is the recombinant vector produced by this method. Also preferred is a method of making a recombinant host cell comprising introducing the vector into a host cell, as well as the recombinant host cell produced by this method.

15 Also preferred is a method of making an isolated polypeptide comprising culturing this recombinant host cell under conditions such that said polypeptide is expressed and recovering said polypeptide. Also preferred is this method of making an isolated polypeptide, wherein said recombinant host cell is a eukaryotic cell and said polypeptide is a secreted portion of a human secreted protein comprising an amino acid  
20 sequence selected from the group consisting of: an amino acid sequence of SEQ ID NO:Y beginning with the residue at the position of the First Amino Acid of the Secreted Portion of SEQ ID NO:Y wherein Y is an integer set forth in Table 1 and said position of the First Amino Acid of the Secreted Portion of SEQ ID NO:Y is defined in Table 1; and an amino acid sequence of a secreted portion of a protein encoded by a human  
25 cDNA clone identified by a cDNA Clone Identifier in Table 1 and contained in the deposit with the ATCC Deposit Number shown for said cDNA clone in Table 1. The isolated polypeptide produced by this method is also preferred.

Also preferred is a method of treatment of an individual in need of an increased level of a secreted protein activity, which method comprises administering to such an  
30 individual a pharmaceutical composition comprising an amount of an isolated polypeptide, polynucleotide, or antibody of the claimed invention effective to increase the level of said protein activity in said individual.

Having generally described the invention, the same will be more readily understood by reference to the following examples, which are provided by way of  
35 illustration and are not intended as limiting.

ExamplesExample 1: Isolation of a Selected cDNA Clone From the Deposited Sample

5 Each cDNA clone in a cited ATCC deposit is contained in a plasmid vector. Table 1 identifies the vectors used to construct the cDNA library from which each clone was isolated. In many cases, the vector used to construct the library is a phage vector from which a plasmid has been excised. The table immediately below correlates the related plasmid for each phage vector used in constructing the cDNA library. For  
 10 example, where a particular clone is identified in Table 1 as being isolated in the vector "Lambda Zap," the corresponding deposited clone is in "pBluescript."

|    | <u>Vector Used to Construct Library</u> | <u>Corresponding Deposited Plasmid</u> |
|----|-----------------------------------------|----------------------------------------|
|    | Lambda Zap                              | pBluescript (pBS)                      |
|    | Uni-Zap XR                              | pBluescript (pBS)                      |
| 15 | Zap Express                             | pBK                                    |
|    | lafmid BA                               | plafmid BA                             |
|    | pSport1                                 | pSport1                                |
|    | pCMVSport 2.0                           | pCMVSport 2.0                          |
|    | pCMVSport 3.0                           | pCMVSport 3.0                          |
| 20 | pCR <sup>®</sup> 2.1                    | pCR <sup>®</sup> 2.1                   |

Vectors Lambda Zap (U.S. Patent Nos. 5,128,256 and 5,286,636), Uni-Zap XR (U.S. Patent Nos. 5,128, 256 and 5,286,636), Zap Express (U.S. Patent Nos. 5,128,256 and 5,286,636), pBluescript (pBS) (Short, J. M. et al., Nucleic Acids Res. 16:7583-7600 (1988); Alting-Mees, M. A. and Short, J. M., Nucleic Acids Res. 17:9494 (1989)) and pBK (Alting-Mees, M. A. et al., Strategies 5:58-61 (1992)) are  
 25 commercially available from Stratagene Cloning Systems, Inc., 11011 N. Torrey Pines Road, La Jolla, CA, 92037. pBS contains an ampicillin resistance gene and pBK contains a neomycin resistance gene. Both can be transformed into E. coli strain XL-1 Blue, also available from Stratagene. pBS comes in 4 forms SK+, SK-, KS+ and KS. The S and K refers to the orientation of the polylinker to the T7 and T3 primer  
 30 sequences which flank the polylinker region ("S" is for SacI and "K" is for KpnI which are the first sites on each respective end of the linker). "+" or "-" refer to the orientation of the f1 origin of replication ("ori"), such that in one orientation, single stranded rescue initiated from the f1 ori generates sense strand DNA and in the other, antisense.

35 Vectors pSport1, pCMVSport 2.0 and pCMVSport 3.0, were obtained from Life Technologies, Inc., P. O. Box 6009, Gaithersburg, MD 20897. All Sport vectors contain an ampicillin resistance gene and may be transformed into E. coli strain

DH10B, also available from Life Technologies. (See, for instance, Gruber, C. E., et al., Focus 15:59 (1993).) Vector lafmid BA (Bento Soares, Columbia University, NY) contains an ampicillin resistance gene and can be transformed into E. coli strain XL-1 Blue. Vector pCR<sup>®</sup>2.1, which is available from Invitrogen, 1600 Faraday Avenue,  
5 Carlsbad, CA 92008, contains an ampicillin resistance gene and may be transformed into E. coli strain DH10B, available from Life Technologies. (See, for instance, Clark, J. M., Nuc. Acids Res. 16:9677-9686 (1988) and Mead, D. et al., Bio/Technology 9: (1991).) Preferably, a polynucleotide of the present invention does not comprise the phage vector sequences identified for the particular clone in Table 1, as well as the  
10 corresponding plasmid vector sequences designated above.

The deposited material in the sample assigned the ATCC Deposit Number cited in Table 1 for any given cDNA clone also may contain one or more additional plasmids, each comprising a cDNA clone different from that given clone. Thus, deposits sharing the same ATCC Deposit Number contain at least a plasmid for each cDNA clone  
15 identified in Table 1. Typically, each ATCC deposit sample cited in Table 1 comprises a mixture of approximately equal amounts (by weight) of about 50 plasmid DNAs, each containing a different cDNA clone; but such a deposit sample may include plasmids for more or less than 50 cDNA clones, up to about 500 cDNA clones.

Two approaches can be used to isolate a particular clone from the deposited  
20 sample of plasmid DNAs cited for that clone in Table 1. First, a plasmid is directly isolated by screening the clones using a polynucleotide probe corresponding to SEQ ID NO:X.

Particularly, a specific polynucleotide with 30-40 nucleotides is synthesized using an Applied Biosystems DNA synthesizer according to the sequence reported.  
25 The oligonucleotide is labeled, for instance, with <sup>32</sup>P-γ-ATP using T4 polynucleotide kinase and purified according to routine methods. (E.g., Maniatis et al., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Press, Cold Spring, NY (1982).) The plasmid mixture is transformed into a suitable host, as indicated above (such as XL-1 Blue (Stratagene)) using techniques known to those of skill in the art, such as  
30 those provided by the vector supplier or in related publications or patents cited above. The transformants are plated on 1.5% agar plates (containing the appropriate selection agent, e.g., ampicillin) to a density of about 150 transformants (colonies) per plate. These plates are screened using Nylon membranes according to routine methods for bacterial colony screening (e.g., Sambrook et al., Molecular Cloning: A Laboratory  
35 Manual, 2nd Edit., (1989), Cold Spring Harbor Laboratory Press, pages 1.93 to 1.104), or other techniques known to those of skill in the art.

Alternatively, two primers of 17-20 nucleotides derived from both ends of the SEQ ID NO:X (i.e., within the region of SEQ ID NO:X bounded by the 5' NT and the 3' NT of the clone defined in Table 1) are synthesized and used to amplify the desired cDNA using the deposited cDNA plasmid as a template. The polymerase chain reaction is carried out under routine conditions, for instance, in 25  $\mu$ l of reaction mixture with 0.5  $\mu$ g of the above cDNA template. A convenient reaction mixture is 1.5-5 mM  $\text{MgCl}_2$ , 0.01% (w/v) gelatin, 20  $\mu$ M each of dATP, dCTP, dGTP, dTTP, 25 pmol of each primer and 0.25 Unit of Taq polymerase. Thirty five cycles of PCR (denaturation at 94°C for 1 min; annealing at 55°C for 1 min; elongation at 72°C for 1 min) are performed with a Perkin-Elmer Cetus automated thermal cycler. The amplified product is analyzed by agarose gel electrophoresis and the DNA band with expected molecular weight is excised and purified. The PCR product is verified to be the selected sequence by subcloning and sequencing the DNA product.

Several methods are available for the identification of the 5' or 3' non-coding portions of a gene which may not be present in the deposited clone. These methods include but are not limited to, filter probing, clone enrichment using specific probes, and protocols similar or identical to 5' and 3' "RACE" protocols which are well known in the art. For instance, a method similar to 5' RACE is available for generating the missing 5' end of a desired full-length transcript. (Fromont-Racine et al., Nucleic Acids Res. 21(7):1683-1684 (1993).)

Briefly, a specific RNA oligonucleotide is ligated to the 5' ends of a population of RNA presumably containing full-length gene RNA transcripts. A primer set containing a primer specific to the ligated RNA oligonucleotide and a primer specific to a known sequence of the gene of interest is used to PCR amplify the 5' portion of the desired full-length gene. This amplified product may then be sequenced and used to generate the full length gene.

This above method starts with total RNA isolated from the desired source, although poly-A+ RNA can be used. The RNA preparation can then be treated with phosphatase if necessary to eliminate 5' phosphate groups on degraded or damaged RNA which may interfere with the later RNA ligase step. The phosphatase should then be inactivated and the RNA treated with tobacco acid pyrophosphatase in order to remove the cap structure present at the 5' ends of messenger RNAs. This reaction leaves a 5' phosphate group at the 5' end of the cap cleaved RNA which can then be ligated to an RNA oligonucleotide using T4 RNA ligase.

This modified RNA preparation is used as a template for first strand cDNA synthesis using a gene specific oligonucleotide. The first strand synthesis reaction is

used as a template for PCR amplification of the desired 5' end using a primer specific to the ligated RNA oligonucleotide and a primer specific to the known sequence of the gene of interest. The resultant product is then sequenced and analyzed to confirm that the 5' end sequence belongs to the desired gene.

5

**Example 2: Isolation of Genomic Clones Corresponding to a Polynucleotide**

A human genomic P1 library (Genomic Systems, Inc.) is screened by PCR using primers selected for the cDNA sequence corresponding to SEQ ID NO:X.,  
10 according to the method described in Example 1. (See also, Sambrook.)

**Example 3: Tissue Distribution of Polypeptide**

Tissue distribution of mRNA expression of polynucleotides of the present invention is determined using protocols for Northern blot analysis, described by,  
15 among others, Sambrook et al. For example, a cDNA probe produced by the method described in Example 1 is labeled with P<sup>32</sup> using the rediprime™ DNA labeling system (Amersham Life Science), according to manufacturer's instructions. After labeling, the probe is purified using CHROMA SPIN-100™ column (Clontech Laboratories, Inc.), according to manufacturer's protocol number PT1200-1. The purified labeled probe is  
20 then used to examine various human tissues for mRNA expression.

Multiple Tissue Northern (MTN) blots containing various human tissues (H) or human immune system tissues (IM) (Clontech) are examined with the labeled probe using ExpressHyb™ hybridization solution (Clontech) according to manufacturer's protocol number PT1190-1. Following hybridization and washing, the blots are  
25 mounted and exposed to film at -70°C overnight, and the films developed according to standard procedures.

**Example 4: Chromosomal Mapping of the Polynucleotides**

An oligonucleotide primer set is designed according to the sequence at the 5'  
30 end of SEQ ID NO:X. This primer preferably spans about 100 nucleotides. This primer set is then used in a polymerase chain reaction under the following set of conditions : 30 seconds, 95°C; 1 minute, 56°C; 1 minute, 70°C. This cycle is repeated 32 times followed by one 5 minute cycle at 70°C. Human, mouse, and hamster DNA is used as template in addition to a somatic cell hybrid panel containing individual  
35 chromosomes or chromosome fragments (Bios, Inc). The reactions is analyzed on

either 8% polyacrylamide gels or 3.5 % agarose gels. Chromosome mapping is determined by the presence of an approximately 100 bp PCR fragment in the particular somatic cell hybrid.

5 **Example 5: Bacterial Expression of a Polypeptide**

A polynucleotide encoding a polypeptide of the present invention is amplified using PCR oligonucleotide primers corresponding to the 5' and 3' ends of the DNA sequence, as outlined in Example 1, to synthesize insertion fragments. The primers used to amplify the cDNA insert should preferably contain restriction sites, such as  
10 BamHI and XbaI, at the 5' end of the primers in order to clone the amplified product into the expression vector. For example, BamHI and XbaI correspond to the restriction enzyme sites on the bacterial expression vector pQE-9. (Qiagen, Inc., Chatsworth, CA). This plasmid vector encodes antibiotic resistance (Amp<sup>r</sup>), a bacterial origin of replication (ori), an IPTG-regulatable promoter/operator (P/O), a ribosome binding site  
15 (RBS), a 6-histidine tag (6-His), and restriction enzyme cloning sites.

The pQE-9 vector is digested with BamHI and XbaI and the amplified fragment is ligated into the pQE-9 vector maintaining the reading frame initiated at the bacterial RBS. The ligation mixture is then used to transform the E. coli strain M15/rep4 (Qiagen, Inc.) which contains multiple copies of the plasmid pREP4, which expresses  
20 the lacI repressor and also confers kanamycin resistance (Kan<sup>r</sup>). Transformants are identified by their ability to grow on LB plates and ampicillin/kanamycin resistant colonies are selected. Plasmid DNA is isolated and confirmed by restriction analysis.

Clones containing the desired constructs are grown overnight (O/N) in liquid culture in LB media supplemented with both Amp (100 ug/ml) and Kan (25 ug/ml).  
25 The O/N culture is used to inoculate a large culture at a ratio of 1:100 to 1:250. The cells are grown to an optical density 600 (O.D.<sup>600</sup>) of between 0.4 and 0.6. IPTG (Isopropyl-B-D-thiogalacto pyranoside) is then added to a final concentration of 1 mM. IPTG induces by inactivating the lacI repressor, clearing the P/O leading to increased gene expression.

30 Cells are grown for an extra 3 to 4 hours. Cells are then harvested by centrifugation (20 mins at 6000Xg). The cell pellet is solubilized in the chaotropic agent 6 Molar Guanidine HCl by stirring for 3-4 hours at 4°C. The cell debris is removed by centrifugation, and the supernatant containing the polypeptide is loaded onto a nickel-nitrilo-tri-acetic acid ("Ni-NTA") affinity resin column (available from  
35 QIAGEN, Inc., *supra*). Proteins with a 6 x His tag bind to the Ni-NTA resin with high

affinity and can be purified in a simple one-step procedure (for details see: The QIAexpressionist (1995) QIAGEN, Inc., *supra*).

Briefly, the supernatant is loaded onto the column in 6 M guanidine-HCl, pH 8, the column is first washed with 10 volumes of 6 M guanidine-HCl, pH 8, then washed  
5 with 10 volumes of 6 M guanidine-HCl pH 6, and finally the polypeptide is eluted with 6 M guanidine-HCl, pH 5.

The purified protein is then renatured by dialyzing it against phosphate-buffered saline (PBS) or 50 mM Na-acetate, pH 6 buffer plus 200 mM NaCl. Alternatively, the protein can be successfully refolded while immobilized on the Ni-NTA column. The  
10 recommended conditions are as follows: renature using a linear 6M-1M urea gradient in 500 mM NaCl, 20% glycerol, 20 mM Tris/HCl pH 7.4, containing protease inhibitors. The renaturation should be performed over a period of 1.5 hours or more. After renaturation the proteins are eluted by the addition of 250 mM imidazole. Imidazole is removed by a final dialyzing step against PBS or 50 mM sodium acetate pH 6 buffer  
15 plus 200 mM NaCl. The purified protein is stored at 4° C or frozen at -80° C.

In addition to the above expression vector, the present invention further includes an expression vector comprising phage operator and promoter elements operatively linked to a polynucleotide of the present invention, called pHE4a. (ATCC Accession Number 209645, deposited on February 25, 1998.) This vector contains: 1) a  
20 neomycinphosphotransferase gene as a selection marker, 2) an E. coli origin of replication, 3) a T5 phage promoter sequence, 4) two lac operator sequences, 5) a Shine-Delgarno sequence, and 6) the lactose operon repressor gene (*lacIq*). The origin of replication (*oriC*) is derived from pUC19 (LTI, Gaithersburg, MD). The promoter sequence and operator sequences are made synthetically.

DNA can be inserted into the pHEa by restricting the vector with NdeI and XbaI, BamHI, XhoI, or Asp718, running the restricted product on a gel, and isolating the larger fragment (the stuffer fragment should be about 310 base pairs). The DNA insert is generated according to the PCR protocol described in Example 1, using PCR  
25 primers having restriction sites for NdeI (5' primer) and XbaI, BamHI, XhoI, or Asp718 (3' primer). The PCR insert is gel purified and restricted with compatible enzymes. The insert and vector are ligated according to standard protocols.  
30

The engineered vector could easily be substituted in the above protocol to express protein in a bacterial system.

### 35 **Example 6: Purification of a Polypeptide from an Inclusion Body**

The following alternative method can be used to purify a polypeptide expressed in *E coli* when it is present in the form of inclusion bodies. Unless otherwise specified, all of the following steps are conducted at 4-10°C.

Upon completion of the production phase of the *E. coli* fermentation, the cell  
5 culture is cooled to 4-10°C and the cells harvested by continuous centrifugation at 15,000 rpm (Heraeus Sepatech). On the basis of the expected yield of protein per unit weight of cell paste and the amount of purified protein required, an appropriate amount of cell paste, by weight, is suspended in a buffer solution containing 100 mM Tris, 50 mM EDTA, pH 7.4. The cells are dispersed to a homogeneous suspension using a  
10 high shear mixer.

The cells are then lysed by passing the solution through a microfluidizer (Microfluidics, Corp. or APV Gaulin, Inc.) twice at 4000-6000 psi. The homogenate is then mixed with NaCl solution to a final concentration of 0.5 M NaCl, followed by centrifugation at 7000 xg for 15 min. The resultant pellet is washed again using 0.5M  
15 NaCl, 100 mM Tris, 50 mM EDTA, pH 7.4.

The resulting washed inclusion bodies are solubilized with 1.5 M guanidine hydrochloride (GuHCl) for 2-4 hours. After 7000 xg centrifugation for 15 min., the pellet is discarded and the polypeptide containing supernatant is incubated at 4°C overnight to allow further GuHCl extraction.

20 Following high speed centrifugation (30,000 xg) to remove insoluble particles, the GuHCl solubilized protein is refolded by quickly mixing the GuHCl extract with 20 volumes of buffer containing 50 mM sodium, pH 4.5, 150 mM NaCl, 2 mM EDTA by vigorous stirring. The refolded diluted protein solution is kept at 4°C without mixing for 12 hours prior to further purification steps.

25 To clarify the refolded polypeptide solution, a previously prepared tangential filtration unit equipped with 0.16 µm membrane filter with appropriate surface area (e.g., Filtron), equilibrated with 40 mM sodium acetate, pH 6.0 is employed. The filtered sample is loaded onto a cation exchange resin (e.g., Poros HS-50, Perseptive Biosystems). The column is washed with 40 mM sodium acetate, pH 6.0 and eluted  
30 with 250 mM, 500 mM, 1000 mM, and 1500 mM NaCl in the same buffer, in a stepwise manner. The absorbance at 280 nm of the effluent is continuously monitored. Fractions are collected and further analyzed by SDS-PAGE.

Fractions containing the polypeptide are then pooled and mixed with 4 volumes of water. The diluted sample is then loaded onto a previously prepared set of tandem

columns of strong anion (Poros HQ-50, Perseptive Biosystems) and weak anion (Poros CM-20, Perseptive Biosystems) exchange resins. The columns are equilibrated with 40 mM sodium acetate, pH 6.0. Both columns are washed with 40 mM sodium acetate, pH 6.0, 200 mM NaCl. The CM-20 column is then eluted using a 10 column  
5 volume linear gradient ranging from 0.2 M NaCl, 50 mM sodium acetate, pH 6.0 to 1.0 M NaCl, 50 mM sodium acetate, pH 6.5. Fractions are collected under constant  $A_{280}$  monitoring of the effluent. Fractions containing the polypeptide (determined, for instance, by 16% SDS-PAGE) are then pooled.

The resultant polypeptide should exhibit greater than 95% purity after the above  
10 refolding and purification steps. No major contaminant bands should be observed from Commaissie blue stained 16% SDS-PAGE gel when 5  $\mu$ g of purified protein is loaded. The purified protein can also be tested for endotoxin/LPS contamination, and typically the LPS content is less than 0.1 ng/ml according to LAL assays.

#### 15 **Example 7: Cloning and Expression of a Polypeptide in a Baculovirus Expression System**

In this example, the plasmid shuttle vector pA2 is used to insert a polynucleotide into a baculovirus to express a polypeptide. This expression vector contains the strong polyhedrin promoter of the *Autographa californica* nuclear polyhedrosis virus  
20 (AcMNPV) followed by convenient restriction sites such as BamHI, Xba I and Asp718. The polyadenylation site of the simian virus 40 ("SV40") is used for efficient polyadenylation. For easy selection of recombinant virus, the plasmid contains the beta-galactosidase gene from *E. coli* under control of a weak *Drosophila* promoter in the same orientation, followed by the polyadenylation signal of the polyhedrin gene. The  
25 inserted genes are flanked on both sides by viral sequences for cell-mediated homologous recombination with wild-type viral DNA to generate a viable virus that express the cloned polynucleotide.

Many other baculovirus vectors can be used in place of the vector above, such as pAc373, pVL941, and pAcIM1, as one skilled in the art would readily appreciate, as  
30 long as the construct provides appropriately located signals for transcription, translation, secretion and the like, including a signal peptide and an in-frame AUG as required. Such vectors are described, for instance, in Luckow et al., *Virology* 170:31-39 (1989).

Specifically, the cDNA sequence contained in the deposited clone, including the  
35 AUG initiation codon and the naturally associated leader sequence identified in Table 1, is amplified using the PCR protocol described in Example 1. If the naturally occurring

signal sequence is used to produce the secreted protein, the pA2 vector does not need a second signal peptide. Alternatively, the vector can be modified (pA2 GP) to include a baculovirus leader sequence, using the standard methods described in Summers et al., "A Manual of Methods for Baculovirus Vectors and Insect Cell Culture Procedures,"  
5 Texas Agricultural Experimental Station Bulletin No. 1555 (1987).

The amplified fragment is isolated from a 1% agarose gel using a commercially available kit ("GeneClean," BIO 101 Inc., La Jolla, Ca.). The fragment then is digested with appropriate restriction enzymes and again purified on a 1% agarose gel.

The plasmid is digested with the corresponding restriction enzymes and  
10 optionally, can be dephosphorylated using calf intestinal phosphatase, using routine procedures known in the art. The DNA is then isolated from a 1% agarose gel using a commercially available kit ("GeneClean" BIO 101 Inc., La Jolla, Ca.).

The fragment and the dephosphorylated plasmid are ligated together with T4 DNA ligase. *E. coli* HB101 or other suitable *E. coli* hosts such as XL-1 Blue  
15 (Stratagene Cloning Systems, La Jolla, CA) cells are transformed with the ligation mixture and spread on culture plates. Bacteria containing the plasmid are identified by digesting DNA from individual colonies and analyzing the digestion product by gel electrophoresis. The sequence of the cloned fragment is confirmed by DNA sequencing.

20 Five µg of a plasmid containing the polynucleotide is co-transfected with 1.0 µg of a commercially available linearized baculovirus DNA ("BaculoGold™ baculovirus DNA", Pharmingen, San Diego, CA), using the lipofection method described by Felgner et al., Proc. Natl. Acad. Sci. USA 84:7413-7417 (1987). One µg of BaculoGold™ virus DNA and 5 µg of the plasmid are mixed in a sterile well of a  
25 microtiter plate containing 50 µl of serum-free Grace's medium (Life Technologies Inc., Gaithersburg, MD). Afterwards, 10 µl Lipofectin plus 90 µl Grace's medium are added, mixed and incubated for 15 minutes at room temperature. Then the transfection mixture is added drop-wise to Sf9 insect cells (ATCC CRL 1711) seeded in a 35 mm tissue culture plate with 1 ml Grace's medium without serum. The plate is then  
30 incubated for 5 hours at 27° C. The transfection solution is then removed from the plate and 1 ml of Grace's insect medium supplemented with 10% fetal calf serum is added. Cultivation is then continued at 27° C for four days.

After four days the supernatant is collected and a plaque assay is performed, as described by Summers and Smith, *supra*. An agarose gel with "Blue Gal" (Life  
35 Technologies Inc., Gaithersburg) is used to allow easy identification and isolation of gal-expressing clones, which produce blue-stained plaques. (A detailed description of a "plaque assay" of this type can also be found in the user's guide for insect cell culture

and baculovirology distributed by Life Technologies Inc., Gaithersburg, page 9-10.) After appropriate incubation, blue stained plaques are picked with the tip of a micropipettor (e.g., Eppendorf). The agar containing the recombinant viruses is then resuspended in a microcentrifuge tube containing 200 µl of Grace's medium and the suspension containing the recombinant baculovirus is used to infect Sf9 cells seeded in 35 mm dishes. Four days later the supernatants of these culture dishes are harvested and then they are stored at 4° C.

To verify the expression of the polypeptide, Sf9 cells are grown in Grace's medium supplemented with 10% heat-inactivated FBS. The cells are infected with the recombinant baculovirus containing the polynucleotide at a multiplicity of infection ("MOI") of about 2. If radiolabeled proteins are desired, 6 hours later the medium is removed and is replaced with SF900 II medium minus methionine and cysteine (available from Life Technologies Inc., Rockville, MD). After 42 hours, 5 µCi of <sup>35</sup>S-methionine and 5 µCi <sup>35</sup>S-cysteine (available from Amersham) are added. The cells are further incubated for 16 hours and then are harvested by centrifugation. The proteins in the supernatant as well as the intracellular proteins are analyzed by SDS-PAGE followed by autoradiography (if radiolabeled).

Microsequencing of the amino acid sequence of the amino terminus of purified protein may be used to determine the amino terminal sequence of the produced protein.

#### **Example 8: Expression of a Polypeptide in Mammalian Cells**

The polypeptide of the present invention can be expressed in a mammalian cell. A typical mammalian expression vector contains a promoter element, which mediates the initiation of transcription of mRNA, a protein coding sequence, and signals required for the termination of transcription and polyadenylation of the transcript. Additional elements include enhancers, Kozak sequences and intervening sequences flanked by donor and acceptor sites for RNA splicing. Highly efficient transcription is achieved with the early and late promoters from SV40, the long terminal repeats (LTRs) from Retroviruses, e.g., RSV, HTLVI, HIVI and the early promoter of the cytomegalovirus (CMV). However, cellular elements can also be used (e.g., the human actin promoter).

Suitable expression vectors for use in practicing the present invention include, for example, vectors such as pSVL and pMSG (Pharmacia, Uppsala, Sweden), pRSVcat (ATCC 37152), pSV2dhfr (ATCC 37146), pBC12MI (ATCC 67109), pCMVSPORT 2.0, and pCMVSPORT 3.0. Mammalian host cells that could be used include, human Hela, 293, H9 and Jurkat cells, mouse NIH3T3 and C127 cells, Cos 1, Cos 7 and CV1, quail QC1-3 cells, mouse L cells and Chinese hamster ovary (CHO) cells.

Alternatively, the polypeptide can be expressed in stable cell lines containing the polynucleotide integrated into a chromosome. The co-transfection with a selectable marker such as dhfr, gpt, neomycin, hygromycin allows the identification and isolation of the transfected cells.

5       The transfected gene can also be amplified to express large amounts of the encoded protein. The DHFR (dihydrofolate reductase) marker is useful in developing cell lines that carry several hundred or even several thousand copies of the gene of interest. (See, e.g., Alt, F. W., et al., J. Biol. Chem. 253:1357-1370 (1978); Hamlin, J. L. and Ma, C., Biochem. et Biophys. Acta, 1097:107-143 (1990); Page, M. J. and  
10   Sydenham, M. A., Biotechnology 9:64-68 (1991).) Another useful selection marker is the enzyme glutamine synthase (GS) (Murphy et al., Biochem J. 227:277-279 (1991); Bebbington et al., Bio/Technology 10:169-175 (1992). Using these markers, the mammalian cells are grown in selective medium and the cells with the highest resistance are selected. These cell lines contain the amplified gene(s) integrated into a  
15   chromosome. Chinese hamster ovary (CHO) and NSO cells are often used for the production of proteins.

Derivatives of the plasmid pSV2-dhfr (ATCC Accession No. 37146), the expression vectors pC4 (ATCC Accession No. 209646) and pC6 (ATCC Accession No.209647) contain the strong promoter (LTR) of the Rous Sarcoma Virus (Cullen et  
20   al., Molecular and Cellular Biology, 438-447 (March, 1985)) plus a fragment of the CMV-enhancer (Boshart et al., Cell 41:521-530 (1985).) Multiple cloning sites, e.g., with the restriction enzyme cleavage sites BamHI, XbaI and Asp718, facilitate the cloning of the gene of interest. The vectors also contain the 3' intron, the polyadenylation and termination signal of the rat preproinsulin gene, and the mouse  
25   DHFR gene under control of the SV40 early promoter.

Specifically, the plasmid pC6, for example, is digested with appropriate restriction enzymes and then dephosphorylated using calf intestinal phosphates by procedures known in the art. The vector is then isolated from a 1% agarose gel.

A polynucleotide of the present invention is amplified according to the protocol  
30   outlined in Example 1. If the naturally occurring signal sequence is used to produce the secreted protein, the vector does not need a second signal peptide. Alternatively, if the naturally occurring signal sequence is not used, the vector can be modified to include a heterologous signal sequence. (See, e.g., WO 96/34891.)

The amplified fragment is isolated from a 1% agarose gel using a commercially  
35   available kit ("GeneClean," BIO 101 Inc., La Jolla, Ca.). The fragment then is digested with appropriate restriction enzymes and again purified on a 1% agarose gel.

The amplified fragment is then digested with the same restriction enzyme and purified on a 1% agarose gel. The isolated fragment and the dephosphorylated vector are then ligated with T4 DNA ligase. *E. coli* HB101 or XL-1 Blue cells are then transformed and bacteria are identified that contain the fragment inserted into plasmid pC6 using, for instance, restriction enzyme analysis.

Chinese hamster ovary cells lacking an active DHFR gene is used for transfection. Five  $\mu$ g of the expression plasmid pC6 is cotransfected with 0.5  $\mu$ g of the plasmid pSVneo using lipofectin (Felgner et al., *supra*). The plasmid pSV2-neo contains a dominant selectable marker, the *neo* gene from Tn5 encoding an enzyme that confers resistance to a group of antibiotics including G418. The cells are seeded in alpha minus MEM supplemented with 1 mg/ml G418. After 2 days, the cells are trypsinized and seeded in hybridoma cloning plates (Greiner, Germany) in alpha minus MEM supplemented with 10, 25, or 50 ng/ml of methotrexate plus 1 mg/ml G418. After about 10-14 days single clones are trypsinized and then seeded in 6-well petri dishes or 10 ml flasks using different concentrations of methotrexate (50 nM, 100 nM, 200 nM, 400 nM, 800 nM). Clones growing at the highest concentrations of methotrexate are then transferred to new 6-well plates containing even higher concentrations of methotrexate (1  $\mu$ M, 2  $\mu$ M, 5  $\mu$ M, 10 mM, 20 mM). The same procedure is repeated until clones are obtained which grow at a concentration of 100 - 200  $\mu$ M. Expression of the desired gene product is analyzed, for instance, by SDS-PAGE and Western blot or by reversed phase HPLC analysis.

### **Example 9: Protein Fusions**

The polypeptides of the present invention are preferably fused to other proteins. These fusion proteins can be used for a variety of applications. For example, fusion of the present polypeptides to His-tag, HA-tag, protein A, IgG domains, and maltose binding protein facilitates purification. (See Example 5; see also EP A 394,827; Traunecker, et al., Nature 331:84-86 (1988).) Similarly, fusion to IgG-1, IgG-3, and albumin increases the halflife time in vivo. Nuclear localization signals fused to the polypeptides of the present invention can target the protein to a specific subcellular localization, while covalent heterodimer or homodimers can increase or decrease the activity of a fusion protein. Fusion proteins can also create chimeric molecules having more than one function. Finally, fusion proteins can increase solubility and/or stability of the fused protein compared to the non-fused protein. All of the types of fusion proteins described above can be made by modifying the following protocol, which outlines the fusion of a polypeptide to an IgG molecule, or the protocol described in Example 5.

Briefly, the human Fc portion of the IgG molecule can be PCR amplified, using primers that span the 5' and 3' ends of the sequence described below. These primers also should have convenient restriction enzyme sites that will facilitate cloning into an expression vector, preferably a mammalian expression vector.

5 For example, if pC4 (Accession No. 209646) is used, the human Fc portion can be ligated into the BamHI cloning site. Note that the 3' BamHI site should be destroyed. Next, the vector containing the human Fc portion is re-restricted with BamHI, linearizing the vector, and a polynucleotide of the present invention, isolated by the PCR protocol described in Example 1, is ligated into this BamHI site. Note that  
10 the polynucleotide is cloned without a stop codon, otherwise a fusion protein will not be produced.

If the naturally occurring signal sequence is used to produce the secreted protein, pC4 does not need a second signal peptide. Alternatively, if the naturally occurring signal sequence is not used, the vector can be modified to include a  
15 heterologous signal sequence. (See, e.g., WO 96/34891.)

