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(54) **COMPOSITIONS FOR THE DETECTION AND TREATMENT OF COLORECTAL CANCER**

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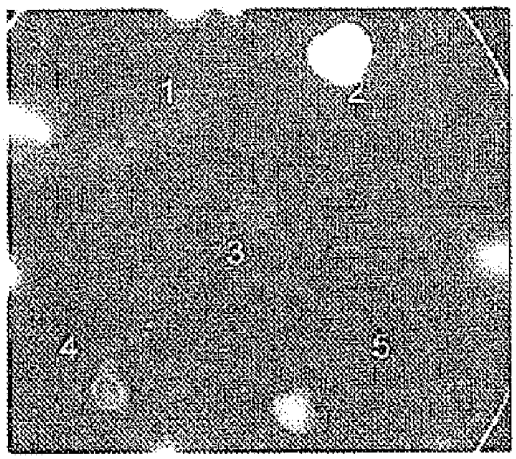
(57) **ABSTRACT**

The invention provides methods of identifying proteins and polypeptides and their cognate polynucleotides that are expressed by cells under one environmental condition and not under a second environmental condition. The invention also provides compositions for the treatment and detection of cancer, including colorectal cancer.

Dot immunoblot to assess reactivity of anti – stage IV colon cancer YPAbs with diseased sera

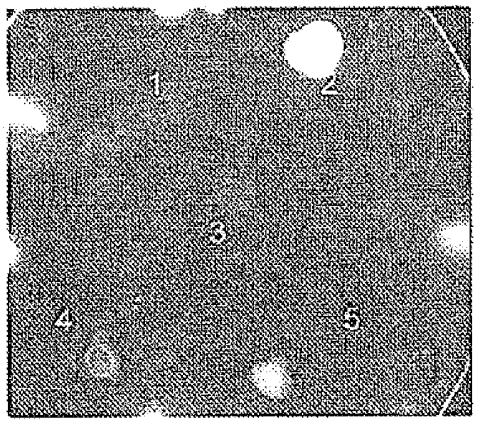


Antigen: Spot 20ug/sample

1 – Composite Healthy Tissue
2 – Stage IV colon cancer tissue
3 – Control BSA
4 – Healthy sera
5 – Composite Stage IV sera

1 antibody- Stage IV YPabs 1:10,000
2 antibody- rabbit anti-chicken HRP 1:10,000

Figure 1 Dot immunoblot to assess reactivity of anti – stage IV colon cancer YPAbs with diseased sera



Antigen: Spot 20ug/sample

1 – Composite Healthy Tissue
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1	antibody- Stage IV YPabs	1:10,000
2	antibody- rabbit anti-chicken HRP	1:10,000

COMPOSITIONS FOR THE DETECTION AND TREATMENT OF COLORECTAL CANCER

PRIORITY

[0001] This application claims the benefit of U.S. Ser. No. 61/081,926, filed Jul. 18, 2008, which is incorporated herein by reference in its entirety.

GOVERNMENT INTEREST

[0002] This invention was supported, in part, by NIH/NCI/SBIR grant number 1R43CA124006-01A1. The government of the United States has certain rights to the invention.

BACKGROUND OF THE INVENTION

[0003] The identification of proteins, polypeptide and other cellular constituent that are made when a cell undergoes a change from one state or condition to another can be important because such molecules are very likely to serve as indicators that the change is or has taken place. In the case where one condition is health and the second condition is a disease state, identification of such "change mediated" proteins, polypeptides or other cellular components should provide excellent targets for the development of new diagnostics, and likewise may provide targets for various types of antibiotherapies (e.g., vaccines) to aid in the treatment of the disease.

[0004] In certain instances, change mediated molecules may be shed from the diseased tissue and enter into bodily fluids that are relatively easily recovered. The identification of the presence of cellular constituents shed from diseased (e.g., cancerous) tissue in bodily fluids can be important because such shed proteins are very likely candidates to serve as ideal diagnostic targets that are pathogenomonic of active disease. For example, polypeptides that are differentially expressed in cancerous cells, such as colorectal cancer cells, and polypeptides that specifically expressed in cancerous cells and that are shed from cancerous cells into bodily fluids can be used to provide a precise and accurate diagnosis of cancer, for screening of anti-cancer compounds, for the development of therapeutic compositions, and other uses.

SUMMARY OF THE INVENTION

[0005] One embodiment of the invention provides a method of detecting cancer or a predisposition to developing cancer in a subject. The method comprises determining an expression level of a cancer-associated polynucleotide, protein, or polypeptide selected from the group consisting of Titin; HBA1; Insulin-like growth factor 1 receptor (IGF1R); Isoform 3 of zonadhesin precursor; latent transforming growth factor beta binding protein 4 (LTBP4); ASXL1 (additional sex combs like 1); beta globin (HBB); BMP15-bone morphogenetic protein; TRIM49; DNAJ homolog subfamily B member 11 precursor; uncharacterized hematopoietic stem/progenitor cells protein MDS027; uncharacterized protein ALB; isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor; isoform 2 of peripherin; mitochondrial 28S ribosomal protein S22; translation initiation factor EIF-2B subunit epsilon; estradiol 17-beta-dehydrogenase 1; XRCC6BP1; brain-specific angiogenesis inhibitor 1 precursor; isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2; hemoglobin subunit beta; isoform 1 of far upstream element-binding protein 1; GALECTIN-3; lysozyme C precursor; actin, alpha skeletal muscle; isoform M2 of pyruvate kinase isozymes M1/M2; AGR2; neutrophil defensin 1 precursor; myeloblastin precursor; uncharacterized protein PSME2; tubulin beta-2C chain; thiosulfate sulfurtransferase; heat shock 70 kDa protein 1; Ig kappa chain V-III region sie; macrophage migration inhibitory factor; isoform 1 of ATP synthase subunit D, mitochondrial; uncharacterized protein ENSP00000374051; isocitrate dehydrogenase [NADP] cytoplasmic; hemoglobin subunit delta; isoform 1 of splicing factor, arginine/serine-rich 7; isoform 1 of mRNA-capping enzyme; LON protease homolog, mitochondrial precursor; signal recognition particle 54 kDa protein; isoform long of galectin-9; integrin-linked protein kinase; bifunctional aminoacyl-tRNA synthetase; isoform 1 of zinc finger protein 207; inorganic pyrophosphatase; calponin-2; isoform 1 of muscleblind-like protein 3; cathepsin G precursor; zinc finger and BTB domain-containing protein 34; adenine phosphoribosyltransferase; 40S ribosomal protein S9; TALIN-1; leucine-rich repeat-containing protein 59; ATP synthase subunit alpha, mitochondrial precursor; isoform 7 of protein transport protein SEC31A; dihydroxyacetone kinase; protein similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2) isoform 4; 18 kDa protein (e.g., UNIPARC Accession Number IP100796554; cold agglutinin FS-1 L-chain; isoform 1 of heterogeneous nuclear ribonucleoprotein d0; DAZAP1/MEF2D fusion protein; POTE2; Keratin 18 (KRT18); PSME4 Isoform 1 of Proteasome activator complex subunit; Mitogen-activated protein kinase-activated protein kinase (MAPKAPK33); Complement component 1, s subcomponent (C1S); Lysozyme C precursor (LYZ); Keritin Type Cytoskeletal 20 (KRT20); RNASE3; Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1); CDNA FLJ25506 fis, clone CBR05185; Isoform B of fibulin-1 precursor (FBLN1); Nucleobindin 1 (NUCB1); Histone cluster 2, H2ba (HIST2H2BA); Tripartite motif-containing 28 (TRIM28); Peroxisomal D3, D2 enoyl-CoA isomerase (PECI); Peptidylprolyl isomerase B (PPIB); Similar to 40S ribosomal protein S17; Eukaryotic translation elongation factor 1 gamma (EEF1G); Keratin 8 (KRT8); Fibulin 2 (FBLN2); VIM; Fibrinogen alpha chain (FGA); Annexin A2 (ANXA2); H2A histone family, member J (H2AFJ); Actin alpha, cardiac muscle 1 (ACTC1); Keratin 19 (KRT19); Immunoglobin lambda locus (IGL@protein); Immunoglobulin heavy constant mu (IGHM); EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1); Tripartite motif-containing protein 34; Isoform 3 of AP1-subunit Gamma Binding Protein 1; Proflin-1; Histone H4; Hemoglobin subunit alpha; Transgelin); Lumican precursor; Hemoglobin Beta; Fibrinogen Beta Chain Precursor; Immunoglobulin kappa constant (IGKC); Uncharacterized Protein ALB; ApoA1; C4A; C3 187 kDa protein; Actin, Cytoplasmic 1 (actin beta); Hemoglobin beta; Hemoglobin subunit alpha; POTE-2 alpha actin; SLC4A10; Ribonuclease P Protein Subunit P20 (POP7); Nuclear RNA export factor 1 (NXF1); UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA; Uncharacterized Protein C13ORF27; Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor; Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10); Gap junction alpha-1 protein (GJA1/Connexion 43); Isoform 1 Of Kinesin-Like Protein KIF25 (KIF25); GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase; Uncharacterized Protein ALB; Galectin-3, LGALS3; Similar to NAC-Alpha Domain-Containing Protein 1 (NACAD); Acetyl-CoA Acetyltransferase, Mitochondrial, ACAT1; KH-Type Splicing Regula-

tory Protein, FUBP2; Profilin 1 (PFN1); Chloride Intracellular Channel Protein 1, CLIC1; Zinc Finger Protein 831; Endoplasmin; Ribosomal Protein S10 (RPS10); Splicing Factor, Arginine/Serine-Rich 3; ACTA2 Protein (alpha actin, smooth muscle); Isoform 1 of Sodium Channel Protein Type 8 Subunit Alpha, SCN8A; Isoform Long of Galectin-9; T-Complex Protein 1 Subunit Epsilon, CCT5; Alpha-Enolase, Lung Specific; Proto-Oncogene Serine/Threonine-Protein Kinase MOS; Isoform 1 Of Beta-Adducin (ADD2); Apolipoprotein E (APOE); Ubiquilin-4 (UBQLN4) (ataxin-1 ubiquitin-like interacting protein); Sumo-Conjugating Enzyme UB21 (UBC9 homolog in yeast); Myosin-15 (MYH15); FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK); Intelectin-1 (ITLN1); Apolipoprotein A-IV (APOA4); Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1); Leucine-Rich Repeat-Containing Protein 59 (LRRC59); 60S Ribosomal Protein L37A (RPL37A); Uridine-Cytidine Kinase 1-like 1 (UCKL1); Aldehyde Dehydrogenase 9A1 (ALDH9A1); Isoform 3 of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1); Nuclear Receptor Subfamily 2 Group E Member 1 (NR2E1); Cation Channel Sperm-Associated Protein 3 (CATSPER3); Transmembrane EMP24 Domain-Containing Protein 1 (TMED1); Protein FAM154A (FAM154A); Sand Isoform 1 of Transcriptional Repressor NF-X1 (NFX1); or any combinations thereof ("the polypeptides of the invention") in a biological sample from the subject. An increase of the expression level of the cancer-associated polynucleotide in the biological sample, such as a bodily fluid, as compared to a control sample indicates that the subject has cancer or has a predisposition to developing cancer. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157. The cancer can be colorectal cancer. The method can further comprise determining the expression level of one or more or two or more of the cancer-associated proteins or polypeptides. The expression level of the cancer-associated proteins or polypeptides can be determined by a method selected from group consisting of: (a) detecting the presence of the protein or polypeptide (b) detecting the biological activity of the protein or polypeptide encoded by the cancer-associated polynucleotide, and (c) detecting mRNA of the cancer-associated polynucleotide. The biological sample can comprise cells, cell extracts, tissue, bodily fluid, and bodily fluid substantially lacking cells (e.g., less than about 1, 5, or 10% cells) such as serum, urine, tears, milk, seminal fluid, prostatic fluid, lung lavage fluid, and saliva. The level of the cancer-associated protein or polypeptide can be determined by detecting its level in the biological sample using an antibody that binds to epitopes of the protein or polypeptide specific to the change mediated protein or polypeptide or by other means known in the art.

[0006] Another embodiment of the invention provides an isolated antibody or antigen-binding fragment thereof that specifically binds to a protein or polypeptide of the invention or any combinations thereof. A protein or polypeptide of the invention can comprise an amino acid sequence set forth as SEQ ID NO:1-157. The antibody can be a monoclonal antibody, a polyclonal antibody, a single-chain antibody, a monospecific single-chain antibody, a bispecific single-chain antibody, a bivalent single-chain antibody, a tetravalent single-chain antibody, a chimeric antibody, an antigen-binding fragment of an antibody, or a humanized antibody.

[0007] Even another embodiment of the invention provides a method of screening for anti-cancer compounds. The method comprises comparing the level of a change mediated protein or polypeptide expression product in a first biological sample in the presence of a test compound to the level of the change mediated protein or polypeptide expression product in a second biological sample in the absence of the test compound. The change mediated expression product comprises a protein or polypeptide of the invention or mRNA encoding the polypeptide of the invention or any combinations thereof. A test compound that decreases the level of the expression product in the first biological sample as compared to the second biological sample is identified as an anti-cancer agent. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157.

[0008] Yet another embodiment of the invention provides a method of screening for a compound for treating or preventing cancer. The method comprises (a) contacting a candidate compound with a cell expressing a protein or polypeptide of the invention or any combinations thereof and (b) selecting a compound that reduces the expression level of the protein or polypeptide. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157.

[0009] Another embodiment of the invention provides a kit for the detection of cancer in a mammal. The kit comprises (a) an antibody or antigen-binding fragment thereof, wherein in the antibody or antigen-binding fragment thereof specifically binds an epitope of the protein or polypeptide of the invention and (b) one or more reagents for detecting a binding reaction between the antibody and the protein or polypeptide. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157 or any combinations thereof.

[0010] Still another embodiment of the invention provides a kit for detecting cancer cells in a biological sample comprising at least one polynucleotide primer or probe wherein the polynucleotide primer or probe is specific for a polynucleotide that encodes a protein or polypeptide of the invention. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157 or any combinations thereof. The kit can comprise at least two polynucleotide primers specific for the polynucleotide that encodes a protein or polypeptide of the invention.

[0011] Yet another embodiment of the invention provides a fusion protein comprising at least two proteins or polypeptides of the invention or any combinations thereof. At least two proteins or polypeptides can he selected from the group consisting of an amino acid sequence set forth as SEQ ID NO:1-157.

[0012] Even another embodiment of the invention provides a composition comprising a first component selected from the group consisting of physiologically acceptable carriers and immunostimulants, and a second component selected from the group consisting of a protein or polypeptide of the invention or any combinations thereof; a polynucleotide that encodes the protein or polypeptide of the invention or any combinations thereof; an antibody according of the invention or any combinations thereof; and a fusion protein of the invention or any combinations thereof. The protein or polypeptide can comprise an amino acid sequence set forth as SEQ ID NO:1-157 or any combinations thereof.

[0013] Another embodiment of the invention provides a colorectal cancer reference expression profile, comprising a pattern of protein or polypeptide expression of two or more proteins or polypeptides of the invention set forth as SEQ ID NO:1-157 or any combinations thereof.

[0014] Another embodiment of the invention provides a colorectal cancer reference expression profile, comprising a

pattern of polynucleotide expression of two or more polynucleotides that encode proteins or polypeptides of the invention or any combinations thereof. The polypeptides of the invention can comprise amino acid sequences set forth as SEQ ID NO:1-157.

[0015] Yet another embodiment of the invention provides an array comprising two or more polynucleotides that specifically hybridize to two or more polynucleotides that encode a protein or polypeptide of the invention or two or more polypeptides of the invention or any combinations thereof. The polypeptides of the invention can comprise amino acid sequences set forth as SEQ ID NO:1-157.

[0016] Still another embodiment of the invention provides a composition for treating cancer. The composition comprises a pharmaceutically effective amount of an antibody or antigen-binding fragment thereof that specifically binds to a protein or polypeptide of the invention or any combinations thereof. The protein or polypeptide of invention can comprise an amino acid sequence set forth as SEQ ID NO:1-157.

[0017] Even another embodiment of the invention provides a composition for treating cancer. The composition comprises a pharmaceutically effective amount of a polypeptide of the invention or a polynucleotide encoding the polypeptide of the invention. The polypeptide of the invention can comprise an amino acid sequence set forth as SEQ ID NO:1-157.

[0018] Another embodiment of the invention provides a method for treating cancer in a subject or stimulating an immune response, such as an anti-tumor immune response or any other type of immune response in a subject. The method comprises (a) administering to the subject a pharmaceutically effective amount of a protein or polypeptide of the invention (b) administering to the subject a pharmaceutically effective amount of a polynucleotide, or fragment thereof, that encodes the polypeptide of the invention; or (c) administering to the subject a pharmaceutically effective amount of an antibody or antigen-binding fragment thereof that specifically binds to the protein or polypeptide of the invention. The protein or polypeptide of the invention can comprise an amino acid sequence set forth as SEQ ID NO:1-157. The cancer can be colorectal cancer.

[0019] Still another embodiment of the invention provides a method of isolating a change mediated protein or polypeptide, and its cognate gene or polynucleotide, expressed by a first host under a first environmental condition and not under a second environmental condition. The method comprises the steps of:

[0020] (a) obtaining a cell, tissue or fluid sample from the first host under the first environmental condition and optionally storing it under conditions (e.g., frozen) to preserve proteins, polypeptides, and other components of potential interest (i.e., change mediated) in the sample;

[0021] (b) immunizing an animal, optionally one that is phylogenetically distant from the first host and optionally using strong adjuvants, with the sample from (a) to elicit a strong, broad antibody response, resulting in an immunized animal;

[0022] (c) collecting antibodies from the immunized animal and optionally purifying the antibodies;

[0023] (d) adsorbing the antibodies with tissue, homogenized tissue, cells, cell extracts or fluid samples from a second host (optionally of the same species or same individual host as used in (a)) under the second environmental condition;

[0024] (e) isolating unadsorbed antibodies; and

[0025] (f) using the unadsorbed antibodies to isolate proteins, polypeptides or other constituents (e.g., lipids, carbohydrates, or glycoproteins) present in the cell, tissue or fluid sample of the first host under the first environmental condition and not present in the cell, tissue or fluid of the host under the second environmental condition; and optionally

[0026] (g) identifying the isolated protein, polypeptide or other component.

The first environmental condition can be a disease, a cancer, or an autoimmune disease. The second environmental condition can be normal condition, healthy condition, non-diseased condition or an environmental condition that is different from the first environmental condition. Cells and tissue can be from any part of the host. In the case where the host is an animal, the bodily fluid can be urine, tears, plasma, milk, lavage fluid, prostatic fluid, seminal fluid, saliva, scrum, sputum, and pleural effusion. The bodily fluid from a plant can be extracted from phloem or xylum. The bodily fluid can substantially lack cells. Where the first host is an animal, the immunized animal can be the same species as the first host animal or a different type of animal than the first host animal. The method can further comprise isolating proteins, peptides or other components of interest directly from homogenates or extracts of cells or tissues taken from the host under the first condition. Proteins or peptide can alternatively be captured using the unadsorbed antibodies from a library constructed using DNA or mRNA obtained from the host under the first environmental condition, wherein the library is an expression library or display library. "Probing a library" can comprise:

[0027] (a) immobilizing the unadsorbed antibodies on a solid support;

[0028] (b) adding cell or tissue homogenates or fluids of the first host under the first condition or expressed proteins of the genomic expression library or surface display library made from the DNA or RNA of the host under the first environmental condition;

[0029] (c) washing unbound proteins or members of the phage library from the solid support;

[0030] (d) recovering proteins and polypeptides or members of the surface display library that are bound to the solid support; and

[0031] (e) identifying the specifically captured proteins and polypeptides, or, in the case of surface display library probing, the gene or polynucleotide responsible for expressing the cognate protein or polypeptide that was captured by the antibody(ies).