Human IgG Fc region:

GGGATCCGGAGCCCAAATCTTCTGACAAAACCTCACACATGCCCACCGTGCC  
CAGCACCTGAATTCGAGGGTGCACCGTCAGTCTTCCTCTTCCCCCAAAACC  
20 CAAGGACACCCTCATGATCTCCCGGACTCCTGAGGTACATGCGTGGTGGT  
GGACGTAAGCCACGAAGACCCTGAGGTCAAGTTCAACTGGTACGTGGACG  
GCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTACAAC  
AGCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTG  
AATGGCAAGGAGTACAAGTGCAAGGTCTCCAACAAAGCCCTCCCAACCCCC  
25 ATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCCCCGAGAACCACAGGT  
GTACACCCTGCCCCCATCCCGGGATGAGCTGACCAAGAACCAGGTCAGCCT  
GACCTGCCTGGTCAAAGGCTTCTATCCAAGCGACATCGCCGTGGAGTGGGA  
GAGCAATGGGCAGCCGGAGAACAACACTACAAGACCACGCCTCCCGTGCTGG  
ACTCCGACGGCTCCTTCTTCCTCTACAGCAAGCTCACCGTGGACAAGAGCA  
30 GGTGGCAGCAGGGGAACGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGC  
ACAACCACTACACGCAGAAGAGCCTCTCCCTGTCTCCGGGTAAATGAGTGC  
GACGGCCGCGACTCTAGAGGAT (SEQ ID NO:1)

#### **Example 10: Production of an Antibody from a Polypeptide**

35 The antibodies of the present invention can be prepared by a variety of methods. (See, Current Protocols, Chapter 2.) For example, cells expressing a polypeptide of the present invention is administered to an animal to induce the production of sera

containing polyclonal antibodies. In a preferred method, a preparation of the secreted protein is prepared and purified to render it substantially free of natural contaminants. Such a preparation is then introduced into an animal in order to produce polyclonal antisera of greater specific activity.

5 In the most preferred method, the antibodies of the present invention are monoclonal antibodies (or protein binding fragments thereof). Such monoclonal antibodies can be prepared using hybridoma technology. (Köhler et al., *Nature* 256:495 (1975); Köhler et al., *Eur. J. Immunol.* 6:511 (1976); Köhler et al., *Eur. J. Immunol.* 6:292 (1976); Hammerling et al., in: *Monoclonal Antibodies and T-Cell*  
10 *Hybridomas*, Elsevier, N.Y., pp. 563-681 (1981).) In general, such procedures involve immunizing an animal (preferably a mouse) with polypeptide or, more preferably, with a secreted polypeptide-expressing cell. Such cells may be cultured in any suitable tissue culture medium; however, it is preferable to culture cells in Earle's modified Eagle's medium supplemented with 10% fetal bovine serum (inactivated at  
15 about 56°C), and supplemented with about 10 g/l of nonessential amino acids, about 1,000 U/ml of penicillin, and about 100 µg/ml of streptomycin.

The splenocytes of such mice are extracted and fused with a suitable myeloma cell line. Any suitable myeloma cell line may be employed in accordance with the present invention; however, it is preferable to employ the parent myeloma cell line  
20 (SP2O), available from the ATCC. After fusion, the resulting hybridoma cells are selectively maintained in HAT medium, and then cloned by limiting dilution as described by Wands et al. (*Gastroenterology* 80:225-232 (1981).) The hybridoma cells obtained through such a selection are then assayed to identify clones which secrete antibodies capable of binding the polypeptide.

25 Alternatively, additional antibodies capable of binding to the polypeptide can be produced in a two-step procedure using anti-idiotypic antibodies. Such a method makes use of the fact that antibodies are themselves antigens, and therefore, it is possible to obtain an antibody which binds to a second antibody. In accordance with this method, protein specific antibodies are used to immunize an animal, preferably a  
30 mouse. The splenocytes of such an animal are then used to produce hybridoma cells, and the hybridoma cells are screened to identify clones which produce an antibody whose ability to bind to the protein-specific antibody can be blocked by the polypeptide. Such antibodies comprise anti-idiotypic antibodies to the protein-specific antibody and can be used to immunize an animal to induce formation of further protein-specific  
35 antibodies.

It will be appreciated that Fab and F(ab')<sub>2</sub> and other fragments of the antibodies of the present invention may be used according to the methods disclosed herein. Such fragments are typically produced by proteolytic cleavage, using enzymes such as papain (to produce Fab fragments) or pepsin (to produce F(ab')<sub>2</sub> fragments). Alternatively,  
5 secreted protein-binding fragments can be produced through the application of recombinant DNA technology or through synthetic chemistry.

For in vivo use of antibodies in humans, it may be preferable to use "humanized" chimeric monoclonal antibodies. Such antibodies can be produced using genetic constructs derived from hybridoma cells producing the monoclonal antibodies  
10 described above. Methods for producing chimeric antibodies are known in the art. (See, for review, Morrison, Science 229:1202 (1985); Oi et al., BioTechniques 4:214 (1986); Cabilly et al., U.S. Patent No. 4,816,567; Taniguchi et al., EP 171496; Morrison et al., EP 173494; Neuberger et al., WO 8601533; Robinson et al., WO 8702671; Boulianne et al., Nature 312:643 (1984); Neuberger et al., Nature 314:268  
15 (1985).)

#### **Example 11: Production Of Secreted Protein For High-Throughput Screening Assays**

The following protocol produces a supernatant containing a polypeptide to be  
20 tested. This supernatant can then be used in the Screening Assays described in Examples 13-20.

First, dilute Poly-D-Lysine (644 587 Boehringer-Mannheim) stock solution (1mg/ml in PBS) 1:20 in PBS (w/o calcium or magnesium 17-516F Biowhittaker) for a working solution of 50ug/ml. Add 200 ul of this solution to each well (24 well plates)  
25 and incubate at RT for 20 minutes. Be sure to distribute the solution over each well (note: a 12-channel pipetter may be used with tips on every other channel). Aspirate off the Poly-D-Lysine solution and rinse with 1ml PBS (Phosphate Buffered Saline). The PBS should remain in the well until just prior to plating the cells and plates may be poly-lysine coated in advance for up to two weeks.

30 Plate 293T cells (do not carry cells past P+20) at  $2 \times 10^5$  cells/well in .5ml DMEM(Dulbecco's Modified Eagle Medium)(with 4.5 G/L glucose and L-glutamine (12-604F Biowhittaker))/10% heat inactivated FBS(14-503F Biowhittaker)/1x Penstrep(17-602E Biowhittaker). Let the cells grow overnight.

The next day, mix together in a sterile solution basin: 300 ul Lipofectamine  
35 (18324-012 Gibco/BRL) and 5ml Optimem I (31985070 Gibco/BRL)/96-well plate. With a small volume multi-channel pipetter, aliquot approximately 2ug of an expression vector containing a polynucleotide insert, produced by the methods described in

Examples 8 or 9, into an appropriately labeled 96-well round bottom plate. With a multi-channel pipetter, add 50ul of the Lipofectamine/Optimem I mixture to each well. Pipette up and down gently to mix. Incubate at RT 15-45 minutes. After about 20 minutes, use a multi-channel pipetter to add 150ul Optimem I to each well. As a control, one plate of vector DNA lacking an insert should be transfected with each set of transfections.

Preferably, the transfection should be performed by tag-teaming the following tasks. By tag-teaming, hands on time is cut in half, and the cells do not spend too much time on PBS. First, person A aspirates off the media from four 24-well plates of cells, and then person B rinses each well with .5-1ml PBS. Person A then aspirates off PBS rinse, and person B, using a 12-channel pipetter with tips on every other channel, adds the 200ul of DNA/Lipofectamine/Optimem I complex to the odd wells first, then to the even wells, to each row on the 24-well plates. Incubate at 37°C for 6 hours.

While cells are incubating, prepare appropriate media, either 1%BSA in DMEM with 1x penstrep, or CHO-5 media (116.6 mg/L of CaCl<sub>2</sub> (anhyd); 0.00130 mg/L CuSO<sub>4</sub>·5H<sub>2</sub>O; 0.050 mg/L of Fe(NO<sub>3</sub>)<sub>3</sub>·9H<sub>2</sub>O; 0.417 mg/L of FeSO<sub>4</sub>·7H<sub>2</sub>O; 311.80 mg/L of KCl; 28.64 mg/L of MgCl<sub>2</sub>; 48.84 mg/L of MgSO<sub>4</sub>; 6995.50 mg/L of NaCl; 2400.0 mg/L of NaHCO<sub>3</sub>; 62.50 mg/L of NaH<sub>2</sub>PO<sub>4</sub>·H<sub>2</sub>O; 71.02 mg/L of Na<sub>2</sub>HPO<sub>4</sub>; .4320 mg/L of ZnSO<sub>4</sub>·7H<sub>2</sub>O; .002 mg/L of Arachidonic Acid ; 1.022 mg/L of Cholesterol; .070 mg/L of DL-alpha-Tocopherol-Acetate; 0.0520 mg/L of Linoleic Acid; 0.010 mg/L of Linolenic Acid; 0.010 mg/L of Myristic Acid; 0.010 mg/L of Oleic Acid; 0.010 mg/L of Palmitic Acid; 0.010 mg/L of Palmitic Acid; 100 mg/L of Pluronic F-68; 0.010 mg/L of Stearic Acid; 2.20 mg/L of Tween 80; 4551 mg/L of D-Glucose; 130.85 mg/ml of L- Alanine; 147.50 mg/ml of L-Arginine-HCL; 7.50 mg/ml of L-Asparagine-H<sub>2</sub>O; 6.65 mg/ml of L-Aspartic Acid; 29.56 mg/ml of L-Cystine-2HCL-H<sub>2</sub>O; 31.29 mg/ml of L-Cystine-2HCL; 7.35 mg/ml of L-Glutamic Acid; 365.0 mg/ml of L-Glutamine; 18.75 mg/ml of Glycine; 52.48 mg/ml of L-Histidine-HCL-H<sub>2</sub>O; 106.97 mg/ml of L-Isoleucine; 111.45 mg/ml of L-Leucine; 163.75 mg/ml of L-Lysine HCL; 32.34 mg/ml of L-Methionine; 68.48 mg/ml of L-Phenylalanine; 40.0 mg/ml of L-Proline; 26.25 mg/ml of L-Serine; 101.05 mg/ml of L-Threonine; 19.22 mg/ml of L-Tryptophan; 91.79 mg/ml of L-Tyrosine-2Na-2H<sub>2</sub>O; 99.65 mg/ml of L-Valine; 0.0035 mg/L of Biotin; 3.24 mg/L of D-Ca Pantothenate; 11.78 mg/L of Choline Chloride; 4.65 mg/L of Folic Acid; 15.60 mg/L of i-Inositol; 3.02 mg/L of Niacinamide; 3.00 mg/L of Pyridoxal HCL; 0.031 mg/L of Pyridoxine HCL; 0.319 mg/L of Riboflavin; 3.17 mg/L of Thiamine HCL; 0.365 mg/L of Thymidine; and 0.680 mg/L of Vitamin B<sub>12</sub>; 25 mM of HEPES Buffer; 2.39 mg/L of Na Hypoxanthine;

0.105 mg/L of Lipoic Acid; 0.081 mg/L of Sodium Putrescine-2HCL; 55.0 mg/L of Sodium Pyruvate; 0.0067 mg/L of Sodium Selenite; 20uM of Ethanolamine; 0.122 mg/L of Ferric Citrate; 41.70 mg/L of Methyl-B-Cyclodextrin complexed with Linoleic Acid; 33.33 mg/L of Methyl-B-Cyclodextrin complexed with Oleic Acid; and 10 mg/L of Methyl-B-Cyclodextrin complexed with Retinal) with 2mm glutamine and 1x penstrep. (BSA (81-068-3 Bayer) 100gm dissolved in 1L DMEM for a 10% BSA stock solution). Filter the media and collect 50 ul for endotoxin assay in 15ml polystyrene conical.

The transfection reaction is terminated, preferably by tag-teaming, at the end of the incubation period. Person A aspirates off the transfection media, while person B adds 1.5ml appropriate media to each well. Incubate at 37°C for 45 or 72 hours depending on the media used: 1%BSA for 45 hours or CHO-5 for 72 hours.

On day four, using a 300ul multichannel pipetter, aliquot 600ul in one 1ml deep well plate and the remaining supernatant into a 2ml deep well. The supernatants from each well can then be used in the assays described in Examples 13-20.

It is specifically understood that when activity is obtained in any of the assays described below using a supernatant, the activity originates from either the polypeptide directly (e.g., as a secreted protein) or by the polypeptide inducing expression of other proteins, which are then secreted into the supernatant. Thus, the invention further provides a method of identifying the protein in the supernatant characterized by an activity in a particular assay.

### **Example 12: Construction of GAS Reporter Construct**

One signal transduction pathway involved in the differentiation and proliferation of cells is called the Jaks-STATs pathway. Activated proteins in the Jaks-STATs pathway bind to gamma activation site "GAS" elements or interferon-sensitive responsive element ("ISRE"), located in the promoter of many genes. The binding of a protein to these elements alter the expression of the associated gene.

GAS and ISRE elements are recognized by a class of transcription factors called Signal Transducers and Activators of Transcription, or "STATs." There are six members of the STATs family. Stat1 and Stat3 are present in many cell types, as is Stat2 (as response to IFN-alpha is widespread). Stat4 is more restricted and is not in many cell types though it has been found in T helper class I, cells after treatment with IL-12. Stat5 was originally called mammary growth factor, but has been found at higher concentrations in other cells including myeloid cells. It can be activated in tissue culture cells by many cytokines.

The STATs are activated to translocate from the cytoplasm to the nucleus upon tyrosine phosphorylation by a set of kinases known as the Janus Kinase ("Jaks") family. Jaks represent a distinct family of soluble tyrosine kinases and include Tyk2, Jak1, Jak2, and Jak3. These kinases display significant sequence similarity and are  
5 generally catalytically inactive in resting cells.

The Jaks are activated by a wide range of receptors summarized in the Table below. (Adapted from review by Schidler and Darnell, Ann. Rev. Biochem. 64:621-51 (1995).) A cytokine receptor family, capable of activating Jaks, is divided into two groups: (a) Class 1 includes receptors for IL-2, IL-3, IL-4, IL-6, IL-7, IL-9, IL-11, IL-  
10 12, IL-15, Epo, PRL, GH, G-CSF, GM-CSF, LIF, CNTF, and thrombopoietin; and (b) Class 2 includes IFN-a, IFN-g, and IL-10. The Class 1 receptors share a conserved cysteine motif (a set of four conserved cysteines and one tryptophan) and a WSXWS motif (a membrane proximal region encoding Trp-Ser-Xxx-Trp-Ser (SEQ ID NO:2)).

15 Thus, on binding of a ligand to a receptor, Jaks are activated, which in turn activate STATs, which then translocate and bind to GAS elements. This entire process is encompassed in the Jaks-STATs signal transduction pathway.

Therefore, activation of the Jaks-STATs pathway, reflected by the binding of the GAS or the ISRE element, can be used to indicate proteins involved in the  
20 proliferation and differentiation of cells. For example, growth factors and cytokines are known to activate the Jaks-STATs pathway. (See Table below.) Thus, by using GAS elements linked to reporter molecules, activators of the Jaks-STATs pathway can be identified.

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| 131 |                                  |             |                            |             |                             |                              |
|-----|----------------------------------|-------------|----------------------------|-------------|-----------------------------|------------------------------|
|     | <u>Ligand</u>                    | <u>tyk2</u> | <u>JAKs</u><br><u>Jak1</u> | <u>Jak2</u> | <u>STATS</u><br><u>Jak3</u> | <u>GAS(elements) or ISRE</u> |
| 5   | <u>IFN family</u>                |             |                            |             |                             |                              |
|     | IFN-a/B                          | +           | +                          | -           | -                           | 1,2,3                        |
|     | IFN-g                            |             | +                          | +           | -                           | 1                            |
|     | Il-10                            | +           | ?                          | ?           | -                           | 1,3                          |
| 10  | <u>gp130 family</u>              |             |                            |             |                             |                              |
|     | IL-6 (Pleiotrohic)               | +           | +                          | +           | ?                           | 1,3                          |
|     | Il-11(Pleiotrohic)               | ?           | +                          | ?           | ?                           | 1,3                          |
|     | OnM(Pleiotrohic)                 | ?           | +                          | +           | ?                           | 1,3                          |
|     | LIF(Pleiotrohic)                 | ?           | +                          | +           | ?                           | 1,3                          |
|     | CNTF(Pleiotrohic)                | -/+         | +                          | +           | ?                           | 1,3                          |
| 15  | G-CSF(Pleiotrohic)               | ?           | +                          | ?           | ?                           | 1,3                          |
|     | IL-12(Pleiotrohic)               | +           | -                          | +           | +                           | 1,3                          |
| 20  | <u>g-C family</u>                |             |                            |             |                             |                              |
|     | IL-2 (lymphocytes)               | -           | +                          | -           | +                           | 1,3,5                        |
|     | IL-4 (lymph/myeloid)             | -           | +                          | -           | +                           | 6                            |
|     | IL-7 (lymphocytes)               | -           | +                          | -           | +                           | 5                            |
|     | IL-9 (lymphocytes)               | -           | +                          | -           | +                           | 5                            |
|     | IL-13 (lymphocyte)               | -           | +                          | ?           | ?                           | 6                            |
|     | IL-15                            | ?           | +                          | ?           | +                           | 5                            |
| 25  | <u>gp140 family</u>              |             |                            |             |                             |                              |
|     | IL-3 (myeloid)                   | -           | -                          | +           | -                           | 5                            |
|     | IL-5 (myeloid)                   | -           | -                          | +           | -                           | 5                            |
|     | GM-CSF (myeloid)                 | -           | -                          | +           | -                           | 5                            |
| 30  | <u>Growth hormone family</u>     |             |                            |             |                             |                              |
|     | GH                               | ?           | -                          | +           | -                           | 5                            |
|     | PRL                              | ?           | +/-                        | +           | -                           | 1,3,5                        |
|     | EPO                              | ?           | -                          | +           | -                           | 5                            |
| 35  | CAS>IRF1=IFP>>Ly6)               |             |                            |             |                             | GAS(B-                       |
| 40  | <u>Receptor Tyrosine Kinases</u> |             |                            |             |                             |                              |
|     | EGF                              | ?           | +                          | +           | -                           | 1,3                          |
|     | PDGF                             | ?           | +                          | +           | -                           | 1,3                          |
|     | CSF-1                            | ?           | +                          | +           | -                           | 1,3                          |
|     |                                  |             |                            |             |                             | GAS (not IRF1)               |

To construct a synthetic GAS containing promoter element, which is used in the Biological Assays described in Examples 13-14, a PCR based strategy is employed to generate a GAS-SV40 promoter sequence. The 5' primer contains four tandem copies of the GAS binding site found in the IRF1 promoter and previously demonstrated to bind STATs upon induction with a range of cytokines (Rothman et al., Immunity 1:457-468 (1994).), although other GAS or ISRE elements can be used instead. The 5' primer also contains 18bp of sequence complementary to the SV40 early promoter sequence and is flanked with an XhoI site. The sequence of the 5' primer is:

5':GCGCCTCGAGATTTCCCCGAAATCTAGATTTCCCCGAAATGATTTCCCCG  
10 AAATGATTTCCCCGAAATATCTGCCATCTCAATTAG:3' (SEQ ID NO:3)

The downstream primer is complementary to the SV40 promoter and is flanked with a Hind III site: 5':GCGGCAAGCTTTTTTGCAAAGCCTAGGC:3' (SEQ ID NO:4)

PCR amplification is performed using the SV40 promoter template present in the B-gal:promoter plasmid obtained from Clontech. The resulting PCR fragment is digested with XhoI/Hind III and subcloned into BLSK2-. (Stratagene.) Sequencing with forward and reverse primers confirms that the insert contains the following sequence:

5':CTCGAGATTTCCCCGAAATCTAGATTTCCCCGAAATGATTTCCCCGAAATG  
20 ATTTCCCCGAAATATCTGCCATCTCAATTAGTCAGCAACCATAGTCCCGCCC  
CTAACTCCGCCCATCCCGCCCCCTAACTCCGCCCAGTTCCGCCCATTCTCCGC  
CCCATGGCTGACTAATTTTTTTTATTTATGCAGAGGCCGAGGCCGCCTCGGC  
CTCTGAGCTATTCCAGAAGTAGTGAGGAGGCTTTTTTTGGAGGCCTAGGCTTT  
TGCAAAAAGCTT:3' (SEQ ID NO:5)

25 With this GAS promoter element linked to the SV40 promoter, a GAS:SEAP2 reporter construct is next engineered. Here, the reporter molecule is a secreted alkaline phosphatase, or "SEAP." Clearly, however, any reporter molecule can be instead of SEAP, in this or in any of the other Examples. Well known reporter molecules that can be used instead of SEAP include chloramphenicol acetyltransferase (CAT), luciferase,  
30 alkaline phosphatase, B-galactosidase, green fluorescent protein (GFP), or any protein detectable by an antibody.

The above sequence confirmed synthetic GAS-SV40 promoter element is subcloned into the pSEAP-Promoter vector obtained from Clontech using HindIII and XhoI, effectively replacing the SV40 promoter with the amplified GAS:SV40 promoter element, to create the GAS-SEAP vector. However, this vector does not contain a  
35 neomycin resistance gene, and therefore, is not preferred for mammalian expression systems.

Thus, in order to generate mammalian stable cell lines expressing the GAS-SEAP reporter, the GAS-SEAP cassette is removed from the GAS-SEAP vector using SalI and NotI, and inserted into a backbone vector containing the neomycin resistance gene, such as pGFP-1 (Clontech), using these restriction sites in the multiple cloning  
5 site, to create the GAS-SEAP/Neo vector. Once this vector is transfected into mammalian cells, this vector can then be used as a reporter molecule for GAS binding as described in Examples 13-14.

Other constructs can be made using the above description and replacing GAS with a different promoter sequence. For example, construction of reporter molecules  
10 containing NFK-B and EGR promoter sequences are described in Examples 15 and 16. However, many other promoters can be substituted using the protocols described in these Examples. For instance, SRE, IL-2, NFAT, or Osteocalcin promoters can be substituted, alone or in combination (e.g., GAS/NF-KB/EGR, GAS/NF-KB, IL-2/NFAT, or NF-KB/GAS). Similarly, other cell lines can be used to test reporter  
15 construct activity, such as HELA (epithelial), HUVEC (endothelial), Reh (B-cell), Saos-2 (osteoblast), HUVAC (aortic), or Cardiomyocyte.

**Example 13: High-Throughput Screening Assay for T-cell Activity.**

The following protocol is used to assess T-cell activity by identifying factors,  
20 such as growth factors and cytokines, that may proliferate or differentiate T-cells. T-cell activity is assessed using the GAS/SEAP/Neo construct produced in Example 12. Thus, factors that increase SEAP activity indicate the ability to activate the Jaks-STATS signal transduction pathway. The T-cell used in this assay is Jurkat T-cells (ATCC Accession No. TIB-152), although Molt-3 cells (ATCC Accession No. CRL-1552) and  
25 Molt-4 cells (ATCC Accession No. CRL-1582) cells can also be used.

Jurkat T-cells are lymphoblastic CD4+ Th1 helper cells. In order to generate stable cell lines, approximately 2 million Jurkat cells are transfected with the GAS-SEAP/neo vector using DMRIE-C (Life Technologies)(transfection procedure described below). The transfected cells are seeded to a density of approximately  
30 20,000 cells per well and transfectants resistant to 1 mg/ml gentamicin selected. Resistant colonies are expanded and then tested for their response to increasing concentrations of interferon gamma. The dose response of a selected clone is demonstrated.

Specifically, the following protocol will yield sufficient cells for 75 wells containing 200 ul of cells. Thus, it is either scaled up, or performed in multiple to  
35 generate sufficient cells for multiple 96 well plates. Jurkat cells are maintained in RPMI + 10% serum with 1%Pen-Strep. Combine 2.5 mls of OPTI-MEM (Life Technologies)

with 10 ug of plasmid DNA in a T25 flask. Add 2.5 ml OPTI-MEM containing 50  $\mu$ l of DMRIE-C and incubate at room temperature for 15-45 mins.

During the incubation period, count cell concentration, spin down the required number of cells ( $10^7$  per transfection), and resuspend in OPTI-MEM to a final  
5 concentration of  $10^7$  cells/ml. Then add 1ml of  $1 \times 10^7$  cells in OPTI-MEM to T25 flask and incubate at 37°C for 6 hrs. After the incubation, add 10 ml of RPMI + 15% serum.

The Jurkat:GAS-SEAP stable reporter lines are maintained in RPMI + 10% serum, 1 mg/ml Gentamicin, and 1% Pen-Strep. These cells are treated with supernatants containing a polypeptide as produced by the protocol described in Example 11.

10 On the day of treatment with the supernatant, the cells should be washed and resuspended in fresh RPMI + 10% serum to a density of 500,000 cells per ml. The exact number of cells required will depend on the number of supernatants being screened. For one 96 well plate, approximately 10 million cells (for 10 plates, 100 million cells) are required.

15 Transfer the cells to a triangular reservoir boat, in order to dispense the cells into a 96 well dish, using a 12 channel pipette. Using a 12 channel pipette, transfer 200  $\mu$ l of cells into each well (therefore adding 100,000 cells per well).

After all the plates have been seeded, 50  $\mu$ l of the supernatants are transferred directly from the 96 well plate containing the supernatants into each well using a 12  
20 channel pipette. In addition, a dose of exogenous interferon gamma (0.1, 1.0, 10 ng) is added to wells H9, H10, and H11 to serve as additional positive controls for the assay.

The 96 well dishes containing Jurkat cells treated with supernatants are placed in an incubator for 48 hrs (note: this time is variable between 48-72 hrs). 35  $\mu$ l samples  
25 from each well are then transferred to an opaque 96 well plate using a 12 channel pipette. The opaque plates should be covered (using sellophane covers) and stored at -20°C until SEAP assays are performed according to Example 17. The plates containing the remaining treated cells are placed at 4°C and serve as a source of material for repeating the assay on a specific well if desired.

30 As a positive control, 100 Unit/ml interferon gamma can be used which is known to activate Jurkat T cells. Over 30 fold induction is typically observed in the positive control wells.

#### 35 **Example 14: High-Throughput Screening Assay Identifying Myeloid Activity**

The following protocol is used to assess myeloid activity by identifying factors, such as growth factors and cytokines, that may proliferate or differentiate myeloid cells. Myeloid cell activity is assessed using the GAS/SEAP/Neo construct produced in Example 12. Thus, factors that increase SEAP activity indicate the ability to activate the Jaks-STATS signal transduction pathway. The myeloid cell used in this assay is U937, a pre-monocyte cell line, although TF-1, HL60, or KG1 can be used.

To transiently transfect U937 cells with the GAS/SEAP/Neo construct produced in Example 12, a DEAE-Dextran method (Kharbanda et. al., 1994, Cell Growth & Differentiation, 5:259-265) is used. First, harvest  $2 \times 10^7$  U937 cells and wash with PBS. The U937 cells are usually grown in RPMI 1640 medium containing 10% heat-inactivated fetal bovine serum (FBS) supplemented with 100 units/ml penicillin and 100 mg/ml streptomycin.

Next, suspend the cells in 1 ml of 20 mM Tris-HCl (pH 7.4) buffer containing 0.5 mg/ml DEAE-Dextran, 8 ug GAS-SEAP2 plasmid DNA, 140 mM NaCl, 5 mM KCl, 375 uM  $\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$ , 1 mM  $\text{MgCl}_2$ , and 675 uM  $\text{CaCl}_2$ . Incubate at  $37^\circ\text{C}$  for 45 min.

Wash the cells with RPMI 1640 medium containing 10% FBS and then resuspend in 10 ml complete medium and incubate at  $37^\circ\text{C}$  for 36 hr.

The GAS-SEAP/U937 stable cells are obtained by growing the cells in 400 ug/ml G418. The G418-free medium is used for routine growth but every one to two months, the cells should be re-grown in 400 ug/ml G418 for couple of passages.

These cells are tested by harvesting  $1 \times 10^8$  cells (this is enough for ten 96-well plates assay) and wash with PBS. Suspend the cells in 200 ml above described growth medium, with a final density of  $5 \times 10^5$  cells/ml. Plate 200 ul cells per well in the 96-well plate (or  $1 \times 10^5$  cells/well).

Add 50 ul of the supernatant prepared by the protocol described in Example 11. Incubate at  $37^\circ\text{C}$  for 48 to 72 hr. As a positive control, 100 Unit/ml interferon gamma can be used which is known to activate U937 cells. Over 30 fold induction is typically observed in the positive control wells. SEAP assay the supernatant according to the protocol described in Example 17.

#### **Example 15: High-Throughput Screening Assay Identifying Neuronal Activity.**

When cells undergo differentiation and proliferation, a group of genes are activated through many different signal transduction pathways. One of these genes, EGR1 (early growth response gene 1), is induced in various tissues and cell types upon

activation. The promoter of EGR1 is responsible for such induction. Using the EGR1 promoter linked to reporter molecules, activation of cells can be assessed.

Particularly, the following protocol is used to assess neuronal activity in PC12 cell lines. PC12 cells (rat phenochromocytoma cells) are known to proliferate and/or  
5 differentiate by activation with a number of mitogens, such as TPA (tetradecanoyl phorbol acetate), NGF (nerve growth factor), and EGF (epidermal growth factor). The EGR1 gene expression is activated during this treatment. Thus, by stably transfecting PC12 cells with a construct containing an EGR promoter linked to SEAP reporter, activation of PC12 cells can be assessed.

10 The EGR/SEAP reporter construct can be assembled by the following protocol. The EGR-1 promoter sequence (-633 to +1)(Sakamoto K et al., Oncogene 6:867-871 (1991)) can be PCR amplified from human genomic DNA using the following primers:

5' GCGCTCGAGGGATGACAGCGATAGAACCCCGG -3' (SEQ ID NO:6)

5' GCGAAGCTTCGCGACTCCCCGGATCCGCCTC-3' (SEQ ID NO:7)

15 Using the GAS:SEAP/Neo vector produced in Example 12, EGR1 amplified product can then be inserted into this vector. Linearize the GAS:SEAP/Neo vector using restriction enzymes XhoI/HindIII, removing the GAS/SV40 stuffer. Restrict the EGR1 amplified product with these same enzymes. Ligate the vector and the EGR1 promoter.

20 To prepare 96 well-plates for cell culture, two mls of a coating solution (1:30 dilution of collagen type I (Upstate Biotech Inc. Cat#08-115) in 30% ethanol (filter sterilized)) is added per one 10 cm plate or 50 ml per well of the 96-well plate, and allowed to air dry for 2 hr.

PC12 cells are routinely grown in RPMI-1640 medium (Bio Whittaker)  
25 containing 10% horse serum (JRH BIOSCIENCES, Cat. # 12449-78P), 5% heat-inactivated fetal bovine serum (FBS) supplemented with 100 units/ml penicillin and 100 ug/ml streptomycin on a precoated 10 cm tissue culture dish. One to four split is done every three to four days. Cells are removed from the plates by scraping and resuspended with pipetting up and down for more than 15 times.

30 Transfect the EGR/SEAP/Neo construct into PC12 using the Lipofectamine protocol described in Example 11. EGR-SEAP/PC12 stable cells are obtained by growing the cells in 300 ug/ml G418. The G418-free medium is used for routine growth but every one to two months, the cells should be re-grown in 300 ug/ml G418 for couple of passages.

35 To assay for neuronal activity, a 10 cm plate with cells around 70 to 80% confluent is screened by removing the old medium. Wash the cells once with PBS

(Phosphate buffered saline). Then starve the cells in low serum medium (RPMI-1640 containing 1% horse serum and 0.5% FBS with antibiotics) overnight.

The next morning, remove the medium and wash the cells with PBS. Scrape off the cells from the plate, suspend the cells well in 2 ml low serum medium. Count the cell number and add more low serum medium to reach final cell density as  $5 \times 10^5$  cells/ml.

Add 200  $\mu$ l of the cell suspension to each well of 96-well plate (equivalent to  $1 \times 10^5$  cells/well). Add 50  $\mu$ l supernatant produced by Example 11, 37°C for 48 to 72 hr. As a positive control, a growth factor known to activate PC12 cells through EGR can be used, such as 50 ng/ $\mu$ l of Neuronal Growth Factor (NGF). Over fifty-fold induction of SEAP is typically seen in the positive control wells. SEAP assay the supernatant according to Example 17.

#### **Example 16: High-Throughput Screening Assay for T-cell Activity**

NF- $\kappa$ B (Nuclear Factor  $\kappa$ B) is a transcription factor activated by a wide variety of agents including the inflammatory cytokines IL-1 and TNF, CD30 and CD40, lymphotoxin-alpha and lymphotoxin-beta, by exposure to LPS or thrombin, and by expression of certain viral gene products. As a transcription factor, NF- $\kappa$ B regulates the expression of genes involved in immune cell activation, control of apoptosis (NF- $\kappa$ B appears to shield cells from apoptosis), B and T-cell development, anti-viral and antimicrobial responses, and multiple stress responses.

In non-stimulated conditions, NF-  $\kappa$ B is retained in the cytoplasm with I- $\kappa$ B (Inhibitor  $\kappa$ B). However, upon stimulation, I-  $\kappa$ B is phosphorylated and degraded, causing NF-  $\kappa$ B to shuttle to the nucleus, thereby activating transcription of target genes. Target genes activated by NF-  $\kappa$ B include IL-2, IL-6, GM-CSF, ICAM-1 and class 1 MHC.

Due to its central role and ability to respond to a range of stimuli, reporter constructs utilizing the NF- $\kappa$ B promoter element are used to screen the supernatants produced in Example 11. Activators or inhibitors of NF- $\kappa$ B would be useful in treating diseases. For example, inhibitors of NF- $\kappa$ B could be used to treat those diseases related to the acute or chronic activation of NF- $\kappa$ B, such as rheumatoid arthritis.