The solid support can be blocked with a blocking agent before the homogenate, fluid, or library is added to decrease non-specific binding. The solid support can be selected from the group consisting of nitrocellulose, nylon, polystyrene, polyvinylchloride, latex, fiberglass, glass, microsphere, liposome, sepharose, sephadex, and a magnetic particle. The antibodies can be derived from an immunized animal selected from the group consisting of humans, baboons, chimpanzees, macaques, cattle, sheep, pigs, horses, goats, dogs, cats, rabbits, guinea pigs, rats, mice, chickens, ducks, and fish. The cells, tissues, and bodily fluid samples can be frozen immediately after it is obtained from the host under the first environmental condition. The cells, tissues, and fluid samples from the second host under the second environmental condition can be frozen immediately after they are obtained to minimize degradation of molecules needed to adsorb and

remove non-change mediated components. Identification of the captured proteins, polypeptides or other components (e.g., lipids, carbohydrates, or glycoproteins) can be performed using conventional methods known in the art such as mass spectroscopy in association with separation methods (e.g., GeLC-MS/MS).

[0032] Also provided is a method of confirming and validating the specifically expressed nature of the isolated protein/polypeptide as expressed by the host in response to the disease or change mediated condition. The method comprises:

[0033] (a) purifying the natural or recombinant protein or polypeptide;

[0034] (b) producing non-cross reactive (e.g., monoclonal) antibodies to the polypeptide;

[0035] (c) probing cells, cell extracts, bodily fluids, or tissue of the host under the first and second environmental conditions with the antibodies of (b); and

[0036] (d) demonstrating relative reactivity of the antibody(ies) with samples from the first but not the second environmental condition.

whereby the identified protein or polypeptide and its cognate polynucleotide is confirmed as being a change mediated molecule expressed under the first environmental condition but not the second if the antibodies specifically bind with the cells, cell extracts, bodily fluids, or tissue obtained from the host under the first condition but not the second.

BRIEF DESCRIPTION OF THE DRAWING

[0037] FIG. **1** shows an assessment of reactivity of polyclonal egg antibodies (YPAbs) raised in chickens using homogenates of stage IV human colon cancer tissue with pooled sera of patients diagnosed with stage IV colon cancer by dot immunoblot assay. Differential reactivity of spotted pooled sera from stage IV colon cancer patients was compared with spots of control serum from age, gender and ethnicity-matched healthy patients (spot 4), BSA (spot 3), and homogenates of healthy tissue (spot 1). A homogenate of stage IV cancer tissue was the positive control (spot 2).

DETAILED DESCRIPTION OF THE INVENTION

[0038] As used in this specification and the appended claims, the singular forms "a," "an" and "the" include plural references unless the content clearly dictates otherwise.

Identification of Proteins that are Differentially Regulated in Cancer Cells

[0039] Proteomics-based Change Mediated Antigen Technology (PCMAT) is a method for identifying proteins and polypeptides and their cognate genes or polynucleotides that are specifically expressed when a cell undergoes a change (e.g., change from a normal, healthy cell to a diseased cell) or is exposed to a change in environmental conditions (e.g., change of a plant cell going from moist to arid conditions). PCMAT can be used to identify proteins and polypeptides and their cognate genes or polynucleotides that are up-regulated or are specifically expressed in cells when the cells become diseased or cancerous.

[0040] By "specifically expressed" is meant that the protein or polypeptide is expressed to a greater or lesser extent under a first environmental condition as compared to a second environmental condition. For example, the protein or polypeptide might be expressed under a first environmental condition but not expressed under a second environmental condition. Alternatively, the protein or polypeptide might be expressed to a greater extent, for example 10%, 20%, 50%, 100%, 200%, or more, in the first environmental condition as compared to the second environmental condition.

[0041] First environmental conditions include, but are not limited to, a disease condition (such as, for example, a viral disease, a bacterial disease, a fungal disease, a disease caused by a prion, a disease caused by a protozoan, a parasitic disease, cancer, an autoimmune disease (e.g., arthritis, chronic inflammatory bowel disease, or diabetes), heat, cold, exposure to toxic chemicals, exposure to drugs, exposure to chemotherapy drugs or regimens, exposure to stress, exposure to toxic metals, exposure to radiation, exposure to toxins, exposure to antibiotics, exposure to chemicals meant to kill or slow the growth of the microbe such as bactericides, viricides, and bacteriostatic or viristatic agents, low oxygen conditions, high oxygen conditions, low pH conditions, high pH conditions, exposure to iron, exposure to low levels of nutrients, and exposure to high levels of nutrients.

[0042] A second environmental condition can be, for example, normal conditions, healthy conditions, non-diseased conditions, and/or the absence of the first environmental conditions. In one embodiment of the invention, a first environmental condition can be one stage or phase of a disease (e.g., early, middle, late, chronic, treated, untreated, treatment for a certain amount of time, remission) and the second environmental condition can be a second, different stage of a disease (e.g., early, middle, late, chronic, treated, untreated, treatment for a certain amount of time, remission).

[0043] One embodiment of the invention provides a method for isolating a protein, polypeptide or other component of a cell (e.g., lipid, carbohydrate, or glycoprotein) that is expressed under a first environmental condition (e.g., a diseased condition) and not under a second environmental condition (e.g., a healthy or non-diseased condition). In general, the method comprises obtaining a first sample from a host in a first condition (e.g., a diseased condition) and immunizing a second animal with the host sample. Antibodies from the immunized animal are collected and adsorbed with host samples collected from a second host under a second environment condition (e.g., healthy conditions). The second host can be the same individual first host under the second conditions (e.g. healthy tissues or cells from the first host) or a different host of the same or different species as the first host. Unadsorbed antibodies are collected and used to collect differentially expressed proteins, polypeptides or other components directly from diseased tissue or fluid of the first host or from an expression or display library of the host's DNA or RNA or similar DNA or RNA.

[0044] The host exposed to the first environmental condition can be any type of organism, for example, a mammal, such as a human, baboon, chimpanzee, macaque, cattle, sheep, pig, horse, goat, dog, cat, rabbit, guinea pig, rat, or mouse. An animal can also be, for example, a chicken, duck, insect, or fish. The host can also be a member of the plant or microbial kingdom.

[0045] In the case where the host is from the animal kingdom, the sample collected from a host in the first environmental condition can be, for example, cells, cell extracts, tissue, bodily fluid, bodily fluid substantially lacking cells (e.g., less than about 1, 5, or 10% cells), serum, urine, tears, milk, seminal fluid, prostatic fluid, lung lavage fluid, saliva, mucosal cells, tumor cells, cancer cells, a biopsy sample, a lavage sample, sputum, plasma, blood, a fecal sample, a

lymph node sample, bone marrow, colon tissue, rectal tissue, or a pleural effusion sample. Where the host is a plant, the sample can be from, e.g., cells, tissues, cell extracts, fluid extracted from phloem, fluid extracted from xylum. Wherein the host is a microbe, bacterium, virus or prion the sample can be cells or cell extracts, or cells or tissues of a host infected or colonized by the microbe.

[0046] Samples from animal host in a first environmental condition can be collected and processed immediately for immunization or are quickly frozen for later processing to preserve as closely as possible all of the potential epitopes that were present in the host animal sample at the moment the sample was taken. Individual samples or pooled samples collected at different time intervals or from different sampling sites or from different animals exposed to the same first environmental condition or similar environmental conditions can be used to immunize an animal to obtain an antibody response.

[0047] Antibodies from the immunized animal are collected. The immunized animal can be any type of animal capable of mounting a humoral immune response, for example, a mammal, such as a human, baboon, chimpanzee, macaque, cattle, sheep, pig, horse, goat, dog, cat, rabbit, guinea pig, rat, or mouse. An animal can also be, for example, a chicken, duck, insect, or fish. In one embodiment, the immunized animal is the same species as the first host animal. In another embodiment, the immunized animal is a different species from the first host animal. In another embodiment, the immunized animal is a different species from the first host animal wherein the immunized animal is distantly related to the first host animal (e.g., the first host animal is a human and the immunized animal is a chicken).

[0048] In the case where a bodily fluid is used as the immunogen, the fluid sample does not need to come from the site of the first environmental condition. That is, the bodily fluid does not need to be collected from the direct site of the diseased tissue or cancerous lesion, but instead can be, e.g., scrum drawn from a site away from the diseased tissue or cancerous lesion.

[0049] The immunization of animals with an antigen sample for the production of antibodies is well known in the art. See e.g., Antibody Techniques, Malik &Lillehoj, eds., Academic Press (1994); Antibodies: A Laboratory Manual, Harlow & Lane, eds., Cold Spring Harbor Laboratories (1988). A sample can be homogenized before administration to an animal. Administration can be by, for example, intramuscular, interperitoneal, subcutaneous, intradermal, intravenous, or nasal/inhalation, or combinations thereof.

[0050] The administration of the sample to the animal can be combined with an adjuvant. Alternatively, an adjuvant can be administered to the animal separately. An adjuvant can enhance an immune response to an antigen. An adjuvant can be, for example, complete Freund's adjuvant (CFA), Incomplete Freund's Adjuvant (IFA), montanide ISA (incomplete Seppic adjuvant), Ribi Adjuvant System (RAS), TiterMax®, Syntex Adjuvant Formulation (SAF), aluminum salt adjuvants, nitrocellulose-adsorbed antigen, encapsulated or entrapped antigens, immune-stimulating complexes (ISCOMs), for example Quil A or QS-21, and Gerbu® adjuvant. One of skill in the art can choose an appropriate adjuvant for a particular sample.

[0051] Booster administrations of the host samples from a first environmental condition can be given to the animal at, for example, 2 weeks, 1 month, two months, or three months after the immunization.

[0052] After an immune response occurs in the animal, an antibody sample is collected from the immunized animal. The sample can comprise, for example, the serum of an immunized animal. The animal's serum will contain antibodies, including antibodies specific for antigens expressed under the first environmental condition by the host animal (e.g., a diseased condition). Antibodies collected from an individual immunized animal can be used or antibodies pooled from two or more animals can be used. For example, antibodies collected from about 2, 5, 25, 100, 500, or 1,000 animals can be pooled.

[0053] Antibodies that bind to antigens that are produced under a second environmental condition, e.g., a healthy or non-disease condition are subtracted from the sample of antibodies. The result is an "unadsorbed antibody" sample. The antibodies are collected from the immunized animal and adsorbed with an animal host sample comparable to the one used to produce the antibodies, except that this sample is obtained from a host animal that is in the second environmental condition (e.g., healthy, normal or a condition that differs from the first environmental condition). The animal host sample (i.e., a host sample collected from a host animal in the second environmental condition) can be, for example, cells, cell extracts, tissue, bodily fluid, bodily fluid substantially lacking cells (e.g., less than about 1, 5, or 10% cells), serum, urine, tears, milk, seminal fluid, prostatic fluid, lung lavage fluid, saliva, mucosal cells, tumor cells, cancer cells, a biopsy sample, a lavage sample, sputum, plasma, blood, a fecal sample, a lymph node sample, bone marrow, colon tissue, rectal tissue, a pleural effusion sample, microbial or plant cells, tissues, or cell extracts. The adsorption removes antibodies that are reactive with proteins and other cell components made by the host in the second environmental condition (e.g., in the absence of disease). Unadsorbed antibodies that are reactive with antigens expressed by the animal host under the first environmental condition are recovered and used to capture proteins, polypeptides and other components specifically expressed by the host under the first environmental condition. The source of the proteins and polypeptides can be extracts of the tissues or bodily fluids from the animal in the first environmental condition. Alternatively, an expression or display library of the host's DNA or RNA can be used as the source of proteins. Proteins specifically captured by the adsorbed antibodies are eluted, concentrated and identified by proteomic methods known to persons skilled in the art (e.g., GeLC-MS/MS). In the case where surface display libraries are used, the cloned genetic fragment encoding the displayed protein is sequenced and the protein expressed by this fragment is deduced.

[0054] The adsorption step can be performed by, for example, contacting the antibody sample with host samples from the second environmental condition that are immobilized on a solid support, such as a nitrocellulose membrane or latex beads. See, Brady & Daphtary, *J. Infect. Dis.* 158:965-972 (1988). Optionally, the host sample from the second environmental condition can be denatured (e.g., by heating) before use to expose additional immunoreactive epitopes. Two or more successive adsorptions can be performed using the same or different adsorption methodologies.

[0055] All or substantially all of the antibodies in the antibody sample whose corresponding antigens are derived from a host under a second environmental condition will bind to these antigens to form immune complexes. However, antibodies directed against antigens that are specifically expressed under the first environmental condition will remain uncomplexed since their corresponding antigens are not present in the host sample under the second environmental condition. The uncomplexed antibodies comprise the unadsorbed antibody sample.

[0056] Polypeptides can be expressed from polynucleotides of the invention. The polypeptides can then be used to generate antibodies that specifically bind to an immunological epitope present in the polypeptides of the invention. Antibodies of the invention are antibody molecules that specifically bind to a polypeptide of the invention or fragment thereof. An antibody of the invention can be a polyclonal antibody, a monoclonal antibody, a single chain antibody (scFv), or an antigen-binding fragment of an antibody.

[0057] Antigens induced under a first environmental condition can be directly verified as actually expressed by the animal host in response to a first environmental condition by directly probing biological samples taken from, e.g., disease sites or from bodily fluid samples by any method known in the art. For example, monoclonal antibodies generated against a change mediated protein can be raised and tested for their specificity and cross reactivity to other proteins or polypeptides that are known to be or may be present in the test sample. Monoclonal antibodies that show appropriate specificity for epitopes on change mediated proteins or polypeptides can be labeled by various methods and tested for their reactivity with appropriate biological samples including tissues or bodily fluids from the host in both environmental conditions one and two. The labeled antibodies will react with the biological sample from the host in condition one (i.e., diseased), but will not react with the biological sample from the host in condition two (i.e., healthy or non-diseased). These results provide direct evidence that the host specifically expresses the antigen of interest under a first environmental condition, and that the change mediated protein or polypeptide so identified has potential for use in diagnosis, prevention, and therapy of the disease condition.

[0058] Samples taken at regular intervals throughout the course of disease will assure the presence of proteins and other potentially important cell components that can be transiently expressed. The more samples that are taken, the better the likelihood that the entire array of specifically expressed components will be obtained. The samples obtained in different time stages of disease or first conditions can be combined for immunization. Alternatively, they can be used to separately immunize animals to determine the approximate time during the disease that a particular protein or other cell component is expressed.

[0059] For example, comparing proteins and polypeptides of a animal host that are expressed under a first environmental condition at different stages of disease can comprise immunizing an animal with a first sample comprising one or more animal host samples under a first environmental condition, wherein each of the one or more host samples is in about the same stage of disease progression or treatment phase (e.g., early, middle, late, chronic, treated, untreated, treatment for a certain amount of time, remission). The stage or treatment phase of the first condition can be ascertained by, for example, by a medical professional. Antibodies from the immunized animal are collected and adsorbed with a host sample under a second environmental condition (e.g., a healthy or normal condition). Unadsorbed antibodies are collected and used as described above to identify change mediated proteins and polypeptides that are expressed throughout the entire time-course of the disease, with and without remission, and with and without treatment).

[0060] An animal is immunized with a second host sample comprising one or more host samples under the first environmental condition, wherein each of host samples is in about the same stage of disease progression or same treatment phase, wherein the stage or phase is different from the stage or phase a described above. Antibodies from the immunized animal are collected and adsorbed with host samples under a second environmental condition. Unadsorbed antibodies are collected and used as described above to identify change mediated proteins and polypeptides that are specifically expressed at particular stages of the disease or those that are specifically expressed in response to remission or treatment.

Colorectal Cancer Application of PCMAT Techniques

[0061] PCMAT and variations of PCMAT were used herein to identify polynucleotides that are expressed when healthy colorectal cells become cancerous colorectal cells. Adenocarcinoma tissues were obtained from Asterand XpressBank (Detroit, Mich.). The samples were harvested and quick frozen to preserve intact any potential antigen that was present at the time of harvest. The identity of the diseased tissue and staging were performed by clinical and histopathological examination. Integrity of the tissue sample was confirmed by RNA profile. From a potential list of approximately 200 available tissue samples, 4 samples were selected based on the following criteria: adenocarcinoma was the principal diagnosis; stages 1, 2, 3 and 4 were represented based on the AJCC/UICC classification scheme; the RNA profile indicated that minimal degradation of the tissue had occurred during the period following harvesting and quick freezing; the diseased tissue was from the large bowel; paired (homologous), healthy tissue (confirmed by clinical and histopathological examination) was available; and the samples represented both males and females.

[0062] Each of the 4 cancerous tissue samples (stage 1, 2, 3 and 4) was processed independently and subjected to PCMAT, which identified proteins and polypeptides that are specifically expressed in the adenocarcinoma samples relative to the proteins that are expressed in healthy bowel tissue.

[0063] Briefly, the adenocarcinoma samples were homogenized in PBS and samples from each cancer stage were individually used to immunize appropriate animals. Chickens, which are phylogenetically distant from humans, were chosen for this step to optimize the strength and breadth of the immune response. A strong adjuvant (Complete Freund's Adjuvant) was also used for this purpose. Colorectal cancer stage-specific polyclonal immunoglobulin (PAbs) was obtained from egg yolks of immunized animals. To selectively enrich for immunoglobulin directed against protein antigens unique to colon carcinoma tissues and concomitantly deplete immunoglobulin directed against protein antigens expressed by cells comprising both healthy and cancerous tissues, homogenates of healthy, autologous bowel tissue were prepared as for the diseased tissue. Antibodies reactive with proteins expressed by healthy bowel tissue were depleted from the immunoglobulin by adsorption using the UltraBind affinity membranes with covalently coupled pro-

teins from healthy tissues. The procedure was repeated until essentially no reactivity was observed in ELISA or western blots between the adsorbed immunoglobulin and the paired healthy tissue homogenates. Immunoglobulin depleted of antibodies reactive with constitutively expressed protein antigens from healthy tissues were subjected to another round of adsorption with whole cells and lysates of the *Escherichia coli* host strain/pET30 grown with inducer (1 mM IPTG) to remove any antibodies reactive or cross-reactive with contaminants in the cDNA libraries.

[0064] Change mediated proteins were captured using the unadsorbed antibodies remaining after the adsorption steps using two different sources. The first source was the homogenates of diseased tissue (stages 1, 2, 3, and 4) used to immunize the animals. The second source was a normalized cDNA library, NCI_CGAP_Col4, which was obtained from the I.M.A.G.E. consortium. This library reportedly was constructed using cDNA generated by reverse transcription of mRNA isolated from moderately differentiated colon adenocarcinoma, and cloning into the shuttle vector, pCMV-SPORT6.

[0065] Adsorbed immunoglobulin preparations were covalently bound to M-280 Tosyl-activated Dynabeads according to the manufacturer's (Dynal Biotech) directions to create "charged" magnetic beads. For immunocapture, 5 ml of previously prepared diseased tissue homogenates or cDNA expression library fractions containing recombinant proteins at a concentration of 1 mg/ml were incubated with 0.5 ml of charged beads for 2 h at 4° C. with tilt rotation. Following immunocapture, charged beads were washed with 10 bead volumes of wash buffer (PBS-0.2% NOG).

[0066] Specifically bound proteins were eluted three times with 1M acetic acid. All wash and elution fractions were collected for analysis. Following elution, the specifically bound proteins were immediately neutralized by addition of 10 volumes of 0.2 M Na_2PO_4 (pH 7.4) and stored at 4° C. in the presence of 0.02% sodium azide until further use. A negative control consisted of an identical volume of beads charged with preimmune immunoglobulin and treated as above to capture non-specifically bound proteins. Eluates from charged columns treated with soluble lysates from the cDNA library, and homogenates of the tumors clearly demonstrated the presence of proteins that were absent in the negative controls.

[0067] Proteins specifically bound by columns charged with adsorbed immunoglobulin were identified by GeLC-MS/MS at the University of Florida Interdisciplinary Center for Biotechnology Research (ICBR). Specifically bound recombinant proteins eluted from charged columns above were concentrated, fractionated on 1D SDS-PAGE, and digested in-gel with trypsin prior to tandem MS/MS. Fractions of the 1D-lane were reduced, alkylated, and digested with trypsin (Promega). The enzymatically-digested samples were separated using a C18 Pep Map HPLC column with elution using a formic acid gradient. GeLC-MS/MS analysis was carried out on a hybrid quadrupole-TOF mass spectrometer (QSTAR, Applied Biosystems, Framingham, Mass.). All MS/MS samples were analyzed using Mascot version 2.0.01 (Matrix Science, London, UK) and Scaffold (version Scaffold-01-06-03, Proteome Software Inc., Portland, Oreg.). Change mediated antigens identified were analyzed via bioinformatics by querying the human genomic sequence database.