To construct a vector containing the NF- $\kappa$ B promoter element, a PCR based strategy is employed. The upstream primer contains four tandem copies of the NF- $\kappa$ B binding site (GGGGACTTTCCC) (SEQ ID NO:8), 18 bp of sequence complementary to the 5' end of the SV40 early promoter sequence, and is flanked with an XhoI site:

5 5':GCGGCCTCGAGGGGACTTTCCCGGGGACTTTCCGGGGACTTTCCGGGAC  
TTTCCATCCTGCCATCTCAATTAG:3' (SEQ ID NO:9)

The downstream primer is complementary to the 3' end of the SV40 promoter and is flanked with a Hind III site:

5':GCGGCAAGCTTTTTGCAAAGCCTAGGC:3' (SEQ ID NO:4)

10 PCR amplification is performed using the SV40 promoter template present in the pB-gal:promoter plasmid obtained from Clontech. The resulting PCR fragment is digested with XhoI and Hind III and subcloned into BLSK2-. (Stratagene) Sequencing with the T7 and T3 primers confirms the insert contains the following sequence:

15 5':CTCGAGGGGACTTTCCCGGGGACTTTCCGGGGACTTTCCGGGGACTTTCC  
ATCTGCCATCTCAATTAGTCAGCAACCATAGTCCCGCCCCCTAACTCCGCCCA  
TCCCGCCCCCTAACTCCGCCCAGTTCCGCCCATTTCTCCGCCCCATGGCTGACT  
AATTTTTTTTATTTATGCAGAGGCCGAGGCCGCCTCGGCCTCTGAGCTATTC  
20 CAGAAGTAGTGAGGAGGCTTTTTTGGAGGCCTAGGCTTTTGCAAAAAGCTT:  
3' (SEQ ID NO:10)

Next, replace the SV40 minimal promoter element present in the pSEAP2-promoter plasmid (Clontech) with this NF- $\kappa$ B/SV40 fragment using XhoI and HindIII.

25 However, this vector does not contain a neomycin resistance gene, and therefore, is not preferred for mammalian expression systems.

In order to generate stable mammalian cell lines, the NF- $\kappa$ B/SV40/SEAP cassette is removed from the above NF- $\kappa$ B/SEAP vector using restriction enzymes SalI and NotI, and inserted into a vector containing neomycin resistance. Particularly, the

30 NF- $\kappa$ B/SV40/SEAP cassette was inserted into pGFP-1 (Clontech), replacing the GFP gene, after restricting pGFP-1 with SalI and NotI.

Once NF- $\kappa$ B/SV40/SEAP/Neo vector is created, stable Jurkat T-cells are created and maintained according to the protocol described in Example 13. Similarly, the method for assaying supernatants with these stable Jurkat T-cells is also described

in Example 13. As a positive control, exogenous TNF alpha (0.1, 1, 10 ng) is added to wells H9, H10, and H11, with a 5-10 fold activation typically observed.

#### **Example 17: Assay for SEAP Activity**

5 As a reporter molecule for the assays described in Examples 13-16, SEAP activity is assayed using the Tropix Phospho-light Kit (Cat. BP-400) according to the following general procedure. The Tropix Phospho-light Kit supplies the Dilution, Assay, and Reaction Buffers used below.

10 Prime a dispenser with the 2.5x Dilution Buffer and dispense 15 µl of 2.5x dilution buffer into Optiplates containing 35 µl of a supernatant. Seal the plates with a plastic sealer and incubate at 65°C for 30 min. Separate the Optiplates to avoid uneven heating.

Cool the samples to room temperature for 15 minutes. Empty the dispenser and prime with the Assay Buffer. Add 50 µl Assay Buffer and incubate at room temperature 5 min. Empty the dispenser and prime with the Reaction Buffer (see the table below). Add 50 µl Reaction Buffer and incubate at room temperature for 20 minutes. Since the intensity of the chemiluminescent signal is time dependent, and it takes about 10 minutes to read 5 plates on luminometer, one should treat 5 plates at each time and start the second set 10 minutes later.

20 Read the relative light unit in the luminometer. Set H12 as blank, and print the results. An increase in chemiluminescence indicates reporter activity.

#### **Reaction Buffer Formulation:**

| # of plates | Rxn buffer diluent (ml) | CSPD (ml) |
|-------------|-------------------------|-----------|
| 10          | 60                      | 3         |
| 11          | 65                      | 3.25      |
| 12          | 70                      | 3.5       |
| 13          | 75                      | 3.75      |
| 14          | 80                      | 4         |
| 15          | 85                      | 4.25      |
| 16          | 90                      | 4.5       |
| 17          | 95                      | 4.75      |
| 18          | 100                     | 5         |
| 19          | 105                     | 5.25      |
| 20          | 110                     | 5.5       |
| 21          | 115                     | 5.75      |
| 22          | 120                     | 6         |
| 23          | 125                     | 6.25      |
| 24          | 130                     | 6.5       |
| 25          | 135                     | 6.75      |
| 26          | 140                     | 7         |
| 27          | 145                     | 7.25      |

|    |     |       |
|----|-----|-------|
| 28 | 150 | 7.5   |
| 29 | 155 | 7.75  |
| 30 | 160 | 8     |
| 31 | 165 | 8.25  |
| 32 | 170 | 8.5   |
| 33 | 175 | 8.75  |
| 34 | 180 | 9     |
| 35 | 185 | 9.25  |
| 36 | 190 | 9.5   |
| 37 | 195 | 9.75  |
| 38 | 200 | 10    |
| 39 | 205 | 10.25 |
| 40 | 210 | 10.5  |
| 41 | 215 | 10.75 |
| 42 | 220 | 11    |
| 43 | 225 | 11.25 |
| 44 | 230 | 11.5  |
| 45 | 235 | 11.75 |
| 46 | 240 | 12    |
| 47 | 245 | 12.25 |
| 48 | 250 | 12.5  |
| 49 | 255 | 12.75 |
| 50 | 260 | 13    |

**Example 18: High-Throughput Screening Assay Identifying Changes in Small Molecule Concentration and Membrane Permeability**

Binding of a ligand to a receptor is known to alter intracellular levels of small molecules, such as calcium, potassium, sodium, and pH, as well as alter membrane potential. These alterations can be measured in an assay to identify supernatants which bind to receptors of a particular cell. Although the following protocol describes an assay for calcium, this protocol can easily be modified to detect changes in potassium, sodium, pH, membrane potential, or any other small molecule which is detectable by a fluorescent probe.

The following assay uses Fluorometric Imaging Plate Reader ("FLIPR") to measure changes in fluorescent molecules (Molecular Probes) that bind small molecules. Clearly, any fluorescent molecule detecting a small molecule can be used instead of the calcium fluorescent molecule, fluo-3, used here.

For adherent cells, seed the cells at 10,000 -20,000 cells/well in a Co-star black 96-well plate with clear bottom. The plate is incubated in a CO<sub>2</sub> incubator for 20 hours. The adherent cells are washed two times in Biotek washer with 200 ul of HBSS (Hank's Balanced Salt Solution) leaving 100 ul of buffer after the final wash.

A stock solution of 1 mg/ml fluo-3 is made in 10% pluronic acid DMSO. To load the cells with fluo-3, 50 ul of 12 ug/ml fluo-3 is added to each well. The plate is

incubated at 37°C in a CO<sub>2</sub> incubator for 60 min. The plate is washed four times in the Biotek washer with HBSS leaving 100 ul of buffer.

For non-adherent cells, the cells are spun down from culture media. Cells are re-suspended to 2-5x10<sup>6</sup> cells/ml with HBSS in a 50-ml conical tube. 4 ul of 1 mg/ml fluo-3 solution in 10% pluronic acid DMSO is added to each ml of cell suspension. The tube is then placed in a 37°C water bath for 30-60 min. The cells are washed twice with HBSS, resuspended to 1x10<sup>6</sup> cells/ml, and dispensed into a microplate, 100 ul/well. The plate is centrifuged at 1000 rpm for 5 min. The plate is then washed once in Denley CellWash with 200 ul, followed by an aspiration step to 100 ul final volume.

For a non-cell based assay, each well contains a fluorescent molecule, such as fluo-3. The supernatant is added to the well, and a change in fluorescence is detected.

To measure the fluorescence of intracellular calcium, the FLIPR is set for the following parameters: (1) System gain is 300-800 mW; (2) Exposure time is 0.4 second; (3) Camera F/stop is F/2; (4) Excitation is 488 nm; (5) Emission is 530 nm; and (6) Sample addition is 50 ul. Increased emission at 530 nm indicates an extracellular signaling event which has resulted in an increase in the intracellular Ca<sup>++</sup> concentration.

#### **Example 19: High-Throughput Screening Assay Identifying Tyrosine Kinase Activity**

The Protein Tyrosine Kinases (PTK) represent a diverse group of transmembrane and cytoplasmic kinases. Within the Receptor Protein Tyrosine Kinase (RPTK) group are receptors for a range of mitogenic and metabolic growth factors including the PDGF, FGF, EGF, NGF, HGF and Insulin receptor subfamilies. In addition there are a large family of RPTKs for which the corresponding ligand is unknown. Ligands for RPTKs include mainly secreted small proteins, but also membrane-bound and extracellular matrix proteins.

Activation of RPTK by ligands involves ligand-mediated receptor dimerization, resulting in transphosphorylation of the receptor subunits and activation of the cytoplasmic tyrosine kinases. The cytoplasmic tyrosine kinases include receptor associated tyrosine kinases of the src-family (e.g., src, yes, lck, lyn, fyn) and non-receptor linked and cytosolic protein tyrosine kinases, such as the Jak family, members of which mediate signal transduction triggered by the cytokine superfamily of receptors (e.g., the Interleukins, Interferons, GM-CSF, and Leptin).

Because of the wide range of known factors capable of stimulating tyrosine kinase activity, the identification of novel human secreted proteins capable of activating

tyrosine kinase signal transduction pathways are of interest. Therefore, the following protocol is designed to identify those novel human secreted proteins capable of activating the tyrosine kinase signal transduction pathways.

Seed target cells (e.g., primary keratinocytes) at a density of approximately  
5 25,000 cells per well in a 96 well Loprodyne Silent Screen Plates purchased from  
Nalge Nunc (Naperville, IL). The plates are sterilized with two 30 minute rinses with  
100% ethanol, rinsed with water and dried overnight. Some plates are coated for 2 hr  
with 100 ml of cell culture grade type I collagen (50 mg/ml), gelatin (2%) or polylysine  
(50 mg/ml), all of which can be purchased from Sigma Chemicals (St. Louis, MO) or  
10 10% Matrigel purchased from Becton Dickinson (Bedford, MA), or calf serum, rinsed  
with PBS and stored at 4°C. Cell growth on these plates is assayed by seeding 5,000  
cells/well in growth medium and indirect quantitation of cell number through use of  
AlamarBlue as described by the manufacturer Alamar Biosciences, Inc. (Sacramento,  
CA) after 48 hr. Falcon plate covers #3071 from Becton Dickinson (Bedford, MA) are  
15 used to cover the Loprodyne Silent Screen Plates. Falcon Microtest III cell culture  
plates can also be used in some proliferation experiments.

To prepare extracts, A431 cells are seeded onto the nylon membranes of  
Loprodyne plates (20,000/200ml/well) and cultured overnight in complete medium.  
Cells are quiesced by incubation in serum-free basal medium for 24 hr. After 5-20  
20 minutes treatment with EGF (60ng/ml) or 50 ul of the supernatant produced in Example  
11, the medium was removed and 100 ml of extraction buffer ((20 mM HEPES pH  
7.5, 0.15 M NaCl, 1% Triton X-100, 0.1% SDS, 2 mM Na<sub>3</sub>VO<sub>4</sub>, 2 mM Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub>  
and a cocktail of protease inhibitors (# 1836170) obtained from Boehringer Mannheim  
(Indianapolis, IN) is added to each well and the plate is shaken on a rotating shaker for  
25 5 minutes at 4°C. The plate is then placed in a vacuum transfer manifold and the extract  
filtered through the 0.45 mm membrane bottoms of each well using house vacuum.  
Extracts are collected in a 96-well catch/assay plate in the bottom of the vacuum  
manifold and immediately placed on ice. To obtain extracts clarified by centrifugation,  
the content of each well, after detergent solubilization for 5 minutes, is removed and  
30 centrifuged for 15 minutes at 4°C at 16,000 x g.

Test the filtered extracts for levels of tyrosine kinase activity. Although many  
methods of detecting tyrosine kinase activity are known, one method is described here.

Generally, the tyrosine kinase activity of a supernatant is evaluated by  
determining its ability to phosphorylate a tyrosine residue on a specific substrate (a  
35 biotinylated peptide). Biotinylated peptides that can be used for this purpose include  
PSK1 (corresponding to amino acids 6-20 of the cell division kinase cdc2-p34) and

PSK2 (corresponding to amino acids 1-17 of gastrin). Both peptides are substrates for a range of tyrosine kinases and are available from Boehringer Mannheim.

The tyrosine kinase reaction is set up by adding the following components in order. First, add 10ul of 5uM Biotinylated Peptide, then 10ul ATP/Mg<sub>2+</sub> (5mM ATP/50mM MgCl<sub>2</sub>), then 10ul of 5x Assay Buffer (40mM imidazole hydrochloride, pH7.3, 40 mM beta-glycerophosphate, 1mM EGTA, 100mM MgCl<sub>2</sub>, 5 mM MnCl<sub>2</sub>, 0.5 mg/ml BSA), then 5ul of Sodium Vanadate(1mM), and then 5ul of water. Mix the components gently and preincubate the reaction mix at 30°C for 2 min. Initiate the reaction by adding 10ul of the control enzyme or the filtered supernatant.

The tyrosine kinase assay reaction is then terminated by adding 10 ul of 120mM EDTA and place the reactions on ice.

Tyrosine kinase activity is determined by transferring 50 ul aliquot of reaction mixture to a microtiter plate (MTP) module and incubating at 37°C for 20 min. This allows the streptavidin coated 96 well plate to associate with the biotinylated peptide. Wash the MTP module with 300ul/well of PBS four times. Next add 75 ul of anti-phosphotyrosine antibody conjugated to horse radish peroxidase(anti-P-Tyr-POD(0.5u/ml)) to each well and incubate at 37°C for one hour. Wash the well as above.

Next add 100ul of peroxidase substrate solution (Boehringer Mannheim) and incubate at room temperature for at least 5 mins (up to 30 min). Measure the absorbance of the sample at 405 nm by using ELISA reader. The level of bound peroxidase activity is quantitated using an ELISA reader and reflects the level of tyrosine kinase activity.

## **Example 20: High-Throughput Screening Assay Identifying Phosphorylation Activity**

As a potential alternative and/or complement to the assay of protein tyrosine kinase activity described in Example 19, an assay which detects activation (phosphorylation) of major intracellular signal transduction intermediates can also be used. For example, as described below one particular assay can detect tyrosine phosphorylation of the Erk-1 and Erk-2 kinases. However, phosphorylation of other molecules, such as Raf, JNK, p38 MAP, Map kinase kinase (MEK), MEK kinase, Src, Muscle specific kinase (MuSK), IRAK, Tec, and Janus, as well as any other phosphoserine, phosphotyrosine, or phosphothreonine molecule, can be detected by substituting these molecules for Erk-1 or Erk-2 in the following assay.

Specifically, assay plates are made by coating the wells of a 96-well ELISA plate with 0.1ml of protein G (1ug/ml) for 2 hr at room temp, (RT). The plates are then rinsed with PBS and blocked with 3% BSA/PBS for 1 hr at RT. The protein G plates are then treated with 2 commercial monoclonal antibodies (100ng/well) against Erk-1 and Erk-2 (1 hr at RT) (Santa Cruz Biotechnology). (To detect other molecules, this step can easily be modified by substituting a monoclonal antibody detecting any of the above described molecules.) After 3-5 rinses with PBS, the plates are stored at 4°C until use.

A431 cells are seeded at 20,000/well in a 96-well Loprodyne filterplate and cultured overnight in growth medium. The cells are then starved for 48 hr in basal medium (DMEM) and then treated with EGF (6ng/well) or 50 ul of the supernatants obtained in Example 11 for 5-20 minutes. The cells are then solubilized and extracts filtered directly into the assay plate.

After incubation with the extract for 1 hr at RT, the wells are again rinsed. As a positive control, a commercial preparation of MAP kinase (10ng/well) is used in place of A431 extract. Plates are then treated with a commercial polyclonal (rabbit) antibody (1ug/ml) which specifically recognizes the phosphorylated epitope of the Erk-1 and Erk-2 kinases (1 hr at RT). This antibody is biotinylated by standard procedures. The bound polyclonal antibody is then quantitated by successive incubations with Europium-streptavidin and Europium fluorescence enhancing reagent in the Wallac DELFIA instrument (time-resolved fluorescence). An increased fluorescent signal over background indicates a phosphorylation.

#### **Example 21: Method of Determining Alterations in a Gene Corresponding to a Polynucleotide**

RNA isolated from entire families or individual patients presenting with a phenotype of interest (such as a disease) is be isolated. cDNA is then generated from these RNA samples using protocols known in the art. (See, Sambrook.) The cDNA is then used as a template for PCR, employing primers surrounding regions of interest in SEQ ID NO:X. Suggested PCR conditions consist of 35 cycles at 95°C for 30 seconds; 60-120 seconds at 52-58°C; and 60-120 seconds at 70°C, using buffer solutions described in Sidransky, D., et al., Science 252:706 (1991).

PCR products are then sequenced using primers labeled at their 5' end with T4 polynucleotide kinase, employing SequiTherm Polymerase. (Epicentre Technologies). The intron-exon borders of selected exons is also determined and genomic PCR

products analyzed to confirm the results. PCR products harboring suspected mutations is then cloned and sequenced to validate the results of the direct sequencing.

PCR products is cloned into T-tailed vectors as described in Holton, T.A. and Graham, M.W., Nucleic Acids Research, 19:1156 (1991) and sequenced with T7  
5 polymerase (United States Biochemical). Affected individuals are identified by mutations not present in unaffected individuals.

Genomic rearrangements are also observed as a method of determining alterations in a gene corresponding to a polynucleotide. Genomic clones isolated according to Example 2 are nick-translated with digoxigenindeoxy-uridine 5'-  
10 triphosphate (Boehringer Mannheim), and FISH performed as described in Johnson, Cg. et al., Methods Cell Biol. 35:73-99 (1991). Hybridization with the labeled probe is carried out using a vast excess of human cot-1 DNA for specific hybridization to the corresponding genomic locus.

Chromosomes are counterstained with 4,6-diamino-2-phenylidole and  
15 propidium iodide, producing a combination of C- and R-bands. Aligned images for precise mapping are obtained using a triple-band filter set (Chroma Technology, Brattleboro, VT) in combination with a cooled charge-coupled device camera (Photometrics, Tucson, AZ) and variable excitation wavelength filters. (Johnson, Cv. et al., Genet. Anal. Tech. Appl., 8:75 (1991).) Image collection, analysis and  
20 chromosomal fractional length measurements are performed using the ISee Graphical Program System. (Inovision Corporation, Durham, NC.) Chromosome alterations of the genomic region hybridized by the probe are identified as insertions, deletions, and translocations. These alterations are used as a diagnostic marker for an associated disease.

25

**Example 22: Method of Detecting Abnormal Levels of a Polypeptide in a Biological Sample**

A polypeptide of the present invention can be detected in a biological sample, and if an increased or decreased level of the polypeptide is detected, this polypeptide is  
30 a marker for a particular phenotype. Methods of detection are numerous, and thus, it is understood that one skilled in the art can modify the following assay to fit their particular needs.

For example, antibody-sandwich ELISAs are used to detect polypeptides in a sample, preferably a biological sample. Wells of a microtiter plate are coated with  
35 specific antibodies, at a final concentration of 0.2 to 10 ug/ml. The antibodies are either monoclonal or polyclonal and are produced by the method described in Example 10.

The wells are blocked so that non-specific binding of the polypeptide to the well is reduced.

The coated wells are then incubated for > 2 hours at RT with a sample containing the polypeptide. Preferably, serial dilutions of the sample should be used to  
5 validate results. The plates are then washed three times with deionized or distilled water to remove unbounded polypeptide.

Next, 50 ul of specific antibody-alkaline phosphatase conjugate, at a concentration of 25-400 ng, is added and incubated for 2 hours at room temperature. The plates are again washed three times with deionized or distilled water to remove  
10 unbounded conjugate.

Add 75 ul of 4-methylumbelliferyl phosphate (MUP) or p-nitrophenyl phosphate (NPP) substrate solution to each well and incubate 1 hour at room temperature. Measure the reaction by a microtiter plate reader. Prepare a standard curve, using serial dilutions of a control sample, and plot polypeptide concentration on  
15 the X-axis (log scale) and fluorescence or absorbance of the Y-axis (linear scale). Interpolate the concentration of the polypeptide in the sample using the standard curve.

### **Example 23: Formulating a Polypeptide**

The secreted polypeptide composition will be formulated and dosed in a fashion  
20 consistent with good medical practice, taking into account the clinical condition of the individual patient (especially the side effects of treatment with the secreted polypeptide alone), the site of delivery, the method of administration, the scheduling of administration, and other factors known to practitioners. The "effective amount" for purposes herein is thus determined by such considerations.

25 As a general proposition, the total pharmaceutically effective amount of secreted polypeptide administered parenterally per dose will be in the range of about 1 µg/kg/day to 10 mg/kg/day of patient body weight, although, as noted above, this will be subject to therapeutic discretion. More preferably, this dose is at least 0.01 mg/kg/day, and most preferably for humans between about 0.01 and 1 mg/kg/day for the hormone. If  
30 given continuously, the secreted polypeptide is typically administered at a dose rate of about 1 µg/kg/hour to about 50 µg/kg/hour, either by 1-4 injections per day or by continuous subcutaneous infusions, for example, using a mini-pump. An intravenous bag solution may also be employed. The length of treatment needed to observe changes and the interval following treatment for responses to occur appears to vary depending  
35 on the desired effect.

Pharmaceutical compositions containing the secreted protein of the invention are administered orally, rectally, parenterally, intracistemally, intravaginally,

intraperitoneally, topically (as by powders, ointments, gels, drops or transdermal patch), buccally, or as an oral or nasal spray. "Pharmaceutically acceptable carrier" refers to a non-toxic solid, semisolid or liquid filler, diluent, encapsulating material or formulation auxiliary of any type. The term "parenteral" as used herein refers to modes of administration which include intravenous, intramuscular, intraperitoneal, intrasternal, subcutaneous and intraarticular injection and infusion.

The secreted polypeptide is also suitably administered by sustained-release systems. Suitable examples of sustained-release compositions include semi-permeable polymer matrices in the form of shaped articles, e.g., films, or microcapsules. Sustained-release matrices include polylactides (U.S. Pat. No. 3,773,919, EP 58,481), copolymers of L-glutamic acid and gamma-ethyl-L-glutamate (Sidman, U. et al., Biopolymers 22:547-556 (1983)), poly (2-hydroxyethyl methacrylate) (R. Langer et al., J. Biomed. Mater. Res. 15:167-277 (1981), and R. Langer, Chem. Tech. 12:98-105 (1982)), ethylene vinyl acetate (R. Langer et al.) or poly-D-(-)-3-hydroxybutyric acid (EP 133,988). Sustained-release compositions also include liposomally entrapped polypeptides. Liposomes containing the secreted polypeptide are prepared by methods known per se: DE 3,218,121; Epstein et al., Proc. Natl. Acad. Sci. USA 82:3688-3692 (1985); Hwang et al., Proc. Natl. Acad. Sci. USA 77:4030-4034 (1980); EP 52,322; EP 36,676; EP 88,046; EP 143,949; EP 142,641; Japanese Pat. Appl. 83-118008; U.S. Pat. Nos. 4,485,045 and 4,544,545; and EP 102,324. Ordinarily, the liposomes are of the small (about 200-800 Angstroms) unilamellar type in which the lipid content is greater than about 30 mol. percent cholesterol, the selected proportion being adjusted for the optimal secreted polypeptide therapy.

For parenteral administration, in one embodiment, the secreted polypeptide is formulated generally by mixing it at the desired degree of purity, in a unit dosage injectable form (solution, suspension, or emulsion), with a pharmaceutically acceptable carrier, i.e., one that is non-toxic to recipients at the dosages and concentrations employed and is compatible with other ingredients of the formulation. For example, the formulation preferably does not include oxidizing agents and other compounds that are known to be deleterious to polypeptides.

Generally, the formulations are prepared by contacting the polypeptide uniformly and intimately with liquid carriers or finely divided solid carriers or both. Then, if necessary, the product is shaped into the desired formulation. Preferably the carrier is a parenteral carrier, more preferably a solution that is isotonic with the blood of the recipient. Examples of such carrier vehicles include water, saline, Ringer's solution, and dextrose solution. Non-aqueous vehicles such as fixed oils and ethyl oleate are also useful herein, as well as liposomes.

The carrier suitably contains minor amounts of additives such as substances that enhance isotonicity and chemical stability. Such materials are non-toxic to recipients at the dosages and concentrations employed, and include buffers such as phosphate, citrate, succinate, acetic acid, and other organic acids or their salts; antioxidants such as ascorbic acid; low molecular weight (less than about ten residues) polypeptides, e.g., polyarginine or tripeptides; proteins, such as serum albumin, gelatin, or immunoglobulins; hydrophilic polymers such as polyvinylpyrrolidone; amino acids, such as glycine, glutamic acid, aspartic acid, or arginine; monosaccharides, disaccharides, and other carbohydrates including cellulose or its derivatives, glucose, manose, or dextrans; chelating agents such as EDTA; sugar alcohols such as mannitol or sorbitol; counterions such as sodium; and/or nonionic surfactants such as polysorbates, poloxamers, or PEG.

The secreted polypeptide is typically formulated in such vehicles at a concentration of about 0.1 mg/ml to 100 mg/ml, preferably 1-10 mg/ml, at a pH of about 3 to 8. It will be understood that the use of certain of the foregoing excipients, carriers, or stabilizers will result in the formation of polypeptide salts.

Any polypeptide to be used for therapeutic administration can be sterile. Sterility is readily accomplished by filtration through sterile filtration membranes (e.g., 0.2 micron membranes). Therapeutic polypeptide compositions generally are placed into a container having a sterile access port, for example, an intravenous solution bag or vial having a stopper pierceable by a hypodermic injection needle.

Polypeptides ordinarily will be stored in unit or multi-dose containers, for example, sealed ampoules or vials, as an aqueous solution or as a lyophilized formulation for reconstitution. As an example of a lyophilized formulation, 10-ml vials are filled with 5 ml of sterile-filtered 1% (w/v) aqueous polypeptide solution, and the resulting mixture is lyophilized. The infusion solution is prepared by reconstituting the lyophilized polypeptide using bacteriostatic Water-for-Injection.

The invention also provides a pharmaceutical pack or kit comprising one or more containers filled with one or more of the ingredients of the pharmaceutical compositions of the invention. Associated with such container(s) can be a notice in the form prescribed by a governmental agency regulating the manufacture, use or sale of pharmaceuticals or biological products, which notice reflects approval by the agency of manufacture, use or sale for human administration. In addition, the polypeptides of the present invention may be employed in conjunction with other therapeutic compounds.

35

#### **Example 24: Method of Treating Decreased Levels of the Polypeptide**

It will be appreciated that conditions caused by a decrease in the standard or normal expression level of a secreted protein in an individual can be treated by administering the polypeptide of the present invention, preferably in the secreted form. Thus, the invention also provides a method of treatment of an individual in need of an increased level of the polypeptide comprising administering to such an individual a pharmaceutical composition comprising an amount of the polypeptide to increase the activity level of the polypeptide in such an individual.

For example, a patient with decreased levels of a polypeptide receives a daily dose 0.1-100 ug/kg of the polypeptide for six consecutive days. Preferably, the polypeptide is in the secreted form. The exact details of the dosing scheme, based on administration and formulation, are provided in Example 23.

#### **Example 25: Method of Treating Increased Levels of the Polypeptide**

Antisense technology is used to inhibit production of a polypeptide of the present invention. This technology is one example of a method of decreasing levels of a polypeptide, preferably a secreted form, due to a variety of etiologies, such as cancer.

For example, a patient diagnosed with abnormally increased levels of a polypeptide is administered intravenously antisense polynucleotides at 0.5, 1.0, 1.5, 2.0 and 3.0 mg/kg day for 21 days. This treatment is repeated after a 7-day rest period if the treatment was well tolerated. The formulation of the antisense polynucleotide is provided in Example 23.

#### **Example 26: Method of Treatment Using Gene Therapy**

One method of gene therapy transplants fibroblasts, which are capable of expressing a polypeptide, onto a patient. Generally, fibroblasts are obtained from a subject by skin biopsy. The resulting tissue is placed in tissue-culture medium and separated into small pieces. Small chunks of the tissue are placed on a wet surface of a tissue culture flask, approximately ten pieces are placed in each flask. The flask is turned upside down, closed tight and left at room temperature over night. After 24 hours at room temperature, the flask is inverted and the chunks of tissue remain fixed to the bottom of the flask and fresh media (e.g., Ham's F12 media, with 10% FBS, penicillin and streptomycin) is added. The flasks are then incubated at 37°C for approximately one week.

At this time, fresh media is added and subsequently changed every several days. After an additional two weeks in culture, a monolayer of fibroblasts emerge. The monolayer is trypsinized and scaled into larger flasks.

pMV-7 (Kirschmeier, P.T. et al., DNA, 7:219-25 (1988)), flanked by the long terminal repeats of the Moloney murine sarcoma virus, is digested with EcoRI and HindIII and subsequently treated with calf intestinal phosphatase. The linear vector is fractionated on agarose gel and purified, using glass beads.

5       The cDNA encoding a polypeptide of the present invention can be amplified using PCR primers which correspond to the 5' and 3' end sequences respectively as set forth in Example 1. Preferably, the 5' primer contains an EcoRI site and the 3' primer includes a HindIII site. Equal quantities of the Moloney murine sarcoma virus linear backbone and the amplified EcoRI and HindIII fragment are added together, in the  
10       presence of T4 DNA ligase. The resulting mixture is maintained under conditions appropriate for ligation of the two fragments. The ligation mixture is then used to transform bacteria HB101, which are then plated onto agar containing kanamycin for the purpose of confirming that the vector has the gene of interest properly inserted.

      The amphotropic pA317 or GP+am12 packaging cells are grown in tissue  
15       culture to confluent density in Dulbecco's Modified Eagles Medium (DMEM) with 10% calf serum (CS), penicillin and streptomycin. The MSV vector containing the gene is then added to the media and the packaging cells transduced with the vector. The packaging cells now produce infectious viral particles containing the gene (the packaging cells are now referred to as producer cells).

20       Fresh media is added to the transduced producer cells, and subsequently, the media is harvested from a 10 cm plate of confluent producer cells. The spent media, containing the infectious viral particles, is filtered through a millipore filter to remove detached producer cells and this media is then used to infect fibroblast cells. Media is removed from a sub-confluent plate of fibroblasts and quickly replaced with the media  
25       from the producer cells. This media is removed and replaced with fresh media. If the titer of virus is high, then virtually all fibroblasts will be infected and no selection is required. If the titer is very low, then it is necessary to use a retroviral vector that has a selectable marker, such as neo or his. Once the fibroblasts have been efficiently infected, the fibroblasts are analyzed to determine whether protein is produced.

30       The engineered fibroblasts are then transplanted onto the host, either alone or after having been grown to confluence on cytodex 3 microcarrier beads.

      It will be clear that the invention may be practiced otherwise than as particularly described in the foregoing description and examples. Numerous modifications and variations of the present invention are possible in light of the above teachings and,  
35       therefore, are within the scope of the appended claims.

      The entire disclosure of each document cited (including patents, patent applications, journal articles, abstracts, laboratory manuals, books, or other

disclosures) in the Background of the Invention, Detailed Description, and Examples is hereby incorporated herein by reference. Further, the hard copy of the sequence listing submitted herewith and the corresponding computer readable form are both incorporated herein by reference in their entireties.

WO 99/19339

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|                                              |          |                               |
|----------------------------------------------|----------|-------------------------------|
| Applicant's or agent's file reference number | PZ018PCT | International application No. |
|----------------------------------------------|----------|-------------------------------|

## INDICATIONS RELATING TO A DEPOSITED MICROORGANISM

(PCT Rule 13bis)

|                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| A. The indications made below relate to the microorganism referred to in the description on page <u>71</u> , line <u>7</u>                                                                                                                                                                                                                                                                                                     |                            |
| B. IDENTIFICATION OF DEPOSIT                                                                                                                                                                                                                                                                                                                                                                                                   |                            |
| Further deposits are identified on an additional sheet <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                |                            |
| Name of depositary institution American Type Culture Collection ("ATCC")                                                                                                                                                                                                                                                                                                                                                       |                            |
| Address of depositary institution (including postal code and country)<br>10801 University Boulevard<br>Manassas, Virginia 20110-2209<br>United States of America                                                                                                                                                                                                                                                               |                            |
| Date of deposit<br>12 SEPTEMBER 1997                                                                                                                                                                                                                                                                                                                                                                                           | Accession Number<br>209244 |
| C. ADDITIONAL INDICATIONS (leave blank if not applicable)                                                                                                                                                                                                                                                                                                                                                                      |                            |
| This information is continued on an additional sheet <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                  |                            |
| DNA Plasmid PS-060                                                                                                                                                                                                                                                                                                                                                                                                             |                            |
| In respect of those designations in which a European Patent is sought a sample of the deposited microorganism will be available until the publication of the mention of the grant of the European patent or until the date on which the application has been refused or withdrawn or is deemed to be withdrawn, only by the issue of such a sample to an expert nominated by the person requesting the sample (Rule 28(4)EPC). |                            |
| D. DESIGNATED STATES FOR WHICH INDICATIONS ARE MADE (if the indications are not for all designated States)                                                                                                                                                                                                                                                                                                                     |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
| E. SEPARATE FURNISHING OF INDICATIONS (leave blank if not applicable)                                                                                                                                                                                                                                                                                                                                                          |                            |
| The indications listed below will be submitted to the International Bureau later (specify the general nature of the indications e.g., "Accession Number of Deposit")                                                                                                                                                                                                                                                           |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |

|                                                                                                |  |
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| For receiving Office use only                                                                  |  |
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| Authorized officer<br>PAUL F. URRUTIA<br>INTERNATIONAL DIVISION<br>1681                        |  |

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|                                                 |          |                             |
|-------------------------------------------------|----------|-----------------------------|
| Applicant's or agent's file<br>reference number | PZ018PCT | International application N |
|-------------------------------------------------|----------|-----------------------------|

## INDICATIONS RELATING TO A DEPOSITED MICROORGANISM

(PCT Rule 13bis)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| A. The indications made below relate to the microorganism referred to in the description<br>on page <u>74</u> , line <u>20</u>                                                                                                                                                                                                                                                                                                                           |                            |
| B. IDENTIFICATION OF DEPOSIT Further deposits are identified on an additional sheet <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                             |                            |
| Name of depositary institution American Type Culture Collection ("ATCC")                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| Address of depositary institution (including postal code and country)<br>10801 University Boulevard<br>Manassas, Virginia 20110-2209<br>United States of America                                                                                                                                                                                                                                                                                         |                            |
| Date of deposit<br>18 SEPTEMBER 1997                                                                                                                                                                                                                                                                                                                                                                                                                     | Accession Number<br>209277 |
| C. ADDITIONAL INDICATIONS (leave blank if not applicable) This information is continued on an additional sheet <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                  |                            |
| DNA Plasmid PS-061<br><br>In respect of those designations in which a European Patent is sought a sample of the deposited microorganism will be available until the publication of the mention of the grant of the European patent or until the date on which the application has been refused or withdrawn or is deemed to be withdrawn, only by the issue of such a sample to an expert nominated by the person requesting the sample (Rule 28(4)EPC). |                            |
| D. DESIGNATED STATES FOR WHICH INDICATIONS ARE MADE (if the indications are not for all designated States)                                                                                                                                                                                                                                                                                                                                               |                            |
| E. SEPARATE FURNISHING OF INDICATIONS (leave blank if not applicable)<br>The indications listed below will be submitted to the International Bureau later (specify the general nature of the indications e.g., "Accession Number of Deposit")                                                                                                                                                                                                            |                            |

|                                                                                                |                                                                                     |
|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| For receiving Office use only                                                                  |                                                                                     |
| <input checked="" type="checkbox"/> This sheet was received with the international application |                                                                                     |
| Authorized officer<br>PAUL F. URRUTIA<br>INTERNATIONAL DIVISION<br>305-3681                    |  |

|                                                                                  |  |
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| <input type="checkbox"/> This sheet was received by the International Bureau on: |  |
| Authorized officer                                                               |  |

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1

&lt;110&gt; Human Genome Sciences, Inc. et al.

&lt;120&gt; 53 Human Secreted Proteins

&lt;130&gt; PZ018.PCT

&lt;140&gt; PCT/US98/21142

&lt;141&gt; 1998-10-08

&lt;150&gt; 60/061,527

&lt;151&gt; 1997-10-09

&lt;150&gt; 60/061,536

&lt;151&gt; 1997-10-09

&lt;150&gt; 60/061,532

&lt;151&gt; 1997-10-09

&lt;150&gt; 60/061,463

&lt;151&gt; 1997-10-09

&lt;150&gt; 60/061,529

&lt;151&gt; 1997-10-09

&lt;150&gt; 60/071,498

&lt;151&gt; 1997-10-09

&lt;160&gt; 145

&lt;170&gt; PatentIn Ver. 2.0

&lt;210&gt; 1

&lt;211&gt; 733

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 1

|            |             |            |            |            |            |     |
|------------|-------------|------------|------------|------------|------------|-----|
| gggatccgga | gcccaaattct | tctgacaaaa | ctcacacatg | cccaccgtgc | ccagcacctg | 60  |
| aattcgaggg | tgcaccgtca  | gtcttctctt | tccccccaaa | acccaaggac | accctcatga | 120 |
| tctcccggac | tcctgaggtc  | acatgcgtgg | tggtggacgt | aagccacgaa | gacctgagg  | 180 |
| tcaagttcaa | ctggtacgtg  | gacggcgtgg | aggtgcataa | tgccaagaca | aagccgcggg | 240 |
| aggagcagta | caacagcacg  | taccgtgtgg | tcagcgtcct | caccgtcctg | caccaggact | 300 |
| ggctgaatgg | caaggagtac  | aagtgcgaag | tctccaacaa | agccctccca | acccccatcg | 360 |
| agaaaaccat | ctccaaagcc  | aaagggcagc | cccgagaacc | acaggtgtac | accctgcccc | 420 |
| catcccggga | tgagctgacc  | aagaaccagg | tcagcctgac | ctgcctggtc | aaaggcttct | 480 |
| atccaagcga | catcgccgtg  | gagtgggaga | gcaatgggca | gccggagAAC | aactacaaga | 540 |
| ccacgcctcc | cgtgctggac  | tccgacggct | ccttcttctt | ctacagcaag | ctcaccgtgg | 600 |
| acaagagcag | gtggcagcag  | gggaacgtct | tctcatgctc | cgtgatgcat | gaggctctgc | 660 |
| acaaccacta | cacgcagaag  | agcctctccc | tgtctccggg | taaatgagtg | cgacggccgc | 720 |
| gactctagag | gat         |            |            |            |            | 733 |

&lt;210&gt; 2

&lt;211&gt; 5

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2

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; Site

&lt;222&gt; (3)

&lt;223&gt; Xaa equals any of the twenty naturally occurring L-amino acids

&lt;400&gt; 2

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| Trp | Ser | Xaa | Trp | Ser |
| 1   |     |     |     | 5   |

&lt;210&gt; 3

&lt;211&gt; 86

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 3

|            |             |            |            |            |            |    |
|------------|-------------|------------|------------|------------|------------|----|
| gcgcctcgag | atttccccga  | aatctagatt | tccccgaaat | gatttccccg | aaatgatttc | 60 |
| cccgaatat  | ctgccaatctc | aattag     |            |            |            | 86 |

&lt;210&gt; 4

&lt;211&gt; 27

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 4

|            |            |         |    |
|------------|------------|---------|----|
| gcggcaagct | ttttgcaaag | cctaggc | 27 |
|------------|------------|---------|----|

&lt;210&gt; 5

&lt;211&gt; 271

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 5

|            |            |            |             |            |            |     |
|------------|------------|------------|-------------|------------|------------|-----|
| ctcgagattt | ccccgaaatc | tagatttccc | cgaaatgatt  | tccccgaaat | gatttccccg | 60  |
| aaatatctgc | catctcaatt | agtcagcaac | catagtccccg | cccctaactc | cgcccatccc | 120 |
| gcccctaact | ccgcccagtt | ccgcccattc | tccgccccat  | ggctgactaa | ttttttttat | 180 |
| ttatgcagag | gccgaggccg | cctcggcctc | tgagctattc  | cagaagtagt | gaggaggctt | 240 |
| ttttggaggc | ctaggctttt | gcaaaaagct | t           |            |            | 271 |

&lt;210&gt; 6

&lt;211&gt; 32

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 6

|            |            |            |    |    |
|------------|------------|------------|----|----|
| gcgctcgagg | gatgacagcg | atagaacccc | gg | 32 |
|------------|------------|------------|----|----|

&lt;210&gt; 7

&lt;211&gt; 31

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 7

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3

gcgaagcttc gcgactcccc ggatccgcct c

31

&lt;210&gt; 8

&lt;211&gt; 12

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 8

ggggactttc cc

12

&lt;210&gt; 9

&lt;211&gt; 73

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 9

gcggcctcga ggggactttc ccggggactt tccggggact ttccgggact ttccatcctg  
ccatctcaat tag

60

73

&lt;210&gt; 10

&lt;211&gt; 256

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 10

ctcgagggga ctttcccggg gactttccgg ggactttccg ggactttcca tctgccatct  
caattagtca gcaaccatag tcccgccct aactccgcc atcccgcgcc taactccgcc  
cagttccgcc cattctccgc cccatggctg actaattttt tttatttatg cagaggccga  
ggccgcctcg gcctctgagc tattccagaa gtagtgagga ggcttttttg gaggcctagg  
cttttgcaaa aagctt

60

120

180

240

256

&lt;210&gt; 11

&lt;211&gt; 680

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 11

ggcacgagct tggaggtcta ctggcagact tccttctctc cagaaaaatc ctcagactca  
tcaccatcag gaaactcttc actgccattg gggttctctt cccatccgtg atcctcgtgt  
ccctgccctg ggtcagatcc agccacagca tgaccatgac cttcttggtg ctgtcttctg  
ccatcagcag cttctgtgaa tcaggagccc ttgttaactt cttggatatt gctcctcggt  
aactggctt tctcaaagga ctattgcaag tctttgcaca catagctgga gccatctctc  
ctactgctgc tggatttttc atcagtcagg attcagagtt tggttggaga aatgtcttct  
tgctttcagc tgctgttaac atatcgggcc tggttttcta cctcatcttt ggccgagcag  
atgtgcagga ctgggctaaa gagcagacat tcacccacct ctgagcaaac cgagagatgt  
gctagatcct ggtgcttagt tcatcattgt tttccctcac agacatttct ctttcatgcc  
tgcttgactg ataagccatt agctagaccc tgactatgta acgctaaaga ttttaccatg  
cctggaaatt ttacagggga agaaaacacg ctagttattt aactgcaaaa aaaaaaaaaa  
aaaaaaaaaa aaaactcgta

60

120

180

240

300

360

420

480

540

600

660

680

&lt;210&gt; 12

&lt;211&gt; 741

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

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4

<220>  
 <221> SITE  
 <222> (35)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (39)  
 <223> n equals a,t,g, or c

<400> 12

|            |             |             |             |            |             |     |
|------------|-------------|-------------|-------------|------------|-------------|-----|
| aattcggcac | gagaccctta  | ggaacacgga  | cgcanctgnc  | ggcattgtca | tctacgcagg  | 60  |
| acatgaaacc | aaggctctgc  | tgaacaacag  | tgggccccgc  | tacaagcgca | saagctggag  | 120 |
| aggcagatga | actgcgacgt  | gctctgggtgt | gtcctgctcc  | ttgtttgcak | gtctctgttt  | 180 |
| tcagcagtcg | gacatggact  | gtggatatgg  | cggtatcaag  | agaagaagtc | attattttat  | 240 |
| gtccccaagt | ctgatggaag  | ctccttatcc  | ccagtcacag  | ctgcagttaa | ctcattttta  | 300 |
| acatgatata | gttckgcagg  | ttttgatccc  | atttccttat  | acgkttccat | tgaaattgtt  | 360 |
| aaagcatgcc | aagtgtactt  | cattaaccag  | gacatgcagt  | tgtatgacga | agaaacagac  | 420 |
| tcgcagctgc | agtgccgagc  | tctgaacatc  | acggaagact  | taggacagat | acagtacatt  | 480 |
| ttctcagata | aaactggcac  | tttgacagag  | aataagatgg  | ttttccgaag | atgcactgtg  | 540 |
| tctgggtgtg | aatatttctca | tgatgcaa    | gaggggtctat | taagagatgc | gcagtgggtcc | 600 |
| acgcggctgg | ccgggtccat  | aagtatctcc  | ttctccggcc  | tcttgacagg | ccctgtctgc  | 660 |
| tttgactcag | caccatgcct  | gtgcttgaag  | ttctgattaa  | acggttgttc | tgataagtaa  | 720 |
| aaaaaaaaaa | aaaaactcgt  | a           |             |            |             | 741 |

<210> 13  
 <211> 619  
 <212> DNA  
 <213> Homo sapiens

<400> 13

|             |            |             |            |            |             |     |
|-------------|------------|-------------|------------|------------|-------------|-----|
| ggcacgagct  | ggggcctgtg | tgcctccacg  | ccataatgct | ggcagaactg | atattttctct | 60  |
| ttaggagtct  | ccatgggata | cttgccctccg | caggcaccat | aggagcagtg | gcagcttggc  | 120 |
| tgatgagcta  | taagccagcc | ttgtttgggt  | tcctattcct | tctgctgttg | cttagcaact  | 180 |
| ggttgggtcaa | gtatgaacac | aagctcaccc  | tcccagagcc | ccagcaggag | gaagagaaac  | 240 |
| caaagacttc  | tgaaaacgac | tccaagaaca  | gcaaggccgt | gaacacaaaa | gaagtcaata  | 300 |
| gaacgcagtc  | ctgctttgcc | ctccaggacg  | agatcctcca | acggctgttg | ttcagtga    | 360 |
| tgaagatgaa  | ggtcctagaa | aatcagatgt  | tcatcatatg | gaataaaatg | aatcaccacg  | 420 |
| ggcgggtcaag | cagacatcgg | aattttccca  | tgaaaaaaca | cagaatgagg | aggcatgagt  | 480 |
| caatttgccc  | cacctgtctt | gactgtactt  | cgagttcccc | cagctaata  | ggycgaggcg  | 540 |
| ggctggcctc  | tgccgatgtt | accttttacc  | tcagtaaaac | ccagtcacag | cctaaaaaaa  | 600 |
| aaaaaaaaaa  | aaactcgta  |             |            |            |             | 619 |

<210> 14  
 <211> 611  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (17)  
 <223> n equals a,t,g, or c

<400> 14

|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| aggatttcgg | cacgagntca | gatccaaagc | tttttgaaat | gattaagtat | tgtcttttga | 60  |
| aaattctgaa | gcaatatcag | acattgagag | aagctcttgt | tgcagcagga | aaagaggtta | 120 |

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|            |            |            |             |            |            |     |
|------------|------------|------------|-------------|------------|------------|-----|
| tatggcatgg | gcggacaaat | gatgaaccag | ctcattactg  | tagcatttgt | gaggtggagg | 180 |
| tttttaatct | gctttttgtc | actaatgaaa | gcaatactca  | aaaaacctac | atagtacatt | 240 |
| gccatgattg | tgcacgaaaa | acaagcaaaa | gtttggaaaa  | ttttgtggtg | ctcgaacagt | 300 |
| acaaaatgga | ggacctaatc | caagtttatg | atcaattttac | actagcctcc | ccatggccac | 360 |
| ccatggacca | gtcggcattc | acttcctccc | ttctgcggcc  | cataaaagcc | ctgggttcag | 420 |
| gcagagctga | gcagacatca | ggtgaccagc | tgcagaaagg  | agctaccac  | tccagggcct | 480 |
| catctctgct | gagagctgca | gagatgacca | gaagacctgc  | atccagagag | gagcttcctg | 540 |
| atccagggct | attctgtcac | tcaataaagc | ttctctttgt  | cttgttaaaa | aaaaaaaaaa | 600 |
| aaaaactcgt | a          |            |             |            |            | 611 |

&lt;210&gt; 15

&lt;211&gt; 585

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (5)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (15)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (19)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (29)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 15

|             |            |             |            |             |             |     |
|-------------|------------|-------------|------------|-------------|-------------|-----|
| gttgnatccc  | ccccngggnc | ttgccaggna  | atctccggcc | accgaggggtg | atcttaactt  | 60  |
| tcgaatggcg  | tttttacctt | tcttttagaa  | aactaatgcg | atggatatta  | atacttggtta | 120 |
| ttgccttggtg | gtttattgag | cttttggtatg | tgtggagcac | ttgtagtcag  | cccatttggtg | 180 |
| caaaatggac  | aaggacagag | gctgagggaa  | gcaagaagtc | tttgtcttct  | gaagggcacc  | 240 |
| acatggatct  | tcctgatgtt | gtcattacct  | cacttcctgg | ttcaggagct  | gaaattctca  | 300 |
| aacaactttt  | tttcaacagt | agtgattttc  | tctacatcag | ggttcctaca  | gcctacattg  | 360 |
| atattcctga  | aactgagttg | gaaatcgact  | catttgtaga | tgcttgtaga  | tggaagtgtc  | 420 |
| agatatccgc  | agtgggcatt | ttcgtttact  | ccgaggctgg | ttgcagtctt  | tagtccagga  | 480 |
| cacaaaatta  | catttgcaaa | acatccatct  | gcatgaacc  | aataggggta  | aactggccca  | 540 |
| atattttgca  | atgaataagg | acaaaaaaaa  | aaaaaaaaaa | ctcga       |             | 585 |

&lt;210&gt; 16

&lt;211&gt; 1040

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 16

|             |            |            |            |            |            |     |
|-------------|------------|------------|------------|------------|------------|-----|
| ggcacgaggt  | gaatccccag | cctgaggtcg | tgcttaagtg | ccacctgctc | aagagagaag | 60  |
| gcttcctgcc  | cgcgcccatg | atgtaagtcc | ccccagatgc | tttccaccat | cctgtccttt | 120 |
| gtctgtaatt  | gcgcttgctg | cttgaacaga | atcctaattg | tgctgattac | atgtttaatt | 180 |
| ttgggtctccc | ctgtaagaca | ggcatgcttt | ttggaggcag | ggactgaatg | tcattcacat | 240 |

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|            |            |            |              |            |            |      |
|------------|------------|------------|--------------|------------|------------|------|
| ctgtgctcct | aggggtcta  | acatgatggt | gcattgtgtaag | tattcagtat | ataacttggt | 300  |
| gaataaatgg | atcgggttta | gcattttccc | ccattggacc   | tggattgacc | tggaaattgg | 360  |
| tggactgaac | ctgcaagtag | agattaaagg | acctaacaac   | tgtagagtgg | ctggtgaagg | 420  |
| tagatataag | tgcagtaagg | gagggagtcg | ttgatgtkgt   | tttggttcgt | agtgcagaat | 480  |
| aaagctactt | atggaaatat | acgactccta | ctcttagttt   | ctgctttgat | gtggtwackg | 540  |
| ctgttgttta | gcgtaagcat | ataaacaat  | cactggctta   | gtgggttaat | ttttcttctc | 600  |
| ttttgttaaa | cagctgagtt | tttgctgttt | tcaaagttag   | ccaaaaattc | cattttcatg | 660  |
| tttaaagtat | ttagaaaaat | catttttctt | taaaaataa    | cagtacataa | aaagaaaaca | 720  |
| ttctcggctg | ggcgcggtgg | ctcacgcctg | taaccagca    | ctttgggagg | ctgagacagg | 780  |
| cagttcacct | gaggtcagga | gtttgagacc | agcctgacca   | acatggagaa | actccgtctc | 840  |
| tactaaaaac | acaaaaattt | tagccgggcg | ttgtgccacg   | ttcctgtaat | cccagctact | 900  |
| cgggaggctg | aggcaggaga | atcgcttgaa | cccgggaggc   | agaggttgca | gtgagccgag | 960  |
| atcgtgtcat | tgcactccag | cctgggcaac | aagagcgaaa   | ctccatctca | aaaaataaaa | 1020 |
| aaaaaaaaaa | aaaactcgta |            |              |            |            | 1040 |

&lt;210&gt; 17

&lt;211&gt; 625

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (6)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (11)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (43)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (46)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (68)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 17

|            |             |            |             |            |            |     |
|------------|-------------|------------|-------------|------------|------------|-----|
| ttaccntcac | ntaaggggaa  | caaaagctgg | agctccaccg  | cgntgncggc | cgctctagaa | 60  |
| ctagtggntc | ccccgggctg  | caggaattcg | gcacgagctc  | gtgccgaatt | cggcacgagc | 120 |
| agcaacagca | acacaggtgt  | ggagttgaca | gacaggtaca  | ttgaaccaga | gctgtgattt | 180 |
| agacaagcca | ggaacctcat  | gtatgtccat | aatgctgctg  | acattcactc | ttcacttccc | 240 |
| cagcacatta | ctgtcatatc  | tcccagagaa | ttatgtcata  | ccttctctct | tctcaaacct | 300 |
| gcaacactgg | atctgctgtg  | ttcactctca | gttggttaacc | tgtttcgtat | ttcagagaga | 360 |
| caatgtaagc | actgagaaga  | gaactcttgc | acactccaac  | acctcatctg | ccacctctca | 420 |
| ccatctgtct | ccttgtaacta | ctggagatgg | tctgccctcc  | tcctggggag | gccaaactca | 480 |
| tccacttctg | cactagattc  | cgctctcttt | tatcttccct  | acatcatgtg | ttttccttct | 540 |
| atactcatca | ttccttttag  | caataaatat | ctttaaaaaa  | aaaactcgag | ggggggcccg | 600 |
| gtaccaatt  | cgccctatag  | tggag      |             |            |            | 625 |

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<210> 18  
 <211> 819  
 <212> DNA  
 <213> Homo sapiens

<400> 18  
 aattcggcac gagggaaact catgcacaaa caaaacagca catgctgtac tcacagccag 60  
 ttacacagaa tgctcatgca tgcattctgtt gcttattaat tttcttcctg ctgtttgtat 120  
 cattcttttg aagaatctcc agcaagcttt gtgctttgcc caattgttta taatgtctat 180  
 aaatcagggg cttggaccaa atgaaatgtc ttagtagtgt ttgcaaaata tttggatatt 240  
 ctgattgcgt tttattttcc cagctttaga aaacatatag atagcctctg ttgggaactt 300  
 atattctcgt tactccttgt ctcttttctt ttttcaggaa ttggtcactc tttcagccaa 360  
 ctctagaggt caaacaatgt ttacatgtag tgctcagttt gttttaactt cckgctgtag 420  
 acattgacag ttttctctc cyaagagtct tatgaatagg caacaaacca aaaccaaacc 480  
 aggcaagtcc catctattac tacgtactta caaatccagg tgaaagtgtc tgggtgaacag 540  
 tctatgtttt agcaactgtt ttttaacgtt tgggtgtgac attttttaac aacagccatt 600  
 gttcaattgt taaactatgt ttggatttga ggtctgaatg agctgaattc aaaatatggg 660  
 actttttatt agaaaccctg gtaaagtgga cactggggaa aaagcccaag atttcatgtg 720  
 tttgatttat tgactatgtg cgtcaacagc ctgcttttaa ttctcagagt aaaataaaaa 780  
 tactcagaat ctaaaaaaaaa aaaaaaaaaa aaaactcga 819

<210> 19  
 <211> 782  
 <212> DNA  
 <213> Homo sapiens

<400> 19  
 ggcacgaggt ttattccctg tcacccacct tatccactg tcttattctt agagttgtct 60  
 ttcagaaacc caaatacaga tcatgtcaca gatactgaga agttccttat tgccttgata 120  
 aggtgatata taaaacctta gaatggcttt cagggttctt tactattccg tctggtttat 180  
 ctttttacac gtgtcatttg ccactccaaa agttacagga ctaattgcct caacatacca 240  
 ttttctttat gtcttcatgt ttctgtcat gatcctttct gcctaattgct tttccacatc 300  
 ttccatttcc gctttgagga actccttttt ctttcttcaa gatacaatgc ttgcagtctt 360  
 aatcttccat gacagtgtc tcatagttta gtttaacctc tgcaatagga tatacctcat 420  
 gattactaca atttatatgt gtttcctttt accaaactct taggaaaaag gagagcctgg 480  
 gccgggtggg gtggctcacg cctgtagtcc cagcacttgg ggaggccgag gcggaggatc 540  
 acaaggtcag gagattgaga ccagcctggc caacatagtg aaaccccgtc tctcctaaaa 600  
 acacaaaaat cagctgggtg tgggtggcgc cgcagctgta atcccagcta ctcaggaggc 660  
 tgaagycagg agaatcgctt gaaccccgga ggcggggatt gcagtgagcc aggatggcgc 720  
 cactgcactc cagcttggtg acagcgagat ccgtctttaa aaaaaaaaaa aaaactcgt 780  
 ag 782

<210> 20  
 <211> 655  
 <212> DNA  
 <213> Homo sapiens

<400> 20  
 gtctgttggt tactaaaatg aaaattcagt tgaaaatgcc actaattcag aaattagtaa 60  
 atcctattta ttatgtatth taccaattaa tagaatacaa aggtatcata tacaactacc 120  
 atggagggtg caggaagaag attgactttt tcaaattggc ttcatactgg aacagattaa 180  
 aaaccaagtc ttctttcttt tctcctgtt aaaactcact tgtgtctcac attagctcc 240  
 taaatgtgcc ctctgtttcc ctaggccaga gccagtgtct aacaagtaat gcatttgag 300  
 ggtcatggcc caacagtcta cattcagcca ggatttagga acttcattcc aatgatcttt 360  
 gaaggacttg tacaactcta gccagccttt gaagggagta ttttgggaac tgggaagaga 420  
 tctttctagt cctcccatgg agacagcaag gttatggtga agtttggaaat cagataaaac 480

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|            |            |            |            |             |            |     |
|------------|------------|------------|------------|-------------|------------|-----|
| taatggaggc | attacatctc | taatctaaaa | tgaggattat | agtctaggtg  | tggtggcaca | 540 |
| cacctgtaat | cccatcactt | tgggaggcca | aggccagagg | attgcttgtc  | caaggagttg | 600 |
| gggaccagcc | tgggcaacat | acagatgcaa | aaaaaaaaaa | aaaaaaaaaac | tcgta      | 655 |

&lt;210&gt; 21

&lt;211&gt; 798

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 21

|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| ggaaaaatgc | agctaattca | gctcataact | ttaacaatta | cacaagtgct | tttcctggat | 60  |
| accatcatgt | ctacatatgt | agcagatacg | gattatgtgg | ttcttcctgt | ttcateccat | 120 |
| aaaawattct | aaagacattc | aaaagttgag | atttaataaa | ataattttta | gtactttatc | 180 |
| aagggcattc | taagtgaatt | cgtgctcttt | tttttaaacc | ataagtacat | agcagtaaag | 240 |
| aagacaataa | ccacattttt | gtgtctctgc | ctttatctgt | ggtaagctga | cagcagtttt | 300 |
| accaccatt  | gcttctgcac | catcagtgca | aatgtcaaaa | tagtgaaaag | gccaggtgca | 360 |
| ktggctcaca | cctgtggtcc | tagcaatttg | ggatgctgag | gcgggtggtt | tacctggtca | 420 |
| ggagtttgag | gccagcctgg | ccaacatggt | gaaaccccat | ctctgctgaa | aatacaaaga | 480 |
| ttagccgggt | gtggtgggcg | cctgtagtcc | cagctactcg | ggaggtagac | gcaggagaat | 540 |
| cgctggaatc | cgggaggcgg | aggttgcaat | gagccgagac | cgcgccaaca | tggtgaaacc | 600 |
| gtgtctctac | taaaaataaa | aaaattagcg | agacctggtg | gtgggcgcct | gtaatcccag | 660 |
| ctactcggga | agttgaggca | ggagaattgc | ttaaaccag  | gagaccgagg | ttgcagtgag | 720 |
| ctgaaaccac | gtcattgcaa | tccagcctgg | gcaacagagc | gagactctgt | ctcaaaaaaa | 780 |
| aaaaaaaaaa | aactcgaa   |            |            |            |            | 798 |

&lt;210&gt; 22

&lt;211&gt; 646

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 22

|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| aggtctttgt | ttcaaattgg | ttagatggaa | ggagaaaagt | ggtcaccatt | ttaattctca | 60  |
| gaagaggaag | ttaatcggtg | ttctgcatct | gactttcacc | tccctccttc | ctttcctttg | 120 |
| tcagttagga | taggtgacac | ttcttttctt | ttacggctat | tatcagagat | tttgtgttta | 180 |
| atagttgctg | ggtcacattt | tacaagtgca | aatgactttg | atgacctcca | tttacttttt | 240 |
| cttagctatc | ttcatgtcta | caaggagtga | aaggctataa | agcattcagg | caggctcctg | 300 |
| ttttgatcag | cctctccagg | tgatcattat | acccaagtca | aaaagtcaat | gcactcccca | 360 |
| aatgagaaac | atatatatat | atatatagga | aatctccctt | ttacaagatc | gtagtgcata | 420 |
| tcctgggttt | tttcccatcc | ttgtgagtca | gttagtttgt | aattgactct | ctaaccagcc | 480 |
| ttccaccttc | tgttaacctt | tattacctat | agtcaaaggg | acctcaggaa | tgcgagagac | 540 |
| ccccccsaa  | actccctgcg | gcttttaagt | ctcatcttac | agcattcccc | ctcaaaccta | 600 |
| aaaaaaaaaa | aaaaaaaaaa | aaaaaaaaaa | aaaaaaaaaa | ctcgtta    |            | 646 |

&lt;210&gt; 23

&lt;211&gt; 752

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 23

|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| gatcaaatcc | tgaagtggta | catgtcacta | ctgttcatag | tctctttgct | ggaacttggt | 60  |
| cctatggccc | tactggcaga | gaggaaggct | atgaaacca  | gtctaggcct | gcgcctagaa | 120 |
| gaagaagaag | aagaaacacc | ttttgaagaa | cagagagcag | tctctgtcat | accaggrgta | 180 |
| cctgtcacat | acttgtagaa | caaaaataag | taacatttta | attattgaaa | caatgtaaca | 240 |
| actttaaaca | cagtttcata | actaggagtg | aatcacccat | aatctcatac | ccggaacaaa | 300 |
| atatctgtta | gtatgatgca | cctttacata | gctgtaatct | taaagggcat | gtacttcctt | 360 |
| ctttgctttc | cttttttttt | ttcttcaccc | ttccctcttc | tcctctctcc |            | 420 |

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|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| tttctccctt | ccttctttct | tttcttcctt | tctttctgat | tttctaactt | ccttctttaa | 480 |
| acattccttg | atcgtctgtg | ggtctggaca | gcaacatgga | gatcaattag | gcgcagcatt | 540 |
| ttaaatttgc | cctcaagaag | ttccactagt | gtaagagtag | gcaagtaacc | aattattaca | 600 |
| atagtgggac | aagcgctgtg | atagaaataa | atacagagta | ctgtggcagt | ccttaccag  | 660 |
| aaaaagatat | ctagggtaga | tggtatctga | actgagaatt | aaagaataaa | tagaagatag | 720 |
| catggcaaaa | aaaaaaaaaa | aaaaactcgt | ag         |            |            | 752 |

&lt;210&gt; 24

&lt;211&gt; 815

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (1)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 24

|            |             |             |             |             |             |     |
|------------|-------------|-------------|-------------|-------------|-------------|-----|
| ngcttcaccg | tgcactttca  | tgtagagag   | atcttaaact  | tcaagaacca  | acctctgcta  | 60  |
| gcttgagaca | ttttttcctr  | cagcttcctc  | acctctctca  | gccttcattg  | aattgaagag  | 120 |
| agttagggcc | ttgttctgga  | ttagggtttg  | gcttaaataa  | atcttctggt  | tgctctgata  | 180 |
| ttctctccag | accaatacaa  | ctttatatta  | aggataaggc  | tggtttgggt  | tcttatcatt  | 240 |
| tggtgtgtga | gtggaatatt  | acttttatatt | ccttcgagaa  | ccttttcttt  | gcatccataa  | 300 |
| cttgggctaa | ctatgggtgca | agascgctag  | cttttggcct  | atctctgctt  | tccacatgcc  | 360 |
| tttctcacta | agtataataa  | tttctagctt  | ttgagttaaa  | gtgaaagacg  | tgcaacccat  | 420 |
| ccttttactt | gaacccttag  | aggccattgt  | atgggttaata | tatggcctaa  | tttcaatatt  | 480 |
| gtgtctcaga | taatagggac  | gcccagagtag | aggagagag   | atgggaaaat  | agcagtcaat  | 540 |
| ggtgtagtca | gaacacatac  | agcatttact  | aagttcacca  | tcttatatgg  | gtgcgggttag | 600 |
| tggtgctcca | aaacaattac  | aatacaaa    | tcaaagatta  | ctgagcacag  | atcaccaagt  | 660 |
| agaaacaatt | ataatgaaaa  | aataggggaat | attgcaagaa  | ttaccaaaaat | gtgacacaga  | 720 |
| gacatgctgt | aaaaatgata  | ccaataaact  | tgcttaaatgc | acagttgcca  | caagctttca  | 780 |
| atctgttaac | aaaaaaaaaa  | aaaaaaaaaa  | tcgta       |             |             | 815 |

&lt;210&gt; 25

&lt;211&gt; 878

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 25

|            |            |            |            |            |             |     |
|------------|------------|------------|------------|------------|-------------|-----|
| gcaacagatg | aattttgggt | gacacaaaca | ttcagaccat | agcagtcact | atctaacaac  | 60  |
| aggtggatgg | gacgtttgtc | taaaccgaat | tgtacttcgg | taacaggatc | atataaggac  | 120 |
| aaatttaacc | aatgtctttt | ttagttttta | gtttcttttg | ttttgggttt | agcaactcta  | 180 |
| gattttctag | agactatcaa | cattaccttt | ctttgctctc | cagcccccat | gcccagaaaa  | 240 |
| gaaataagat | tattagggag | tcaagcatct | cggctcttct | tacctcttag | ggtagtaaat  | 300 |
| tgctttttgt | atgcgagtgg | ttttgcgtat | gtgaagataa | ttttgagata | ggagtagaat  | 360 |
| gccctgaaga | taatgcttat | gttttaaa   | taataagcca | acacagtga  | cgggaataagc | 420 |
| tgcactggac | ctgaggagtg | aggttaaata | gggaagtaag | acaccacctg | gagacagtat  | 480 |
| tgctcaagac | tgaaagtgga | tgagggttgc | aaagctgttt | gcacagtgtc | tctgaagcat  | 540 |
| catggcagcc | tggggaattt | cccatgctga | gcttgccctg | agtatgtgtg | tgtatgcatg  | 600 |
| catgtgtatg | tgcatctcgt | tgtgtgtgaa | ggaaggggag | cagagctgtc | ggcttagtca  | 660 |
| gctacctttg | aatgcttctc | cctcaacaga | ggctgagaac | cagaccctt  | gcctttgtcc  | 720 |
| ctgaattata | ttagctcagg | ggttcttatg | ccatccaaag | ataaggacat | aagaagaata  | 780 |
| gggaaagtgc | tgggattgca | ggtgtgagcc | actgtgtctg | gtccattatt | ttagagggta  | 840 |
| ctcctactca | ttaaaaaaaa | aaaaaaaaaa | actcgtag   |            |             | 878 |