[0068] Proteins and their cognate polynucleotides that are upregulated in stage 1 cancerous cells were identified. The identified polypeptides and proteins are as follows: Titin (also known as TTN rhabdomyosarcoma antigen MU-RMS 40) (e.g., GenBank Accession Number Q8WZ42-2 (SEQ ID NO:1)); HBA1 (e.g., GenBank Accession Number P69905 (SEQ ID NO:2)); Insulin-like growth factor 1 receptor (IGF1R) (e.g., GenBank Accession Number P08069 (SEQ ID NO:3)); Isoform 3 or zonadhesin precursor (e.g., GenBank Accession Number Q9Y493-1 (SEQ ID NO:4)); latent transforming growth factor beta binding protein 4 (LTBP4) (e.g., UniProt Accession Number A6NCG8 (SEQ ID NO:5)); ASXL1 (additional sex combs like 1) (e.g., GenBank Accession Number Q8IXJ9-1 (SEQ ID NO:6)); beta globin (HBB) (e.g., GenBank Accession Number P68871 (SEQ ID NO:7)); BMP15-bone morphogenetic protein (e.g., GenBank Accession Number NM_005448.1 (see also, UniProt Accession Number O95972) (SEQ ID NO:8)); TRIM49 (also known as RNF18; tripartite motif-containing 49) (e.g., GenBank Accession Number Q9NS80 (SEQ ID NO:9)); DNAJ homolog subfamily B member 11 precursor (e.g., GenBank Accession Number Q9UBS4 (SEQ ID NO:10)); uncharacterized hematopoietic stem/progenitor cells protein MDS027 (also known as MDS027 hHBrk1 HSPC300) GenBank Accession Number Q9NZ47 (SEQ ID NO:11)); uncharacterized protein ALB (e.g., UniProt Accession Number A6NBZ8 (SEQ ID NO:12)); isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor (e.g., GenBank Accession Number Q8TER0-4 (SEQ ID NO:13)); isoform 2 of peripherin (e.g., GenBank Accession Number P41219-2 (SEQ ID NO:14)); mitochondrial 28S ribosomal protein S22 (e.g., GenBank Accession Number P82650 (SEQ ID NO:15)); translation initiation factor EIF-2B subunit epsilon (e.g., GenBank Accession Number Q13144 (SEQ ID NO:16)); estradiol 17-beta-dehydrogenase 1 (e.g., GenBank Accession Number P14061 (SEQ ID NO:17)); XRCC6BP1 (e.g., GenBank Accession Number Q8N4L5 (SEQ ID NO:18)); brain-specific angiogenesis inhibitor 1 precursor (e.g., GenBank Accession Number O14514 (SEQ ID NO:19)); isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2 (e.g., GenBank Accession Number Q91-HBD1-2 (SEQ ID NO:20)); hemoglobin subunit beta (e.g., GenBank Accession Number P68871 (SEQ ID NO:21)); isoform 1 of far upstream element-binding protein 1 (e.g., GenBank Accession Number Q96AE4-1 (SEQ ID NO:22)); GALECTIN-3 (e.g., GenBank Accession Number P17931 (SEQ ID NO:23)); lysozyme C precursor (e.g., GenBank Accession Number P61626 (SEQ ID NO:24)); actin, alpha skeletal muscle (e.g., GenBank Accession Number P68133 (SEQ ID NO:25)); isoform M2 of pyruvate kinase isozymes M1/M2 (e.g., GenBank Accession Number P14618-1 (SEQ ID NO:26)); AGR2 (e.g., GenBank Accession Number O95994 (SEQ ID NO:27)); neutrophil defensin 1 precursor (e.g., GenBank Accession Number P59665 (SEQ ID NO:28)); myeloblastin precursor (e.g., GenBank Accession Number P24158 (SEQ ID NO:29)); uncharacterized protein PSME2 (e.g., GenBank Accession Number Q9UL46 (SEQ ID NO:30)); tubulin beta-2C chain (e.g., UniProt Accession Number P68371 (SEQ ID NO:31)); thiosulfate sulfurtransferase (e.g., GenBank Accession Number Q16762 (SEQ ID NO:32)); heat shock 70 kDa protein 1(e.g., GenBank Accession Number P08107 (SEQ ID NO:33)); Ig kappa chain V-III region sie (e.g., GenBank Accession Number P01620 (SEQ ID NO:34)); macrophage migration inhibitory

factor (e.g., GenBank Accession Number P14174 (SEQ ID NO:35)); isoform 1 of ATP synthase subunit D, mitochondrial (e.g., GenBank Accession Number O75947-1 (SEQ ID NO:36)); uncharacterized protein ENSP00000374051 (e.g., GenBank Accession Number A6NGM3 (SEQ ID NO:37)); isocitrate dehydrogenase [NADP] cytoplasmic (e.g., UniProt Accession Number O75874 (SEQ ID NO:38)); hemoglobin subunit delta (e.g., GenBank Accession Number P02042 (SEQ ID NO:39)); isoform 1 of splicing factor, arginine/serine-rich 7 (e.g., GenBank Accession Number Q16629-1 (SEQ ID NO:40)); isoform 1 of mRNA-capping enzyme (e.g., GenBank Accession Number O60942-1 (SEQ ID NO:41)); LON protease homolog, mitochondrial precursor (e.g., GenBank Accession Number P36776 (SEQ ID NO:42)); signal recognition particle 54 kDa protein (e.g., GenBank Accession Number P61011 (SEQ ID NO:43)); isoform long of galectin-9 (e.g., GenBank Accession Number O00182-1 (SEQ ID NO:44)); integrin-linked protein kinase (e.g., GenBank Accession Number Q13418 (SEQ ID NO:45)); bifunctional aminoacyl-tRNA synthetase (e.g., GenBank Accession Number P07814 (SEQ ID NO:46)); isoform 1 of zinc finger protein 207 (e.g., GenBank Accession Number O43670-1 (SEQ ID NO:47)); inorganic pyrophosphatase (e.g., GenBank Accession Number Q15181 (SEQ ID NO:48)); calponin-2 (e.g., GenBank Accession Number Q99439 (SEQ ID NO:49)); isoform 1 of muscleblind-like protein 3 (e.g., GenBank Accession Number Q9NUK0-1 (SEQ ID NO:50)); cathepsin G precursor (e.g., GenBank Accession Number P08311 (SEQ ID NO:51)); zinc finger and BTB domain-containing protein 34 (e.g., GenBank Accession Number Q8NCN2 (SEQ ID NO:52)); adenine phosphoribosyltransferase (e.g., GenBank Accession Number P07741 (SEQ ID NO:53)); 40S ribosomal protein S9 (e.g., GenBank Accession Number P46781 (SEQ ID NO:54)); TALIN-1 (e.g., GenBank Accession Number Q9Y490 (SEQ ID NO:55)); leucine-rich repeat-containing protein 59 (e.g., GenBank Accession Number Q96AG4 (SEQ ID NO:56)); ATP synthase subunit alpha, mitochondrial precursor (e.g., GenBank Accession Number P25705 (SEQ ID NO:57)); isoform 7 of protein transport protein SEC31A (e.g., GenBank Accession Number O94979-7 (SEQ ID NO:58)); dihydroxyacetone kinase (e.g., GenBank Accession Number Q3LXA3 (SEQ ID NO:59)); protein similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2) isoform 4 (e.g., ENSEMBL Accession Number ENST0000342709 (see also, GenBank Accession No. NM_004500.3 and UNIPARC Accession Number IP100868835) (SEQ ID NO:60)); 18 kDa protein (e.g., UNIPARC Accession Number IP100796554 (SEQ ID NO:61)); cold agglutinin FS-1 L-chain (e.g., GenBank Accession Number A2NB45 (SEQ ID NO:62)); isoform 1 of heterogeneous nuclear ribonucleoprotein d0 (e.g., UniProt Accession Number Q14103-1 (SEQ ID NO:63)); DAZAP1/MEF2D fusion protein (e.g., GenBank Accession Number Q51RN2 (SEQ ID NO:64)).

[0069] Proteins and their cognate polynucleotides that are upregulated in stage IV cancerous cells were also identified. The polynucleotides encode the following polypeptides: POTE2 (also known as ANKRD26-like family C, member 1A) (e.g., GenBank Accession Number NP_001077007 (SEQ ID NO: 65)); keratin 18 (KRT18) (e.g., GenBank Accession Number NP_000215 (SEQ ID NO: 66)); PSME4 Isoform 1 of Proteasome activator complex subunit (also known as prosome macropain, activator subunit 4) (e.g., GenBank Accession Number NP_055429 (SEQ ID NO: 67)); Mitogen-activated protein kinase-activated protein kinase (MAPKAPK33) (e.g., GenBank Accession Number NP_004626 (SEQ ID NO: 68)); Complement component 1, s subcomponent (C1S) (e.g., GenBank Accession Number NP_001725 (SEQ ID NO: 69)); Lysozyme C precursor (LYZ) (e.g., GenBank Accession Number NP_000230 (SEQ ID NO: 70)); Keritin Type Cytoskeletal 20 (KRT20) (e.g., GenBank Accession Number NP_061883 (SEQ ID NO: 71)); RNASE3 (also known as ECP RNS3, ribonuclease, RNase A family 3) (e.g., GenBank Accession Number NP_002926 (SEQ ID NO: 72)); Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1) (e.g., GenBank Accession Number NP_000683 (SEQ ID NO: 73)); CDNA FLJ25506 fis, clone CBR05185 (e.g., GenBank Accession Number Q8N716 (SEQ ID NO: 74)); Isoform B of fibulin-1 precursor (FBLN1) (e.g., GenBank Accession Number P23142-2 (SEQ ID NO: 75)); Nucleobindin 1 (NUCB1) (e.g., GenBank Accession Number NP_006175 (SEQ ID NO: 76)); Historic cluster 2, H2ba (HIST2H2BA) (e.g., GenBank Accession Number NP_001019770 (SEQ ID NO: 77)); Tripartite motif-containing 28 (TRIM28) (e.g., GenBank Accession Number NP_005753 (SEQ ID NO: 78)); Peroxisomal D3, D2 enoyl-CoA isomerase (PECI) (e.g., GenBank Accession Number NP_006108 (SEQ ID NO: 79)); Peptidylprolyl isomerase B (PPIB) (e.g., GenBank Accession Number NP_000933 (SEQ ID NO: 80)); Similar to 40S ribosomal protein S17 (e.g., GenBank Accession Number IP00743305 (SEQ ID NO: 81)); Eukaryotic translation elongation factor 1 gamma (EEF1G) (e.g., GenBank Accession Number IP100747497 (SEQ ID NO: 82)); Keratin 8 (KRT8) (e.g., GenBank Accession Number NP_002264 (SEQ ID NO: 83)); Fibulin 2 (FBLN2) (e.g., GenBank Accession Number NP_001989 (SEQ ID NO: 84)); VIM (e.g., GenBank Accession Number NP_003371 (SEQ ID NO: 85)); Fibrinogen alpha chain (FGA) (e.g., GenBank Accession Number NP_000499 (SEQ ID NO: 86)); Annexin A2 (ANXA2) (e.g., GenBank Accession Number NP_001002858 (SEQ ID NO: 87)); H2A histone family, member J (H2AFJ) (e.g., GenBank Accession Number NP_808760 (SEQ ID NO: 88)); Actin alpha, cardiac muscle 1 (ACTC1) (e.g., GenBank Accession Number NP_005150 (SEQ ID NO: 89)); Keratin 19 (KRT19) (e.g., GenBank Accession Number NP_002267 (SEQ ID NO: 90)); Immunoglobin lambda locus (IGL@protein) (e.g., GenBank Accession Number Q6PIQ7 (SEQ ID NO: 91)); immunoglobulin heavy constant mu (IGHM) (e.g., GenBank Accession Number Q8WUK1 (SEQ ID NO: 92)); EGF-containing Fibulin-like extracellular matrix protein 1 (EFEMP1) (e.g., GenBank Accession Number Q12805-3 (SEQ ID NO: 93)); Tripartite motif-containing protein 34 (e.g., GenBank Accession Number NP_067629 (SEQ ID NO: 94)); Isoform 3 of AP1-subunit Gamma Binding Protein 1 (e.g., GenBank Accession Number NP_542117 (SEQ ID NO: 95)); Proflin-1 (e.g., GenBank Accession Number NP_005013 (SEQ ID NO:96)); Histone H4 (e.g., GenBank Accession Number NP_001029249 (SEQ ID NO: 97)); Hemoglobin subunit alpha (e.g., GenBank Accession Number NP_000549 (SEQ ID NO: 98)); Transgelin (also known as TAGLN) (e.g., GenBank Accession Number NP_001001522 (SEQ ID NO: 99)); Lumican precursor (e.g., GenBank Accession Number NP_002336 (SEQ ID NO: 100)); Hemoglobin Beta (also known as HBD CD113t) (e.g., GenBank Accession Number NP_000509 (SEQ ID NO: 101)); Fibrinogen Beta Chain Precursor (e.g., GenBank

Accession Number NP_005132 (SEQ ID NO: 102)); immunoglobulin kappa constant (IGKC) (e.g., GenBank Accession Number Q6GMX8 (SEQ ID NO: 103)); Uncharacterized Protein ALB (also known as albumin) (e.g., GenBank Accession Number Q56G89 (SEQ ID NO: 104)).

[0070] In another example, PCMAT was used to identify proteins that are shed into body fluids during a diseased state, namely stage IV colorectal bowel cancer. See Example 1. This study used the YPAbs (polyclonal IgY antibodies) raised in chickens against adjuvanted homogenates of stage IV human colon cancer tissue. The YPAbs evoked from the stage IV tumor tissue were adsorbed with sera from healthy subjects bound to a solid support. After confirmation using western and dot blots that no remaining antibodies reactive with antigens present in healthy serum was established, the remaining unadsorbed antibodies were bound to a solid support resin to create a charged column as described above. Serum from patients with stage IV colorectal cancer was passed through the column, and non-specifically bound proteins and peptides were removed by washing. Specifically bound proteins were removed using acetic acid, which were identified by GeLC-MS/MS as described above. Stage II tumor tissue was used in the same manner to identify SEQ ID NOs:108-157 and are as follows: Actin, Cytoplasmic 1 (actin beta) (e.g., GenBank Accession Number NP_001092 (SEQ ID NO:108)); Hemoglobin beta (e.g., GenBank Accession Number O95408 (SEQ ID NO:109)); Hemoglobin subunit alpha (e.g., GenBank Accession Number P69905 (SEQ ID NO:110)); POTE-2 alpha actin (e.g., GenBank Accession Number A5A3E0 (SEQ ID NO:111)); SLC4A10 (e.g., GenBank Accession Number Q6U841 (SEQ ID NO:112)); Ribonuclease P Protein Subunit P20 (POP7) (e.g., GenBank Accession Number O75817 (SEQ ID NO:113)); Nuclear RNA export factor 1 (NXF1) (e.g., GenBank Accession Number Q59E96 (SEQ ID NO:114)); UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA (e.g., GenBank Accession Number Q05DB3 (SEQ ID NO:115)); Uncharacterized Protein C13ORF27 (e.g., GenBank Accession Number Q5JUR7 (SEQ ID NO:116)); Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor (e.g., GenBank Accession Number Q8TER0 (SEQ ID NO:117)); Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10): (e.g., GenBank Accession Number Q8IVF4 (SEQ ID NO:118)); Gap junction alpha-1 protein (GJA1/Connexion 43) (e.g., GenBank Accession Number P17302 (SEQ ID NO:119)); Isoform 1 Of Kinesin-Like Protein KIF25 (KIF25) (e.g., GenBank Accession Number Q5SZU8 (SEQ ID NO:120)); GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase (e.g., GenBank Accession Number P04406 (SEQ ID NO:121)); Uncharacterized Protein ALB (e.g., GenBank Accession Number P02768 (SEQ ID NO:122)); Galectin-3, LGALS3 (e.g., GenBank Accession Number NP_002297 (SEQ ID NO:123)); Similar to NAC-Alpha Domain-Containing Protein 1 (NACAD) (e.g., GenBank Accession Number O15069 (SEQ ID NO:124)); Acetyl-CoA Acetyltransferase, Mitochondrial, ACAT1 (e.g., GenBank Accession Number NP_000010 (SEQ ID NO:125)); KH-Type Splicing Regulatory Protein, FUBP2 (e.g., GenBank Accession Number NP_003676 (SEQ ID NO:126)); Profilin 1 (PFN1) (e.g., GenBank Accession Number NP_005013 (SEQ ID NO:127)); Chloride Intracellular Channel Protein 1, CLIC1 (e.g., GenBank Accession Number NP_001279 (SEQ ID NO:128)); Zinc Finger Protein 831 (e.g., GenBank Accession Number NP_848552 (SEQ ID NO:129)); Endoplasmin (e.g., GenBank Accession Number NP_003290 (SEQ ID NO:130)); Ribosomal Protein S10 (RPS10) (e.g., GenBank Accession Number P46783 (SEQ ID NO:131)); Splicing Factor, Arginine/Serine-Rich 3 (e.g., GenBank Accession Number NP_003008 (SEQ ID NO:132)); ACTA2 Protein (alpha actin, smooth muscle) (e.g., GenBank Accession Number P62736 (SEQ ID NO:133)); Isoform 1 of Sodium Channel Protein Type 8 Subunit Alpha, SCN8A (e.g., GenBank Accession Number NP_055006 SEQ ID NO:134)); Isoform Long of Galectin-9 GenBank Accession Number NP_033665 SEQ ID NO:135)); T-Complex Protein 1 Subunit Epsilon, CCT5 (e.g., GenBank Accession Number NP_036205 (SEQ ID NO:136)); Alpha-Enolase, Lung Specific (e.g., GenBank Accession Number CAA47179 (SEQ ID NO:137)); Proto-Oncogene Serine/Threonine-Protein Kinase MOS (e.g., GenBank Accession Number NP_005363 (SEQ ID NO:138)); Isoform 1 Of Beta-Adducin (ADD2) (e.g., GenBank Accession Number NP_001608 (SEQ ID NO:139)); Apolipoprotein E (APOE) (e.g., GenBank Accession Number NP_000032 SEQ ID NO:140)); Ubiquitin-4 (UBQLN4) (ataxin-1 ubiquitin-like interacting protein) (e.g., GenBank Accession Number NP_064516 (SEQ ID NO:141)); Sumo-Conjugating Enzyme UB21 (UBC9 homolog in yeast) (e.g., GenBank Accession Number NP_003336 (SEQ ID NO:142)); Myosin-15 (MYH15) (e.g., GenBank Accession Number NP_055796 (SEQ ID NO:143)); FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK) (e.g., GenBank Accession Number NP_057392 (SEQ ID NO:144)); Intelectin-1 (ITLN1) (e.g., GenBank Accession Number NP_060095 (SEQ ID NO:145)); Apolipoprotein A-IV (APOA4) (e.g., GenBank Accession Number Q13784 (SEQ ID NO:146)); Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1) (e.g., GenBank Accession Number P08559 (SEQ ID NO:147)); Leucine-Rich Repeat-Containing Protein 59 (LRRC59) (e.g., GenBank Accession Number NP_060979 (SEQ ID NO:148)); 60S Ribosomal Protein L37A (RPL37A) (e.g., GenBank Accession Number NP_000989 (SEQ ID NO:149)); Uridine-Cytidine Kinase 1-like 1 (UCKL1) (e.g., GenBank Accession Number Q53HM1 (SEQ ID NO:150)); Aldehyde Dehydrogenase 9A1 (ALDH9A1) (e.g., GenBank Accession Number NP_000687 (SEQ ID NO:151)); Isoform 3 Of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1) (e.g., GenBank Accession Number Q16881 (SEQ ID NO:152)); Nuclear Receptor Subfamily 2 Group E Member 1 (NR2E1) (e.g., GenBank. Accession Number NP_003260 (SEQ ID NO:153)); Cation Channel Sperm-Associated Protein 3 (CATSPER3) (e.g., GenBank Accession Number NP_821138 (SEQ ID NO:154)); Transmembrane EMP24 Domain-Containing Protein 1 (TMED1) (e.g., GenBank Accession Number NP_006849 (SEQ ID NO:155)); Protein FAM154A (FAM154A) (e.g., GenBank Accession Number NP_714918 (SEQ ID NO:156)); Isoform 1 of Transcriptional Repressor NF-X1 (NFX1) (e.g., GenBank Accession Number NP_002495 (SEQ ID NO:157)).

[0071] Shed change mediated proteins and their cognate polynucleotides that are upregulated in stage IV cancerous cells were identified. The polynucleotides encode the polypeptides shown in SEQ ID NOs:105-107 (ApoA1 e.g., GenBank Accession Number P02647 (SEQ ID NO:105); C4A (e.g., GenBank Accession Number P0C0L4 (SEQ ID NO:106); and C3 187 kDa protein (e.g., GenBank Accession Number P01024 (SEQ ID NO:107)).

[0072] In general, PCMAT has a number of outstanding attributes, including its speed (the entire biomarker discovery portion of the project can be performed in less than 6 months), cost efficiency, and, most importantly, its sensitivity. In general, chickens serve as an excellent host in which to raise high titer, broadly reactive antibodies: they tolerate very strong adjuvants extremely well, they are phylogenetically distant from humans, which makes them more likely to respond to human immunogens in cancer studies, they have a very large immune repertoire, and enormous amounts of purified IgY (essentially identical to IgG) can be readily obtained from their eggs. The use of strong adjuvants helps to assure that even low abundance proteins will elicit an antibody response and will be recovered. Another aspect of PCMAT that promotes sensitivity is that the size of the charged column and the amount of the body fluid that can be passed through it can be substantial. Again, this promotes the likelihood of finding low abundance proteins. Finally, the subtraction step in which fluids from healthy subjects are used to remove antibodies reactive with background proteins results in a tremendously increased signal to noise ratio. The need for sensitivity as provided by PCMAT cannot be overstated. It is highly likely that cancerous proteins that are shed into body fluids are of relatively low-abundance, and therefore missed by strategies that are currently in use. The use of PCMAT to find cancerous shed proteins presents a unique opportunity for the identification of novel target for the development of diagnostics for cancer.

[0073] All of these polypeptides are referred to herein as "the polypeptides of the invention" or "cancer-associated antigens or polypeptides." The polynucleotides that encode the polypeptides of the invention are referred to herein as "the polynucleotides of the invention" or "cancer-associated polynucleotides."

Polypeptides

[0074] A polypeptide is a polymer of three or more amino acids covalently linked by amide bonds. A polypeptide can be post-translationally modified. A purified polypeptide is a polypeptide preparation that is substantially free of cellular material, other types of polypeptides, chemical precursors, chemicals used in synthesis of the polypeptide, or combinations thereof. A polypeptide preparation that is substantially free of cellular material, culture medium, chemical precursors, and/or chemicals used in synthesis of the polypeptide has less than about 30%, 20%, 10%, 5%, 1% or more of other polypeptides, culture medium, chemical precursors, and/or other chemicals used in synthesis. Therefore, a purified polypeptide is about 70%, 80%, 90%, 95%, 99% or more pure.

[0075] A polypeptide of the invention can comprise at least 1, 2, 3, 4, 5, 10, 25, 100, 500, 1,000 or more non-naturally occurring amino acids immediately contiguous with one or both of the amino and carboxy termini of the polypeptide.

[0076] Polypeptides of the invention can either be full-length polypeptides or proteins or fragments of polypeptides or proteins. For example, fragments of polypeptides of the invention can comprise about 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 250, 500, 750, 1,000, 2,000, 3,000, 4,000, 5,000 or more contiguous amino acids of polypeptides of the invention or any value or range between 5 and 5,000. Examples of polypeptides of the invention include those shown in SEQ ID NOs:1-157. Variant polypeptides are at least about 80, or about 85% 90, 91, 92, 93, 94, 95, 96, 97, 98, 99% or more identical to the polypeptide sequences shown in SEQ ID NOs:1-157. Variant polypeptides have one or more conservative amino acid variations or other minor modifications and retain biological activity, i.e., are biologically functional equivalents. A biologically active equivalent has substantially equivalent function when compared to the corresponding wild-type polypeptide.

[0077] Percent sequence identity has an art recognized meaning and there are a number of methods to measure identity between two polypeptide or polynucleotide sequences. See, e.g., Lesk, Ed., *Computational Molecular Biology,* Oxford University Press, New York, (1988); Smith, Ed., *Biocomputing: Informatics And Genuine Projects,* Academic Press, New York, (1993); Griffin & Griffin, Eds., *Computer Analysis Of Sequence Data, Part I,* Humana Press, New Jersey, (1994); von Heinje, *Sequence Analysis In Molecular Biology,* Academic Press, (1987); and Gribskov & Devereux, Eds., *Sequence Analysis Primer,* M Stockton Press, New York, (1991). Methods for aligning polynucleotides or polypeptides are codified in computer programs, including the GCG program package (Devereux et al., *Nuc. Acids Res.* 12:387 (1984)), BLASTP, BLASTN, FASTA (Atschul et al., *J. Molec. Biol.* 215:403 (1990)); and Bestfit program (Wisconsin Sequence Analysis Package, Version 8 for Unix, Genetics Computer Group, University Research Park, 575 Science Drive, Madison, Wis. 53711) which uses the local homology algorithm of Smith and Waterman (*Adv. App. Math.,* 2:482-489 (1981)). For example, the computer program ALIGN which employs the FASTA algorithm can be used, with an affine gap search with a gap open penalty of −12 and a gap extension penalty of −2.

[0078] When using any of the sequence alignment programs to determine whether a particular sequence is, for instance, about 95% identical to a reference sequence, the parameters are set such that the percentage of identity is calculated over the full length of the reference polynucleotide and that gaps in identity of up to 5% of the total number of nucleotides in the reference polynucleotide are allowed.

[0079] Variants can generally be identified by modifying one of the polypeptide sequences of the invention, and evaluating the properties of the modified polypeptide to determine if it is a biological equivalent. A variant is a biological equivalent if it reacts substantially the same as a polypeptide of the invention in an assay such as an immunohistochemical assay, an enzyme-linked immunosorbent assay (ELISA), a radioimmunoassay (RIA), immunoenzyme assay or a western blot assay, e.g. has 90-110% of the activity of the original polypeptide. In one embodiment, the assay is a competition assay wherein the biologically equivalent polypeptide is capable of reducing binding of the polypeptide of the invention to a corresponding reactive antigen or antibody by about 80, 95, 99, or 100%. An antibody that specifically binds a corresponding wild-type polypeptide also specifically binds the variant polypeptide. Variant polypeptides of the invention can comprise about 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 60, 70, 80, 100, 200 or more conservative amino acid substitutions or any value or range of substitutions between about 1 and about 200.

[0080] A conservative substitution is one in which an amino acid is substituted for another amino acid that has similar properties, such that one skilled in the art of peptide chemistry would expect the secondary structure and hydropathic nature of the polypeptide to be substantially unchanged. Conservative substitutions include swaps within

groups of amino acids such as 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 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.

[0081] A polypeptide of the invention can further comprise a signal (or leader) sequence that co-translationally or post-translationally directs transfer of the protein. The polypeptide can also comprise a linker or other sequence for case of synthesis, purification or identification of the polypeptide (e.g., poly-His), or to enhance binding of the polypeptide to a solid support. A polypeptide of the invention can further comprise a signal (or leader) sequence that co-translationally or post-translationally directs transfer of the protein. The polypeptide can also comprise a linker or other sequence for ease of synthesis, purification or identification of the polypeptide (e.g., poly-His), or to enhance binding of the polypeptide to a solid support. For example, a polypeptide can be conjugated to an immunoglobulin Fc region or bovine serum albumin.

[0082] A polypeptide can be covalently or non-covalently linked to an amino acid sequence to which the polypeptide is not normally associated with in nature. A polypeptide can also be covalently or non-covalently linked to compounds or molecules other than amino acids. For example, a polypeptide can be linked to an indicator reagent, an amino acid spacer, an amino acid linker, a signal sequence, a stop transfer sequence, a transmembrane domain, a protein purification ligand, or a combination thereof. In one embodiment of the invention a protein purification ligand can be one or more amino acid residues at, for example, the amino terminus or carboxy terminus of a polypeptide of the invention. An amino acid spacer is a sequence of amino acids that are not usually associated with a polypeptide of the invention in nature. An amino acid spacer can comprise about 1, 5, 10, 20, 100, 500, 1,000 or more amino acids.

[0083] If desired, a polypeptide can be a fusion protein, which can also contain other amino acid sequences, such as amino acid linkers, amino acid spacers, signal sequences, TMR stop transfer sequences, transmembrane domains, as well as ligands useful in protein purification, such as glutathione-S-transferase, histidine tag, and staphylococcal protein A, or combinations thereof. More than one polypeptide of the invention can be present in a fusion protein. Fragments of polypeptides of the invention can be present in a fusion protein of the invention. A fusion protein of the invention can comprise one or more of SEQ ID NOs:1-157, fragments thereof, or combinations thereof.

[0084] Polypeptides of the invention can be in a multimeric form. That is, a polypeptide can comprise one or more copies of SEQ ID NOs:1-157 or a combination thereof. A multimeric polypeptide can be a multiple antigen peptide (MAP). See e.g., Tam, J. Immunol. Methods, 196:17-32 (1996).

[0085] Polypeptides of the invention can comprise an antigen that is recognized by an antibody. The antigen can comprise one or more epitopes (i.e., antigenic determinants). An epitope can be a linear epitope, sequential epitope or a conformational epitope. Epitopes within a polypeptide of the invention can be identified by several methods. See, e.g., U.S. Pat. No. 4,554,101; Jameson & Wolf, *CABIOS* 4:181-186 (1988). For example, a polypeptide of the invention can be isolated and screened. A series of short peptides, which together span an entire polypeptide sequence, can be prepared by proteolytic cleavage. By starting with, for example, 100-mer polypeptide fragments, each fragment can be tested for the presence of epitopes recognized in an ELISA. For example, in an ELISA assay a polypeptide, such as a 100-mer polypeptide fragment, is attached to a solid support, such as the wells of a plastic multi-well plate. A population of antibodies are labeled, added to the solid support and allowed to bind to the unlabeled antigen, under conditions where non-specific absorption is blocked, and any unbound antibody and other proteins are washed away. Antibody binding is detected by, for example, a reaction that converts a colorless substrate into a colored reaction product. Progressively smaller and overlapping fragments can then be tested from an identified 100-mer to map the epitope of interest.

[0086] A polypeptide of the invention can be produced recombinantly. A polynucleotide encoding a polypeptide of the invention can be introduced into a recombinant expression vector that can be expressed in a suitable expression host cell system using techniques well known in the art. A variety of bacterial, yeast, plant, mammalian, and insect expression systems are available in the art and any such expression system can be used. Optionally, a polynucleotide encoding a polypeptide can be translated in a cell-free translation system. A polypeptide can also be chemically synthesized or obtained from cancerous cells.

[0087] An immunogenic polypeptide of the invention can comprise an amino acid sequence shown in SEQ ID NOs:1-157. An immunogenic polypeptide can elicit antibodies or other immune responses (e.g., T-cell responses of the immune system) that recognize epitopes of polypeptides having SEQ ID NOs:1-157. An immunogenic polypeptide of the invention can also be a fragment of a polypeptide that has an amino acid sequence shown in SEQ NOs:1-157. An immunogenic polypeptide fragment of the invention can be about 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 250, 500, 750, 1,000, 2,000, 3,000, 4,000, 5,000 or more or any value or range between about 5 and about 5,000 amino acids in length.

Polynucleotides

[0088] Polynucleotides of the invention contain less than an entire genome and can be single- or double-stranded nucleic acids. A polynucleotide can be RNA, mRNA, DNA, cDNA, genomic DNA, chemically synthesized RNA or DNA or combinations thereof. The polynucleotides can be purified free of other components, such as proteins, lipids and other polynucleotides. For example, the polynucleotide can be 50%, 75%, 90%, 95%, 96%, 97%, 98%, 99%, or 100% purified. The polynucleotides of the invention encode the polypeptides described above. In one embodiment of the invention the polynucleotides encode polypeptides of the invention and polypeptides shown in SEQ ID NOs:1-157, the complements thereof, or combinations thereof. Polynucleotides of the invention can comprise other nucleotide sequences, such as sequences coding for linkers, signal sequences, TMR stop transfer sequences, transmembrane domains, or ligands useful in protein purification such as glutathione-S-transferase, histidine tag, and staphylococcal protein A.

[0089] Polynucleotides of the invention can be isolated. An isolated polynucleotide is a polynucleotide that is not immediately contiguous with one or both of the 5' and 3' flanking genomic sequences that it is naturally associated with. An

isolated polynucleotide can be, for example, a recombinant DNA molecule of any length, provided that the nucleic acid sequences naturally found immediately flanking the recombinant DNA molecule in a naturally-occurring genome is removed or absent. Isolated polynucleotides also include non-naturally occurring nucleic acid molecules. A nucleic acid molecule existing among hundreds to millions of other nucleic acid molecules within, for example, cDNA or genomic libraries, or gel slices containing a genomic DNA restriction digest are not to be considered an isolated or purified polynucleotide.

[0090] Polynucleotides of the invention can also comprise fragments that encode immunogenic polypeptides. Polynucleotides of the invention can encode full-length polypeptides or proteins, polypeptide fragments, and variant or fusion polypeptides.

[0091] Degenerate nucleotide sequences encoding polypeptides of the invention, as well as homologous nucleotide sequences that are at least about 80, or about 85, 90, 95, 96, 97, 98, 99% or more identical to the polynucleotide sequences of the invention and the complements thereof are also polynucleotides of the invention. Percent sequence identity can be calculated as described in the "Polypeptides" section. Degenerate nucleotide sequences are polynucleotides that encode a polypeptide of the invention or fragments thereof, but differ in nucleic acid sequence from the wild-type polynucleotide sequence, due to the degeneracy of the genetic code. Complementary DNA (cDNA) molecules, species homologs, and variants of polynucleotides that encode biologically functional polypeptides of the invention also are polynucleotides of the invention. Polynucleotides of the invention can be isolated from nucleic acid sequences present in, for example, a biological sample, such as blood, serum, saliva, or tissue from an individual patient. Polynucleotides can also he synthesized in the laboratory, for example, using an automatic synthesizer. An amplification method such as PCR can be used to amplify polynucleotides from either genomic DNA or cDNA encoding the polypeptides.

[0092] Polynucleotides of the invention can comprise coding sequences for naturally occurring polypeptides or can encode altered sequences that do not occur in nature. If desired, polynucleotides can be cloned into an expression vector comprising expression control elements, including for example, origins of replication, promoters, enhancers, or other regulatory elements that drive expression of the polynucleotides of the invention in host cells. An expression vector can be, for example, a plasmid, such as pBR322, pUC, or ColE1, or an adenovirus vector, such as an adenovirus Type 2 vector or Type 5 vector. Optionally, other vectors can be used, including but not limited to Sindbis virus, simian virus 40, alphavirus vectors, poxvirus vectors, and cytomegalovirus and retroviral vectors, such as murine sarcoma virus, mouse mammary tumor virus, Moloney murine leukemia virus, and Rous sarcoma virus. Minichromosomes such as MC and MC1, bacteriophages, phagemids, yeast artificial chromosomes, bacterial artificial chromosomes, virus particles, virus-like particles, cosmids (plasmids into which phage lambda cos sites have been inserted) and replicons (genetic elements that are capable of replication under their own control in a cell) can also be used.

[0093] Methods for preparing polynucleotides operably linked to an expression control sequence and expressing them in a host cell are well-known in the art. See, e.g., U.S. Pat. No. 4,366,246. A polynucleotide of the invention is operably linked when it is positioned adjacent to or close to one or more expression control elements, which direct transcription and/or translation of the polynucleotide.

[0094] Polynucleotides of the invention can be used, for example, as probes or primers, for example PCR primers, to detect the presence of polynucleotides in a sample, such as a biological sample. The ability of such probes and primers to specifically hybridize to polynucleotides of the invention will enable them to be of use in detecting the presence of complementary sequences in a given sample. Polynucleotide probes and primers of the invention can hybridize to complementary sequences in a sample such as a biological sample, including saliva, sputum, blood, urine, feces, cerebrospinal fluid, amniotic fluid, wound exudate, or tissue. Polynucleotides from the sample can be, for example, subjected to gel electrophoresis or other size separation techniques or can be immobilized without size separation. The polynucleotide probes or primers can be labeled. Suitable labels and methods for labeling probes and primers are known in the art, and include, for example, radioactive labels incorporated by nick translation or by kinase, biotin labels, fluorescent labels, chemiluminescent labels, bioluminescent labels, metal chelator labels and enzyme labels. Polynucleotides from a sample are contacted with the probes or primers under hybridization conditions of suitable stringencies.

[0095] Depending on the application, varying conditions of hybridization can be used to achieve varying degrees of selectivity of the probe or primer towards the target sequence. For applications requiring high selectivity, relatively stringent conditions can be used, such as low salt and/or high temperature conditions, such as provided by a salt concentration of from about 0.02 M to about 0.15 M salt, or any value or range between about 0.02M to about 0.15 M salt, at temperatures of from about 50° C. to about 70° C., or any value or range between about 50° C. to about 70° C. For applications requiring less selectivity, less stringent hybridization conditions can be used. For example, salt conditions from about 0.14 M to about 0.9M salt or any value or range between about 0.14 M to about 0.9M salt, at temperatures ranging from about 20° C. to about 55° C. or any value or range between about 20° C. to about 55° C. The presence of a hybridized complex comprising the probe or primer and a complementary polynucleotide from the test sample can indicate the presence of cancer in the sample.

Antibodies

[0096] Antibodies of the invention are antibody molecules that specifically and stably bind to a polypeptide of the invention or fragment thereof. An antibody of the invention can be a polyclonal antibody, a monoclonal antibody, a single chain antibody (scFv), a monospecific single-chain antibody, a bispecific single-chain antibody, a bivalent single-chain antibody, a tetravalent single-chain antibody, a chimeric antibody, a humanized antibody, or an antigen-binding fragment of an antibody. Antigen-binding fragments of antibodies are a portion of an intact antibody comprising the antigen binding site or variable region of an intact antibody, wherein the portion is free of the constant heavy chain domains of the Fc region of the intact antibody. Examples of antigen-binding antibody fragments include Fab, Fab', Fab'-SH, $F(ab')_2$ and F_v fragments.

[0097] An isolated antibody is substantially separated from its natural environment. For instance, an isolated antibody is substantially separated from the biological source from

which it is derived. A purified antibody is substantially free of other material that associates with the antibody in its natural environment. For instance, a purified antibody is substantially free of cellular material or other proteins or antibodies from the cell or tissue from which it is derived. The term refers to preparations where the isolated antibody is at least about 70% to 80% (w/w) pure, more preferably, at least about 80%-90% (w/w) pure, even more preferably about 90-95% pure; and, most preferably at least about 95%, 96%, 97%, 98%, 99%, or 100% (w/w) pure.

[0098] An antibody of the invention can be any antibody class and any subtype, including for example, IgG (IgG1, IgG2, IgG4), IgM, IgA, IgD, IgE, and IgY. An antibody or antigen-binding fragment thereof binds to an epitope of a polypeptide of the invention. An antibody can be made in vivo in suitable laboratory animals or in vitro using recombinant DNA techniques. Means for preparing and characterizing antibodies are well know in the art. See, e.g., Dean, *Methods Mol. Biol.* 80:23-37 (1998); Dean, *Methods. Mol. Biol.* 32:361-79 (1994); Baileg, *Methods Mol. Biol.* 32:381-88 (1994); Gullick, *Methods Mol. Biol.* 32:389-99 (1994); Drenckhahn et al. *Methods Cell. Biol.* 37:7-56 (1993); Morrison, *Ann. Rev. Immunol.* 10:239-65 (1992); Wright et al. *Crit. Rev. Immunol.* 12:125-68 (1992). For example, polyclonal antibodies can be produced by administering a polypeptide of the invention to an animal, such as a human or other primate, mouse, rat, rabbit, guinea pig, goat, pig, dog, cow, sheep, donkey, chicken, or horse. Scrum from the immunized animal is collected and the antibodies are purified from the plasma by, for example, precipitation with ammonium sulfate, followed by chromatography, such as affinity chromatography. Techniques for producing and processing polyclonal antibodies are known in the art.