&lt;210&gt; 26

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&lt;211&gt; 850

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 26

|             |             |            |            |            |             |     |
|-------------|-------------|------------|------------|------------|-------------|-----|
| gggcaaacat  | tgtctacaag  | taataaatgc | tttgcataaa | tgtgcagaca | cacgtgtatg  | 60  |
| aatgtgctat  | gcaaataccc  | ttccttttag | aagtatttgt | tattcataca | ggtgttttag  | 120 |
| gaagtaaatt  | gcttaaatct  | ggtgggtctt | ttgatttaac | atccttttca | ccaatgataa  | 180 |
| tttgcttttag | taataaaaagt | tagtctcttg | ttgttactgg | aatattgtta | attcatcaaa  | 240 |
| aaaatcaaaa  | gcctatcatg  | acaggaatta | ttctaataac | tctctaaaag | gataatcata  | 300 |
| ataataaatt  | aactagcaaa  | gtgacaatcc | ctttccttaa | ggtgtttatg | gcctggtagt  | 360 |
| gaaaagagaa  | acctgaagca  | attaccccat | aattacgagg | aatacagaat | aatcactata  | 420 |
| atggatgaat  | ggatggatga  | tgcagagaag | caatgcaatg | attaggctta | aggaaatcag  | 480 |
| ggacaacttc  | acaaaggaag  | gactgtttaa | ggagaggctt | aaagaatgga | ggccagggtgc | 540 |
| agtstctcac  | gcctgtaatc  | ctagcacttt | gggaggctga | ggcaggtgaa | tcacctgagg  | 600 |
| ttaggagttc  | aagaccagcc  | tagccaacat | ggtgaaaccc | tgtctctatt | aaaaatacaa  | 660 |
| aaattagccg  | ggcatgggtg  | caggcatctg | tagaatccca | gctacctggg | aggctgaggc  | 720 |
| aggagaatcc  | cttgaacccg  | ggagacagaa | gttgcagcga | gccacgtttg | caccactgca  | 780 |
| ctccagcctg  | ggcaacagag  | tgagactctg | tcttaaaaaa | aagaaaaaaa | aaaaaaaaaa  | 840 |
| aaaactcgta  |             |            |            |            |             | 850 |

&lt;210&gt; 27

&lt;211&gt; 788

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 27

|            |            |             |            |            |            |     |
|------------|------------|-------------|------------|------------|------------|-----|
| gtttttgttg | agtataggag | ttcttttatat | actctggata | ttaacctctt | attagataca | 60  |
| tggtttgcaa | atattttctc | ccattctgta  | ggttaccttt | tcactcttgt | ttcctttaat | 120 |
| gggcagaagt | taagtttgat | atgggtctcat | ttgcctgctt | ttgctttcat | tgtctgtttt | 180 |
| tggtgtcata | tccaagaaat | cattgccaac  | ttcagtgtcg | tgatgctttt | tcccgaagtt | 240 |
| ttcttctagg | agtttttcag | gtcttatatt  | taggttttat | caactacatt | acgttttatg | 300 |
| ttgaagaaaa | aacackggaa | tagaattaat  | gtttaaactg | ataataaatt | ttcttcccc  | 360 |
| acaaaacaaa | ccacctgaa  | tataaatact  | gtaaggccac | tctgtgtgct | tgggaaagtt | 420 |
| gactcagagg | tgtcagatcc | tagtgaaacg  | attagatttt | aaagataaaa | gaagtcctct | 480 |
| cgggccagga | gtggtggctc | atgcctgtga  | tcccagcact | ttgggaggct | gaggcaggca | 540 |
| gatcacttga | ggccaggagt | ttgagaccag  | cctggccaac | atggcaaagc | cccatctcta | 600 |
| ctaaaaatac | aaaacttagc | tgggcttggt  | ggtgcacact | tgtaatccca | gctacttggg | 660 |
| aggctgagtc | catgagaatt | gcttgaaccc  | aagaggccag | ggttgacagt | agccaagatc | 720 |
| gcaccactgc | actccagcct | gggcaacaga  | gtcaagactg | tctcaaaaaa | aaaaaaaaaa | 780 |
| aactcgta   |            |             |            |            |            | 788 |

&lt;210&gt; 28

&lt;211&gt; 848

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (388)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 28

|            |            |            |            |            |            |     |
|------------|------------|------------|------------|------------|------------|-----|
| aattcggcag | aggaaacaca | atactgtttc | tgcgtcataa | caaagatcta | gttgcgcaaa | 60  |
| ctgcacagcc | agaccaaccc | aattatgggt | ttcctctgga | tctcttacgc | tgtgaaagcc | 120 |
| ttcttggttt | ggaccctgca | acttgcagca | gagttctaaa | caaaaattac | acgtgcttg  | 180 |
| tttccatggc | tcccctcacc | aatgaaatcc | ggcctgtcag | cagctgcacc | cctcagcata | 240 |

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|            |            |            |             |             |            |     |
|------------|------------|------------|-------------|-------------|------------|-----|
| ttggaccagc | tatcccagaa | gtcagctctg | tctgggtttaa | actgtacatt  | tatcatgtca | 300 |
| ctggacaagg | accaccatcc | cttttattgt | ccaaaggtac  | aagacttcga  | aaactgccag | 360 |
| atatatttca | gagttatgat | cgattgcnaa | taacatcttg  | gggtcatgat  | cctggagtag | 420 |
| ttcctacctc | aaatgtgctc | acgatgttga | atgatgcttt  | aacacattct  | gcagttttaa | 480 |
| ttcaggggca | tggtctgcat | gggataggag | aaactgtcca  | tgtcccattt  | ccatttgatg | 540 |
| aaacagaact | acaaggagag | ttcactcgtg | tcaatatggg  | tggttcataaa | gcattgcaga | 600 |
| tactaaggaa | cagagtgrac | ttacagcatc | tctgtggata  | tgtcaccatg  | ttgaatgctt | 660 |
| ccagccaact | tgcagataga | aaactcagtg | atgcttctga  | tgagagagga  | gaacctgatt | 720 |
| tggcttctgg | ctcagatgta | aatgggagta | cagagtcatt  | tgaaatgggc  | attgaggaag | 780 |
| caactataga | ttcagcaaca | aagcaaacct | ctgggtgccac | aacagaagca  | gattgggttc | 840 |
| ctctcgta   |            |            |             |             |            | 848 |

&lt;210&gt; 29

&lt;211&gt; 755

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (640)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 29

|             |            |             |            |            |            |     |
|-------------|------------|-------------|------------|------------|------------|-----|
| ggcagagggga | aatgcatagg | cttgtaatga  | taattaagat | tcaatctcac | tctcaatgag | 60  |
| atcttgggat  | tcctgcaagt | ttgaccttca  | cttatgcaat | ctgtaaaatg | aaggcattgg | 120 |
| gcttagatga  | cttagatggg | ttcttcagtg  | tcttacaggc | ttacatgtta | tatttttgaa | 180 |
| ttgctataaa  | gcatgttttg | caaattctga  | caccaaacaa | tgttttgcat | tcctatagca | 240 |
| cagataaacc  | atgtttatag | tagccttact  | cattctccat | tgggccttag | gtggtacagt | 300 |
| gatgtccaag  | tgactcgtga | cctctcactt  | cttccacttt | tccaggtaga | agatcagcct | 360 |
| tgctcagcct  | cctgggatta | ggagatgttt  | taagaaaagg | agaatttgca | tcaaagttct | 420 |
| gacattgttt  | gaggaaaaga | ggtagatttc  | ctaaaaattc | ccctgaagcc | cataggatat | 480 |
| attctcttca  | aaataatgag | tggggccggg  | gcagtggctc | acacctgtta | tcccagcact | 540 |
| ttggaaggcc  | atggtgggca | gatcacttga  | ggtcaggagt | ttgagaccag | cctggccagc | 600 |
| atggtgaaac  | cctgtctcta | ctaaaaatac  | aaaaattagn | ccggatgtgg | tggtgcatgc | 660 |
| ctgaggttgc  | agacagccga | gatggtgcca  | ctgcactcca | gcctgggcaa | cagagcgaga | 720 |
| ccctgtctca  | gaaaaaaaaa | aaaaaaaaaac | tcgaa      |            |            | 755 |

&lt;210&gt; 30

&lt;211&gt; 813

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (283)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (691)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 30

|             |            |            |            |            |            |     |
|-------------|------------|------------|------------|------------|------------|-----|
| gcaggaattt  | ctacctatat | ttccttcctt | actgtgttgt | gtgtgtttgt | atgtgtgtgt | 60  |
| gtttaatttg  | tagcatttgc | cagtttctgt | ggtgtaaata | ctcccactac | agctgttttc | 120 |
| aagctaacat  | tgtgatacca | caaaaaatgg | aattgggaag | gcacaatcaa | gattaacaag | 180 |
| ccagttttaga | ccaagacaat | ttttctgccc | tattagttgg | gcacaagtta | gaaaggctga | 240 |

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|            |            |             |            |            |             |     |
|------------|------------|-------------|------------|------------|-------------|-----|
| tagtatctca | tggtggaaag | gtgagagaga  | aggccctcat | gcnttattaa | tgccatattgc | 300 |
| attgaagtgc | cctgtttgag | ggcatgctgt  | tagtaacttt | taaaatatga | gatgtcatac  | 360 |
| tttttgactg | aaaatacaac | tcttgtagga  | ttctatttta | tagaactact | taggtgcata  | 420 |
| aatatacaaa | aataactgtc | attgcagcat  | tatttgtaat | agtggaaaca | gaagactttt  | 480 |
| cattaataag | agaatgggta | ggccagatcc  | agtggctcac | acctgtaatc | ccaacatttt  | 540 |
| gggaatccaa | ggcaggagga | tcgcttttagc | ctaggagttg | gagaccagca | tgggcaacat  | 600 |
| aacaagacct | tgtctctact | aaaaaaaaat  | aataataatt | agtctggcat | ggtggcacac  | 660 |
| ctgtactccc | agctacttgg | gaggctgggg  | ncaaggagga | ttgcttgagc | ccaggagatt  | 720 |
| gaggctgcag | tgaactgtga | tcacaccact  | gcacaccagc | ctgggtgaca | cagcaaaact  | 780 |
| ctgtctcaaa | aaaaaaaaaa | aaaaaaactc  | gta        |            |             | 813 |

&lt;210&gt; 31

&lt;211&gt; 513

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 31

|            |             |             |            |            |            |     |
|------------|-------------|-------------|------------|------------|------------|-----|
| ggcacgagat | tttttaaaaa  | atcttaattt  | ttttctctgt | tttagggatt | atcttaatta | 60  |
| aaacttagaa | aataatgact  | tttggttttag | gccagggcct | ttgttttctt | ttttgctacc | 120 |
| aggtacttgt | tgcttttaga  | ctgaccaacc  | agatccctgc | actgggggat | atatcccatc | 180 |
| tatcttccca | cataccatac  | ttggctctct  | ttggatagac | tctgatatta | agtacttggt | 240 |
| tctcttctac | ttgaaagtat  | ctatatattca | tggaggatgg | tgcttcttaa | cgttctgggt | 300 |
| gcagggctct | aggcctgaag  | ggcttttttg  | gctagtgaag | atgggtttca | tcatgttttt | 360 |
| caagtcacac | tttcttcggt  | ggtggtcttg  | ttgccatacc | cagctgagct | tatatctaac | 420 |
| cagccctact | ttcagagagt  | tggcattcag  | gtgtcttcat | ataaagttca | gttatgctgg | 480 |
| agtaacagag | aacaaaaaaaa | aaaaaaaaaa  | aaa        |            |            | 513 |

&lt;210&gt; 32

&lt;211&gt; 576

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 32

|            |             |            |             |            |             |     |
|------------|-------------|------------|-------------|------------|-------------|-----|
| ggcacgaggt | ctattaattt  | gcttttcttt | agatgtattc  | tagagggggg | aaaatcagta  | 60  |
| gaagaacagt | tatgtaattc  | ttacaagttc | tccatgtgtc  | ttgccatctt | gcttttcttc  | 120 |
| atcctatcag | tactggatga  | gaatgtttat | ttcactgaac  | tttgccaaag | agtttcaaca  | 180 |
| tttttttggt | taatcatagg  | agaaaaaggt | ttatcttatt  | tttaaaaatt | tttatttaatt | 240 |
| tctttcatta | caaatgaagt  | cccagaagtt | gtatttggtt  | ctttaggctg | ttcttaattg  | 300 |
| ttcatkggaa | caggcagggt  | ttgaaggagt | ggggatactg  | ggaaagccag | ggtgatgaga  | 360 |
| aaataggaaa | ggggtcttgt  | cattgggagg | ccactatacc  | agtggccctt | gtaccaggac  | 420 |
| taatatggta | ctttgaagct  | ttaaattcat | ttctttattc  | accagataat | tattgagtgc  | 480 |
| ttactgggtc | tggacaagta  | agcattcaat | aatttttaggc | atcccaggat | acatcagtga  | 540 |
| acaaacaaac | ataaaaaaaaa | aaaaaaaaaa | ctcgta      |            |             | 576 |

&lt;210&gt; 33

&lt;211&gt; 1019

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (126)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

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&lt;222&gt; (202)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (380)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (476)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (511)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 33

|            |            |             |             |            |            |      |
|------------|------------|-------------|-------------|------------|------------|------|
| gtctcactgt | gccacgcagg | tgccctgcag  | ccacggagac  | gaatgtggac | ggccagaagg | 60   |
| tgtaccgaga | ctgtagctgt | atccctcaga  | atctttcctc  | tggttttggc | catgccactg | 120  |
| cagggnaaat | gcacttcaac | ttgtcagaga  | aagccctcc   | ttctggtttt | catattcggt | 180  |
| gtgaattttc | tttacattcc | tncagcagca  | ttcctgcact  | aacggcaact | ctacgatgtg | 240  |
| tccgtgaccc | tcagagatcc | tttgccctgg  | gaatccagtg  | gattgtagtt | agaatactag | 300  |
| ggggcatccc | ggggcccatc | gccttcggct  | gggtgatcga  | caaggcctgt | ctgctgtggc | 360  |
| agraccagtg | tggccagcan | ggctcctgct  | tgggtgtacca | gawtcggcca | tgagccgcta | 420  |
| cataytcatc | atggggctcc | tgtacaagtg  | ctgggcgtcc  | tcttctttgc | catagnctgc | 480  |
| ttcttawama | agccctgtgc | ggagtcttca  | natggcytgg  | raamttgtyt | gcccagccag | 540  |
| tcctcagccc | ctgacagtgc | ccacagatag  | ccagctccag  | agcagcgtct | gaccaccgcc | 600  |
| cgcgcccacc | cggccacggc | gggcactcag  | catttcctga  | tgacagaaca | gtgccgttgg | 660  |
| gtgatgcaat | cacacgggaa | cttctatttg  | acctgcaacc  | ttctacttaa | cctgtgggtt | 720  |
| aaagtcggct | gtgacctcct | gtccccagag  | ctgtacggcc  | ctgcagtggg | tgggaggaac | 780  |
| ttgcataaat | atatatttat | ggacacacag  | tttgcatcag  | aacgtgttta | tagaatgtgt | 840  |
| tttatacccg | atcgtgtgtg | gtgtgctgta  | ggacaaactc  | cgcaggggct | gtgaatccca | 900  |
| ctgggagggc | ggtggcctgc | agcccagagga | aggcttgtgt  | gtcctcagtt | aaaactgtgc | 960  |
| atatcgaaat | atattttggt | atttaagcct  | gaaaaaaaaa  | aaaaaaaaaa | aaaaaaaaaa | 1019 |

&lt;210&gt; 34

&lt;211&gt; 433

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (309)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (408)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (418)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

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<221> SITE  
 <222> (419)  
 <223> n equals a,t,g, or c

<400> 34  
 ggcacagctc accttcctac cctccactgg aaaccaactcc tctccatggt gacctcctgg 60  
 attgcctcca tccccctccc ctgtgggggt ctgtgtatct gcttggtggt tggattgggt 120  
 cactgtctgg atctgtcaag gaagataacc attttttcag gagctgtgta catggtgaaa 180  
 aatatacagt tctgggtgta aggaactctc acttgggaat attattattt aaaaacttat 240  
 acgttgagct cagtgtctgt acagaggtaa gaatactgtg gaaaggctat aaatattttt 300  
 ccccaaagnc aggggttgga aacatttttc tttcctaggc tggtgagact cacagggaaa 360  
 aaaaaaaaaa aaaatccggg ggggggcccc gtaccattg gccctangg gggggttnna 420  
 aaaagggcc gtt 433

<210> 35  
 <211> 642  
 <212> DNA  
 <213> Homo sapiens

<400> 35  
 aggaatgccca ggtcgcactc caccttgctg gccggcaagt cctcttaacc tggtggtctg 60  
 ctttctttgt tacaaagttg gtctggctta tactgctgaa ggtcatggga tttttgctag 120  
 catattattg aaatgagaca tttgtggcac tggcgttgta ttgtttctgc taataggagc 180  
 ccgcgtgtct ttcacatatg gttagtctga ttgctttttc tagcctggga ctttgccttg 240  
 gagagagtcc tagcaaaata ccattcacag ccttcttcca cagggaagga tgactaagag 300  
 tttagtgtct gaagagcaga agaggaaagc tggaagatca gaaatgaaat tggagctgtt 360  
 gatgcgtgtg tctctatggt acagtgggca agccctagtc cttcttgggt tgatcactaa 420  
 cttgtcatgc agtgtcttgg gcaagtcctt tcacctctca ggacctctgt ctgtctccct 480  
 atagaacggg gaaggtggcc gggcatggta cctcacacca ccagtgtttt gggaggatga 540  
 ggcaagggga tctactggagg ctaggagttt gagaccagcc tcagcaacag agcaaattcg 600  
 tctcaattta aaaaaattaa aaaaaaaaaa aaaaaactcg ta 642

<210> 36  
 <211> 667  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (656)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (660)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (661)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (662)  
 <223> n equals a,t,g, or c

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&lt;400&gt; 36

|             |             |            |            |            |             |     |
|-------------|-------------|------------|------------|------------|-------------|-----|
| agagactttg  | gctgtgagcc  | ctcacctggg | actgatactg | gctctttgag | cttttttagtc | 60  |
| atgtgcttgt  | ctcttctctt  | acttagcttg | tcatgccttg | ctgtgccatg | gtggcctcat  | 120 |
| tcagtgactg  | ctcttcaact  | ctcaccagaa | agtgaccacc | attcctgact | tccaagatcc  | 180 |
| ttcttcaagg  | atatgatgga  | gagctcagag | ctttccagct | tcttagagta | gctcagcatt  | 240 |
| tccctcaaat  | ggggtcttcc  | cttttcccgt | agtgaactc  | atcagccact | gttctgcacc  | 300 |
| cttgcattgg  | ctctggagat  | cttttaacaa | gtattgttga | gcgtcaccct | tctgccaagg  | 360 |
| atatggatgt  | aatgggtatga | gcaaaaacaa | aaatactcgc | cagtggaggg | tatgatccag  | 420 |
| tgaggggagaa | agatgtcaat  | caaataatta | taccaataaa | aagtagcaac | catgactagt  | 480 |
| gctatgaaga  | ggagaaatac  | aatgcagtga | atgagaacct | agaatagggt | gattctakcc  | 540 |
| agttagggaa  | agatggaaga  | tttttataag | gaagtgactc | ttgggctgag | gtwcacggta  | 600 |
| aaaaaaaaaa  | aaaaaaactc  | gagggggggc | ccgtacccaa | tcgaccctga | tgatgnatgn  | 660 |
| nncatac     |             |            |            |            |             | 667 |

&lt;210&gt; 37

&lt;211&gt; 654

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 37

|             |            |            |            |             |            |     |
|-------------|------------|------------|------------|-------------|------------|-----|
| gccaacataa  | gcacacttaa | cctagacttc | aatatgcagt | agacgcataa  | ataaacaat  | 60  |
| caatgggtga  | atgcttatta | cttttttcct | taagcaactc | tcctcatatt  | ttgtttgctt | 120 |
| gttcttcatt  | ktctaggaga | atgtggatta | tattattcag | gagctccgaa  | gacccaaata | 180 |
| cactatatat  | ttcatttgta | agtatgttag | ttcacttttt | caaacatgta  | acaacatccc | 240 |
| agttagtgtg  | tttcattgag | cccttcatat | catcaataac | ttcatkgaat  | ctgtcactat | 300 |
| aaaagtctag  | tttatttaat | gtccttccaa | agtattaaaa | atcttttgac  | ctgccgggcg | 360 |
| cgggtggctca | cacctgtaat | cccagcactt | tggggggcca | gggcgggagg  | atcatctgag | 420 |
| gagtttgaga  | ccagcctgac | caacatgggt | aaaccccatc | tctactaaaa  | atacaagatt | 480 |
| agctgggcat  | ggtggcacat | gcctgtaatc | ccagctactt | gggaggctga  | ggtcaggaga | 540 |
| atcgcttgaa  | ccggagaggc | ggagattgca | gtgagccgag | attgcgtcca  | ttgcactcca | 600 |
| gcctgggcaa  | caaagcgaaa | ctccatctca | aaaaaaaaaa | aaaaaaaaact | cgta       | 654 |

&lt;210&gt; 38

&lt;211&gt; 731

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 38

|            |            |             |             |             |            |     |
|------------|------------|-------------|-------------|-------------|------------|-----|
| ggagagagag | agaatgtgga | gaaataggaa  | tgctttttaca | ccattggagg  | gagtgtaaat | 60  |
| tagttcgacc | attgtggaag | acagtatggc  | aattcctcaa  | ggatctagaa  | ccagaaatac | 120 |
| catttgaccc | agcaatccca | ttactgggta  | tatacccaaa  | ggattgtaaa  | tcattctact | 180 |
| acaaagacac | atgcacacgt | gtgttttattg | cagcattatt  | cacaatagca  | aagacttggg | 240 |
| aaccaaccca | aatgtccaac | aatgatagac  | tggattaaga  | aaatgtggca  | catatacacc | 300 |
| atggaatact | atgcagccat | aaaaaatgat  | gagttcacgt  | ctttggaggg  | acatggatga | 360 |
| aactgcaa   | catccttctc | agtaaactat  | cgcaaggaca  | aaaaaccaa   | caccgcatat | 420 |
| tctcactcat | aggtgggaat | tgaacaatga  | gaacacatgg  | acacaggaag  | gggaacatca | 480 |
| cactctgggg | actgtttgtg | agtgagggga  | ggggggagtg  | atagcttttag | gatataatac | 540 |
| taatgctaaa | tgacgagtta | atgggtgcag  | cacaccagca  | tggcacatgt  | atacatatgt | 600 |
| aactaacctg | cacattgtgc | acatgtacgc  | taawayttww  | wgtwtaataa  | taataaaata | 660 |
| aaataaaata | aaaaaagaaa | agatgtggct  | ccaggtttct  | ttgcttctaa  | aaaaaaaaaa | 720 |
| aaaaaactcg | a          |             |             |             |            | 731 |

&lt;210&gt; 39

&lt;211&gt; 378

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

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<400> 39  
 tcgacccacg cgtccgtaag attaaatcag ataatgcaca cggaaatagc ttacaaatgg 60  
 aagtgttggt gttcttccaa gtttgcaagg agaggcagcg gcagtgttct tgcagtgtgt 120  
 ctgagttcca cgtgacttat attggattat tatataaatc ctgtaattga tctgtcatac 180  
 ttttatgtcc attctttatg tcatatttct ctctcacata tacatacaca gttgtataca 240  
 tacttaaate tctatgtatt agcagtcctgc acaacatata ccttttaata tttatatattc 300  
 tgttcagttc tgttcatacc acagaatatg tgttataaac tcttttatta agcttaaaaa 360  
 aaaaaaaaaa gggcggcc 378

<210> 40  
 <211> 642  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (41)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (49)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (64)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (607)  
 <223> n equals a,t,g, or c

<220>  
 <221> SITE  
 <222> (621)  
 <223> n equals a,t,g, or c

<400> 40  
 taaaggggaa acaaaaaggc tgggaaggct tccaaccgcg ntttgcggn cggcttctag 60  
 gaantagtgg aatcccccg gctggcagga attcggcacg agaaaatgac ttcagacaaa 120  
 tatgatcaat ctctacagtc ccctgatgaa tttcacaggt tcccaccacc atcagttcta 180  
 cctattcatc tcatccatgc tcattgttct gcctctttcc tgttcctatg gatgccctgg 240  
 catgtttgtt tctttctttc tggcctccta tttccctccc ctacagacatc acttcagcat 300  
 ctgtgccttc tcaattccct taccctgggt gttaccattt cagcctatga gcatgccatt 360  
 aatttgccat ctttacaaaa ttctctcttg acttcacatc cctctgtagc tgccctctcc 420  
 cttctctcct cttctttaca aaaaaactcc ttaaaagaac tgttggctgg gcacagtgg 480  
 tcactcctat aatcccagca ctttcagaag ccaagggtggg aacatcactt gaggccaaga 540  
 ggtcgagacc agcccaggca acacagtggg acctcatcac tacaaaaaaa aaaaaaaaaa 600  
 actcganggg ggggcccggta nccaattggc ctaaagtggg tc 642

<210> 41  
 <211> 442  
 <212> DNA  
 <213> Homo sapiens

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&lt;400&gt; 41

|             |            |            |             |            |            |     |
|-------------|------------|------------|-------------|------------|------------|-----|
| ggcacgagat  | agaacccact | gcctcctgat | gaagtcctta  | ctgttcaccc | ttgcagtttt | 60  |
| tatgctcctg  | gcccaattgg | tctcaggtaa | ttggatatgtg | aaaaagtgtc | taaacgacgt | 120 |
| tggaatttgc  | aagaagaagt | gcaaacctga | agagatgcat  | gtaaagaatg | gttgggcaat | 180 |
| gtgcgggcaaa | caaagggact | gctgtgttcc | agctgacaga  | cgtgctaatt | atcctgtttt | 240 |
| ctgtgtccag  | acaaagacta | caagaatttc | aacagtaaca  | gcaacaacag | caacaacaac | 300 |
| tttgatgatg  | actactgctt | cgatgtcttc | gatggctcct  | acccccgttt | ctcccactgg | 360 |
| ttgaacattc  | cagcctctgt | ctcctgctct | aggatccccg  | actcattaaa | gcaaagaggc | 420 |
| ttaaaaaaaa  | aaaaaaaaaa | aa         |             |            |            | 442 |

&lt;210&gt; 42

&lt;211&gt; 1734

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (1714)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (1719)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (1723)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 42

|             |            |            |             |             |             |      |
|-------------|------------|------------|-------------|-------------|-------------|------|
| gcgggagttc  | ctccttgctc | tgcgccctac | tctttctggt  | gttagatcga  | gcwaccctct  | 60   |
| aaaagcagtt  | tagagtggta | aaaaaaaaaa | aaaacacacc  | aaacgctcgc  | agccacaaaa  | 120  |
| gggatgaaat  | ttcttctgga | catcctcctg | cttctcccgt  | tactgatcgt  | ctgctcccta  | 180  |
| gagtccttcg  | tgaagctttt | tattcctaag | aggagaaaat  | cagtcaccgg  | cgaaatcgtg  | 240  |
| ctgattacag  | gagctgggca | tggaattggg | agactgactg  | cctatgaatt  | tgctaaactt  | 300  |
| aaaagcaagc  | tggttctctg | ggatataaat | aagcatggac  | tggaggaaac  | agctgccaaa  | 360  |
| tgcaagggac  | tgggtgccaa | ggttcatacc | tttgtggtag  | actgcagcaa  | ccgagaagat  | 420  |
| atttacagct  | ctgcaaagaa | ggtgaaggca | gaaattggag  | atgttagtat  | tttagtaaat  | 480  |
| aatgctgggt  | tagtctatac | atcagatttg | tttgctacac  | aagatcctca  | gattgaaaag  | 540  |
| acttttgaag  | ttaatgtact | tgcacatttc | tggactacaa  | aggcatttct  | tcctgcaatg  | 600  |
| acgaagaata  | accatggcca | tattgtcact | gtggcttcgg  | cagctggaca  | tgtctcggtc  | 660  |
| cccttccttac | tggcttactg | ttcaagcaag | tttgctgctg  | ttggatttca  | taaaactttg  | 720  |
| acagatgaac  | tggctgcctt | acaaataact | ggagtcaaaa  | caacatgtct  | gtgtcctaata | 780  |
| ttcgtaaaca  | ctggcttcat | caaaaatcca | agtacaagtt  | tgggaccac   | tctggaacct  | 840  |
| gaggaagtgg  | taaacaggct | gatgcatggg | attctgactg  | agcagaagat  | gatttttatt  | 900  |
| ccatcttcta  | tagctttttt | aacaacattg | gaaaggatcc  | ttcctgagcg  | tttcttgcca  | 960  |
| gttttaaaac  | gaaaaatcag | tgttaagttt | gatgcagtta  | ttggatataa  | aatgaaagcg  | 1020 |
| caataagcac  | ctagttttct | gaaaactgat | ttaccagggt  | taggttgatg  | tcattctaata | 1080 |
| gtgccagaat  | tttaatgttt | gaacttctgt | tttttctaata | tatccccatt  | tcttcaatat  | 1140 |
| cattttttgag | gctttggcag | tcttcattta | ctaccacttg  | ttcttttagcc | aaaagctgat  | 1200 |
| tacatatgat  | ataaacagag | aaataccttt | agaggtgact  | ttaaggaaaa  | tgaagaaaaa  | 1260 |
| gaaccaaata  | gactttatta | aaataatttc | caagattatt  | tgtggctcac  | ctgaaggctt  | 1320 |
| tgcaaaaattt | gtaccataac | cgtttattta | acatatattt  | ttatttttga  | ttgcacttaa  | 1380 |
| attttgtata  | atttgtgttt | ctttttctgt | tctacataaa  | atcagaaact  | tcaagctctc  | 1440 |
| taaataaaat  | gaaggactat | atctagtggg | atttcacaaat | gaatatcatg  | aactctcaat  | 1500 |
| gggtaggttt  | catectaccc | attgccactc | tgtttcctga  | gagatacctc  | acattccaat  | 1560 |

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|            |            |            |             |             |            |      |
|------------|------------|------------|-------------|-------------|------------|------|
| gccaaacatt | tctgcacagg | gaagctagag | gtggatacac  | gtggttgcaag | tataaaagca | 1620 |
| tcactgggat | ttaaggagaa | ttgagagaat | gtacccacaa  | atggcagcaa  | taataaatgg | 1680 |
| atcacactta | aaaaaaaaaa | aagggggggg | cgcncctggng | ggnccaagct  | ttcg       | 1734 |

&lt;210&gt; 43

&lt;211&gt; 517

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 43

|            |            |            |             |            |             |     |
|------------|------------|------------|-------------|------------|-------------|-----|
| gcacgagtag | aagcatgttc | ttcacttcaa | gacccaggac  | cccatggaca | tcctgcctac  | 60  |
| agatcgcccc | actagccctg | cttcagtcac | tgggcatctg  | gcagcactcg | ataggtgcca  | 120 |
| tgtggtactg | cctgctctgt | gggtgcagct | gccatgccaa  | ggccgtcccc | tctgtcctct  | 180 |
| ccaggctctc | ctgtaacctc | ccagctctgc | tctcccatgc  | cctccctcaa | cccagccctt  | 240 |
| ccgtgggggg | tcctcctggc | tctccccggc | ctgtccctcc  | acacccccct | tcagaccctc  | 300 |
| acagctgcct | ccccacacca | gccttcaggg | gactctgcag  | cccacctctc | tgcccaactcc | 360 |
| ttcctcctag | attctcactg | aagcttcccc | cgctctccct  | agacccgcag | ctcatacccc  | 420 |
| cggctactta | ttagaatgcc | tggcaagctt | ggataaaaacc | ccatactcag | ccacacccag  | 480 |
| gcccattaaa | ccagacacct | agagttggcc | tggaagc     |            |             | 517 |

&lt;210&gt; 44

&lt;211&gt; 486

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 44

|            |            |             |            |             |            |     |
|------------|------------|-------------|------------|-------------|------------|-----|
| gcacgagagg | aaatataaat | gtgcatgttc  | tctacatgtg | gcttaagtaa  | ttacttaata | 60  |
| attaccacat | tcttgctcct | cagtatctct  | tcccttggtc | cccctacacc  | tagcaaatta | 120 |
| tttgactcat | ccagtcattg | gaaataactga | gttcgaatca | aaatgctgga  | gtgagaagga | 180 |
| atgttacacg | tagtgcagcc | tctccatgta  | gacatgaaaa | aactgaggtc  | cagaatttgt | 240 |
| gccttatcca | aagtcacagg | tttatgtggg  | gatactcttc | ctctcctaga  | gcctttaatt | 300 |
| ataattatta | ctattattat | catcaacagt  | ttagcttttc | tctgccatct  | gagaagatga | 360 |
| actaacgaat | ggctaaagtt | agaagtttag  | aatggaaata | aggtctgact  | cttgaaatcc | 420 |
| ttccagcatc | tttttcttta | gcaactctgt  | tccacaggca | gtggggagaaa | aaaaaaaaaa | 480 |
| aaaaaa     |            |             |            |             |            | 486 |