[0099] "Specifically binds" or "specific for" means that a first antigen, e.g., a polypeptide of the invention, recognizes and binds to an antibody of the invention with greater affinity than other, non-specific molecules. A non-specific molecule is an antigen that shares no common epitope with the first antigen. In this case, polypeptides of the invention would not generally be desirable choices for non-specific control molecules. For example, an antibody raised against a first antigen (e.g., a polypeptide) to which it binds more efficiently than to a non-specific antigen can be described as specifically binding to the first antigen. In a preferred embodiment, an antibody or antigen-binding portion thereof specifically binds to a polypeptide of the invention, such as SEQ ID NOs:1-157 or fragments thereof when it binds with a binding affinity K_a of 10^7 l/mol or more. Specific binding can be tested using, for example, an enzyme-linked immunosorbant assay (ELISA), a radioimmunoassay (RIA), or a western blot assay using methodology well known in the art.

[0100] Additionally, monoclonal antibodies directed against epitopes present on a polypeptide of the invention can also be readily produced. For example, normal B cells from a mammal, such as a mouse, which was immunized with a polypeptide of the invention can be fused with, for example, HAT-sensitive mouse myeloma cells to produce hybridomas. Hybridomas producing antibodies can be identified using RIA or ELISA and isolated by cloning in semi-solid agar or by limiting dilution. Clones producing polypeptide-specific antibodies are isolated by another round of screening. Monoclonal antibodies can be screened for specificity using standard techniques, for example, by binding a polypeptide of the invention to a microtiter plate and measuring binding of the monoclonal antibody by an ELISA assay. Techniques for producing and processing monoclonal antibodies are known in the art. See e.g., Kohler & Milstein, Nature, 256:495 (1975). Particular isotypes of a monoclonal antibody can be prepared directly, by selecting from the initial fusion, or prepared secondarily, from a parental hybridoma secreting a monoclonal antibody of a different isotype by using a sib selection technique to isolate class-switch variants. See Steplewski et al., *P.N.A.S. U.S.A.* 82:8653 1985; Spria et al., *J. Immunolog. Meth.* 74:307, 1984. Monoclonal antibodies of the invention can also be recombinant monoclonal antibodies. See, e.g., U.S. Pat. No. 4,474,893; U.S. Pat. No. 4,816,567. Antibodies of the invention can also be chemically constructed. See, e.g., U.S. Pat. No. 4,676,980.

[0101] Antibodies of the invention can be chimeric (see, e.g., U.S. Pat. No. 5,482,856), humanized (see, e.g., Jones et al., *Nature* 321:522 (1986); Reichmann et al., *Nature* 332:323 (1988); Presta, *Curr. Op. Struct. Biol.* 2:593 (1992)), or human antibodies. Human antibodies can be made by, for example, direct immortilization, phage display, transgenic mice, or a Trimera methodology, see e.g., Reisener et al., *Trends Biotechnol.* 16:242-246 (1998).

[0102] Antibodies that specifically bind antigens (e.g., polypeptides of the invention), are particularly useful for detecting the presence of cancer-associated antigens in a sample, such as a serum, blood, urine, tissue, or saliva sample from an animal suspected of having cancer, such as a human. An immunoassay for cancer-associated antigens can utilize one antibody or several antibodies. An immunoassay for cancer-associated antigens can use, for example, a monoclonal antibody directed towards one epitope of a polypeptide of the invention, a combination of monoclonal antibodies directed towards epitopes of one polypeptide of the invention, monoclonal antibodies directed towards epitopes of different polypeptides of the invention, polyclonal antibodies directed towards the same antigen from a polypeptide of the invention, polyclonal antibodies directed towards different antigens, or a combination of monoclonal and polyclonal antibodies. Immunoassay protocols can be based upon, for example, competition, direct reaction, or sandwich type assays using, for example, labeled antibody. Antibodies of the invention can be labeled with any type of label known in the art, including, for example, fluorescent, chemiluminescent, radioactive, enzyme, colloidal metal, radioisotope and bioluminescent labels.

[0103] Antibodies of the invention include antibodies and antigen-binding fragments thereof that (a) compete with a reference antibody for binding to polypeptides of the invention, such as SEQ ID NOs:1-157 or antigen binding fragments thereof; (b) binds to the same epitope of polypeptides of the invention, such as SEQ ID NOs:1-157 or antigen binding fragments thereof as a reference antibody; (c) binds to polypeptides of the invention, such as SEQ ID NOs:1-157 or antigen binding fragments thereof with substantially the same K_d as a reference antibody; and/or (d) binds to polypeptides of the invention such as SEQ ID NOs:1-157 or fragments thereof with substantially the same off rate as a reference antibody, wherein the reference antibody is an antibody or antigen-binding fragment thereof that specifically binds to a polypeptide of the invention, such as SEQ ID NOs:1-157 or antigen-binding fragments thereof with a binding affinity K_a of 10^7 l/mol or more.

[0104] Antibodies of the invention or antigen-binding fragments thereof can be bound to a support and used to detect the

presence of cancer-associated antigens. Supports include, for example, glass, polystyrene, polypropylene, polyethylene, dextran, nylon, amylases, natural and modified celluloses, polyacrylamides, agaroses and magletite.

[0105] Antibodies of the invention can further be used to isolate cancer-associated antigens by immunoaffinity columns. The antibodies can be affixed to a solid support by, for example, adsorbtion or by covalent linkage so that the antibodies retain their immunoselective activity. Optionally, spacer groups can be included so that the antigen binding site of the antibody remains accessible. The immobilized antibodies can then be used to bind cancer-associated antigens from a sample, such as a biological sample including saliva, serum, sputum, blood, urine, feces, cerebrospinal fluid, amniotic fluid, wound exudate, or tissue. The bound cancer-associated antigens are recovered from the column matrix by, for example, a change in pH.

[0106] Antibodies of the invention can also be used in immunolocalization studies to analyze the presence and distribution of a polypeptide of the invention during various cellular events or physiological conditions. Antibodies can also be used to identify molecules involved in passive immunization and to identify molecules involved in the biosynthesis of non-protein antigens. Identification of such molecules can be useful in vaccine development. Antibodies of the invention, including, for example, monoclonal antibodies and single chain antibodies, can be used to monitor the course of amelioration of a cancer. Stage IV polynucleotide of the invention (i.e., polynucleotides that encode SEQ ID NOs:65-107) are particularly useful in this method, however, Stage I (i.e., polynucleotides that encode SEQ ID NOs:1-64) and Stage II (i.e., polynucleotides that encode SEQ ID NOs:108-157) can be used in this method. By measuring the increase or decrease of antibodies to cancer-associated antigens in a test sample from an animal, it can be determined whether a particular therapeutic regiment aimed at ameliorating the cancer is effective. Antibodies can be detected and/or quantified using for example, direct binding assays such as RIA, ELISA, or western blot assays.

Methods of Detection of Cancer

[0107] Methods of detecting cancer, a predisposition to developing cancer, or a susceptibility to developing cancer in a subject are provided herein. A predisposition to cancer means that a subject is susceptible to cancer, such as colorectal cancer, or is more likely to develop cancer than a normal individual or a normal population of individuals. A subject can be a mammal such as a human, non-human primate, mouse, rat, dog, cat, sheep, pig, horse, or cow. One hundred seven polypeptides that were specifically expressed (i.e., the polypeptides are expressed in cancerous tissues, but are not expressed or are expressed at low levels in healthy tissues) in colon cancer tissues were identified. These polypeptides are cancer-associated polypeptides and are encoded by cancer-associated polynucleotides. The stage I polypeptides and polynucleotides are especially useful for early diagnosis. An expression level of one or more of the cancer-associated polynucleotides that encode polypeptides of the invention can be determined in a biological sample from a subject, wherein an increase of the expression level of the cancer-associated polynucleotides compared to a normal control expression level of the polynucleotide indicates that the subject has cancer or is at risk of developing cancer. A comparison to a normal control expression level is not necessary since the polynucleotides of the invention are not expressed or are expressed at low levels in healthy cells and tissues.

[0108] In general, PCMAT can be applied to a wide variety of cancers. The cancer can be colon cancer (also known as, and referred to herein also as colorectal or large bowel cancer), adenocarcinoma, carcinoma, sarcoma, lymphoma, leukemia, prostrate cancer, gastric cancer, lung cancer, bladder cancer, melanoma, pancreatic cancer, breast cancer, endometrial cancer, ovarian cancer, anal cancer, skin cancer, osteosarcoma, brain tumor, gastrointestinal cancer, esophageal cancer, bile duct cancer, eye cancer, gall bladder cancer, glioma, head and neck cancer, liver cancer, kidney cancer, laryngeal cancer, lip and oral cancer, mesothelioma, small intestinal cancer, testicular cancer, thyroid cancer, urethral cancer, uterine cancer, vaginal cancer, vulvar cancer, penile cancer, or any combination or subset thereof. The biological sample can be, for example, mucosal cells, tumor cells, cancer cells, a biopsy sample, a lavage sample, a sputum sample, a serum sample, a gastric secretion sample, a plasma sample, a blood sample, a fecal sample, a lymph node sample, a bone marrow sample, a urine sample, a tissue sample, a colorectal tissue sample, a pleural effusion sample, cells, cell extracts, bodily fluid, bodily fluids that are substantially lacking cells (e.g., less than about 1, 5, or 10% cells, tears, milk, seminal fluid, prostatic fluid, lung lavage fluid, or saliva.

[0109] The expression level of cancer-associated protein or polypeptide can be determined by detecting the polypeptide encoded by the cancer-associated polynucleotide. The level of the polypeptide expression can be detected using an immunoassay such as an ELISA, an immunohistochemical assay, an immunocytochemical assay, and a flow cytometry assay of antibody-labeled cells. The level of the polypeptide expression can be detected by, e.g., using an antibody that specifically binds to the polypeptide. The expression level of cancer-associated proteins and polypeptides can also be determined by detecting the biological activity of the polypeptides encoded by the cancer-associated polynucleotides. Methods of detecting the biological activity of polypeptides are well known in the art.

[0110] The expression level of a polynucleotide of the invention (i.e., "cancer-associated polynucleotide") can be determined by detecting mRNA expression levels of the cancer-associated polynucleotide. The expression level of a cancer-associated polynucleotide can be determined by detecting hybridization of a cancer-associated polynucleotide probe to a polynucleotide transcript of a patient-derived biological sample. Hybridization can be detected using, for example a polynucleotide array. For example, probes for detecting RNA sequences corresponding to the cancer-associated polynucleotides of the invention can be used in, e.g., northern blot hybridization assays. Alternatively, polynucleotides of the invention can be used to construct primers that specifically amplify polynucleotide sequences in, e.g., amplification-based detection methods such as reverse-transcription based polymerase chain reaction (RT-PCR), polymerase chain reaction amplification (PCR), ligase chain reaction amplification (LCR), strand displacement amplification (SDA), and nucleic acid sequence based amplification (NASBA).

[0111] The expression level of one or more of the cancer-associated polynucleotides of the invention in the test sample can be compared to expression levels of the cancer-associated polynucleotides in a control sample. The control sample can be, e.g., a cancerous sample or non-cancerous sample (e.g., healthy tissue, such as healthy colorectal tissue).

[0112] Where the control sample is non-cancerous, a similar protein or polynucleotide expression level in the test sample and control sample indicates the test sample is non-cancerous. A test sample can be compared to multiple control samples. Thus, a test sample can be compared to a second control sample that contains, e.g., cancerous cells, as well as a second control that contains, e.g., non-cancerous cells.

[0113] Proteins, polypeptides and polynucleotides of the invention can be used to test a putative therapeutic or prophylactic anti-cancer agent, such as an anti-colorectal cancer agent, in a test sample from a specific subject to determine if the agent is a suitable anti-cancer agent in the specific subject. To identify an anti-cancer agent that is appropriate for a specific subject, a test sample, such as a cancerous cell or tumor sample is obtained from the subject and is exposed to the anti-cancer agent. The expression of one or more of polynucleotides of the invention is determined. The pattern of cancer-associated polynucleotide expression of the test sample can be measured and compared to one or more control profiles, e.g. a colorectal cancer reference expression profile or a non-colorectal cancer reference expression profile. Preferably, the cell population is contacted ex vivo with the agent or activated form of the anti-cancer agent.

[0114] Expression of the cancer-associated polypeptide or polynucleotides in the test sample is then compared to the expression of the cancer-associated polypeptide or polynucleotide in a control sample. The control sample can be cells whose cancer state is known. If the control sample is non-cancerous, a similar gene expression profile between the test sample and the control sample indicates the anti-cancer agent is suitable for treating cancer in the subject. A difference in expression between polypeptide or polynucleotide expression in the test sample and those in the control sample indicates that the anti-cancer agent is not suitable for treating cancer in the subject. A decrease in expression of one or more of the cancer-associated polypeptide or polynucleotides in a test sample relative to a control sample from cancerous tissues is indicative that the agent is therapeutic.

[0115] Polypeptides or polynucleotides of the invention can also be used to identify candidate therapeutic agents for treating a cancer, such as colorectal cancer. A candidate therapeutic agent is screened to determine if it converts an expression profile of cancer-associated polypeptide or polynucleotides characteristic of a cancer state, such as a colorectal cancer state, to a pattern indicative of a non-cancerous state.

[0116] A cancerous sample is exposed to a test agent or a combination of test agents (sequentially or simultaneously) and the expression of one or more cancer-associated polypeptide or polynucleotides in the sample is measured. The expression of the cancer-associated polypeptide or polynucleotides in the test sample is compared to expression level of the cancer-associated polypeptide or polynucleotides in a control sample that is not exposed to the test agent. Therapeutic test agents will decrease the expression of cancer-associated polypeptide or polynucleotides that are up-regulated in cancer cells.

[0117] The control sample can be cancerous cells, such as cancerous colorectal cancer cells. A decrease in expression of the cancer-associated polypeptide or polynucleotides in the presence of the test agent from the expression profile of the control sample in the absence of the test agent indicates the test agent is a candidate therapeutic agent for treating cancer, such as colorectal cancer.

[0118] Also provided is a method of assessing the prognosis of a subject with cancer, such as colorectal cancer, by comparing the expression of one or more polypeptide or polynucleotides of the invention in a test sample to the expression of the polypeptide or polynucleotides in a control sample derived from patients over a spectrum of disease stages. By comparing polypeptide or polynucleotide expression of one or more polypeptide or polynucleotides of the invention in the test sample and the control samples, or by comparing the pattern of polypeptide or polynucleotide expression over time in test samples derived from the subject, the prognosis of the subject can be assessed. The expression of one or more stage IV polypeptide or polynucleotides (i.e., polypeptide or polynucleotides that encode SEQ ID NOs:65-107) would be indicative of poorer prognosis. The expression of one or more stage I polypeptide or polynucleotides (i.e., polypeptide or polynucleotides that encode SEQ ID NOs:1-64) to the exclusion of expression of one or more stage IV polynucleotides would be indicative of a better prognosis.

[0119] The control sample can be a healthy sample or a cancerous sample, such as a colorectal cancer sample. Alternatively, the control sample is a cancer expression profile, such as a colorectal cancer expression profile. When the control sample is cancerous an increase of expression of one or more of the polypeptides of the invention, indicates less favorable prognosis. A decrease in expression of polypeptides or polypeptides of the invention indicates a more favorable prognosis for the subject. Alternatively, when a control sample is a healthy sample, an increase in expression of one or more or the polypeptides or polypeptides of the invention indicates a less favorable prognosis in the subject, while a decrease or similar expression indicates a more favorable prognosis.

[0120] The invention also provides a colorectal cancer reference expression profile comprising a pattern of polypeptide or polynucleotide expression levels of two or more of polypeptide or polynucleotides of the invention, optionally, over the course of the disease. The expression profile serves as a control for the diagnosis of colorectal cancer or predisposition for developing the disease, monitoring the course of treatment and assessing prognosis of a subject with the disease.

[0121] The invention also provides methods for predicting propensity for high-grade or low-grade metastatic spread of a cancer. The presence and/or level of a polypeptide or polynucleotide expression product in a cancerous sample can be detected and/or quantified and correlated to the propensity of the tumor to metastasize. The expression of one or more stage IV polypeptides or polynucleotides (i.e., polypeptides or polynucleotides that encode SEQ ID NOs:65-107) would be indicative of a higher grade metastatic spread of cancer. The expression of one or more stage I polynucleotides (i.e., polypeptides or polynucleotides that encode SEQ ID NOs:1-64) to the exclusion of expression of one or more stage IV polynucleotides would be indicative of a lower grade metastatic spread of cancer.

[0122] The polypeptides and polynucleotides of the invention can also be used to monitor the course of treatment of cancer, such as colorectal cancer. A test sample from a subject undergoing treatment for cancer, such as colorectal cancer is obtained. Test samples can be obtained from the subject at various time points before, during, or after treatment. Expression of one or more of the polypeptides or polynucleotides of the invention in the test sample is determined and compared to

a control sample that includes cells having a known cancer state. Preferably, the control sample has not been exposed to the treatment. Stage IV polypeptides or polynucleotides of the invention (i.e., polypeptides of SEQ ID NOs:65-107 or polynucleotides that encode SEQ ID NOs:65-107) are particularly useful in this method, however, stage I (i.e., polypeptides of SEQ ID NOs:1-64 or polynucleotides that encode SEQ ID NOs:1-64) and stage II (i.e., polypeptides of SEQ ID NOs:108-157 or polynucleotides that encode SEQ ID NOs: 108-157) can be used in this method.

[0123] Where the control sample contains non-cancerous cells, a similarity in expression between polypeptides or polynucleotides of the invention in the test sample and the control sample indicates that the treatment is efficacious. However, an increase in expression of polypeptides or polynucleotides of the invention in the test sample as compared the control sample indicates the treatment is not efficacious.

[0124] Efficacious means that the treatment leads to a decrease in size, prevalence, or metastatic potential of cancer, such as colorectal cancer, in a subject. When treatment is applied prophylactically, efficacious means that the treatment retards, slows, or prevents cancer, such as colorectal cancer, from forming. Efficaciousness can be determined in association with any known method for diagnosing or treating cancer, such as colorectal cancer.

[0125] Where the control sample is cancerous, e.g., where the control sample includes cancer cells taken from the subject at the time of diagnosis, but prior to beginning treatment, a similarity in the expression pattern between the test sample and the control sample indicates the treatment is not efficacious. A difference in expression between polypeptide or polynucleotide expression in the test sample (i.e., a decrease in the test sample) and the control sample indicates the treatment is efficacious. Where the control sample contains non-cancerous cells, a decrease in expression of one or more of the polypeptide or polynucleotides of the invention in the test sample as compared to the control sample indicates that the treatment is efficacious.

Methods of Treatment of Cancer

[0126] The invention provides methods for treating cancer, such as colorectal cancer, in a subject or stimulating an immune response in a subject comprising, for example, (a) administering to the subject a pharmaceutically effective amount of a polypeptide of the invention; (b) administering to the subject a pharmaceutically effective amount of a polynucleotide that encodes a polypeptide of the invention; or (c) administering to the subject a pharmaceutically effective amount of an antibody or antigen-binding fragment thereof that specifically binds to a polypeptide of the invention.

[0127] The invention also provides methods for inducing anti-tumor immunity in a subject comprising, for example, contacting a polypeptide of the invention with antigen presenting cells, or introducing a polynucleotide encoding the polypeptide or a vector comprising the polynucleotide to antigen presenting cells, and then administering the antigen presenting cells to the subject.

[0128] Administration of a therapeutic agent can be prophylactic or therapeutic to a subject at risk of (or susceptible to) a disorder or having a disorder associated with the differentially expressed polynucleotides of the invention. The expression, function, or both, of one or more expression products of the polynucleotides of the invention can be decreased in order to prophylactically or therapeutically treat a subject. Expression can be inhibited or decreased by administering to the subject a polynucleotide, such as an antisense molecule or siRNA molecule that inhibits or decreases the expression of the polynucleotides of the invention.

[0129] Antisense molecules and siRNA that correspond to polynucleotides of the invention are useful for the treatment of cancer, such as colorectal cancer. Antisense molecules and siRNA molecules can be entirely complementary to the target sequence or can have a mismatch of one or more nucleotides, so long as the antisense molecules and siRNA molecules can specifically hybridize to the target sequences. For example, the antisense molecules or siRNA molecules include polynucleotides that have a homology to a polynucleotide of the invention or its complement, of at least 80% or higher, more preferably 90% or higher, even more preferably 95% or higher over a span of at least 15 continuous nucleotides. Algorithms known in the art can be used to determine the homology.

[0130] Antisense molecules, siRNA molecules and polynucleotides of the invention can be delivered to a subject by standard vectors and/or gene delivery systems. Suitable gene delivery systems include liposomes, receptor-mediated delivery systems, naked DNA, and viral vectors such as herpes viruses, retroviruses, adenoviruses and adeno-associated viruses, among others.

[0131] Antisense molecules or siRNA molecules inhibit the expression of a polynucleotide of the invention and is thereby useful for suppressing the biological activity of a polypeptide of the invention. Therefore, a composition comprising an antisense molecule or siRNA molecule targeted to a polynucleotide of the invention is useful in treating a cancer, such as colorectal cancer.

[0132] In another embodiment of the invention, the function of one or more expression products of the polynucleotides of the invention can be inhibited by administering a compound that binds to or otherwise inhibits the function of the expression products. The compound can be, e.g., an antibody that specifically binds to an expression product of the polynucleotides of the invention.

[0133] Therapeutic compounds that may be utilized include, e.g., (i) a polypeptide or fragments thereof of SEQ ID NOs:1-157; (ii) antibodies or specific binding fragments thereof that specifically bind SEQ ID NOs:1-157; (iii) polynucleotides or fragments thereof that encode SEQ ID NOs: 1-157; (iv) antisense molecules specific for polynucleotides (or complements thereof) that encode SEQ ID NOs:1-157 or fragments thereof; (v) siRNA molecules specific for polynucleotides (or complements thereof) that encode SEQ ID NOs:1-157 or fragments thereof; and (vi) modulators (i.e., inhibitors, agonists and antagonists that alter the interaction between a polypeptide of the invention and its binding partner).

[0134] Administration of a prophylactic pharmaceutical composition can occur prior to the manifestation of symptoms characteristic of a disease or disorder, such that a disease or disorder is prevented or, alternatively, delayed in its progression.

[0135] The present invention also relates to a method of treating or preventing cancer, such as colorectal cancer, in a subject comprising administering to said subject an immunological composition (i.e., a composition that can induce antibodies or other immune responses in a subject) comprising a polypeptide encoded by a polynucleotide of the invention or an immunologically active fragment of said polypeptide, or a

polynucleotide encoding the polypeptide or the fragment thereof. Administration of the polypeptide can induce an anti-tumor immunity in a subject. In one embodiment the polypeptides of the invention or fragments thereof may be administered in a form bound to a T cell receptor (TCR) or presented by an antigen presenting cell (APC), such as macrophage, dendritic cell (DC), or B-cell.

[0136] In the present invention, an immunological composition against cancer, such as colorectal cancer, can function to induce anti-tumor immunity upon inoculation into a subject. Polypeptides of the invention may induce potent and specific immune response against cancer, such as colorectal cancer. In general, anti-tumor immunity includes immune responses such as induction of cytotoxic lymphocytes against tumors, induction of antibodies that recognize tumors, and induction of anti-tumor cytokine production.

[0137] Anti-tumor immunity is induced by administering the immunological composition of this invention, and the induction of anti-tumor immunity enables treatment and prevention of cancer, such as colorectal cancer.

[0138] A polypeptide of the invention that has immunological activity or a vector encoding the polypeptide may be combined with an adjuvant. An adjuvant can enhance the immune response against the polypeptide when administered together (or successively) with the polypeptide having immunological activity. The immunological composition is administered systemically or locally. Immunological composition administration may be performed by single administration, or boosted by multiple administrations.

[0139] In another aspect the invention includes pharmaceutical, or therapeutic, compositions containing one or more therapeutic compounds described herein. Pharmaceutical formulations may include those suitable for oral, rectal, nasal, topical (including buccal and sub-lingual), vaginal or parenteral (including intramuscular, intraperitoneal, intratumor, sub-cutaneous and intravenous) administration, or for administration by inhalation or insufflation. The formulations may, where appropriate, be conveniently presented in discrete dosage units and may be prepared by any of the methods well known in the art of pharmacy. All such pharmacy methods include the steps of bringing into association the active compound with liquid carriers or finely divided solid carriers or both as needed and then, if necessary, shaping the product into the desired formulation.

[0140] Pharmaceutical formulations suitable for oral administration may conveniently be presented as discrete units, such as capsules, cachets or tablets, each containing a predetermined amount of the active ingredient; as a powder or granules; or as a solution, a suspension or as an emulsion. The tablets or capsules may optionally be formulated so as to provide slow or controlled release of the active ingredient therein. The active ingredient may also be presented as a bolus electuary or paste, and be in a pure form, i.e., without a carrier. Oral fluid preparations may be in the form of, for example, aqueous or oily suspensions, solutions, emulsions, syrups or elixirs, or may be presented as a dry product for constitution with water or other suitable vehicle before use. Such liquid preparations may contain conventional additives such as suspending agents, emulsifying agents, non-aqueous vehicles (which may include edible oils), or preservatives.

[0141] Formulations for parenteral administration include aqueous and non-aqueous sterile injection solutions which may contain anti-oxidants, buffers, bacteriostats and solutes which render the formulation isotonic with the blood of the intended recipient; and aqueous and non-aqueous sterile suspensions which may include suspending agents and thickening agents. The formulations may be presented in unit dose or multi-dose containers, for example sealed ampoules and vials, and may be stored in a freeze-dried (lyophilized) condition requiring only the addition of the sterile liquid carrier, for example, saline, water-for-injection, immediately prior to use. Alternatively, the formulations may be presented for continuous infusion. Extemporaneous injection solutions and suspensions may be prepared from sterile powders, granules and tablets of the kind previously described.

[0142] Formulations for rectal administration may be presented as a suppository with the usual carriers such as cocoa butter or polyethylene glycol. Formulations for topical administration in the mouth, for example buccally or sublingually, include lozenges, comprising the active ingredient in a flavored base such as sucrose and acacia or tragacanth, and pastilles comprising the active ingredient in a base such as gelatin and glycerin or sucrose and acacia. For intra-nasal administration the compounds of the invention may be used as a liquid spray or dispersible powder or in the form of drops. Drops may be formulated with an aqueous or non-aqueous base also comprising one or more dispersing agents, solubilizing agents or suspending agents. Liquid sprays are conveniently delivered from pressurized packs.

[0143] For administration by inhalation the compounds are conveniently delivered from an insufflator, nebulizer, pressurized packs or other convenient means of delivering an aerosol spray. Pressurized packs may comprise a suitable propellant such as dichlorodifluoromethane, trichlorofluoromethane, dichlorotetrafluoroethane, carbon dioxide or other suitable gas. In the case of a pressurized aerosol, the dosage unit may be determined by providing a valve to deliver a metered amount.

[0144] Alternatively, for administration by inhalation or insufflation, the compounds may take the form of a dry powder composition, for example a powder mix of the compound and a suitable powder base such as lactose or starch. The powder composition may be presented in unit dosage form, in for example, capsules, cartridges, gelatin or blister packs from which the powder may be administered with the aid of an inhalator or insufflators.

[0145] When desired, the above described formulations, adapted to give sustained release of the active ingredient, may be employed. The pharmaceutical compositions may also contain other active ingredients such as antimicrobial agents, immunosuppressants or preservatives.

[0146] For each of the aforementioned conditions, the compositions may be administered orally or via injection at a dose of from about 0.1 to about 250 mg/kg per day. The dose range for adult humans is generally from about 5 mg to about 17.5 g/day, preferably about 5 mg to about 10 g/day, and most preferably about 100 mg to about 3 g/day. Tablets or other unit dosage forms of presentation provided in discrete units may conveniently contain an amount which is effective at such dosage or as a multiple of the same, for instance, units containing about 5 mg to about 500 mg, usually from about 100 mg to about 500 mg. The dose employed will depend upon a number of factors, including the age and sex of the subject, the precise disorder being treated, and its severity. Also the route of administration may vary depending upon the condition and its severity.

Methods for Screening Anti-Cancer Compounds

[0147] The invention provides methods for screening for anti-cancer compounds, e.g. anti-colorectal cancer com-

pounds. For example, anti-cancer compounds can be identified by comparing the level of a polypeptide or polynucleotide expression product in a first biological sample (e.g., a cancerous sample) in the presence of a test compound to the level of the polypeptide or polynucleotide expression product in a second biological sample (e.g., a cancerous sample) in the absence of the test compound; wherein the polypeptide or polynucleotide expression product comprises, for example, a polypeptide selected from the group consisting of SEQ ID NOs:1-157 or mRNA encoding the polypeptide. A test compound that decreases the level of the polypeptide or polynucleotide expression product in the first biological sample as compared to the second biological sample is identified as an anti-cancer agent. In one embodiment of the invention, the test compound decreases the level of the polypeptide or polynucleotide expression product by at least about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% (or any value or range between about 10% and about 90%) in the first biological sample as compared to the level of the expression product in the second biological sample.

[0148] In one embodiment of the invention, screening for anti-cancer compounds, e.g. anti-colorectal cancer compounds, can comprise comparing the level of biological activity of a polypeptide of the invention in a first biological sample in the presence of a test compound to the level of biological activity in a second biological sample in the absence of the test compound; wherein a test compound that decreases the level of biological activity in the first biological sample as compared to the second biological sample is identified as an anti-cancer agent.

[0149] In one embodiment of the invention, screening for anti-cancer compounds, e.g. anti-colorectal cancer compounds can comprise a) contacting a test compound with a polypeptide of the invention; b) detecting the binding activity between the polypeptide and the test compound; and c) selecting a compound that binds to the polypeptide.

[0150] In one embodiment of the invention, screening for anti-cancer compounds, e.g. anti-colorectal cancer compounds, can comprise a) contacting a candidate compound with a test cell expressing, one or more of the polypeptides of the invention; and b) selecting a compound that reduces the expression level of one or more polypeptides of the invention. The test cell can comprise a colorectal cancer cell.

[0151] In one embodiment of the invention, screening for anti-cancer compounds, e.g. anti-colorectal cancer compounds, can comprise a) contacting a candidate compound with a cell into which a vector comprising the transcriptional regulatory region of one or more marker genes and a reporter gene that is expressed under the control of the transcriptional regulatory region has been introduced, wherein the one or more marker genes are selected from the group consisting of polynucleotides that encode SEQ ID NOs:1-157) measuring the activity of the reporter gene; and c) selecting a compound that reduces the expression level of the reporter gene as compared to a control.

[0152] The invention provides kits for use, for example, in diagnostic methods. Components of the kits can include, for example, compounds, reagents, containers and/or equipment. For example, one container within a kit may contain a monoclonal antibody or antigen-binding fragment thereof that specifically binds to a polypeptide of the invention. The antibodies or antigen-binding fragments can be, e.g., attached to a support material. One or more additional containers can contain elements, such as reagents or buffers, to be used in an assay. The kits can also, or alternatively, contain a detection reagent that contains a reporter group suitable for direct or indirect detection of specific antibody binding.

[0153] Alternatively, a kit can be used to detect, e.g., the level of mRNA encoding a polypeptide of the invention in a biological sample. Such kits can comprise at least one, two, or more polynucleotide probes or primers, that hybridize to a polynucleotide (or the complement thereof) encoding a polypeptide of the invention. Such polynucleotides can be used, for example, within an amplification assay (e.g., RT-PCR) or hybridization assay. Additional components that can be present in such kits include a second polynucleotide and/or a diagnostic reagent or container to facilitate the detection of a polynucleotide encoding a polypeptide of the invention.

[0154] The invention illustratively described herein suitably can be practiced in the absence of any element or elements, limitation or limitations that are not specifically disclosed herein. Thus, for example, in each instance herein any of the terms "comprising", "consisting essentially of", and "consisting of" may be replaced with either of the other two terms, without changing the ordinary meanings of these terms. The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention that in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by preferred embodiments, optional features, modification and variation of the concepts herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention as defined by the description and the appended claims.

[0155] In addition, where features or aspects of the invention are described in terms of Markush groups or other grouping of alternatives, those skilled in the art will recognize that the invention is also thereby described in terms of any individual member or subgroup of members of the Markush group or other group.

[0156] All references cited in this disclosure are incorporated herein in their entirety by reference. Furthermore, the content (as of the filing date of this application) of all GenBank, ENSEMBL, UNIPARC, and UniProt Accession Numbers (and data associated therewith) listed herein are incorporated herein by reference in their entirety.

Titin (also known as TTN rhabdomyosarcoma antigen MU-RMS 40)
(e.g., GenBank Accession Number Q8WZ42-2

(SEQ ID NO: 1)

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26401gsitvpitii vldrpgppgp iridevscds itiswnppey dggcqisnyi vekkettstt

26461whivsqavar tsikivrltt gseyqfrvca enrygkssys essavvaeyp fsppgppgtp

26521kvvhatkstm lvtwqvpvnd ggsrvigyhl eykerssilw skankiliad tqmkvsglde

26581glmyeyrvya eniagigkcs kscepvpard pcdppggpev tnitrksysl kwskphydgg

26641akitgyiver relpdgrwlk cnytniqety fevteltedq ryefrvfarn aadsvsepse

26701stgpiivkdd vepprvmmdv kfrdvivvka gevlkinadi agrplpvisw akdgieieer

26761arteiistdn htlltvkdci rrdtgqyvlt lknvagtrsv avnckvldkp gppagplein

26821gltaekcsls wgrpqedgga didyyivekr etshlawtic egelqmtsck vtkllkgney

26881ifrvtgvnky gvgeplesva ikaldpftvp spptsleits vtkesmtlcw srpesdggse

26941isgyiierre knslrwvrvn kkpvydlrvk stglregcey eyrvyaenaa glslpsetsp

27001liraedpvfl psppskpkiv dsgkttitia wvkplfdgga pitgytveyk ksddtdwkts

27061iqslrgteyt isglttgaey vfrvksvnkv gasdpsdssd pqiakereee plfdidsemr

27121ktlivkagas ftmtvpfrgr pvpnvlwskp dtdlrtrayv dttdsrtslt ienanrndsg

27181kytltiqnvl saasltlvvk vldtpgpptn itvqdvtkes avlswdvpen dggapvknyh

27241iekreaskka wvsvtnncnr lsykvtnlqe gaiyyfrvsg enefyvgipa etkegvkite

27301kpsppeklgv tsiskdsysl twlkpehdgg srivhyvvea lekgqknwvk cavaksthhv

27361vsglrensey ffrvfaenqa glsdprelll pvlikeqlep peidmknfps htvyvragsn

27421lkvdipisgk plpkvtlsrd gvplkatmrf nteitaenlt inlkesvtad agryeitaan

27481ssgttkafin ivvldrpgpp tgpvvisdit eesvtlkwep pkydggsqvt nyillkrets

27541tavwtevsat vartmmkvmk lttgeeyqfr ikaenrfgis dhidsacvtv klpyttpgpp

27601stpwvtnvtr esitvgwhep vsnggsavvg yhlemkdrns ilwqkanklv irtthfkvtt

27661isagliyefr vyaenaagvg kpshpsepvl aidacepprn vritdiskns vslswqqpaf

27721dggskitgyi verrdlpdgr wtkasftnvt etqfiisglt qnsqyefrvf arnavgsisn

27781psevvgpitc idsyggpvid lpleytevvk yragtsvklr agisgkpapt iewykddkel

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27841qtnalvcven ttdlasilik dadrlnsgcy elklrnamgs asatirvqil dkpgppggpi

27901efktvtaeki tllwrppadd ggakithyiv ekretsrvvw smvsehleec iitttkiikg

27961neyifrvrav nkygigeple sdsvvaknaf vtpgppgipe vtkitknsmt vvwsrpiadg

28021gsdisgyfle krdkkslgwf kvlketirdt rqkvtglten sdyqyrvcav naagqgpfse

28081psefykaadp idppgppaki riadstkssi tlgwskpvyd ggsavtgyvv eirqgeeeew

28141ttvstkgevr tteyvvsnlk pgvnyyfrvs avncagqgep iemnepvqak dileapeidl

28201dvalrtsvia kagedvqvli pfkgrppptv twrkdeknlg sdarysient dsssslltipq

28261vtrndtgkyi ltiengvgep ksstvsvkvl dtpaacqklq vkhvsrgtvt llwdpplidg

28321gspiinyvie krdatkrtws vvshkcssts fklidlsekt pfffrvlaen eigigepcet

28381tepvkaaevp apirdlsmkd stktsvilsw tkpdfdggsv iteyvverkg kgeqtwshag

28441isktceievs qlkegsvlef rvfaknekgl sdpvtigpit vkeliitpev dlsdipgaqv

28501tvrighnvhl elpykgkpkp siswlkdglp lkesefvrfs ktenkitlsi knakkehggk

28561ytvildnavc riavpitvit lgppskpkgp irfdeikads vilswdvped ngggeitcys

28621iekretsqtn wkmvcssvar ttfkvpnlvk daeyqfrvra enrygvsqpl vssiivakhq

28681fripgppgkp viynvtsdgm sltwdapvyd ggsevtgfhv ekkernsilw qkvntspisg

28741reyratglve gldyqfrvya ensaglsspa dpskftlavs pvdppgtpdy idvtretitl

28801kwnpplrdgg skivgysiek rqgnerwvrc nftdvsecqy tvtglspgdr yefriiarna

28861vgtisppsqs sgiimtrden vppivefgpe yfdgliiksg eslrikalvq grpvprvtwf

28921kdgveiekrm nmeitdvlgs tslfvrdatr dhrgvytvea knasgsakae ikvkvqdtpg

28981kvvgpirftn itgekmtlww daplndgcap ithyiiekre tsrlawalie dkceaqsyta

29041iklingneyq frvsavnkfg vgrpldsdpv vaqiqytvpd apgipepsni tgnsitltwa

29101rpesdggsei qqyilerrek kstrwvkvis krpisetrfk vtgltegney efhvmaenaa

29161gvgpasgisr likcrepvnp pgpptvvkvt dtskttvsle wskpvfdggm eiigyiiemc

29221kadlgdwhkv naeacvktry tvcdlqagee ykfrvsaing agkgdscevt gtikavdrlt

29281apeldidanf kgthvvraga sirlflayqg rptptavwsk pdsnlslrad ihttdsfstl

29341tvencnrnda gkytltvenn sgsksitftv kvldtpgppg pitfkdvtrg satlmwdapl

29401ldggarihhy vvekreasrr swqvisekct rqifkvndla egvpyyfrvs avneygvgep

29461yempepivat eqpapprrld vvdtskssav lawlkpdhdg gsritgylle mrqkgsdfwv

29521eaghtkqltf tverlvekte yefrvkaknd agysepreaf ssviikepqi eptadltgit

29581nqlitckags pftidvpisg rpapkvtwkl eemrlketdr vsitttkdrt tltvkdsmrg

29641dsgryfltle ntagvktfsv tvvvigrpgp vtgpievssv saescvlswg epkdgggtei

29701tnyivekres gttawqlvns svkrtgikvt hltkymeysf rvssenrfgv skplesapii

29761aehpfvppsa ptrpevyhvs anamsirwee pyhdggskii gywvekkern tilwvkenkv

29821pclecnykvt glvegleyqf rtyalnaagv skaseasrpi maqnpvdapg rpevtdvtrs

29881tvsliwsapa ydggskvvgy iierkpvsev gdgrwlkcny tivsdnfftv talsegdtye

29941frvlaknaag viskgsestg pvtcrdeyap pkaeldarlh gdlvtirags dlvldaavgg

30001kpepkiiwtk gdkeldlcek vslqytgkra tavikfcdrs dsgkytltvk nasgtkavsv

30061mvkvldspgp cgkltvsrvt gekctlawsl pqedggaeit hyiverrets rlnwvivege

30121cptlsyvvtr liknneyifr vravnkygpg vpvesepiva rnsftipspp gipeevgtgk

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30181ehiiiqwtkp esdggneisn ylvdkrekks lrwtrvnkdy vvydtrlkvt slmegcdyqf