&lt;210&gt; 45

&lt;211&gt; 826

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 45

|             |            |             |             |            |            |     |
|-------------|------------|-------------|-------------|------------|------------|-----|
| ggcacagctg  | gatttagtga | cttgctttta  | gtgaatgtaa  | tgtgtcagac | aagacggagt | 60  |
| attactttca  | agaataagtt | acaaaaggag  | tcacgcattt  | atcctatgca | tctcctgttg | 120 |
| ctttcttgct  | tgctggctgg | caaagcaagc  | tgtcatgttg  | tgagaagccc | tgtggataat | 180 |
| cccttggtgg  | aaggaggtaa | tgcctatggc  | caacagccag  | taaggactgg | gccttgccaa | 240 |
| caaccacata  | agtgagcttg | aaagtgaatt  | gtccccattc  | aagccttgag | atgactgcag | 300 |
| cccggggccag | caacttgatt | gcagcgtttt  | gagagaccct  | acaccagaca | cacctggcta | 360 |
| atttctactt  | agacttttta | ctccacaaaa  | actaagagat  | aataaatctg | ttactttaaa | 420 |
| ctgctgagta  | ttgtttactt | tgccgtacgt  | aagcagtata  | gacagacttt | tacataaatc | 480 |
| ctgattccaa  | tgcttatcca | ttgtgcatta  | tgattaagtt  | atagcacaat | ctcagtttcc | 540 |
| tcattctctat | aaaaagtga  | aggaggcaga  | ggccagcaga  | tcacttgagg | tcaggggtgc | 600 |
| aagaccagcc  | tggccaacat | ggtgaaaccc  | cgtctctact  | aaaaatacaa | aaattagcca | 660 |
| ggcgtggtgg  | ctcatgcccg | taatcccagc  | tacttggggag | gctgaggcag | gggaattgct | 720 |
| tgaatccagg  | aggcggagg  | tgcagtgcgc  | tgagatcatk  | ccactgtact | tcagcctggc | 780 |
| cgacagagtg  | agactccatc | tcaaaaaaaaa | aaaaaaaaaaa | ctcgag     |            | 826 |

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<210> 46  
 <211> 694  
 <212> DNA  
 <213> Homo sapiens

<400> 46  
 gcttagattt ttttaagtcct ctcaaatttg tacactcaga actaagtata ttcaaagtga 60  
 gtctgatttg catagagaat gacattttct tcattcagac tttgttttta atgaaacctg 120  
 ataccagtga ttttggcagc tgtaacaggc tgtatgtctc tttgaaatag acttttttaa 180  
 aagcctagtt gtttctcact gtcctgtgcc attttgttgt tattgttgat ttttttggtc 240  
 taagcttatg acttttatatt tatccttatt aaatatgata cccttaaatt tagcctcctg 300  
 ttccagccac ttagaattac ttaaaaagtt gattatgtca tacagggtat ttacttttcc 360  
 catcccagat acctgtcatt tgcacatttg atcgctcctc tttccatatt ctcaccaag 420  
 tcatttataa aaaaatgtta caaaggacag gttgctctgg gccctgttg catactactg 480  
 agccttcttc cagatttata tgcactcttt aggtacagtt gtatagttgt ctgtgaagcc 540  
 acttaacttt taagttaaaa aattcatatt ttttcacctt gcacagtgat atcaagagag 600  
 actttatttt atgccttgct gaaatccaga tactatatatt atgcctctag catttgctgg 660  
 cctaaccata taaaaaaaaa aaaaaagggc ggcc 694

<210> 47  
 <211> 856  
 <212> DNA  
 <213> Homo sapiens

<400> 47  
 gaattattga aaataactga aagaaagcct agtggattgt tactaatgat ttaatgtatt 60  
 ttctttttaac ctgtaggttc tctcttcata tcttgccttg ccctcttttt ctttgttttc 120  
 ttctccttg cagtttattt gttgaagaaa ccagttatct ctgttttggt tcccatggta 180  
 tgaattttgc tgagtgcata tttacatgta gtttaatgtg ttgtttggtc cttcacattt 240  
 cctgtaaatt gacagttgaa tctacaagct tgatcacatt cacatttttt ttaggggtgg 300  
 ggggctggcg gtacacacag ttatttccat ttcatgatgt tagcagtcgt tgataatcat 360  
 gctgcatct attcattata tgttacaaaa tggatgata attttatcat ttattaactg 420  
 ttcttttaaa agtttatata atatatctct gtgtgtatat ataaagatta atgtgcagga 480  
 gttttgcttt cagtgaatgt ttgcattcca atcattgctt agaaagtfff ttgccccttg 540  
 ccgggcgcgg tggctcacgc ctgtaatccc agcacttttg gaggccgagg cgggcggatc 600  
 acgaggtcag gagatcgaga ccattccggc taaaacgggt aaaccccgct tctactaaaa 660  
 atacaaaaaa ttagccgggc gtagtggcgg gcgcctgtag tccagctac ttgggaggct 720  
 gaggcaggag aatggcgtga acccgggagg cggagcttgc agtgagccga ggtcccggca 780  
 ctgcactcca gcctgggcga cagagtcgag atccgtctca aaaaaaaaaa aaaaaaaaaa 840  
 aaaaatgacc ctcgta 856

<210> 48  
 <211> 1643  
 <212> DNA  
 <213> Homo sapiens

<400> 48  
 gaattcggca cgaggaaact gttagccctt aatatgcata acatttgttg ttccatagtg 60  
 cttctccttt gcttgtttga tctctgcatg gcagcagtg ggcagctcca catttgagc 120  
 ccatactcca aaatgcagag cactcttctc acagcacaca tcccagccc caaacaac 180  
 ctgaattttc aactctgccc attaaagtga atgtatccct gtaatttagt atgtacttat 240  
 tatggaaaat gtaacaaaag cagagaagtg tgatttcatt ctgtatcaca aattgaagca 300  
 aatcaacagc aaatacagca ggattcaggg aggccttagt tacaacgtac tttgtacctc 360  
 ctgccattta aattattttg ccactctggg cttctgaaaa cacaaggga gatacagccc 420  
 tccaactatg agccttgcat agagagacaa aagggccaga ggtcctggga tggaatacta 480

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|             |            |             |             |             |             |      |
|-------------|------------|-------------|-------------|-------------|-------------|------|
| gagccccac   | cttctcatgc | tttggaaacc  | tgccagagcr  | cttaccctgc  | tggaagatta  | 540  |
| atgaagactc  | cattctgtgt | ttcataacag  | tagcgttggt  | ttctccatca  | aaaacagagg  | 600  |
| gtcacagaaa  | tgtgctgaaa | agatgtggtc  | cagcaagggt  | ctgtagtccc  | acctcagtgc  | 660  |
| ctgtgggctg  | tgtttttcac | tgtaacaagc  | acttttggtta | actagaaaga  | agaaaggatt  | 720  |
| ctcaggatgt  | gttcaaagct | aagagagttt  | tcatttttaa  | aagaaacata  | catactcact  | 780  |
| ccatggcttt  | cctcctcctc | ctctcttttt  | tcttcttggt  | gggaagctgg  | atgcggggca  | 840  |
| tgcattcattc | tgtatggaca | aatgtgttat  | gtccacccat  | actcttggtga | caactcccca  | 900  |
| gcactgtcct  | gcaataccat | gctggccttg  | gtagtaaaac  | tccttggtat  | ctgtgagagt  | 960  |
| cctcttttttc | tatgccctag | actactttta  | accacttttc  | tctggaatga  | ctcccacatt  | 1020 |
| tgattgggta  | ttgaaagggt | aacagcaaaa  | tgatgattgt  | ggagatggat  | ctattagggtc | 1080 |
| tcatgttggt  | cccctgggtg | aaactatwtt  | caaaaaagcc  | ccaacaatgg  | gcctgtcmcc  | 1140 |
| ttgctagtca  | tccattctta | atgcctattt  | atcagccctc  | tgaggtcata  | taaaagttgc  | 1200 |
| caccttttga  | accaagtatt | tgtattttact | atgggaaagg  | tgtggactac  | agattcgtat  | 1260 |
| tatattattt  | taatggattt | taagtaattt  | ataagtatgc  | tgagtgtaaa  | tttttttttaa | 1320 |
| aaactgtatt  | ataaaaggac | atatacctgtg | aaatataaca  | ttttactggt  | taatagaata  | 1380 |
| attctataag  | aagaatgatt | tatctcacc   | acggaactga  | ttacattccg  | gatgcaatca  | 1440 |
| ataggcactt  | tgtaatttcc | tttttggttt  | tttttctttg  | ctgggggggtt | gaggggtaac  | 1500 |
| aagataccat  | ctgtataaag | tgtagtttgt  | gtcactcaaa  | atatgcactg  | tatggctaca  | 1560 |
| caaaagcagc  | ttgatgaaca | aatcacccca  | tggtctatta  | aagaacaaag  | cttcagaaaa  | 1620 |
| aaaaaaaaa   | aaaaaaactc | gta         |             |             |             | 1643 |

&lt;210&gt; 49

&lt;211&gt; 709

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 49

|            |            |            |            |             |              |     |
|------------|------------|------------|------------|-------------|--------------|-----|
| gaagaaaagg | aagcagtaac | tacgaatagt | gcttatacat | gctgggggtct | gtttgcaggg   | 60  |
| cccttcatgt | attaacctgt | ttactgctct | ccagtaaccc | tgtgggtgcag | gcaccatggt   | 120 |
| ccctcaatga | ggaaagtaaa | tcacaagggg | tgacatgtgc | tgtgctccca  | gctgggggatt  | 180 |
| tgaacccagg | tagtctagta | tcagcatgtg | tgcccttaac | cgtaacccta  | taacggtttag  | 240 |
| aagagcttca | gggaccttcg | tcaggacata | catcttgtaa | ataattgggt  | tgggagtaaa   | 300 |
| atgcatgctg | agtcaccagt | gaatcttctg | tgttctcatg | ttactttggg  | catatcttca   | 360 |
| tcaaaacatt | gcagcagtct | cttacaagtt | ttgtttggtt | cctagtcatg  | aggactggga   | 420 |
| ttctgctttt | catgtttgat | tactcagagt | acatagtttg | gcatatttta  | ggcacggtaa   | 480 |
| atattgatcc | aatctgattc | ctagttcagt | ggttttatgc | tgtaacagct  | ttttcctcct   | 540 |
| cctttacgtt | gtcaagccac | tttctcatgg | tttcatcttt | tccttcttgc  | tttgtttctg   | 600 |
| gagcacacat | tttttacttt | tttttgattg | ccttctattt | ggttttcttt  | aagggtgggtgc | 660 |
| atttaaaaag | cagccccctc | ttcttcaaaa | aaaaaaaaaa | agggcgggcc  |              | 709 |

&lt;210&gt; 50

&lt;211&gt; 541

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 50

|             |             |            |             |            |             |     |
|-------------|-------------|------------|-------------|------------|-------------|-----|
| tgcaggtaac  | cgttccggaa  | ttcccggggt | cgacccaagg  | ggtcccgtga | tgccttggtca | 60  |
| tggtcttctt  | gcacagggcc  | tcagcctggc | acctctgccca | ccgtgggctc | tctgttggtgt | 120 |
| gggggtgtcc  | cgtgcattgc  | aggacatcca | gcagcatccc  | cggcctcctg | ctccgtgccca | 180 |
| gtagcgccgc  | accccgccgt  | cgtgacagcc | caggtctccc  | ggtgtgcaga | atgcccgtctg | 240 |
| gtcatgctga  | gaggtacagg  | ggtgctgccc | ccagggtttg  | aacgctgtct | aactcccacc  | 300 |
| tctgggtgtgt | ctctcccctg  | tgtgtagcgt | ggagtactctg | gatgagtgtg | gtgacctccc  | 360 |
| tgtgtccagc  | tgccctgggc  | tgcaagcagg | tccctcctgc  | agccctccag | gccaccctta  | 420 |
| agcagagctg  | gaccagcctg  | gccaacatgg | tgaaccccca  | tctctactaa | aaatacaaaa  | 480 |
| attagccaag  | cgtgggtggaa | ctctgtctca | aaaaaaaaaa  | aaaaaaaaaa | aaagggcggc  | 540 |
| c           |             |            |             |            |             | 541 |

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<210> 51  
 <211> 720  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (20)  
 <223> n equals a,t,g, or c

<400> 51  
 ccacgcgtcc gctccgcggn cgcctcgggc ggaacctgga gataatgggc agcacctggg 60  
 ggagccctgg ctgggtgcgg ctgcctcttt gcctgacggg cttagtgtct tcgctctacg 120  
 cgctgcacgt gaaggcggcg cgcgcccggg accgggatta ccgcgcgctc tgcgacgtgg 180  
 gcaccgccat cagctgttcg cgcgtcttct cctccagggt gcctgsggac acgctgggccc 240  
 tctgtmctga tgctgctgag ctccctgggt tctctcgctg gttctgtcta cctggsctgg 300  
 atcctgttct tcgtgctcta tgawtttctg cattgtttgt aatcaccacc tatgctatca 360  
 acgtgacctg atgtggctca gtttccggaa ggtccaagaa ccccagggca aggctaagag 420  
 gcactgagcc ctcaacccaa gccaggctga cctcatctgc tttgcttttg catgtgagcc 480  
 ttgcctaagg gggcatatct gggtccttag aaggccctag atgtggggct tctagattac 540  
 cccctcctcc tgccataccc gcacatgaca atggaccaaa tgtgccacac gctcgctctt 600  
 ttttacaccc agtgccctctg actctgtccc catgggctgg tctccaaagc tctttccatt 660  
 gccacgggag ggaaggttct gagcaataaa gtttcttaga tcaaaaaaaaa aaaaaaaaaa 720

<210> 52  
 <211> 979  
 <212> DNA  
 <213> Homo sapiens

<400> 52  
 ggcacgagta caaagccaaa atgtgatgga acatcccatg atgcagacaa ttcatttttac 60  
 tccagctgta ctccactttc ttttcctgtg gtcttccacg tggagtgtct ctatctgagt 120  
 cccctgtcca gcccttttta agggatatct gttgagcagg atttgaaatg tttcacattt 180  
 tgcttaatcc tccacctcca ccctgatgtc ctgcagtaaa tattcacgca catttcagct 240  
 tgacacactc taggcaagca gctcacccca gtgtgggcaa cagttctttt tttgcttcac 300  
 tagctaacca gctggatgac tcatctctgc ctttagattt tccagggtga tgttggacat 360  
 ggcacattct gctcaccaaa ctccctgcgt agcatagcaa gaccagagt ttccttgaca 420  
 ccctctctca catgcacaag gggagaggca gctcctctct gctcctttct gagaggcatg 480  
 aatcggtgaa aacaacagca tagcccatcc cagcaatgtc ctcaaaaat tccaactgcc 540  
 cattctttac ggtgagtttt ctaaacaggt ttcctccatg acaattttct ctacttgctg 600  
 tcttaatagg agatttttgt tccccccac ctgtattttt aatggacaca tatacctttc 660  
 tgataaaaat atgtaaaata ttctgttcgt ttttaaaatg tcatattcaa gtctgtggcc 720  
 atcttttggt cttaatatcc acgtctataa aatgggctag aaaacagcat cattgctcaa 780  
 ggtgtaaagc tattgggtta tctagctgaa aagggtgtgca aggactattg aaaaaagaaa 840  
 tgttcattca gaaacatggg ctcttttatt ttgtacatat cttacagcat aggatttttt 900  
 cccctgggtg atatgccaaa gatcagcctc agctgaaaaa aaaaaacaca tatgcccta 960  
 acttactgct tgcttccaa 979

<210> 53  
 <211> 380  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (6)

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&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (7)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (11)

&lt;223&gt; n equals a,t,g, or c

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (376)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 53

|            |             |            |            |            |            |     |
|------------|-------------|------------|------------|------------|------------|-----|
| ggttcnnacc | ntagtgggttc | caaagaattc | ggcacgaggt | gtatgtgcat | actccactca | 60  |
| cattgtcttt | tattttttaa  | tttaaaccag | gtagtctgct | ttcatgggaa | tttttctctc | 120 |
| tcctgttttt | gccaaaccca  | aataagttat | attaacatat | tttctgggaa | aaatgggtgt | 180 |
| gattcaaagt | tagaacattt  | gttattttac | ttcagaaagt | ctttattgaa | catctttctt | 240 |
| gtgtaggacc | ctgtgtagaa  | aatgcaaaga | gaaatcatac | ttgtcctaca | ggaaattata | 300 |
| atcttgtcgg | gaagataaga  | tgcagactga | tataattcaa | ggtaaaaaaa | aaaaaaaaaa | 360 |
| actcgagagt | tcttcnagag  |            |            |            |            | 380 |

&lt;210&gt; 54

&lt;211&gt; 2023

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 54

|             |             |             |             |            |             |      |
|-------------|-------------|-------------|-------------|------------|-------------|------|
| cccacgcgtc  | cgcccacgcg  | tccgaaaaaa  | aaaaaaaaaa  | aaaaaaattg | gcagactcca  | 60   |
| gagcccacac  | atattgcactc | tagactctac  | tgccttcctc  | atgaagaatt | ttaggacccc  | 120  |
| cgtctggctg  | tgttggttgc  | tgggggttcaa | attctgggtg  | aaagatggcg | gctgcagtgg  | 180  |
| gaccactatt  | atctctgtcc  | tcacagagtt  | caagctgaag  | aagatgtgga | aaagtcccaa  | 240  |
| tggaaactatc | cggaacatcc  | tggggggggac | tgtcttccgg  | gagcccatca | tctgcaaaaa  | 300  |
| catcccacgc  | ctagtccctg  | gctggaccaa  | gcccacacc   | attggcaggc | acgcccattg  | 360  |
| csaccagtac  | aaggccacag  | actttgtggc  | agaccggggc  | ggcactttca | aaatgggtctt | 420  |
| caccccaaaa  | gatggcagtg  | gtgtcaagga  | gtgggaagtg  | tacaacttcc | ccgcagcggc  | 480  |
| gtgggcatgg  | gcatgtacaa  | caccgacgag  | tccatctcag  | gttttgcgca | cagctgcttc  | 540  |
| cagtatgcc   | tccagaagaa  | atggccgctg  | tacatgagca  | ccaagaacac | catactgaaa  | 600  |
| gcctacgatg  | ggcgtttcaa  | ggacatcttc  | caggagatct  | ttgacaagca | ctataagacc  | 660  |
| gacttcgaca  | agaataagat  | ctggtatgag  | caccggctca  | ttgatgacat | ggtggctcag  | 720  |
| gtcctcaagt  | cttcgggtgg  | ctttgtgtgg  | gcctgcaaga  | actatgacgg | agatgtgcag  | 780  |
| tcagacatcc  | tggcccaggg  | ctttggctcc  | cttggcctga  | tgacgtccgt | cctggtctgc  | 840  |
| cctgatggga  | agacgattga  | ggctgaggcc  | gctcatggga  | ccgtcaccgg | ccactatcgg  | 900  |
| gagcaccaga  | agggcccgcc  | caccagcacc  | aaccccatcg  | ccagcatctt | tgcctggaca  | 960  |
| cgtggcctgg  | agcaccgggg  | gaagctggat  | gggaaccaag  | acctcatcag | gtttgcccag  | 1020 |
| atgctggaga  | aggtgtgcgt  | ggagacgggtg | gagagtggag  | ccatgaccaa | ggacctggcg  | 1080 |
| ggctgcattc  | acggcctcag  | caatgtgaag  | ctgaacgagc  | acttcctgaa | caccacggac  | 1140 |
| ttcctcgaca  | ccatcaagag  | caacctggac  | agagccctgg  | gcaggcagta | gggggaggcg  | 1200 |
| ccacccatgg  | ctgcagtgga  | ggggccaggg  | ctgagccggc  | gggtcctcct | gagcgcggca  | 1260 |
| gagggtgagc  | ctcacagccc  | ctctctggag  | gcctttctag  | gggatgtttt | tttataagcc  | 1320 |
| agatgttttt  | aaaagcatat  | gtgtgtttcc  | cctcatgggtg | acgtgaggca | ggagcagtgc  | 1380 |
| gttttacctc  | agccagtcag  | tatgttttgc  | atactgtaat  | ttatatgtcc | cttggaaacac | 1440 |
| atggtgccat  | atttagctac  | taaaaagctc  | ttcacaaaat  | tgtctgctgt | gtttgtccct  | 1500 |
| gaggggagga  | ggtagtggga  | ccctgaggca  | gaggccctgc  | tagagctggc | aggttcccct  | 1560 |

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|            |            |            |             |            |            |      |
|------------|------------|------------|-------------|------------|------------|------|
| ggggcagacc | agagcacctc | aggaaggggc | tgccacggca  | gggaagggac | caggcagccc | 1620 |
| tgggagcccg | cattccacag | gggccactg  | cggagtctc   | ggacactcag | ggcacargcc | 1680 |
| tgtgggttcc | ctggaatfff | ctagcatgat | ccagtfffctg | tgtccagttc | tccattctga | 1740 |
| gagtcaatca | gttcctgata | ggttgtcatt | gattfftttc  | ttcgttggtt | ttaaccttct | 1800 |
| aaacatctcc | aggccactff | cttagcctff | ttctaggtac  | taaaaagagg | tcctacccac | 1860 |
| acctgcctca | cacttctcct | ttccaaggct | gcctgagttt  | ggaggggctt | gggtgtgtgt | 1920 |
| gaacaagggc | cctgcattgt | ctaggcctgc | agttcccagg  | cttgggttca | ctttcaccat | 1980 |
| gcattggcaa | aactagaaaa | gtaagcttgt | gacaaattgt  | tct        |            | 2023 |

&lt;210&gt; 55

&lt;211&gt; 885

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (7)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 55

|             |             |             |             |             |             |     |
|-------------|-------------|-------------|-------------|-------------|-------------|-----|
| gggtcgnacc  | cacgcgtccg  | aattttactff | gctactfftaa | tgattaattg  | gcaatgatca  | 60  |
| atgcacaacc  | ttttactctc  | atgtgttatt  | ttcaattfftc | cccttggtgtt | tattgtagca  | 120 |
| agaactccct  | accttccttc  | cttattatct  | atfftgtaatt | tgggaagcccc | agtatacctt  | 180 |
| agaattgatc  | caggatggcc  | tcattttatgt | atggcttgag  | agttffttff  | aacagaaaaa  | 240 |
| acattgattc  | tctaaaaaat  | aagagttffat | atcatagttt  | ctcaatattt  | tcctatctac  | 300 |
| aaggacaaaa  | ttttfftttca | gaagcaaaac  | aactagcata  | ctaactffct  | gtttatgcag  | 360 |
| tagtaaatat  | tggttgatta  | ctgcacaatt  | tccaggaawt  | atgcagagat  | aactacagag  | 420 |
| atgagtagaa  | taaaactcat  | tttagagctt  | caaactctag  | tcagagatgt  | agttacaaac  | 480 |
| aaataatcca  | gtgtagtttag | ttaggtactc  | tggcagaagt  | gtaatgaaag  | tagtatgaaa  | 540 |
| aaacagagaa  | agaaatcgaa  | ggaacacatg  | gacaaagtga  | tattaaaaag  | aatgaggccg  | 600 |
| ggtgcagtgg  | ctcacgcctg  | tgatcccagc  | actfftgagg  | gacctgaggt  | caggagtffca | 660 |
| agttccagctt | ggccaacatg  | gtgaaagctc  | atctfftacta | aaaatacaaa  | aatttagccag | 720 |
| atgtgggtggc | aagtgcctgt  | aaccccagct  | actcctgagg  | ctgaggggca  | gcagaattgc  | 780 |
| ttgaacccag  | gaggtggagg  | ttgcagtgag  | ccgagattgc  | gccactgcac  | tccagcctgg  | 840 |
| ctgacaagag  | caaaacactg  | tcaaaaaaaa  | aaaaaaaggg  | cggcc       |             | 885 |

&lt;210&gt; 56

&lt;211&gt; 1106

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 56

|            |            |             |             |            |             |     |
|------------|------------|-------------|-------------|------------|-------------|-----|
| ggcacgagct | gagaggtgtg | ccctgacatg  | ggtccagaaa  | catggttgac | ttgatattgc  | 60  |
| ttctcttcca | cagtgcagtt | ggctgtaacc  | tgaaaagtag  | aggggccctt | cagacccttc  | 120 |
| atgactctat | gactffgtcc | tctffctatt  | cctcgaaaac  | ttctctcatt | tgagccattc  | 180 |
| ctgtcctggg | gagagatatg | caagttgctg  | cttctcctct  | ttgtaccaag | tacgggtggc  | 240 |
| ccattffggg | taaagccatg | agccccctgc  | aagtctgacc  | atccacgcct | acattffaccc | 300 |
| caagctcctc | ctffgtggcc | aagaaccatc  | actffctffg  | accccaccct | ttctcttccc  | 360 |
| ttccagctgc | attggtaggt | atctffttgga | gtctfftgctt | tgggagtggt | tgcacttgcc  | 420 |
| acagtgtgat | gtgggcacta | ggggccttgt  | ggtcctgctg  | ggcttctff  | ctcaccaagg  | 480 |
| cttccctctt | gtccccatc  | taaggggggg  | ttctgattca  | cgctcctgcc | ttcaacaaaa  | 540 |
| tgcaggagac | tcacagatct | ctcttgaaat  | caaagccata  | atgtccagac | tgccacctff  | 600 |
| gccagttffg | cttcagtgtg | atattaggga  | aaagctagaa  | cactggtttc | agagccacac  | 660 |
| agaccaggtt | gtaatctctg | ctgtattffgt | tgtatgacct  | ctgccaagtc | atffccctgc  | 720 |
| ttggttffct | catctgtgaa | acatgaaaaa  | tattattffag | ctcataaatg | gtffttgagtg | 780 |
| ctgggggtga | gtgtgaaatg | tttggcctcg  | gccaggtgca  | gtggcctgta | atcccagcac  | 840 |
| tttggggagg | cgaggcgggc | agatcacctg  | aggttggggg  | ttcgagacca | gcctgaccaa  | 900 |

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|            |             |            |            |            |            |      |
|------------|-------------|------------|------------|------------|------------|------|
| catggagaaa | cctgtgtctct | actaaaaatg | caaaattagt | cgggcgtggg | ggcacatgcc | 960  |
| cataatccca | ctactcggga  | ggctggggca | ggacaatcgc | ttgaaccag  | gaggtggagg | 1020 |
| ttgcagtgag | ccaagatcac  | gccattgcac | tccagcctgg | gcaacaagag | caaaactcta | 1080 |
| tcttaagaaa | aaaaaaaaaa  | aaaaaa     |            |            |            | 1106 |

&lt;210&gt; 57

&lt;211&gt; 764

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 57

|             |            |             |             |             |             |     |
|-------------|------------|-------------|-------------|-------------|-------------|-----|
| ggagctgcag  | gatcttcaca | gttccccag   | ccccttctctg | atgttcacac  | atgtcacatg  | 60  |
| ttctgcccat  | ctcagatgga | tctggagcct  | ttctgggttct | gtttaatggc  | agccctatctt | 120 |
| atctttttatt | gcctccttct | ctatttttttg | cacatattca  | aagatggggg  | gagtaggtta  | 180 |
| ccctccactg  | aatacaata  | caaaagcttg  | agtgtactgg  | tgttctgcaa  | gaagcatgac  | 240 |
| tgttctttct  | gaactgagct | tacttccctg  | aacaccacgc  | agggggcatc  | tgcacctgaa  | 300 |
| actgcagggc  | attcttgagg | tcccacgttt  | ggattgacag  | tgccaacctg  | ggaggccagt  | 360 |
| ccctttttcca | tcatcacctt | ttccttcttg  | tcagatatgt  | cataacccca  | aacaggcccc  | 420 |
| catgatttga  | taaattgcta | ataatgttca  | tgccagggtat | ttgggtgactt | aaaagtgttc  | 480 |
| acgggctggg  | cgcagtgtct | catgcctata  | atcccagcac  | tttgagaggc  | tgagacgggt  | 540 |
| ggatcatctg  | aggccaggag | tatgagacca  | gcctggccaa  | caaggcaaaa  | ccccatctct  | 600 |
| actaaaaata  | caaaaattag | ccgggcatgg  | tggcgggcgc  | ctgtaattca  | gctactcggg  | 660 |
| aggcagaggc  | ggaggttgca | gtgagccgag  | atagcgycgc  | tgcactccag  | cctgggcaac  | 720 |
| agagagactc  | tgccataaaa | aaaaaaaaaa  | aaaaaagggc  | ggcc        |             | 764 |

&lt;210&gt; 58

&lt;211&gt; 738

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 58

|            |             |             |             |             |            |     |
|------------|-------------|-------------|-------------|-------------|------------|-----|
| ggcacgaggt | aagaattaca  | tcttgcagca  | attagccttt  | gccacaatgg  | tgtattacaa | 60  |
| acaacttcaa | aattcagtga  | ctgaaaaaaaa | ttattttgtt  | tctccagatg  | tttgagtcag | 120 |
| ctgggcaggt | tttgcttcac  | attgcaggct  | tgcagggtctg | ggctcttctc  | acatgtcttt | 180 |
| catccttttt | ggtcccattg  | agttattcag  | ggtacattcc  | tctcatgggtg | atggcagagg | 240 |
| cacaccaaat | ggcaagccca  | accacgcaag  | cactttttcaa | actgcttttt  | gcatcacatc | 300 |
| tgctaacatt | ctattagcca  | aagcaaaaca  | catagtccag  | cccaaaatta  | agaggctgag | 360 |
| aaggacattc | catcttttagt | tgcagaaaaat | gcaaaaactac | caggcataga  | atgtagacac | 420 |
| aggaaataat | aaagagtcag  | ataaaataat  | tcaacctctc  | agaccccata  | aagatattga | 480 |
| ttgaaatgtg | tttgaaactg  | agggaaggat  | ttgggggttg  | cagttattct  | cagtggacca | 540 |
| gagaaagaag | agatttgaga  | gttctctgag  | cagcaggcta  | tgagacagag  | cacattaaac | 600 |
| agggagggct | cttgaaatca  | atacctgtga  | aaaggagtga  | aagggaagcaa | aactgggcaa | 660 |
| agggaaaagt | tgagctttga  | tgtgggtctca | gcaaagggtt  | caggcaactc  | catgggaagt | 720 |
| gttggaactt | gtggccct    |             |             |             |            | 738 |

&lt;210&gt; 59

&lt;211&gt; 441

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 59

|            |             |            |            |            |            |     |
|------------|-------------|------------|------------|------------|------------|-----|
| gggggcatgt | gattttttagt | atggacttaa | gagctccatg | gcttgggttc | aaattccact | 60  |
| tctgccgttc | actagctgtg  | tgaccttggg | caagtacctt | aacctctctg | tgccacattt | 120 |
| ttctcatttg | cacaaggaga  | ataatagttt | actacttcat | agggttggtg | tgagtctgac | 180 |
| aatgagtcac | tatgtgtaaa  | atgtttttca | cagtgcctga | cacagaatgc | tatagtagat | 240 |
| caacatttgc | tgtaactatt  | actatttgtt | attagtgcac | ttgctgtatt | ttgtttaatg | 300 |

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|            |            |            |            |             |            |     |
|------------|------------|------------|------------|-------------|------------|-----|
| agaggaagtt | taataacact | aggattaaaa | cattccttct | ggtcattgtct | tcctgacaag | 360 |
| taaaaaagtt | gctacttggt | ttccttgggt | aatcattgaa | aaaaaaaaaa  | caaaaaacaa | 420 |
| aaaaaaaaaa | aaagggcggc | c          |            |             |            | 441 |

&lt;210&gt; 60

&lt;211&gt; 784

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (56)

&lt;223&gt; n equals a,t,g, or c

&lt;400&gt; 60

|            |            |            |             |             |             |     |
|------------|------------|------------|-------------|-------------|-------------|-----|
| gatttttagt | actgctatac | tcagttgcct | gtctgtagta  | cccctgtacg  | tagtantctt  | 60  |
| ttcttacaac | tctgttccca | gtacccttat | gttttagtccc | ttgtttctcat | gttctcacta  | 120 |
| ccccataact | taatatactt | tgttctcagt | atccttggtg  | ttagtaccct  | gttctcacta  | 180 |
| ccccttttct | tagtaccctt | gaggggggaa | aaaaaggatg  | ataatggggg  | ataagtctca  | 240 |
| aaaaactttt | ggattgtttg | atttgamctg | rgtcaaagg   | aaaaccagt   | ttctggagtt  | 300 |
| cgacttctgg | gtgcaaattc | ctggtgcac  | attactggcc  | ttgtggctga  | atagggttatt | 360 |
| aaactctgta | aaatgggcat | taaaaycgtg | tgtcattcat  | agtgttgctg  | tgaataawgtg | 420 |
| agccattcca | tattgaggg  | tcacacagt  | tccagcaact  | ggctaaagtt  | tgcaaaccctt | 480 |
| accattatt  | attgtcattg | ttagtggtat | actttgaggc  | tgtcacaaat  | aagcagatat  | 540 |
| ttcttcttgt | gagagctata | taatccctta | gtgtagagaa  | aaatttaatt  | ttgtttacaag | 600 |
| tgatccaagc | caggtatgg  | ggcaagtgc  | tgtataccca  | gctgtacttg  | ggaggggtgaa | 660 |
| gtgggaagat | tgcttgagac | caggggttcg | aggctgccgt  | gagccttggt  | tgcactactg  | 720 |
| cattccagcc | tggatgacat | agcaagaccc | tgtctcctta  | aaaaaaaaaa  | aaaaaaaaact | 780 |
| cgta       |            |            |             |             |             | 784 |