30241rvtavnaagn sepseasnfi screpsytpg ppsaprvvdt tkhsislawt kpmydggtdi

30301vgyvlemgek dtdqwyrvht natirnteft vpdlkmgqky sfrvaavnvk gmseysesia

30361eiepveriei pdleladdlk ktvtiragas lrlmvsysgr pppvitwskq gidlasraii

30421dttesyslli vdkvnrydag kytieaenqs gkksatvlvk vydtpgpcps vkvkevsrds

30481vtitweipti dggapvnnyi vekreaamra fktvttkcsk tlyrisglve gtmyyfrvlp

30541eniygigepc etsdavlvse vplvpaklev vdvtkstvtl awekplydgg srltgyvlea

30601ckagterwmk vvtlkptvle htvtslnege qylfriraqn ekgvsepret vtavtvqdlr

30661vlptidlstm pqktihvpag rpvelvipia grpppaaswf fagsklrese rvtvethtkv

30721akltiretti rdtgeytlel knvtgttset ikviildkpg pptgpikide idatsitisw

30781eppeldggap lsgyvveqrd ahrpgwlpvs esvtrstfkf trltegneyv frvaatnrfg

30841igsylqsevi ecrssiripg ppetlqifdv srdgmtltwy ppeddggsqv tgyiverkev

30901radrwvrvnk vpvtmtryrs tgltegleye hrvtainarg sgkpsrpskp ivamdpiapp

30961gkpqnprvtd ttrtsyslaw svpedeggsk vtgyliemqk vdqhewtkcn ttptkireyt

31021lthlpqgaey rfrvlacnag gpgepaevpg tvkvtemley pdyelderyq egifvrqggv

31081irltipikgk pfpickwtke gqdiskrami atsethtelv ikeadrgdsg tydlvlenkc

31141gkkavyikvr vigspnspeg pleyddiqvr svrvswrppa ddggadilgy ilerrevpka

31201awytidsrvr gtslvvkglk enveyhfrvs aenqfgiskp lkseepvtpk tpinppepps

31261nppevldvtk ssvslswsrp kddggsrvtg yyierketst dkwvrhnktq itttmytvtg

31321lvpdaeyqfr iiagndvgls etspasepvv ckdpfdkpsq pgeleilsis kdsvtlqwek

31381pecdggkeil gywveyrqsg dsawkksnke rikdkqftig glleateyef rvfaenetgl

31441srprrtamsi ktkltsgeap girkemkdvt tklgeaaqls cqivgrplpd ikwyrfgkel

31501iqsrkykmss dgrthtltvm teeqedegvy tciatnevge vetssklllq atpqfhpgyp

31561lkekyygavg stlrlhvmyi grpvpamtwf hgqkllqnse nitientehy thlvmknvqr

31621kthagkykvq lsnvfgtvda ildveiqdkp dkptgpivie allknsavis wkppaddggs

31681witnyvvekc eakegaewql vssaisvttc rivnltenag yyfrvsaqnt fgisdplevs

31741svviikspfe kpgapgkpti tavtkdscvv awkppasdgg akirnyylek rekkqnkwis

31801vtteeiretv fsvknliegl eyefrvkcen lggesewsei sepitpksdv piqaphfkee

31861lrnlnvryqs natlvckvtg hpkpivkwyr qgkeiiadgl kyriqefkgg yhqliiasvt

31921dddatvyqvr atnqggsysg taslevevpa kihlpktleg mgavhalrge vvsikipfsg

31981kpdpvitwqk gqdlidnngh yqvivtrsft slvfpngver kdagfyvvca knrfgidqkt

32041veldvadvpd pprgvkvsdv srdsvnltwt epasdggski tnyivekcat taerwlrvgq

32101aretrytvin lfgktsyqfr viaenkfgls kpsepsepti tkedktramn ydeevdetre

32161vsmtkashss tkelyekymi aedlgrgefg ivhrcvetss kktymakfvk vkgtdqvlvk

32221keisilniar hrnilhlhes fesmeelvmi fefisgldif erintsafel nereivsyvh

32281qvcealqflh shnighfdir peniiyqtrr sstikiiefg qarqlkpgdn frllftapey

32341yapevhqhdv vstatdmwsl gtivyvllsg inpflaetnq qiienimnae ytfdeeafke

32401isieamdfvd rllvkerksr mtasealqhp wlkqkiervs tkvirtlkhr ryyhtlikkd

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32461lnmvvsaari scggairsqk gvsvakvkva sieigpvsgq imhavgeegg hvkyvckien

32521ydqstqvtwy fgvrglense kyeityedgv ailyvkditk lddgtyrckv vndygedssy

32581aelfvkgvre vydyycrrtm kkikrrtdtm rllerppeft lplynktayv genvrfgvti

32641tvhpephvtw yksgqkikpg dndkkytfes dkglyqltin svttdddaey tvvarnkyge

32701dsckakltvt lhppptdstl rpmfkrllan aecqegqsvc feirvsgipp ptlkwekdgq

32761plslgpniei ihegldyyal hirdtlpedt gyyrvtatnt agstscqahl gverlrykkq

32821efkskeeher hvqkqidktl rmaeilsgte svpltqvake alreaavlyk pavstktvkg

32881efrleieekk eerklrmpyd vpeprkykqt tieedqrikq fvpmsdmkwy kkirdqyemp

32941gkldrvvqkr pkrirlsrwe qfyvmplpri tdqyrpkwri pklsqddlei vrparrrtps

33001pdydfyyrpr rrslgdisde elllpiddyl amkrteeerl rleeelelgf sasppsrspp

33061hfelsslrys spqahvkvee trkdfrysty hiptkaeast syaelrerha qaayrqpkqr

33121qrimaerede ellrpvtttq hlseykseld fmskeeksrk ksrrqrevte iteieeeyei

33181skhaqresss sasrllrrrr slsptyielm rpvselirsr pqpaeeyedd terrsptper

33241trprspspvs serslsrfer sarfdifsry esmkaalktq ktserkyevl sqqpftldha

33301pritlrmrsh rvpcgqntrf ilnvqskpta evkwyhngve lqesskihyt ntsgvltlei

33361ldchtddsgt yravctnykg easdyatldv tggdyttyas qrrdeevprs vfpeltrtea

33421yavssfkkts emeasssvre vksqmtetre slssyehsas aemksaalee ksleeksttr

33481kikttlaari ltkprsmtvy egesarfscd tdgepvptvt wlrkgqvlst sarhqvtttk

33541ykstfeissv qasdegnysv vvensegkqe aeftltiqka rvtekavtsp prvkspeprv

33601kspeavkspk rvkspepshp kavsptetkp tptekvqhlp vsappkitqf lkaeaskeia

33661kltcvvessv lrakevtwyk dgkklkengh fqfhysadgt yelkinnlte sdqgeyvcei

33721sgeggtsktn lqfmgqafks ihekvskise tkksdqktte stvtrktepk apepisskpv

33781ivtglqdttv ssdsvakfav katgeprpta iwtkdgkait qggkyklsed kggffleihk

33841tdtsdsglyt ctvknsagsv ssscktika ikdteaqkvs tqktseitpq kkavvqeeis

33901qkalrseeik mseaksqekl alkeeaskvl iseevkksaa tsleksivhe eitktsqase

33961evrthaeika fstqmsineg grlvlkania gatdvkwvln gveltnseey rygvsgsdqt

34021ltikqashrd egiltciskt kegivkcqyd ltlskelsda pafisqprsq ninegqnvlf

34081tceisgepsp eiewfknnlp isissnvsis rsrnvyslei rnasysdsgk ytikaknfrg

34141qcsataslmv lplveepsre vvlrtsgdts lqgsfssqsv qmsaskqeas fssfssssas

34201smtemkfasm saqsmssmqe sfvemssssf mgisnmtqle sstskmlkag irgippkiea

34261lpsdisideg kvltvacaft geptpevtws cggrkihsqe ggrfhientd dlttliimdv

34321qkqdgglytl slgnefgsds atvnihirsi

HBA1 (e.g., GenBank AccessionNumber P69905 (SEQ ID NO: 2):

1 mvlspadktn vkaawgkvga hageygaeal ermflsfptt ktyfphfdls hgsaqvkghg

61 kkvadaltna vahvddmpna lsalsdlhah klrvdpvnfk llshcllvtl aahlpaeftp

121 avhasldkfl asvstvltsk yr

Insulin-like growth factor 1 receptor (IGF1R)
(e.g., GenBank Accession Number F08069 (SEQ ID NO: 3):

```
   1 mksgsgggsp tslwgllfls aalslwptsg eicgpgidir ndyqqlkrle nctviegylh

  61 illiskaedy rsyrfpkltv iteylllfrv agleslgdlf pnltvirgwk lfynyalvif

 121 emtnlkdigl ynlrnitrga irieknadlc ylstvdwsli ldavsnnyiv gnkppkecgd

 181 lcpgtmeekp mcekttinne ynyrcwttnr cqkmcpstcg kractennec chpeclgscs

 241 apdndtacva crhyyyagvc vpacppntyr fegwrcvdrd fcanilsaes sdsegfvihd

 301 gecmqecpsg firngsgsmy cipcegpcpk vceeekktkt idsvtsaqml qgctifkgnl

 361 linirrgnni aselenfmgl ievvtgyvki rhshalvsls flknlrlilg eeqlegnysf

 421 yvldnqnlqq lwdwdhrnlt ikagkmyfaf npklcvseiy rmeevtgtkq rqskgdintr

 481 nngerasces dvlhftsttt sknriiitwh ryrppdyrdl isftvyykea pfknvteydg

 541 qdacgsnswn mvdvdlppnk dvepgillhg lkpwtqyavy vkavtltmve ndhirgakse

 601 ilyirtnasv psipldvlsa snsssqlivk wnppslpngn lsyyivrwqr qpqdgylyrh

 661 nycskdkipi rkyadgtidi eevtenpkte vcggekgpcc acpkteaekq aekeeaeyrk

 721 vfenflhnsi fvprperkrr dvmqvanttm ssrsrnttaa dtynitdpee leteypffes

 781 rvdnkertvi snlrpftlyr idihscnhea eklgcsasnf vfartmpaeg addipgpvtw

 841 eprpensifl kwpepenpng lilmyeikyg sqvedqrecv srqeyrkygg aklnrlnpgn

 901 ytariqatsl sgngswtdpv ffyvqaktgy enfihliial pvavllivgg lvimlyvfhr

 961 krnnsrlgng vlyasvnpey fsaadvyvpd ewevarekit msrelgqgsf gmvyegvakg

1021 vvkdepetrv aiktvneaas mrerieflne asvmkefnch hvvrllgvvs qgqptlvime

1081 lmtrgdlksy lrslrpemen npvlappsls kmiqmageia dgmaylnank fvhrdlaarn

1141 cmvaedftvk igdfgmtrdi yetdyyrkgg kgllpvrwms peslkdgvft tysdvwsfgv

1201 vlweiatlae qpyqglsneq vlrfvmeggl ldkpdncpdm lfelmrmcwq ynpkmrpsfl

1261 eiissikeem epgfrevsfy yseenklpep eeldlepenm esvpldpsas ssslplpdrh

1321 sghkaengpg pgvlvlrasf derqpyahmn ggrkneralp lpgsstc
```

Isoform 3 of zonadhesin precursor
(e.g., GenBank Accession Number Q9Y493-1 (SEQ ID NO: 4):

```
   1 mvppvwtlll lvgaalfrke kppdqklvvr ssrdnyvltq cdfeddakpl cdwsqvsadd

  61 edwvrasgps ptgstgapgg ypngegsylh mesnsfhrgg varllspdlw eqgplcvhfa

 121 hhmfglswga qlrllllsge egrrpdvlwk hwntqrpswm Ittvtvpagf tlptrlmfeg

 181 trgstayldi aldalsirrg scnrvcmmqt csfdipndlc dwtwiptasg akwtqkkgss

 241 gkpgvgpdgd fsspgsgcym lldpknarpg qkavllspvs lssgclsfsf hyilrgqspg

 301 aalhiyasvl gsirkhtlfs gqpgpnwqav svnytavgri qfavvgvfgk tpepavavda

 361 tsiapcgegf pqcdfednah pfcdwvqtsg dgghwalghk ngpvhgmgpa ggfpnagghy

 421 iyleadefsh aggsvrlvsr pfcapgdicv efayhmyglg egtmlelllg spagsppipl

 481 wkrvgsqrpy wqntsvtvps ghqqpmqlif kgiqgsntas vvamgfilin pqtcpvkvlp

 541 elppvspvss tgpsettglt enptistkkp tvsiekpsvt tekptvpkek ptiptekpti
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601 stekptipse kpnmpsekpt ipsekptilt ekptipsekp tipsekptis tekptvptee

661 pttpteettt smeepvipte kpsiptekps iptekptism eetiistekp tispekptip

721 tekptiptek stispekptt ptekptipte kptispekpt tptekptisp ekltiptekp

781 tiptekptip tekptistee pttpteetti stekpsipme kptlpteett tsveettist

841 ekltipmekp tistekptip tekptispek ltipteklti ptekptipie ettisteklt

901 iptekptisp ekptistekp tiptekptip teettistek ltiptekpti spekltipte

961 kptistekpt iptekltipt ekptiptekp tiptekltal rpphpsptat glaalvmsph

1021 apstpmtsvi lgttttsrss tercppnary escacpasck sprpscgplc regcvcnpgf

1081 lfsdnhciqa sscncfynnd yyepgaewfs pnctehcrcw pgsrvecqis qcgthtvcql

1141 kngqygchpy agtatclvyg dphyvtfdgr hfgfmgkcty ilaqpcgnst dpffrvtakn

1201 eeqgqegvsc lskvyvtlpe stvtllkgrr tlyggqqvtl paipskgvfl gasgrfvelq

1261 tefglrvrwd gdqqlyvtvs stysgklcgl cgnydgnsdn dhlkldgspa gdkeelgnsw

1321 qtdqdedqec qkyqvvnsps cdsslqssms gpgfcgrlvd thgpfetcll hvkaasffds

1381 cmldmcgfqg lqhllcthms tmtttcqdag havkpwreph fcpmacppns kyslcakpcp

1441 dtchsgfsgm fcsdrcveac ecnpgfvlsg leciprsqcg clhpagsyfk vgerwykpgc

1501 kelcvcesnn rircqpwrcr aqefcgqqdg iygchaqgaa tctasgdphy ltfdgalhhf

1561 mgtctyvltr pcwsrsqdsy fvvsatnenr ggilevsyik avhvtvfdls isllrgckvm

1621 lnghrvalpv wlaqgrvtir lssnlvllyt nfglqvrydg shlvevtvps syggqlcglc

1681 gnynnnsldd nlrpdrklag dsmqlgaawk lpessepgcf lvggkpsscq ensmadawnk

1741 ncailinpqg pfsqchqvvp pgssfascvh gqcgtkgdtt alcrslqaya slcaqagqap

1801 awrnrtfcpm rcppgssysp csspcpdtcs sinnprdcpk alpcaescec qkghilsgts

1861 cvplgqcgct dpagsyhpvg erwytentct rlctcsvhnn itcfqstckp nqicwaldgl

1921 lhcrasgvgv cqlpgeshyv sfdgsnhsip dactivlvkv chpamalplf kisakhekee

1981 ggteafrlhe vyidiydaqv tlqkghrvli nskqvtipai sqipgvsvks ssiytivnik

2041 igvqvkfdgn hlleieiptt yygkvcgmcg nfndeeedel mmpsdevans dsefvnswkd

2101 kdidpscqsl pvdeqqipae qgenpsgncr aadlrrarek ceaalrapvw aqcasridlt

2161 pflvdcantl cefgglyqal cqalqafgat cqsqglkppl wrnssfcple cpayssytnc

2221 lpscspscwd ldgrcegakv psacaegcic qpgyvlsedk cvprsqcgck dahggsiplg

2281 kswvssgcte kcvctggaiq cgdfrcpsgs hcqltsdnsn sncvsdkseq csvygdpryl

2341 tfdgfsyrlq grmtyvlikt vdvlpegvep llvegrnkmd pprssiflqe vittvygykv

2401 qlqaglelvv nnqkmavpyr pnehlrvtlr gqrlylvtdf elvvsfygrk navislpsmy

2461 eglvsglcgn ydknrkndmm lpsgaltqnl ntfgnswevk tedallrfpr aipaeeegqg

2521 aelglrtglq vsecspeqla snstqacrvl adpqgpfaac hqtvapepfq ehcvldlcsa

2581 qdpreqeelr cqvlsghgvs sryhiselyd tlpsilcqpg rprglrgplr grlrqhprlc

2641 lqwhpeppla dcgctsngiy yqlgssflte dcsqrctcas srillcepfs cragevctlg

2701 nhtqgcfpes pclqnpcqnd gqcreggatf tcecevgygg glcmeprdap pprkpasnlv

2761 gvllgllvpv vvvllavtre ciyrtrrkre ktqegdrlar lvdtdtvldc ac

latent transforming growth factor beta binding
protein 4 (LTBP4) (e.g., GenBank Accession Number
A6NCG8 (SEQ ID NO: 5):

```
mplanhrdde hgvasmvsvh vehpqeasvv vhqvervsgp weeadaeava      50

raeaaaraea aapytvlaqs apredgyoda sgfgycfrel rggecasplp     100

glrtqevccr gaglawgvhd cqlcserlgn servsapdgp cptgfervng     150

scedvdecat ggrcqhgeca ntrggytcvc pdgflldssr sscisqhvis     200

eakgpcfrvl rdggcslpil rnitkqiccc srvgkawgrg cqlcppfgse     250

gfreicpagp gyhysasdlr yntrplgqep prvslsqprt lpatsrpsag     300

flpthrlepr peprpdprpg pelplpsipa wtgpeipesg pssgmcqrnp     350

qvcgpgrcis rpsgytcacd sgfrispqgt rcidvdecrr vpppcapgrc     400

enspgsfrcv cgpgfragpr aaecldvdec hrvpppcdlg rcentpgsfl     450

cvcpagyqaa phgascqdvd ectqspglcg rgacknlpgs frcvcpagfr     500

gsaceedvde caqepppcgp grcdntagsf hcacpagfrs rgpgapcqdv     550

decarspppc tygrcenteg sfqcvcpmgf qpntagsece dvdecenhla     600

cpgqecvnsp gsfqcrtcps ghhlhrgrct dvdecssgap pcgphghctn     650

tegsfrcsca pgyrapsgrp gpcadvnecl egdfcfphge clntdgsfac     700

tcapgyrpgp rgascldvde cseedlcqsg ictntdgsfe cicppghrag     750

pdlascldvd ecrergpalc gsqrcenspg syrcvrdcdp gyhagpegtc     800

ddvdecqeyg peicgaqrce ntpgsyrctp acdpgyqptp gggcqdvdec     850

rnrsfcgaha vcqnlpgsfq clcdqyegar dgrhcvdvne cetlqgvcga     900

alcenvegsf lcvcpnspee fdpmtgrcvp prtsagtfpg sqpqapaspv     950

lparpppppl prrpstprqg pvgsgrrecy fdtaapdacd nilarnvtwq    1000

eccctvgegw gsgcriqqcp gtetaeyqsl cphgrgylap sgdlslrrdv    1050

decqlfrdqv cksgvcvnta pgyscycsng yyyhtqrlec idndecadee    1100

paceggrcvn tvgsyhctce pplvldgsqr rcvsnesqsl ddnlgvcwqe    1350

vgadlvcshp rldrqatyte ccclygeawg mdcalcpaqd sddfealcnv    1200

lrppaysppr pggfglpyey gpdlgppyqg lpygpelypp palpydpypp    1250

ppgpfarrea pygaprfdmp dfeddggpyg eseapappgp gtrwpyrsrd    1300

trrsfpepee ppeggsyags laepyeelea eecgildgct ngrcvrvpeg    1350

ftcrcfdgyr ldmtrmacvd inecdeaeaa splcvnarcl ntdgsfrcic    1400

rpgfapthqp hhcaparpra                                     1420
```

ASXL1 (additional sex combs like 1) (e.g., GenBank Accession
Number Q8IXJ9-1 (SEQ ID NO: 6):