&lt;210&gt; 61

&lt;211&gt; 539

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 61

|            |            |            |            |             |             |     |
|------------|------------|------------|------------|-------------|-------------|-----|
| gacctcctac | atztatgagc | aaagctcgg  | ttcccttttt | gctttccctc  | cgctgggttct | 60  |
| ctgcttagaa | cactcacagg | catccttgg  | aaccagactc | cctgtgggtca | caccatcctc  | 120 |
| actcccctcc | tcctgcaagg | aataggatgt | ggtttcctgg | agcttggata  | gaaagaacag  | 180 |
| gaagggcggt | ttcatatgcc | cggcattaag | gctttgaagt | tcttaaaacc  | ccttctaggg  | 240 |
| tgaaaccggt | agggaatttc | aacgacgtac | tagaattatt | gaacaaatgc  | aatgggagga  | 300 |
| tcttgccctg | atcctgaagc | aacaaataca | ctttaaaatg | acgttttaga  | gggaaatggg  | 360 |
| ggaaattgaa | tatggactgg | gaactaaatg | attgaaagta | gttttggtta  | tcttggttgg  | 420 |
| ataatatatt | gtagttctgt | ttttaaactg | ctgtcagtgt | ttatggccag  | agtctaaatg  | 480 |
| tttacgagtt | gctttgcttt | taaaatattc | caacaaaaaa | aaaaaaaaag  | ggcggcgct   | 539 |

&lt;210&gt; 62

&lt;211&gt; 604

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 62

|            |            |            |            |             |            |     |
|------------|------------|------------|------------|-------------|------------|-----|
| ggtttgggga | gtcgggtcga | cagkacttgt | ttatggattg | gatgtggaga  | gtgacgagga | 60  |
| gaggagagtt | aacttcatgt | ctgtctggag | ccacgtacct | gtttttttat  | ggtgtctcaa | 120 |
| caccccatgc | acttgccacc | tacttgagaa | aactactaga | ccttaaaagt  | gagagtttta | 180 |
| aacaaatgaa | tgtttgtttt | gttttacatt | taccgtggga | aatttttaaat | atatacagaa | 240 |

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|            |            |            |            |             |            |     |
|------------|------------|------------|------------|-------------|------------|-----|
| atagagtatc | atagcaagcc | tgcattcatc | tgtcacccag | ctccaaaaat  | tataaactca | 300 |
| tagctaattc | tgtttcactt | ttactccac  | ttctttccct | ccccactcca  | ctggatcatt | 360 |
| ttgaagcaaa | ttccaaatgt | cacgtcgttt | cattagcttc | tattttctaaa | taaggtgtct | 420 |
| cttaaacata | accagaatac | ccccttttga | aaaggaaggc | tgggtgaggt  | gactcattcc | 480 |
| tctaattcca | gcactttagg | aagccaaggt | caggatgatc | gcttgaggcc  | aggagttcaa | 540 |
| ggccagactg | agcagcatag | tgagatccag | tcttaaaaaa | aaaaaaaaaa  | aaaaaagggc | 600 |
| ggcc       |            |            |            |             |            | 604 |

&lt;210&gt; 63

&lt;211&gt; 752

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 63

|             |             |            |             |             |             |     |
|-------------|-------------|------------|-------------|-------------|-------------|-----|
| attgaaggat  | gatgttaatt  | ttgtattata | gtgttatata  | tgtaactacc  | tgtccctaaa  | 60  |
| tataacactg  | tatgtatcat  | ttcaacatac | ttgccagctc  | tactgattat  | gaatattaat  | 120 |
| cacagataag  | gaaattgtaa  | aatatccttt | tctcaaaaagg | cagacacatt  | tatagccctg  | 180 |
| tgatcctgac  | tgacacagta  | tgaagagctt | tcctagtaca  | tattttcaaaa | gttctagctt  | 240 |
| ccagaatacc  | aaataccaga  | ctggtgttat | aagtgttctg  | atttcttatg  | aaatagagta  | 300 |
| tgctgctttc  | tatcattttgt | cttgtaagat | cactcttcca  | tcattctgtga | gcagraattg  | 360 |
| tttcattttct | gaayccttag  | tggcctcaca | gtgcctggac  | acataaaggt  | actcaatggt  | 420 |
| tgctgaagga  | aaaataagtt  | acagtattag | ccagggtgtgg | tggctcacac  | tgtaatccca  | 480 |
| gcatttgagg  | ggccraggcg  | ggcggatcac | gagktcagga  | gattgagacc  | atcctggcta  | 540 |
| atgcggtgaa  | accccgctct  | tactgaagat | acaaaaaat   | tagcctggcg  | tgggtggcggg | 600 |
| tgccctgtagt | cccagctact  | tgggaggctg | aagcggggaga | atggcatgaa  | cccaggaggc  | 660 |
| agagcttgca  | gtgagtcgag  | attacgccgc | tgcaatccag  | cctggggcgac | agagtgaaga  | 720 |
| ctctgtctca  | aaaaaaaaaa  | aaaaaaactc | ga          |             |             | 752 |

&lt;210&gt; 64

&lt;211&gt; 769

&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

&lt;400&gt; 64

|             |             |             |             |             |            |     |
|-------------|-------------|-------------|-------------|-------------|------------|-----|
| gcacgagaat  | ttttgtactg  | ctatactcag  | ttgcctgtct  | gtagtaccce  | tgtacgtatc | 60  |
| ttttcttaca  | actctgttcc  | cagtaccctt  | atgttttagtc | ccttggttctc | atgttctcac | 120 |
| tacccaata   | cttaaaaactt | gttctcagta  | tccttgttgt  | tagtaccctg  | ttctcactcc | 180 |
| cctttttctta | gtaccctctga | gggggggaaaa | aaggtgataa  | tgggggtataa | gtccaaaaac | 240 |
| ttttggattg  | tttgatttga  | actgagtcaa  | agtaaaccag  | tgttctggag  | ttcgacttcg | 300 |
| ggtgcaaata  | cctgttgcat  | catttactgg  | ccttggtggct | gaatagggtta | ttaaactctg | 360 |
| taaaatgggc  | attaaaacgt  | gtgtcattca  | tagtgttgct  | gtgaatatgt  | gagccattcc | 420 |
| atattgaggg  | ttcacacagt  | gtccagcaac  | tggctaaagt  | ttgcaaacct  | taccatttat | 480 |
| tattgtcatt  | gttagtggtta | tactttgagg  | ctgtcacaaa  | taagcagata  | tttcttcttg | 540 |
| tgagagctat  | ataatccctt  | agtgtagaga  | aaaatttaata | tttgttacaa  | gtgatccaag | 600 |
| ccaggatatgg | tggcaagtgc  | ctgtataccc  | agctgtactt  | gggaggggtga | agtgggaaga | 660 |
| ttgcttgaga  | ccaggggttc  | gaggctgccg  | tgagccttgt  | ttgcatcact  | gcattccagc | 720 |
| ctggatgaca  | tagcaagacc  | ctgtctcctt  | aaaaaaaaaa  | aaaaaaaaaa  |            | 769 |

&lt;210&gt; 65

&lt;211&gt; 74

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (74)

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&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 65

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Ser | Cys | Phe | Gln | Leu | Leu | Leu | Thr | Tyr | Arg | Ala | Trp | Phe | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Ser | Ser | Leu | Ala | Glu | Gln | Met | Cys | Arg | Thr | Gly | Leu | Lys | Ser | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Ser | Pro | Thr | Ser | Glu | Gln | Thr | Glu | Arg | Cys | Ala | Arg | Ser | Trp | Cys |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Val | His | His | Cys | Phe | Pro | Ser | Gln | Thr | Phe | Leu | Phe | His | Ala | Cys |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Asp | Lys | Pro | Leu | Ala | Arg | Pro | Xaa |
| 65  |     |     |     |     | 70  |     |     |     |     |

&lt;210&gt; 66

&lt;211&gt; 60

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (15)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (60)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 66

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asn | Cys | Asp | Val | Leu | Trp | Cys | Val | Leu | Leu | Leu | Val | Cys | Xaa | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Phe | Ser | Ala | Val | Gly | His | Gly | Leu | Trp | Ile | Trp | Arg | Tyr | Gln | Glu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Lys | Ser | Leu | Phe | Tyr | Val | Pro | Lys | Ser | Asp | Gly | Ser | Ser | Leu | Ser |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Val | Thr | Ala | Ala | Val | Asn | Ser | Phe | Leu | Thr | Xaa |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |

&lt;210&gt; 67

&lt;211&gt; 135

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (135)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 67

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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Tyr | Lys | Pro | Ala | Leu | Phe | Gly | Phe | Leu | Phe | Leu | Leu | Leu | Leu | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Leu | Ser | Asn | Trp | Leu | Val | Lys | Tyr | Glu | His | Lys | Leu | Thr | Leu | Pro | Glu |     |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Pro | Gln | Gln | Glu | Glu | Glu | Lys | Pro | Lys | Thr | Ser | Glu | Asn | Asp | Ser | Lys |     |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Asn | Ser | Lys | Ala | Val | Asn | Thr | Lys | Glu | Val | Asn | Arg | Thr | His | Ala | Cys |     |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Phe | Ala | Leu | Gln | Asp | Glu | Ile | Leu | Gln | Arg | Leu | Leu | Phe | Ser | Glu | Met |     |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Lys | Met | Lys | Val | Leu | Glu | Asn | Gln | Met | Phe | Ile | Ile | Trp | Asn | Lys | Met |     |
|     |     |     | 85  |     |     |     |     |     | 90  |     |     |     |     | 95  |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Asn | His | His | Gly | Arg | Ser | Ser | Arg | His | Arg | Asn | Phe | Pro | Met | Lys | Lys |     |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| His | Arg | Met | Arg | Arg | His | Glu | Ser | Ile | Cys | Pro | Thr | Leu | Ser | Asp | Cys |     |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Thr | Ser | Ser | Ser | Pro | Ser | Xaa |     |     |     |     |     |     |     |     |     |     |
|     | 130 |     |     |     |     | 135 |     |     |     |     |     |     |     |     |     |     |

<210> 68  
 <211> 36  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (36)  
 <223> Xaa equals stop translation

<400> 68

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gly | Gly | Gln | Met | Met | Asn | Gln | Leu | Ile | Thr | Val | Ala | Phe | Val | Arg |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Trp | Arg | Phe | Leu | Ile | Cys | Phe | Leu | Ser | Leu | Met | Lys | Ala | Ile | Leu | Lys |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Lys | Pro | Thr | Xaa |     |     |     |     |     |     |     |     |     |     |     |     |
|     |     |     | 35  |     |     |     |     |     |     |     |     |     |     |     |     |

<210> 69  
 <211> 126  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (126)  
 <223> Xaa equals stop translation

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&lt;400&gt; 69

Met Arg Trp Ile Leu Ile Leu Val Ile Ala Leu Trp Phe Ile Glu Leu  
 1 5 10 15

Leu Asp Val Trp Ser Thr Cys Ser Gln Pro Ile Cys Ala Lys Trp Thr  
 20 25 30

Arg Thr Glu Ala Glu Gly Ser Lys Lys Ser Leu Ser Ser Glu Gly His  
 35 40 45

His Met Asp Leu Pro Asp Val Val Ile Thr Ser Leu Pro Gly Ser Gly  
 50 55 60

Ala Glu Ile Leu Lys Gln Leu Phe Phe Asn Ser Ser Asp Phe Leu Tyr  
 65 70 75 80

Ile Arg Val Pro Thr Ala Tyr Ile Asp Ile Pro Glu Thr Glu Leu Glu  
 85 90 95

Ile Asp Ser Phe Val Asp Ala Cys Glu Trp Lys Cys Gln Ile Ser Ala  
 100 105 110

Val Gly Ile Phe Val Tyr Ser Glu Ala Gly Cys Ser Leu Xaa  
 115 120 125

&lt;210&gt; 70

&lt;211&gt; 52

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (52)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 70

Met Leu Ser Thr Ile Leu Ser Phe Val Cys Asn Cys Ala Cys Arg Leu  
 1 5 10 15

Asn Arg Ile Leu Ile Val Leu Ile Thr Cys Leu Ile Leu Val Ser Pro  
 20 25 30

Val Arg Gln Ala Cys Phe Leu Glu Ala Gly Thr Glu Cys His Ser His  
 35 40 45

Leu Cys Ser Xaa  
 50

&lt;210&gt; 71

&lt;211&gt; 98

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (98)

&lt;223&gt; Xaa equals stop translation

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&lt;400&gt; 71

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Ile | Met | Leu | Leu | Thr | Phe | Thr | Leu | His | Phe | Pro | Ser | Thr | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Ser | Tyr | Leu | Pro | Glu | Asn | Tyr | Val | Ile | Pro | Ser | Leu | Phe | Ser | Asn |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Gln | His | Trp | Ile | Cys | Cys | Val | His | Ser | Gln | Leu | Val | Thr | Cys | Phe |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Phe | Gln | Arg | Asp | Asn | Val | Ser | Thr | Glu | Lys | Arg | Thr | Leu | Ala | His |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Asn | Thr | Ser | Ser | Ala | Thr | Ser | His | His | Leu | Ser | Pro | Cys | Thr | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Asp | Gly | Leu | Pro | Ser | Ser | Trp | Gly | Gly | Gln | Thr | His | Pro | Leu | Leu |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |

His Xaa

&lt;210&gt; 72

&lt;211&gt; 45

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (45)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 72

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | His | Leu | Leu | Leu | Ile | Asn | Phe | Leu | Pro | Ala | Val | Cys | Ile | Ile | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Lys | Asn | Leu | Gln | Gln | Ala | Leu | Cys | Phe | Ala | Gln | Leu | Phe | Ile | Met |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Ile | Asn | Gln | Gly | Leu | Gly | Pro | Asn | Glu | Met | Ser | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |

&lt;210&gt; 73

&lt;211&gt; 48

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (48)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 73

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Phe | Arg | Val | Leu | Tyr | Tyr | Ser | Val | Trp | Phe | Ile | Phe | Leu | His |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

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|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ser | Phe | Ala | Thr | Pro | Lys | Val | Thr | Gly | Leu | Ile | Ala | Ser | Thr | Tyr |
|     |     |     | 20  |     |     |     |     |     | 25  |     |     |     | 30  |     |     |

  

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Phe | Leu | Tyr | Val | Phe | Met | Phe | Leu | Leu | Met | Ile | Leu | Ser | Ala | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

<210> 74  
 <211> 27  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (27)  
 <223> Xaa equals stop translation

<400> 74

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Phe | Ile | Leu | Glu | Gln | Ile | Lys | Asn | Gln | Val | Phe | Phe | Leu | Phe |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

  

|     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Leu | Lys | Leu | Thr | Cys | Val | Ser | His | Xaa |
|     |     |     | 20  |     |     |     |     | 25  |     |     |

<210> 75  
 <211> 42  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (40)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (42)  
 <223> Xaa equals stop translation

<400> 75

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gln | Leu | Ile | Gln | Leu | Ile | Thr | Leu | Thr | Ile | Thr | Gln | Val | Leu | Phe |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

  

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Asp | Thr | Ile | Met | Ser | Thr | Tyr | Val | Ala | Asp | Thr | Asp | Tyr | Val | Val |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

  

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Pro | Val | Ser | Ser | His | Lys | Xaa | Phe | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |

<210> 76  
 <211> 23  
 <212> PRT  
 <213> Homo sapiens

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&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (23)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 76

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Thr | Leu | Met | Thr | Ser | Ile | Tyr | Phe | Phe | Leu | Ala | Ile | Phe | Met | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|
| Thr | Arg | Ser | Glu | Arg | Leu | Xaa |
|     |     |     | 20  |     |     |     |

&lt;210&gt; 77

&lt;211&gt; 59

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (59)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 77

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Leu | Leu | Phe | Ile | Val | Ser | Leu | Leu | Glu | Leu | Gly | Pro | Met | Ala |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Ala | Glu | Arg | Lys | Ala | Met | Lys | Pro | Ser | Leu | Gly | Leu | Arg | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Glu | Glu | Glu | Glu | Glu | Thr | Pro | Phe | Glu | Glu | Gln | Arg | Ala | Val | Ser |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ile | Pro | Gly | Val | Pro | Val | Thr | Tyr | Leu | Xaa |
|     | 50  |     |     |     |     | 55  |     |     |     |     |

&lt;210&gt; 78

&lt;211&gt; 48

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (48)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 78

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asn | Phe | Val | Ala | Ala | Leu | Ile | Phe | Ser | Pro | Asp | Gln | Tyr | Asn | Phe |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Leu | Arg | Ile | Arg | Leu | Phe | Trp | Phe | Leu | Ile | Ile | Cys | Val | Leu | Ser |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Ile | Leu | Leu | Leu | Phe | Pro | Ser | Arg | Thr | Phe | Ser | Leu | His | Pro | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

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33

<210> 79  
 <211> 53  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (53)  
 <223> Xaa equals stop translation

<400> 79  
 Met Ser Phe Leu Val Phe Ser Phe Phe Cys Phe Gly Phe Ser Asn Ser  
     1                    5                    10                    15  
 Arg Phe Ser Arg Asp Tyr Gln His Tyr Leu Ser Leu Leu Ser Ser Pro  
                     20                    25                    30  
 His Ala Gln Lys Arg Asn Lys Ile Ile Arg Glu Ser Ser Ile Ser Ala  
             35                    40                    45  
 Leu Leu Thr Ser Xaa  
     50

<210> 80  
 <211> 45  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (45)  
 <223> Xaa equals stop translation

<400> 80  
 Met Gln Ile Pro Phe Leu Leu Glu Val Phe Val Ile His Thr Gly Val  
     1                    5                    10                    15  
 Leu Gly Ser Lys Leu Leu Lys Ser Gly Gly Leu Phe Asp Leu Thr Ser  
                     20                    25                    30  
 Phe Ser Pro Met Ile Ile Cys Phe Ser Asn Lys Ser Xaa  
             35                    40                    45

<210> 81  
 <211> 61  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (59)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE

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&lt;222&gt; (61)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 81

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Ser | Phe | Ala | Cys | Phe | Cys | Phe | His | Cys | Leu | Phe | Leu | Val | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Pro | Arg | Asn | His | Cys | Gln | Ile | Gln | Cys | Arg | Asp | Ala | Phe | Ser | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Phe | Leu | Leu | Gly | Val | Phe | Gln | Val | Leu | Tyr | Leu | Gly | Phe | Ile | Asn |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ile | Thr | Phe | Tyr | Val | Glu | Glu | Lys | Thr | Xaa | Glu | Xaa |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |

&lt;210&gt; 82

&lt;211&gt; 25

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (25)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 82

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Phe | Leu | Trp | Ile | Ser | Tyr | Ala | Val | Lys | Ala | Phe | Leu | Val | Trp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Leu | Gln | Leu | Ala | Ala | Glu | Phe | Xaa |
|     |     | 20  |     |     |     |     | 25  |     |

&lt;210&gt; 83

&lt;211&gt; 21

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (21)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 83

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Phe | Ile | Val | Ala | Leu | Leu | Ile | Leu | His | Trp | Ala | Leu | Gly | Gly | Thr |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| Val | Met | Ser | Lys | Xaa |
|     |     |     | 20  |     |

&lt;210&gt; 84

&lt;211&gt; 42

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

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35

&lt;221&gt; SITE

&lt;222&gt; (42)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 84

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Cys | Val | Cys | Leu | Ile | Cys | Ser | Ile | Cys | Gln | Phe | Leu | Trp | Cys | Lys |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ser | His | Tyr | Ser | Cys | Phe | Gln | Ala | Asn | Ile | Val | Ile | Pro | Gln | Lys |
|     |     | 20  |     |     |     |     | 25  |     |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Glu | Leu | Gly | Arg | His | Asn | Gln | Asp | Xaa |
|     |     | 35  |     |     |     | 40  |     |     |     |

&lt;210&gt; 85

&lt;211&gt; 48

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (48)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 85

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Thr | Phe | Gly | Leu | Gly | Gln | Gly | Leu | Cys | Phe | Leu | Phe | Cys | Tyr | Gln |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Leu | Val | Ala | Phe | Arg | Leu | Thr | Asn | Gln | Ile | Pro | Ala | Leu | Gly | Tyr |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Ser | His | Leu | Ser | Ser | His | Ile | Pro | Tyr | Leu | Ala | Leu | Phe | Gly | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

&lt;210&gt; 86

&lt;211&gt; 44

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (44)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 86

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Cys | Leu | Ala | Ile | Leu | Leu | Phe | Leu | Ile | Leu | Ser | Val | Leu | Asp | Glu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Val | Tyr | Phe | Thr | Glu | Leu | Cys | Gln | Arg | Val | Ser | Thr | Phe | Phe | Cys |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Ile | Ile | Gly | Glu | Lys | Gly | Leu | Ser | Tyr | Phe | Xaa |
|     |     | 35  |     |     |     | 40  |     |     |     |     |     |

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36

<210> 87  
 <211> 60  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (54)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (60)  
 <223> Xaa equals stop translation

<400> 87  
 Met Trp Thr Ala Arg Arg Cys Thr Glu Thr Val Ala Val Ser Leu Arg  
   1                  5                  10                  15  
 Ile Phe Pro Leu Val Leu Ala Met Pro Leu Gln Gly Lys Cys Thr Ser  
                   20                  25                  30  
 Thr Cys Gln Arg Lys Pro Leu Leu Leu Val Phe Ile Phe Val Val Asn  
           35                  40                  45  
 Phe Leu Tyr Ile Pro Xaa Ala Ala Phe Leu His Xaa  
   50                  55                  60

<210> 88  
 <211> 52  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (52)  
 <223> Xaa equals stop translation

<400> 88  
 Met Leu Thr Ser Trp Ile Ala Ser Ile Pro Ser Arg Cys Gly Val Leu  
   1                  5                  10                  15  
 Cys Ile Cys Leu Cys Phe Gly Leu Val His Cys Leu Asp Leu Ser Arg  
                   20                  25                  30  
 Lys Ile Thr Ile Phe Ser Gly Ala Val Tyr Met Val Lys Asn Ile Gln  
           35                  40                  45  
 Phe Trp Leu Xaa  
   50

<210> 89  
 <211> 32  
 <212> PRT  
 <213> Homo sapiens

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&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (32)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 89

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Ser | Leu | Ile | Ala | Phe | Ser | Ser | Leu | Gly | Leu | Cys | Leu | Gly | Glu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Pro | Ser | Lys | Ile | Pro | Phe | Thr | Ala | Phe | Phe | His | Arg | Glu | Gly | Xaa |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

&lt;210&gt; 90

&lt;211&gt; 36

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (36)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 90

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Cys | Leu | Ser | Leu | Leu | Leu | Leu | Ser | Leu | Ser | Cys | Leu | Ala | Val | Pro |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Trp | Trp | Pro | His | Ser | Val | Thr | Ala | Leu | Gln | Leu | Ser | Pro | Glu | Ser | Asp |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |
|-----|-----|-----|-----|
| His | His | Ser | Xaa |
|     |     |     | 35  |

&lt;210&gt; 91

&lt;211&gt; 49

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 91

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Phe | Gln | Ser | Ile | Lys | Asn | Leu | Leu | Thr | Cys | Arg | Ala | Arg | Trp |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Pro | Val | Ile | Pro | Ala | Leu | Trp | Gly | Ala | Arg | Ala | Gly | Gly | Ser |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Glu | Glu | Phe | Glu | Thr | Ser | Leu | Thr | Asn | Met | Val | Lys | Pro | His | Leu |
|     |     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

Tyr

&lt;210&gt; 92

&lt;211&gt; 25

&lt;212&gt; PRT

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&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (25)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 92

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | His | Thr | Cys | Val | Tyr | Cys | Ser | Ile | Ile | His | Asn | Ser | Lys | Asp | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Thr | Asn | Pro | Asn | Val | Gln | Gln | Xaa |
|     |     |     | 20  |     |     |     |     | 25  |

&lt;210&gt; 93

&lt;211&gt; 47

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (47)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 93

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Tyr | Phe | Ser | Leu | Thr | Tyr | Thr | Tyr | Thr | Val | Val | Tyr | Ile | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Ser | Leu | Cys | Ile | Ser | Ser | Leu | His | Asn | Ile | Tyr | Leu | Leu | Ile | Phe |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Phe | Leu | Phe | Ser | Ser | Val | His | Thr | Thr | Glu | Tyr | Val | Leu | Xaa |
|     | 35  |     |     |     |     |     | 40  |     |     |     |     | 45  |     |     |

&lt;210&gt; 94

&lt;211&gt; 87

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (87)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 94

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Pro | Trp | His | Val | Cys | Phe | Phe | Leu | Ser | Gly | Leu | Leu | Phe | Pro | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Gln | Thr | Ser | Leu | Gln | His | Leu | Cys | Leu | Leu | Thr | Ser | Leu | Ile | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Val | Thr | Ile | Ser | Ala | Tyr | Glu | His | Ala | Ile | Asn | Leu | Pro | Ser | Leu |
|     | 35  |     |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Asn | Ser | Leu | Leu | Thr | Ser | His | Pro | Ser | Val | Ala | Ala | Leu | Ser | Leu |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

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Leu Ser Ser Ser Leu Gln Gln Asn Ser Leu Lys Glu Leu Leu Ala Gly  
 65 70 75 80

His Ser Gly Ser Leu Leu Xaa  
 85

<210> 95  
 <211> 112  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (112)  
 <223> Xaa equals stop translation

<400> 95  
 Met Lys Ser Leu Leu Phe Thr Leu Ala Val Phe Met Leu Leu Ala Gln  
 1 5 10 15

Leu Val Ser Gly Asn Trp Tyr Val Lys Lys Cys Leu Asn Asp Val Gly  
 20 25 30

Ile Cys Lys Lys Lys Cys Lys Pro Glu Glu Met His Val Lys Asn Gly  
 35 40 45

Trp Ala Met Cys Gly Lys Gln Arg Asp Cys Cys Val Pro Ala Asp Arg  
 50 55 60

Arg Ala Asn Tyr Pro Val Phe Cys Val Gln Thr Lys Thr Thr Arg Ile  
 65 70 75 80

Ser Thr Val Thr Ala Thr Thr Ala Thr Thr Thr Leu Met Met Thr Thr  
 85 90 95

Ala Ser Met Ser Ser Met Ala Pro Thr Pro Val Ser Pro Thr Gly Xaa  
 100 105 110

<210> 96  
 <211> 301  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (301)  
 <223> Xaa equals stop translation

<400> 96  
 Met Lys Phe Leu Leu Asp Ile Leu Leu Leu Leu Pro Leu Leu Ile Val  
 1 5 10 15

Cys Ser Leu Glu Ser Phe Val Lys Leu Phe Ile Pro Lys Arg Arg Lys  
 20 25 30

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40

Ser Val Thr Gly Glu Ile Val Leu Ile Thr Gly Ala Gly His Gly Ile  
 35 40 45  
 Gly Arg Leu Thr Ala Tyr Glu Phe Ala Lys Leu Lys Ser Lys Leu Val  
 50 55 60  
 Leu Trp Asp Ile Asn Lys His Gly Leu Glu Glu Thr Ala Ala Lys Cys  
 65 70 75 80  
 Lys Gly Leu Gly Ala Lys Val His Thr Phe Val Val Asp Cys Ser Asn  
 85 90 95  
 Arg Glu Asp Ile Tyr Ser Ser Ala Lys Lys Val Lys Ala Glu Ile Gly  
 100 105 110  
 Asp Val Ser Ile Leu Val Asn Asn Ala Gly Val Val Tyr Thr Ser Asp  
 115 120 125  
 Leu Phe Ala Thr Gln Asp Pro Gln Ile Glu Lys Thr Phe Glu Val Asn  
 130 135 140  
 Val Leu Ala His Phe Trp Thr Thr Lys Ala Phe Leu Pro Ala Met Thr  
 145 150 155 160  
 Lys Asn Asn His Gly His Ile Val Thr Val Ala Ser Ala Ala Gly His  
 165 170 175  
 Val Ser Val Pro Phe Leu Leu Ala Tyr Cys Ser Ser Lys Phe Ala Ala  
 180 185 190  
 Val Gly Phe His Lys Thr Leu Thr Asp Glu Leu Ala Ala Leu Gln Ile  
 195 200 205  
 Thr Gly Val Lys Thr Thr Cys Leu Cys Pro Asn Phe Val Asn Thr Gly  
 210 215 220  
 Phe Ile Lys Asn Pro Ser Thr Ser Leu Gly Pro Thr Leu Glu Pro Glu  
 225 230 235 240  
 Glu Val Val Asn Arg Leu Met His Gly Ile Leu Thr Glu Gln Lys Met  
 245 250 255  
 Ile Phe Ile Pro Ser Ser Ile Ala Phe Leu Thr Thr Leu Glu Arg Ile  
 260 265 270  
 Leu Pro Glu Arg Phe Leu Ala Val Leu Lys Arg Lys Ile Ser Val Lys  
 275 280 285  
 Phe Asp Ala Val Ile Gly Tyr Lys Met Lys Ala Gln Xaa  
 290 295 300

&lt;210&gt; 97

&lt;211&gt; 105

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

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&lt;221&gt; SITE

&lt;222&gt; (105)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 97

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Trp | Tyr | Cys | Leu | Leu | Cys | Gly | Cys | Ser | Cys | His | Ala | Lys | Ala | Val |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Ser | Val | Leu | Ser | Arg | Leu | Ser | Cys | Asn | Leu | Pro | Ala | Leu | Leu | Ser |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Ala | Leu | Pro | Gln | Pro | Ser | Pro | Ser | Val | Gly | Ala | Pro | Pro | Gly | Ser |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Arg | Pro | Val | Pro | Pro | His | Pro | Leu | Ser | Asp | Pro | His | Ser | Cys | Leu |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Thr | Pro | Ala | Phe | Arg | Gly | Leu | Cys | Ser | Pro | Pro | Leu | Cys | Pro | Leu |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Pro | Pro | Arg | Phe | Ser | Leu | Lys | Leu | Pro | Pro | Leu | Ser | Leu | Asp | Pro |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Leu | Ile | Pro | Pro | Ala | Thr | Tyr | Xaa |
|     |     |     | 100 |     |     |     |     | 105 |

&lt;210&gt; 98

&lt;211&gt; 44

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (44)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 98

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Cys | Met | Phe | Ser | Thr | Cys | Gly | Leu | Ser | Asn | Tyr | Leu | Ile | Ile | Thr |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Phe | Leu | Leu | Leu | Ser | Ile | Ser | Ser | Leu | Val | Pro | Pro | Thr | Pro | Ser |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Leu | Phe | Asp | Ser | Ser | Ser | His | Trp | Lys | Tyr | Xaa |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     |

&lt;210&gt; 99

&lt;211&gt; 50

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (50)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 99

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Met His Leu Leu Leu Leu Ser Cys Leu Leu Ala Gly Lys Ala Ser Cys  
 1 5 10 15

His Val Val Arg Ser Pro Val Asp Asn Pro Leu Trp Gln Gly Gly Asn  
 20 25 30

Ala Tyr Gly Gln Gln Pro Val Arg Thr Gly Pro Cys Gln Gln Pro His  
 35 40 45

Lys Xaa  
 50

<210> 100  
 <211> 48  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (48)  
 <223> Xaa equals stop translation

<400> 100  
 Met Thr Leu Tyr Leu Ser Leu Leu Asn Met Ile Pro Leu Asn Leu Ala  
 1 5 10 15

Ser Cys Ser Ser His Leu Glu Leu Leu Lys Lys Leu Ile Met Ser Tyr  
 20 25 30

Arg Val Phe Thr Phe Pro Ile Pro Asp Thr Cys His Leu His Ile Xaa  
 35 40 45

<210> 101  
 <211> 100  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (100)  
 <223> Xaa equals stop translation

<400> 101  
 Met Tyr Phe Leu Leu Thr Cys Arg Phe Ser Leu His Leu Leu Pro Cys  
 1 5 10 15

Pro Leu Phe Leu Cys Phe Leu Pro Pro Cys Ser Leu Phe Val Glu Glu  
 20 25 30

Thr Ser Tyr Leu Cys Phe Val Ser His Gly Met Asn Phe Ala Glu Cys  
 35 40 45

Ile Phe Thr Cys Ser Leu Met Cys Cys Leu Val Leu His Ile Ser Cys  
 50 55 60

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43

Lys Leu Thr Val Glu Ser Thr Ser Leu Ile Thr Phe Thr Phe Phe Leu  
 65 70 75 80

Gly Trp Trp Gly Trp Arg Tyr Thr Gln Leu Phe Pro Phe His Asp Val  
 85 90 95

Ser Ser Arg Xaa  
 100

<210> 102  
 <211> 59  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (59)  
 <223> Xaa equals stop translation

<400> 102  
 Met His His Ile Cys Gly Ser Ile Val Leu Leu Leu Cys Leu Phe Asp  
 1 5 10 15

Leu Cys Met Ala Ala Val Gly Gln Leu His Ile Trp Ser Pro Tyr Ser  
 20 25 30

Lys Met Gln Ser Thr Leu Leu Thr Ala His Ile Pro Ser Pro Lys Gln  
 35 40 45

Asn Leu Asn Phe Gln Leu Cys Pro Leu Lys Xaa  
 50 55

<210> 103  
 <211> 65  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (65)  
 <223> Xaa equals stop translation

<400> 103  
 Met Leu Gly Ser Val Cys Arg Ala Leu His Val Leu Thr Cys Leu Leu  
 1 5 10 15

Leu Ser Ser Asn Pro Val Val Gln Ala Pro Cys Ser Leu Asn Glu Glu  
 20 25 30

Ser Lys Ser Gln Gly Val Thr Cys Ala Val Leu Pro Ala Gly Asp Leu  
 35 40 45

Asn Pro Gly Ser Leu Val Ser Ala Cys Val Pro Leu Thr Val Thr Leu  
 50 55 60

Xaa

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44

65

&lt;210&gt; 104

&lt;211&gt; 45

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (45)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 104

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Pro | Cys | His | Gly | Leu | Leu | Ala | Gln | Gly | Leu | Ser | Leu | Ala | Pro | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Pro | Trp | Ala | Leu | Cys | Cys | Val | Gly | Val | Ser | Arg | Ala | Leu | Gln | Asp |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Gln | Gln | His | Pro | Arg | Pro | Pro | Ala | Pro | Cys | Gln | Xaa |
|     | 35  |     |     |     |     | 40  |     |     |     |     |     | 45  |

&lt;210&gt; 105

&lt;211&gt; 93

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (61)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (68)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (93)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 105

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gly | Ser | Thr | Trp | Gly | Ser | Pro | Gly | Trp | Val | Arg | Leu | Ala | Leu | Cys |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Gly | Leu | Val | Leu | Ser | Leu | Tyr | Ala | Leu | His | Val | Lys | Ala | Ala |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Ala | Arg | Asp | Arg | Asp | Tyr | Arg | Ala | Leu | Cys | Asp | Val | Gly | Thr | Ala |
|     |     | 35  |     |     |     | 40  |     |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Ser | Cys | Ser | Arg | Val | Phe | Ser | Ser | Arg | Leu | Pro | Xaa | Asp | Thr | Leu |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Leu | Cys | Xaa | Asp | Ala | Ala | Glu | Leu | Pro | Gly | Val | Ser | Arg | Trp | Phe |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     | 80  |     |

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45

Cys Leu Pro Gly Leu Asp Pro Val Leu Arg Ala Leu Xaa  
                             85                            90

<210> 106  
 <211> 26  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (26)  
 <223> Xaa equals stop translation

<400> 106  
 Met Gln Thr Ile His Phe Thr Pro Ala Val Leu His Phe Leu Phe Leu  
     1                            5                            10                            15

Trp Ser Ser Thr Trp Ser Val Ser Ile Xaa  
                             20                            25

<210> 107  
 <211> 68  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (68)  
 <223> Xaa equals stop translation

<400> 107  
 Met Cys Ile Leu His Ser His Cys Leu Leu Phe Leu Asn Leu Asn Gln  
     1                            5                            10                            15

Val Val Cys Phe His Gly Asn Phe Ser Leu Ser Cys Phe Cys Gln Thr  
                             20                            25                            30

Gln Ile Ser Tyr Ile Asn Ile Phe Ser Gly Lys Asn Gly Cys Asp Ser  
                             35                            40                            45

Lys Leu Glu His Leu Leu Phe Tyr Phe Arg Lys Ser Leu Leu Asn Ile  
     50                            55                            60

Phe Leu Val Xaa  
     65

<210> 108  
 <211> 45  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (45)  
 <223> Xaa equals stop translation

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&lt;400&gt; 108

Met Ser Thr Gly Ser Leu Met Thr Trp Trp Leu Arg Ser Ser Ser Leu  
 1 5 10 15

Arg Val Ala Leu Cys Gly Pro Ala Arg Thr Met Thr Glu Met Cys Ser  
 20 25 30

Gln Thr Ser Trp Pro Arg Ala Leu Ala Pro Leu Ala Xaa  
 35 40 45

&lt;210&gt; 109

&lt;211&gt; 53

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (53)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 109

Met His Asn Leu Leu Leu Ser Cys Val Ile Phe Asn Phe Pro Leu Val  
 1 5 10 15

Phe Ile Val Ala Arg Thr Pro Tyr Leu Pro Ser Leu Leu Ser Ile Cys  
 20 25 30

Asn Leu Glu Ala Pro Val Tyr Leu Arg Ile Asp Pro Gly Trp Pro His  
 35 40 45

Leu Cys Met Ala Xaa  
 50

&lt;210&gt; 110

&lt;211&gt; 44

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (44)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 110

Met Val Asp Leu Ile Leu Leu Leu Phe His Ser Ala Val Gly Cys Asn  
 1 5 10 15

Leu Lys Ser Arg Gly Ala Leu Gln Thr Leu His Asp Ser Met Thr Leu  
 20 25 30

Ser Ser Phe Tyr Ser Ser Lys Thr Ser Leu Ile Xaa  
 35 40

&lt;210&gt; 111

&lt;211&gt; 65

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47

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (65)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 111

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Phe | Cys | Pro | Ser | Gln | Met | Asp | Leu | Glu | Pro | Phe | Trp | Phe | Cys | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Ala | Leu | Phe | Ile | Phe | Tyr | Cys | Leu | Leu | Leu | Tyr | Phe | Leu | His |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Phe | Lys | Asp | Gly | Val | Ser | Arg | Leu | Pro | Ser | Thr | Glu | Tyr | Lys | Tyr |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Ser | Leu | Ser | Val | Leu | Val | Phe | Cys | Lys | Lys | His | Asp | Cys | Ser | Phe |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

Xaa

65

&lt;210&gt; 112

&lt;211&gt; 70

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (70)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 112

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Phe | Glu | Ser | Ala | Gly | Gln | Val | Leu | Leu | His | Ile | Ala | Gly | Leu | Gln |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Trp | Val | Phe | Leu | Thr | Cys | Leu | Ser | Ser | Phe | Leu | Val | Pro | Leu | Ser |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ser | Gly | Tyr | Ile | Pro | Leu | Met | Val | Met | Ala | Glu | Ala | His | Gln | Met |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ser | Pro | Thr | Thr | Gln | Ala | Leu | Phe | Lys | Leu | Leu | Phe | Ala | Ser | His |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Thr | Phe | Tyr | Xaa |
| 65  |     |     |     |     | 70  |

&lt;210&gt; 113

&lt;211&gt; 54

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

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48

&lt;222&gt; (54)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 113

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Trp | Val | Gln | Ile | Pro | Leu | Leu | Pro | Phe | Thr | Ser | Cys | Val | Thr |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Gly | Lys | Tyr | Leu | Asn | Leu | Ser | Val | Pro | His | Phe | Ser | His | Leu | His |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Glu | Asn | Asn | Ser | Leu | Leu | Leu | His | Arg | Val | Val | Met | Ser | Leu | Thr |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| Met | Ser | His | Tyr | Val | Xaa |
|     | 50  |     |     |     |     |

&lt;210&gt; 114

&lt;211&gt; 41

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 114

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Phe | Ser | Leu | Pro | Gln | Tyr | Leu | Ile | Tyr | Phe | Val | Leu | Ser | Ile | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Val | Ser | Thr | Leu | Phe | Ser | Leu | Pro | Leu | Phe | Leu | Val | Pro | Leu | Arg |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Glu | Lys | Lys | Asp | Asp | Asn | Gly | Val |
|     |     | 35  |     |     |     |     | 40  |     |

&lt;210&gt; 115

&lt;211&gt; 18

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (18)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 115

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Lys | Ala | Arg | Phe | Pro | Phe | Leu | Leu | Ser | Leu | Arg | Trp | Phe | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

Ala Xaa

&lt;210&gt; 116

&lt;211&gt; 71

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (71)

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&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 116

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Trp | Arg | Val | Thr | Arg | Arg | Gly | Glu | Leu | Thr | Ser | Cys | Leu | Ser | Gly |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Thr | Tyr | Leu | Phe | Phe | Tyr | Gly | Val | Ser | Thr | Pro | His | Ala | Leu | Ala |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Tyr | Leu | Arg | Lys | Leu | Leu | Asp | Leu | Lys | Ser | Glu | Ser | Phe | Lys | Gln |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asn | Val | Cys | Phe | Val | Leu | His | Leu | Pro | Trp | Glu | Ile | Leu | Asn | Ile |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Arg | Asn | Arg | Val | Ser | Xaa |
| 65  |     |     |     |     | 70  |     |

&lt;210&gt; 117

&lt;211&gt; 17

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (17)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 117

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Leu | Ser | Ile | Ile | Cys | Leu | Val | Arg | Ser | Leu | Phe | His | His | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

Xaa

&lt;210&gt; 118

&lt;211&gt; 27

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (27)

&lt;223&gt; Xaa equals stop translation

&lt;400&gt; 118

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Phe | Ser | Leu | Pro | Gln | Tyr | Leu | Lys | Leu | Val | Leu | Ser | Ile | Leu | Val |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ser | Thr | Leu | Phe | Ser | Leu | Pro | Phe | Ser | Xaa |
|     |     |     | 20  |     |     |     |     | 25  |     |     |

&lt;210&gt; 119

&lt;211&gt; 153

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

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&lt;400&gt; 119

His Glu Leu Gly Gly Leu Leu Ala Asp Phe Leu Leu Ser Arg Lys Ile  
 1 5 10 15

Leu Arg Leu Ile Thr Ile Arg Lys Leu Phe Thr Ala Ile Gly Val Leu  
 20 25 30

Phe Pro Ser Val Ile Leu Val Ser Leu Pro Trp Val Arg Ser Ser His  
 35 40 45

Ser Met Thr Met Thr Phe Leu Val Leu Ser Ser Ala Ile Ser Ser Phe  
 50 55 60

Cys Glu Ser Gly Ala Leu Val Asn Phe Leu Asp Ile Ala Pro Arg Tyr  
 65 70 75 80

Thr Gly Phe Leu Lys Gly Leu Leu Gln Val Phe Ala His Ile Ala Gly  
 85 90 95

Ala Ile Ser Pro Thr Ala Ala Gly Phe Phe Ile Ser Gln Asp Ser Glu  
 100 105 110

Phe Gly Trp Arg Asn Val Phe Leu Leu Ser Ala Ala Val Asn Ile Ser  
 115 120 125

Gly Leu Val Phe Tyr Leu Ile Phe Gly Arg Ala Asp Val Gln Asp Trp  
 130 135 140

Ala Lys Glu Gln Thr Phe Thr His Leu  
 145 150

&lt;210&gt; 120

&lt;211&gt; 108

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 120

Leu Met Lys Asn Pro Ala Ala Val Gly Glu Met Ala Pro Ala Met Cys  
 1 5 10 15

Ala Lys Thr Cys Asn Ser Pro Leu Arg Lys Pro Val Tyr Arg Gly Ala  
 20 25 30

Ile Ser Lys Lys Leu Thr Arg Ala Pro Asp Ser Gln Lys Leu Leu Met  
 35 40 45

Ala Glu Asp Ser Thr Lys Lys Val Met Val Met Leu Trp Leu Asp Leu  
 50 55 60

Thr Gln Gly Arg Asp Thr Arg Ile Thr Asp Gly Lys Arg Thr Pro Met  
 65 70 75 80

Ala Val Lys Ser Phe Leu Met Val Met Ser Leu Arg Ile Phe Leu Glu  
 85 90 95

Arg Arg Lys Ser Ala Ser Arg Pro Pro Ser Ser Cys  
 100 105

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<210> 121  
 <211> 106  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (72)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<400> 121  
 Glu Tyr Ser Thr Pro Asp Thr Val His Leu Arg Lys Thr Ile Leu Phe  
     1                    5                    10                    15  
 Ser Val Lys Val Pro Val Leu Ser Glu Lys Met Tyr Cys Ile Cys Pro  
                     20                    25                    30  
 Lys Ser Ser Val Met Phe Arg Ala Arg His Cys Ser Cys Glu Ser Val  
                     35                    40                    45  
 Ser Ser Ser Tyr Asn Cys Met Ser Trp Leu Met Lys Tyr Thr Trp His  
                     50                    55                    60  
 Ala Leu Thr Ile Ser Met Glu Xaa Tyr Lys Glu Met Gly Ser Lys Pro  
     65                    70                    75                    80  
 Ala Glu Leu Tyr His Val Lys Asn Glu Leu Thr Ala Ala Val Thr Gly  
                     85                    90                    95  
 Asp Lys Glu Leu Pro Ser Asp Leu Gly Thr  
                     100                    105

<210> 122  
 <211> 20  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (15)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<400> 122  
 Asn Gln Gly Ser Ala Glu Gln Gln Trp Ala Pro Leu Gln Ala Xaa Lys  
     1                    5                    10                    15  
 Leu Glu Arg Gln  
                     20

<210> 123  
 <211> 42  
 <212> PRT  
 <213> Homo sapiens

<220>

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&lt;221&gt; SITE

&lt;222&gt; (12)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (13)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (37)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 123

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Arg | His | Glu | Thr | Leu | Arg | Asn | Thr | Asp | Ala | Xaa | Xaa | Gly | Ile | Val |
| 1   |     |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Tyr | Ala | Gly | His | Glu | Thr | Lys | Ala | Leu | Leu | Asn | Asn | Ser | Gly | Pro |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Tyr | Lys | Arg | Xaa | Ser | Trp | Arg | Gly | Arg |
|     |     | 35  |     |     |     |     | 40  |     |     |

&lt;210&gt; 124

&lt;211&gt; 40

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 124

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Glu | Leu | Gly | Pro | Val | Cys | Leu | His | Ala | Ile | Met | Leu | Ala | Glu | Leu |
| 1   |     |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Phe | Leu | Phe | Arg | Ser | Leu | His | Gly | Ile | Leu | Ala | Ser | Ala | Gly | Thr |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Gly | Ala | Val | Ala | Ala | Trp | Leu |
|     |     | 35  |     |     |     | 40  |     |

&lt;210&gt; 125

&lt;211&gt; 195

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (5)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 125

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Phe | Gly | Thr | Xaa | Ser | Asp | Pro | Lys | Leu | Phe | Glu | Met | Ile | Lys | Tyr |
| 1   |     |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Cys | Leu | Leu | Lys | Ile | Leu | Lys | Gln | Tyr | Gln | Thr | Leu | Arg | Glu | Ala | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ala | Ala | Gly | Lys | Glu | Val | Ile | Trp | His | Gly | Arg | Thr | Asn | Asp | Glu |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

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35 40 53 45  
 Pro Ala His Tyr Cys Ser Ile Cys Glu Val Glu Val Phe Asn Leu Leu  
 50 55 60  
 Phe Val Thr Asn Glu Ser Asn Thr Gln Lys Thr Tyr Ile Val His Cys  
 65 70 75 80  
 His Asp Cys Ala Arg Lys Thr Ser Lys Ser Leu Glu Asn Phe Val Val  
 85 90 95  
 Leu Glu Gln Tyr Lys Met Glu Asp Leu Ile Gln Val Tyr Asp Gln Phe  
 100 105 110  
 Thr Leu Ala Ser Pro Trp Pro Pro Met Asp Gln Ser Ala Phe Thr Ser  
 115 120 125  
 Ser Leu Leu Arg Pro Ile Lys Ala Leu Gly Ser Gly Arg Ala Glu Gln  
 130 135 140  
 Thr Ser Gly Asp Gln Leu Gln Lys Gly Ala Thr His Ser Arg Ala Ser  
 145 150 155 160  
 Ser Leu Leu Arg Ala Ala Glu Met Thr Arg Arg Pro Ala Ser Arg Glu  
 165 170 175  
 Glu Leu Pro Asp Pro Gly Leu Phe Cys His Ser Ile Lys Leu Leu Phe  
 180 185 190  
 Val Leu Leu  
 195

<210> 126  
 <211> 25  
 <212> PRT  
 <213> Homo sapiens

<400> 126  
 Leu Pro Gly Asn Phe Arg Pro Pro Arg Val Ile Leu Thr Phe Gln Trp  
 1 5 10 15  
 Arg Phe Tyr Leu Ser Phe Arg Lys Leu  
 20 25

<210> 127  
 <211> 95  
 <212> PRT  
 <213> Homo sapiens

<400> 127  
 Tyr Leu Leu Leu Pro Cys Gly Leu Leu Ser Phe Trp Met Cys Gly Ala  
 1 5 10 15  
 Leu Val Val Ser Pro Phe Val Gln Asn Gly Gln Gly Gln Arg Leu Arg  
 20 25 30  
 Glu Ala Arg Ser Leu Cys Leu Leu Lys Gly Thr Thr Trp Ile Phe Leu

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35 40 54 45  
 Met Leu Ser Leu Pro His Phe Leu Val Gln Glu Leu Lys Phe Ser Asn  
 50 55 60  
 Asn Phe Phe Ser Thr Val Val Ile Phe Ser Thr Ser Gly Phe Leu Gln  
 65 70 75 80  
 Pro Thr Leu Ile Phe Leu Lys Leu Ser Trp Lys Ser Thr His Leu  
 85 90 95

<210> 128  
 <211> 64  
 <212> PRT  
 <213> Homo sapiens

<400> 128  
 Tyr Met Met Val His Cys Lys Tyr Ser Val Tyr Asn Leu Leu Asn Lys  
 1 5 10 15  
 Trp Ile Gly Phe Ser Ile Phe Pro His Trp Thr Trp Ile Asp Leu Glu  
 20 25 30  
 Ile Gly Gly Leu Asn Leu Gln Val Glu Ile Lys Gly Pro Asn Asn Cys  
 35 40 45  
 Arg Val Ala Gly Glu Gly Arg Tyr Lys Cys Ser Lys Gly Gly Ser Arg  
 50 55 60

<210> 129  
 <211> 74  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (53)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (60)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (61)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (72)  
 <223> Xaa equals any of the naturally occurring L-amino acids

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&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (73)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 129

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Ala | Ala | Leu | Trp | Thr | Tyr | Met | Arg | Phe | Leu | Ala | Cys | Leu | Asn |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Ser | Ser | Gly | Ser | Met | Tyr | Leu | Ser | Val | Asn | Ser | Thr | Pro | Val | Leu |
|     |     |     | 20  |     |     |     | 25  |     |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Leu | Leu | Val | Pro | Asn | Ser | Ala | Arg | Ala | Arg | Ala | Glu | Phe | Leu |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Pro | Gly | Gly | Xaa | Thr | Ser | Ser | Arg | Ala | Ala | Xaa | Xaa | Ala | Val | Glu |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Gln | Leu | Leu | Phe | Pro | Leu | Xaa | Xaa | Gly |
| 65  |     |     |     |     | 70  |     |     |     |     |

&lt;210&gt; 130

&lt;211&gt; 65

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 130

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Arg | Gln | Ala | Arg | Asn | Leu | Met | Tyr | Val | His | Asn | Ala | Ala | Asp | Ile |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Ser | Ser | Leu | Pro | Gln | His | Ile | Thr | Val | Ile | Ser | Pro | Arg | Glu | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Cys | His | Thr | Phe | Ser | Leu | Leu | Lys | Pro | Ala | Thr | Leu | Asp | Leu | Leu | Cys |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Leu | Ser | Val | Gly | Asn | Leu | Phe | Arg | Ile | Ser | Glu | Arg | Gln | Cys | Lys |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |
|-----|
| His |
| 65  |

&lt;210&gt; 131

&lt;211&gt; 56

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (55)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 131

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Val | Asn | Val | Ser | Ser | Ile | Met | Asp | Ile | His | Glu | Val | Pro | Gly | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Lys | Ser | Gln | Leu | Trp | Phe | Asn | Val | Pro | Val | Cys | Gln | Leu | His | Thr |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

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Cys Tyr Phe Pro Ile Ser Leu Pro Leu Leu Gly Arg Pro Tyr Tyr Leu  
                     20                    25                    30

Arg His Asn Ile Glu Ile Arg Pro Tyr Ile Asn His Thr Met Ala Ser  
                     35                    40                    45

Lys Gly Ser Ser Lys Arg Met Gly Cys Thr Ser Phe Thr Leu Thr Gln  
                     50                    55                    60

Lys Leu Glu Ile Ile Ile Leu Ser Glu Lys Gly Met Trp Lys Ala Glu  
                     65                    70                    75                    80

Ile Gly Gln Lys Leu Gly Xaa Leu His His Ser  
                     85                    90

&lt;210&gt; 135

&lt;211&gt; 14

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 135

Met Leu Cys Ile Asn Val Gln Thr His Val Tyr Glu Cys Ala  
                     1                    5                    10

&lt;210&gt; 136

&lt;211&gt; 99

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 136

Leu Cys Cys Pro Gly Trp Ser Ala Val Val Arg Ser Trp Leu Thr Ala  
                     1                    5                    10                    15

Thr Leu Ala Ser Trp Val Gln Ala Ile Leu Met Asp Ser Ala Ser Gln  
                     20                    25                    30

Val Ala Gly Ile Thr Ser Val His His Gln Ala Gln Leu Ser Phe Val  
                     35                    40                    45

Phe Leu Val Glu Met Gly Leu Cys His Val Gly Gln Ala Gly Leu Lys  
                     50                    55                    60

Leu Leu Ala Ser Ser Asp Leu Pro Ala Ser Ala Ser Gln Ser Ala Gly  
                     65                    70                    75                    80

Ile Thr Gly Met Ser His His Ser Trp Pro Glu Arg Thr Ser Phe Ile  
                     85                    90                    95

Phe Lys Ile

&lt;210&gt; 137

&lt;211&gt; 282

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

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58

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (129)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (206)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 137

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Gly | Arg | Gly | Asn | Thr | Ile | Leu | Phe | Leu | Arg | His | Asn | Lys | Asp | Leu |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ala | Gln | Thr | Ala | Gln | Pro | Asp | Gln | Pro | Asn | Tyr | Gly | Phe | Pro | Leu |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Leu | Leu | Arg | Cys | Glu | Ser | Leu | Leu | Gly | Leu | Asp | Pro | Ala | Thr | Cys |
|     | 35  |     |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Arg | Val | Leu | Asn | Lys | Asn | Tyr | Thr | Leu | Leu | Val | Ser | Met | Ala | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Asn | Glu | Ile | Arg | Pro | Val | Ser | Ser | Cys | Thr | Pro | Gln | His | Ile |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Pro | Ala | Ile | Pro | Glu | Val | Ser | Ser | Val | Trp | Phe | Lys | Leu | Tyr | Ile |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | His | Val | Thr | Gly | Gln | Gly | Pro | Pro | Ser | Leu | Leu | Leu | Ser | Lys | Gly |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Arg | Leu | Arg | Lys | Leu | Pro | Asp | Ile | Phe | Gln | Ser | Tyr | Asp | Arg | Leu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Xaa | Ile | Thr | Ser | Trp | Gly | His | Asp | Pro | Gly | Val | Val | Pro | Thr | Ser | Asn |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Leu | Thr | Met | Leu | Asn | Asp | Ala | Leu | Thr | His | Ser | Ala | Val | Leu | Ile |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Gly | His | Gly | Leu | His | Gly | Ile | Gly | Glu | Thr | Val | His | Val | Pro | Phe |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Phe | Asp | Glu | Thr | Glu | Leu | Gln | Gly | Glu | Phe | Thr | Arg | Val | Asn | Met |
|     |     | 180 |     |     |     |     |     | 185 |     |     |     |     | 190 |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Val | His | Lys | Ala | Leu | Gln | Ile | Leu | Arg | Asn | Arg | Val | Xaa | Leu | Gln |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Leu | Cys | Gly | Tyr | Val | Thr | Met | Leu | Asn | Ala | Ser | Ser | Gln | Leu | Ala |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Arg | Lys | Leu | Ser | Asp | Ala | Ser | Asp | Glu | Arg | Gly | Glu | Pro | Asp | Leu |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     | 240 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ser | Gly | Ser | Asp | Val | Asn | Gly | Ser | Thr | Glu | Ser | Phe | Glu | Met | Val |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |

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Ile Glu Glu Ala Thr Ile Asp Ser Ala Thr Lys Gln Thr Ser Gly Ala  
                   260                  265                  270

Thr Thr Glu Ala Asp Trp Val Pro Leu Val  
           275                  280

<210> 138  
 <211> 31  
 <212> PRT  
 <213> Homo sapiens

<400> 138  
 Gly Thr Arg Ser Ile Asn Leu Leu Phe Phe Arg Cys Ile Leu Glu Gly  
   1                  5                  10                  15

Gly Lys Ser Val Glu Glu Gln Leu Cys Asn Ser Tyr Lys Phe Ser  
                   20                  25                  30

<210> 139  
 <211> 136  
 <212> PRT  
 <213> Homo sapiens

<220>  
 <221> SITE  
 <222> (42)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (67)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (121)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (126)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<220>  
 <221> SITE  
 <222> (134)  
 <223> Xaa equals any of the naturally occurring L-amino acids

<400> 139  
 Leu Thr Val Pro Arg Arg Cys Pro Ala Ala Thr Glu Thr Asn Val Asp  
   1                  5                  10                  15

Gly Gln Lys Val Tyr Arg Asp Cys Ser Cys Ile Pro Gln Asn Leu Ser  
           20                  25                  30

Ser Gly Phe Gly His Ala Thr Ala Gly Xaa Met His Phe Asn Leu Ser

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35 40 60 45  
 Glu Lys Ala Pro Pro Ser Gly Phe His Ile Arg Cys Glu Phe Ser Leu  
 50 55 60  
 His Ser Xaa Ser Ser Ile Pro Ala Leu Thr Ala Thr Leu Arg Cys Val  
 65 70 75 80  
 Arg Asp Pro Gln Arg Ser Phe Ala Leu Gly Ile Gln Trp Ile Val Val  
 85 90 95  
 Arg Ile Leu Gly Gly Ile Pro Gly Pro Ile Ala Phe Gly Trp Val Ile  
 100 105 110  
 Asp Lys Ala Cys Leu Leu Trp Gln Xaa Gln Cys Gly Gln Xaa Gly Ser  
 115 120 125  
 Cys Leu Val Tyr Gln Xaa Arg Pro  
 130 135

<210> 140  
 <211> 39  
 <212> PRT  
 <213> Homo sapiens

<400> 140  
 Leu Val Met Gln Cys Leu Gly Gln Val Leu Ser Pro Leu Arg Thr Ser  
 1 5 10 15  
 Val Cys Leu Pro Ile Glu Arg Gly Arg Trp Pro Gly Met Val Pro His  
 20 25 30  
 Thr Thr Ser Ala Leu Gly Gly  
 35

<210> 141  
 <211> 76  
 <212> PRT  
 <213> Homo sapiens

<400> 141  
 Gln Asn Thr Ile His Ser Leu Leu Pro Gln Gly Arg Met Thr Lys Ser  
 1 5 10 15  
 Leu Val Leu Glu Glu Gln Lys Arg Lys Ala Gly Arg Ser Glu Met Lys  
 20 25 30  
 Leu Glu Leu Leu Met Arg Val Ser Leu Trp Tyr Ser Gly Gln Ala Leu  
 35 40 45  
 Val Leu Leu Gly Leu Ile Thr Asn Leu Ser Cys Ser Val Leu Gly Lys  
 50 55 60  
 Ser Phe His Leu Ser Gly Pro Leu Ser Val Ser Leu  
 65 70 75

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61

&lt;210&gt; 142

&lt;211&gt; 75

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 142

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Pro | Arg | Pro | Ser | Pro | Leu | Ser | Ser | Pro | Gly | Ser | Pro | Val | Thr | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Leu | Cys | Ser | Pro | Met | Pro | Ser | Leu | Asn | Pro | Ala | Leu | Pro | Trp | Gly |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Leu | Leu | Ala | Leu | Pro | Gly | Leu | Ser | Leu | His | Thr | Pro | Phe | Gln | Thr |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Ala | Ala | Ser | Pro | His | Gln | Pro | Ser | Gly | Asp | Ser | Ala | Ala | His |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Ser | Ala | His | Ser | Phe | Leu | Leu | Asp | Ser | His |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |

&lt;210&gt; 143

&lt;211&gt; 55

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;400&gt; 143

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asp | Thr | Tyr | Thr | Phe | Leu | Ile | Lys | Ile | Cys | Lys | Ile | Phe | Cys | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Leu | Lys | Cys | His | Ile | Gln | Val | Cys | Gly | His | Leu | Leu | Phe | Leu | Ile |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Thr | Ser | Ile | Lys | Trp | Ala | Arg | Lys | Gln | His | His | Cys | Ser | Arg | Cys |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|
| Lys | Ala | Ile | Gly | Leu | Ser | Ser |
|     | 50  |     |     |     |     | 55  |

&lt;210&gt; 144

&lt;211&gt; 67

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (17)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (18)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (57)

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&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (67)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 144

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ile | Met | Gly | Tyr | Lys | Ser | Gln | Lys | Thr | Phe | Gly | Leu | Phe | Asp | Leu |
| 1   |     |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Xaa | Xaa | Val | Lys | Gly | Lys | Thr | Ser | Val | Leu | Glu | Phe | Asp | Phe | Trp | Val |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     | 30  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Ile | Pro | Val | Ala | Ser | Leu | Leu | Ala | Leu | Trp | Leu | Asn | Arg | Leu | Leu |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Ser | Val | Lys | Trp | Ala | Leu | Lys | Xaa | Cys | Val | Ile | His | Ser | Val | Ala |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |
|-----|-----|-----|
| Val | Asn | Xaa |
| 65  |     |     |

&lt;210&gt; 145

&lt;211&gt; 68

&lt;212&gt; PRT

&lt;213&gt; Homo sapiens

&lt;220&gt;

&lt;221&gt; SITE

&lt;222&gt; (59)

&lt;223&gt; Xaa equals any of the naturally occurring L-amino acids

&lt;400&gt; 145

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Lys | Ser | Phe | Pro | Ser | Thr | Tyr | Phe | Lys | Ser | Ser | Ser | Phe | Gln | Asn |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Lys | Tyr | Gln | Thr | Gly | Val | Ile | Ser | Val | Leu | Ile | Ser | Tyr | Glu | Ile |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Tyr | Ala | Ala | Phe | Tyr | His | Leu | Ser | Cys | Lys | Ile | Thr | Leu | Pro | Ser |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Val | Ser | Arg | Asn | Cys | Phe | Ile | Ser | Glu | Xaa | Leu | Val | Ala | Ser | Gln |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |

|     |     |     |     |
|-----|-----|-----|-----|
| Cys | Leu | Asp | Thr |
| 65  |     |     |     |

SUBSTITUTE SHEET (RULE 26)

***What Is Claimed Is:***

1. An isolated nucleic acid molecule comprising a polynucleotide having a nucleotide sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a polynucleotide fragment of SEQ ID NO:X or a polynucleotide fragment of the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X;

(b) a polynucleotide encoding a polypeptide fragment of SEQ ID NO:Y or a polypeptide fragment encoded by the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X;

(c) a polynucleotide encoding a polypeptide domain of SEQ ID NO:Y or a polypeptide domain encoded by the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X;

(d) a polynucleotide encoding a polypeptide epitope of SEQ ID NO:Y or a polypeptide epitope encoded by the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X;

(e) a polynucleotide encoding a polypeptide of SEQ ID NO:Y or the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X, having biological activity;

(f) a polynucleotide which is a variant of SEQ ID NO:X;

(g) a polynucleotide which is an allelic variant of SEQ ID NO:X;

(h) a polynucleotide which encodes a species homologue of the SEQ ID NO:Y;

(i) a polynucleotide capable of hybridizing under stringent conditions to any one of the polynucleotides specified in (a)-(h), wherein said polynucleotide does not hybridize under stringent conditions to a nucleic acid molecule having a nucleotide sequence of only A residues or of only T residues.

2. The isolated nucleic acid molecule of claim 1, wherein the polynucleotide fragment comprises a nucleotide sequence encoding a secreted protein.

3. The isolated nucleic acid molecule of claim 1, wherein the polynucleotide fragment comprises a nucleotide sequence encoding the sequence identified as SEQ ID NO:Y or the polypeptide encoded by the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X.

4. The isolated nucleic acid molecule of claim 1, wherein the polynucleotide fragment comprises the entire nucleotide sequence of SEQ ID NO:X or the cDNA sequence included in ATCC Deposit No:Z, which is hybridizable to SEQ ID NO:X.
5. The isolated nucleic acid molecule of claim 2, wherein the nucleotide sequence comprises sequential nucleotide deletions from either the C-terminus or the N-terminus.
6. The isolated nucleic acid molecule of claim 3, wherein the nucleotide sequence comprises sequential nucleotide deletions from either the C-terminus or the N-terminus.
7. A recombinant vector comprising the isolated nucleic acid molecule of claim 1.
8. A method of making a recombinant host cell comprising the isolated nucleic acid molecule of claim 1.
9. A recombinant host cell produced by the method of claim 8.
10. The recombinant host cell of claim 9 comprising vector sequences.
11. An isolated polypeptide comprising an amino acid sequence at least 95% identical to a sequence selected from the group consisting of:
  - (a) a polypeptide fragment of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z;
  - (b) a polypeptide fragment of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z, having biological activity;
  - (c) a polypeptide domain of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z;
  - (d) a polypeptide epitope of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z;
  - (e) a secreted form of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z;
  - (f) a full length protein of SEQ ID NO:Y or the encoded sequence included in ATCC Deposit No:Z;

- (g) a variant of SEQ ID NO:Y;
- (h) an allelic variant of SEQ ID NO:Y; or
- (i) a species homologue of the SEQ ID NO:Y.

12. The isolated polypeptide of claim 11, wherein the secreted form or the full length protein comprises sequential amino acid deletions from either the C-terminus or the N-terminus.

13. An isolated antibody that binds specifically to the isolated polypeptide of claim 11.

14. A recombinant host cell that expresses the isolated polypeptide of claim 11.

15. A method of making an isolated polypeptide comprising:  
(a) culturing the recombinant host cell of claim 14 under conditions such that said polypeptide is expressed; and  
(b) recovering said polypeptide.

16. The polypeptide produced by claim 15.

17. A method for preventing, treating, or ameliorating a medical condition, comprising administering to a mammalian subject a therapeutically effective amount of the polypeptide of claim 11 or the polynucleotide of claim 1.

18. A method of diagnosing a pathological condition or a susceptibility to a pathological condition in a subject comprising:

- (a) determining the presence or absence of a mutation in the polynucleotide of claim 1; and
- (b) diagnosing a pathological condition or a susceptibility to a pathological condition based on the presence or absence of said mutation.

19. A method of diagnosing a pathological condition or a susceptibility to a pathological condition in a subject comprising:

- (a) determining the presence or amount of expression of the polypeptide of claim 11 in a biological sample; and
- (b) diagnosing a pathological condition or a susceptibility to a pathological condition based on the presence or amount of expression of the polypeptide.

20. A method for identifying a binding partner to the polypeptide of claim 11 comprising:

- (a) contacting the polypeptide of claim 11 with a binding partner; and
- (b) determining whether the binding partner effects an activity of the polypeptide.

21. The gene corresponding to the cDNA sequence of SEQ ID NO:Y.

22. A method of identifying an activity in a biological assay, wherein the method comprises:

- (a) expressing SEQ ID NO:X in a cell;
- (b) isolating the supernatant;
- (c) detecting an activity in a biological assay; and
- (d) identifying the protein in the supernatant having the activity.

23. The product produced by the method of claim 20.