```
   1 mkdkqkkkke rtwaeaarlv lenysdapmt pkqilqviea eglkemrsgt splaclnaml

  61 hsnsrggegl fyklpgrisl ftlkkdalqw srhpatvege epedtadves cgsneastvs

 121 gendvsldet ssnascstes qsrplsnprd syrassgank qkkktgvmlp rvvltplkvn

 181 gahvesasgf sgchadgesg spssssssgsl algsaairgq aevtqdpapl lrgfrkpatg

 241 qmkrnrgeei dfetpgsilv ntnlralins rtfhalpshf qqqllflllpe vdrqvgtdgl

 301 lrlsssalnn effthaaqsw rerladgeft hemqvrirqe mekekkveqw kekffedyyg
```

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```
 361 qklgltkees lqqnvgqeea eiksglcvpg esvriqrgpa trqrdghfkk rsrpdlrtra

 421 rrnlykkqes eqagvakdak svasdvplyk dgeaktdpag lssphlpgts saapdlegpe

 481 fpvesvasri qaepdnlara saspdripsl pgetvdqepk dqkrksfeqa asasfpekkp

 541 rledrqsfrn tiesvhtekp qptkeepkvp piriqlsrik ppwvvkgqpt yqicpriipt

 601 tesscrgwtg artladikar alqvrgargh hchreaatta iggggpgggg gggatdeggg

 661 rgsssgdgge acghpeprgg pstpgkctsd lqrtqllppy plngehtqag tamsrarred

 721 lpslrkeesc llqratvglt dglgdasqlp vaptgdqpcq alpllssqts vaerlveqpq

 781 lhpdvrtece sgttswesdd eeqgptvpad ngpipslvgd dtlekgtgqa ldshptmkdp

 841 vnvtpsstpe ssptdclqnr afddelglgg scppmresdt rgenlktkal vsnsslhwip

 901 ipsndevvkq pkpesrehip svepqvgeew ekaaptppal pgdltaeegl dpldsltslw

 961 tvpsrggsds ngsycqqvdi eklkingdse alsphgestd tasdfeghlt edsseadtre

1021 aavtkgssvd kdekpnwnqs aplskvngdm rlvtrtdgmv apqswvsrvc avrqkipdsl

1081 llasteyqpr avclsmpgss veatnplvmq llqgslplek vlppanddsm sespqvpltk

1141 dqshgslrmg slhglgknsg mvdgsspssl ralkepllpd scetgtglar ieatqapgap

1201 qknckavpsf dslhpvtnpi tssrkleemd skeqfssfsc edqkevrams qdsnsnaapg

1261 kspgdlttsr tprfsspnvi sfgpeqtgra lgdqsnvtgq gkklfgsgnv aatlqrprpa

1321 dpmplpaeip pvfpsgklgp stnsmsggvq tpredwapkp hafvgsvkne ktfvggplka

1381 naenrkatgh splelvghle gmpfvmdlpf wklprepgkg lseplepssl paqlsikqaf

1441 yqklsklqls stsfnyssss ptfpkglags vvqlshkanf gashsaslsl qmftdsstve

1501 sislqcacsl kamimcqgcg afchddcigp sklcvlclvv r
```

beta globin (BBB) (e.g., GenBank Accession Number P68871
(SEQ ID NO: 7):

```
  1 mvhltpeeks avtalwgkvn vdevggealg rllvvypwtq rffesfgdls tpdavmgnpk

 61 vkahgkkvlg afsdglahld nlkgtfatls elhcdklhvd penfrllgnv lvcvlahhfg

121 keftppvqaa yqkvvagvan alahkyh
```

BMP15-bone morphogenetic protein (e.g., GenBank Accession Number NM_005448.1
(see also, UniProt Accession Number O95972) (SEQ ID NO: 8):

```
   1  mvllsilril flcelvlfme hraqmaeggq ssiallaeap tlplieelle espgeqprkp

  61  rllghslrym lelyrrsads hghprenrti gatmvrlvkp ltnvarphrg twhiqilgfp

 121  lrpnrglyql vratvvyrhh lqltrfnlsc hvepwvqknp tnhfpssegd sskpslmsna

 181  wkemditqlv qqrfwnnkgh rilrlrfmcq qqkdsgglel whgtssldia flllyfndth

 241  ksirkakflp rgmeefmere sllrrtrqad gisaevtass skhsgpennq cslhpfqisf

 301  rqlgwdhwii appfytpnyc kgtclrvlrd glnspnhaii qnlinqlvdq svprpscvpy

 361  kyvpisvlmi eangsilyke yegmiaesct cr
```

TRIM49 (also known as RNF18; tripartite motif-containing 49)
(e.g., GenBank Accession Number Q9NS80 (SEQ ID NO: 9):

```
   1  mnsgilqvfq gelicplcmn yfidpvtidc ghsfcrpcfy lnwqdipflv qcsectkste

  61  qinlktnihl kkmaslarkv slwlflssee qmcgthretk kifcevdrsl lcllcsssqe

 121  hryhrhrpie waaeehrekl lqkmqslwek acenhrnlnv ettrtrcwkd yvnlrleair
```

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```
  181  aeyqkmpafh heeekhnlem lkkkgkeifh rlhlskakma hrmeilrgmy eelnemchkp

  241  dvellqafgd ilhrsesvll hmpqplnpel sagpitglrd rlngfrvhit lhheeanndi

  301  flyeilrsmc igcdhqdvpy ftatprsfla wgvqtftsgk yywevhvgds wnwafgvcnm

  361  yrkeknqnek idgkaglfll gcvkndiqcs lfttsplmlq yipkptsrvg lfldceaktv

  421  sfvdvnqssl iytipncsfs pplrpifcci hf
```

DNAJ homolog subfamily B member 11 precursor (e.g., GenBank Accession Number Q9UBS4 (SEQ ID NO: 10):

```
    1  mapqnlstfc llllyligav iagrdfykil gvprsasikd ikkayrklal qlhpdrnpdd

   61  pqaqekfqdl gaayevlsds ekrkqydtyg eeglkdghqs shgdifshff gdfgfmfggt

  121  prqqdrnipr gsdiivdlev tleevyagnf vevvrnkpva rqapgkrkcn crqemrttql

  181  gpgrfqmtqe vvcdecpnvk lvneertlev eiepgvrdgm eypfigegep hvdgepgdlr

  241  frikvvkhpi ferrgddlyt nvtislvesl vgfemdithl dghkvhisrd kitrpgaklw

  301  kkgeglpnfd nnnikgslii tfdvdfpkeq lteearegik qllkqgsvqk vynglqgy
```

uncharacterized hematopoietic stem/progenitor cells protein MDS027 (also known as MDS027 hHBrk1 HSPC300) (e.g., GenBank Accession Number Q9NZ47(SEQ ID NO: 11):

```
   1   mrgidtpsdr kkslkmslqa kwgpgldlsk strnwwvsnn ilwqphcqgm svltrtaphf

  61   ppkvgrrqrl fteavqrq
```

uncharacterized protein ALB (e.g., GenBank Accession Number A6NBZ8 (SEQ ID NO: 12):

```
mkwvtfisll flfssaysrg vfrrdahkse vahrfkdlge enfkalvlia       50

fagylqqcpf edhvklvnev tefaktcvad esaencdksl htlfgdklct      100

vatlretyge madccakqep ernecflqhk ddnpnlprlv rpevdvmcta      150

fhdneetflk kylyeiarrh pyfyapellf fakrykaaft eccqaadkaa      200

cllpkldelr degkassakq rlkcaslqkf gerafkawav arlsqrfpka      250

efaevsklvt dltkvhtecc hgdllecadd radlakyice nqdsissklk      300

eccekpllek shciaevend empadlpsla adfveskdvc knyaeakdvf      350

lgmflyeyar rhpdysvvll lrlaktyett lekccaaadp hecyakvfde      400

fkplveepqn likqncelfe qlgeykfqna llvrytkkvp qvstptlvev      450

srnlgkvgsk cckhpeakrm pcaedylsvv lnqlcvlhek tpvsdrvtkc      500

cteslvnrrp cfsalevdet yvpkefnaet ftfhadictl sekerqikkq      550

talvelvkhk pkatkeqlka vmddfaafve kcckaddket cfaeegqktc      600

cckssclrli tshlkasqpt mrirerk                               627
```

isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor (e.g., GenBank Accession Number Q8TER0-4 (SEQ ID NO: 13):

```
    1  mrhgvawall vaaalglgar gvrgavalad fypfgaergd avtpkqddgg sglrplsvpf

   61  pffgaehsgl yvnnngiisf lkevsqftpv afpiakdrcv vaafwadvdn rragdvyyre

  121  atdpamlrra tedvrhyfpe lldfnatwvf vatwyrvtff ggsssspvnt fqtvlitdgk
```

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```
  181 lsftifnyes ivwttgthas sggnatglgg iaaqagfnag dgqryfsipg srtadmaeve

  241 tttnvgvpgr wafriddaqv rvggcghtts vclalrpcln ggkciddcvt gnpsytcscl

  301 sgftgrrchl dvnecasqpc qnggtcthgi nsfrcqcpag fggptcetaq spcdtkecqh

  361 ggqcqvengs avcvcqagyt gaacemdvdd cspdpclngg scvdlvgnyt clcaepfkgl

  421 rcetgdhpvp daclsapchn ggtcvdadqg yvcecpegfm gldcrervpd dcecrnggrc

  481 lganttlcqc plgffgllce feitampcnm ntqcpdggyc mehggsylcv chtdhnashs

  541 lpspcdsdpc fnggscdahd dsytcecprg fhgkhcekar phlcssgpcr nggtckeagg

  601 eyhcscpyrf tgrhceigkp dscasgpchn ggtcfhyigk ykcdcppgfs grhceiapsp

  661 cfrspcvngg tcedrdtdff chcqagymgr rcqaevdcgp peevkhatlr fngtrlgava

  721 lyacdrgysl sapsrirvcq phgvwseppq cleidecrsq pclhggscqd rvagylclcs

  781 tgyegahcel erdecrahpc rnggscrnlp gayvcrcpag fvgvhcetev dacdsspcqh

  841 ggrcesggga ylcvcpesff gyhcetvsdp cfsspcggrg yclasngshs ctckvgytge

  901 dcakelfppt alkmervees gvsiswnppn gpaarqmldg yavtyvssdg syrrtdfvdr

  961 trsshqlqal aagraynisv fsvkrnsnnk ndisrpavll artrprpveg fevtnvtast

 1021 isvqwalhri rhatvsgvrv sirhpealrd qatdvdrsvd rftfrallpg krytiqlttl

 1081 sglrgeehpt eslatapthv wtrplppanl taarvtatsa hvvwdaptpg slleayvinv

 1141 ttsqstksry vpngklasyt vrdllpgrry qlsviavqst elgpqhsepa hlyiitsprd

 1201 gadrrwhqgg hhprvlknrp pparlpelrl lndhsapetp tqpprfselv dgrgrvsarf

 1261 ggspskaatv rsqptasaql enmeeapkrv slalqlpehg skdignvpgn csenpcqngg

 1321 tcvpgadahs cdcgpgfkgr rcelacikvs rpctrlfset kafpvweggv chhvykrvyr

 1381 vhqdicfkes cestslkktp nrkqsksqtl eks
```

isoform 2 of peripherin (e.g., GenBank Accession Number P41219-2 (SEQ ID NO: 14):

```
    1  mshhpsglra gfsstsyrrt fgpppslspg afsysssrf sssrllgsas psssvrlgsf

   61  rspragagal lrlpserldf smaealnqef latrsnekqe lqelndrfan fiekvrfleq

  121  qnaalrgels qargqepara dqlcqqelre lrrelellgr erdrvqverd glaedlaalk

  181  qrleeetrkr edaehnlvlf rkdvddatls rlelerkies lmdeieflkk lheeelrdlq

  241  vsvesqqvqq veveatvkpe ltaalrdira qyesiaaknl qeaeewyksk yadlsdaanr

  301  nhealrqakq emnesrrqiq sltcevdglr gtneallrql releeqfale aggyqagaar

  361  leeelrqlke emarhlreyq ellnvkmald ieiatyrkll egeesrisvp vhsfaslnik

  421  ttvpeveppq dshsrktvli ktietrngev vtesqkeqrs eldkssahsy
```

mitochondrial 28S ribosomal protein S22 (e.g., GenBank Accession Number P82650 (SEQ ID NO: 15):

```
    1  maplgttvll wsllrsspgv ervcfrariq pwhggllqpl pcsfemglpr rrfsseaaes

   61  gspetkkptf mdeevqsilt kmtglnlqkt fkpaiqelkp ptyklmtqaq leeatrqave

  121  aakvrlkmpp vleervpind vlaedkileg tettkyvftd isysiphrer fivvrepsgt

  181  lrkasweerd rmiqvyfpke grkiltpiif keenlrtmys qdrhvdvlnl cfagfepdst

  241  eyikvhhkty edidkrgkyd llrstryfgg mvwyfvnnkk idgllidqiq rdliddatnl

  301  vqlyhvlhpd gqsaqgakdq aaeginlikv fakteaqkga yieltlqtyq ealsrhsaas
```

translation initiation factor EIF-2B subunit epsilon (e.g., GenBank Accession Number Q13144 (SEQ ID NO: 16):

```
    1  maapvvappg vvvsrankrs gagpggsggg gargaeeepp pplqavlvad sfdrrffpis

   61  kdqprvllpl anvalidytl efltatgvqe tfvfccwkaa qikehllksk wcrptslnvv

  121  riitselyrs lgdvlrdvda kalvrsdfll vygdvisnin itraleehrl rrkleknvsv

  181  mtmifkessp shptrchedn vvvavdsttn rvlhfqktqg lrrfafplsl fqgssdgvev

  241  rydlldchis icspqvaqlf tdnfdyqtrd dfvrgllvne eilgnqihmh vtakeygarv

  301  snlhmysavc advirrwvyp ltpeanftds ttqscthsrh niyrgpevsl ghgsileenv

  361  llgsgtvigs ncfitnsvig pgchigdnvv ldqtylwqgv rvaagaqihq sllcdnaevk

  421  ervtlkprsv ltsqvvvgpn itlpegsvis lhppdaeede ddgefsddsg adqekdkvkm

  481  kgynpaevga agkgylwkaa gmnmeeeeel qqnlwglkin meeesesese qsmdseepds

  541  rggspqmddi kvfqnevlgt lqrgkeenis cdnlvleins lkyaynislk evmqvlshvv

  601  lefplqqmds pldssrycal llpllkawsp vfrnyikraa dhlealaaie dffleheal g

  661  ismakvlmaf yqleilaeet ilswfsqrdt tdkgqqlrkn qqlqrfiqwl keaeeessed

  721  d
```

estradiol 17-beta-dehydrogenase 1 (e.g., GenBank Accession Number P14061 (SEQ ID NO: 17):

```
    1  martvvlitg cssgiglhla vrlasdpsqs fkvyatlrdl ktqgrlweaa ralacppgsl

   61  etlqldvrds ksvaaarerv tegrvdvlvc naglgllgpl ealgedavas vldvnvvgtv

  121  rmlqaflpdm krrgsgrvlv tgsvgglmgl pfndvycask faleglcesl avlllpfgvh

  181  lsliecgpvh tafmekvlgs peevldrtdi htfhrfyqyl ahskqvfrea aqnpeevaev

  241  fltalrapkp tlryfttерf lpllrmrldd psgsnyvtam hrevfgdvpa kaeagaeagg

  301  gagpgaedea grsavgdpel gdppaapq
```

XRCC6BP1 (e.g., GenBank Accession Number Q8N4L5 (SEQ ID NO: 18):

```
   1  magapderrr gpaageqlqq qhvscqvfpe rlaqgnpqqg ffssfftcnq kcqlrllktl

  61  etsrshdlea vvpqngsetg warkglgntw pgasgsaqsl drlgimgagl ga
```

brain-specific angiogenesis inhibitor 1 precursor (e.g., GenBank Accession Number O14514(SEQ ID NO: 19):

```
    1  mrgqaaapgp vwilaпllll llllgrrara aagadagpgp epcatlvqgk ffgyfsaaav

   61  fpanasrcsw tlrnpdprry tlymkvakap vpcsgpgrvr tyqfdsfles trtylgvesf

  121  devlrlcdps aplaflqask qflqmrrqqp pqhdglrpra gppgptddfs veylvvgnrn

  181  psraacqmlc rwldaclags rsshpcgimq tpcaclggea ggpaagplap rgdvclrdav

  241  aggpenclts ltqdrgghga tggwklwslw gectrdcggg lqtrtrtclp apgvegggce

  301  gvleegrqcn reacgpagrt ssrsqslrst darrreelgd elqqfgfpap qtgdpaaeew

  361  spwsvcsstc gegwqtrtrf cvsssystqc sgplreqrlc nnsavcpvhg awdewspwsl

  421  csstcgrgfr drtrtcrppq fggnpcegpe kqtkfcnial cpgravdgnw newsswsacs

  481  ascsqgrqqr trecngpsyg gaecqghwve trdcflqqcp vdgkwqawas wgscsvtcga

  541  gsqrrervcs gpffggaacq gpqdeyrqcg tqrcpephei cdednfgavi wketpageva

  601  avrcprnatg lilrrcelde egiayweppt yircvsidyr niqmmtrehl akaqrglpge
```

-continued

```
 661 gvseviqtlv eisqdgtsys gdllstidvl rnmteifrra yysptpgdvq nfvqilsnll

 721 aeenrdkwee aqlagpnake lfrlvedfvd vigfrmkdlr dayqvtdnlv lsihklpasg

 781 atdisfpmkg wratgdwakv pedrvtvsks vfstgltead easvfvvgtv lyrnlgsfla

 841 lqrnttvlns kvisvtvkpp prslrtplei efahmyngtt nqtcilwdet dvpsssappq

 901 lgpwswrgcr tvpldalrtr clcdrlstfa ilaqlsadan mekatlpsvt livgcgvssl

 961 tllmlviiyv svwryirser svilinfcls iissnalili gqtqtrnkvm ctlvaaflhf

1021 fflssfcwvl teawqsymav tghlrnrlir krflclgwgl palvvaisvg ftkakgystm

1081 nycwlslegg llyafvgpaa avvlvnmvig ilvfnklvsk dgitdkklke ragaslwssc

1141 vvlpllaltw msavlavtdr rsalfqilfa vfdslegfvi vmvhcilrre vqdavkcrvv

1201 drqeegngds ggsfqnghaq lmtdfekdvd lacrsvlnkd iaacrtatit gtlkrpslpe

1261 eeklklahak gpptnfnslp anvsklhlhg sprypggplp dfpnhsltlk rdkapkssfv

1321 gdgdifkkld selsraqeka ldtsyvilpt atatlrpkpk eepkysihid qmpqtrlihl

1381 stapeaslpa rsppsrqpps ggppeappaq pppppppppp ppqqplpppp nlepappslg

1141 dpgepaahpg pstgpstkne nvatlsvssl errksryael dfekimhtrk rhqdmfqdln

1501 rklqhaaekd kevlgpdskp ekqqtpnkrp weslrkahgt ptwvkkelep lqpsplelrs

1561 vewersgati plvgqdiidl qtev
```

isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2 (e.g., GenBank Accession Number Q9HBD1-2 (SEQ ID NO: 20):

```
    1 mpvqaaqwte flscpicyne fdenvhkpis lgcshtvckt clnklhrkac pfdqtaintd

   61 idvlpvnfal lqlvgaqvpd hqsiklsnlg enkhyevakk cvedlalylk plsggkyvas

  121 lnqsalsrpm qrklvtlvnc qlveeegrvr amraarslge rtvtelilqh qnpqqlsanl

  181 waavrargcq flgpamqeea lklvllaled gsalsrkvlv lfvvqrlepr fpqasktsig

  241 hvvqllyras cfkvtkrded sslmqlkeef rsyealrreh daqivhiame aglrispeqw

  301 ssllygdlah kshmqsiidk lqspesfaks vqeltivlqr tgdpanlnrl rphlellani

  361 dpnpdavspt weqlenamva vktvvhglvd fiqnysrkgh etpqpqpnsk yktsmcrdlr

  421 qqggcprgtn ctfahsqeel ekyrlrnkki natvrtfpll nkvgvnntvt ttagnvisvi

  481 gstettgkiv pstngisnae nsvsqlisrs tdstlralet vkkvgkvgan gqnaagpsad

  541 svtenkigsp pktpvsnvaa tsagpsnvgt elnsvpqkss pfltrvpvyp phseniqyfq

  601 dprtqipfev pqypqtgyyp ppptvpagva pcvprfvrsn nvpesslppa smpyadhyst

  661 fsprdrmnss pyqpppppqpy gpvppvpsgm yapvydsrri wrppmyqrdd iirsnslppm

  721 dvmhssvyqt slrerynsld gyysvacqpp seprttvplp repcghlkts ceeqirrkpd

  781 qwaqyhtqka plvsstlpva tqsptppspl fsvdfradfs esvsgtkfee dhlshyspws

  841 cgtigscina idsepkdvia nsnavlmdld sgdvkrrvhl fetqrrtkee dpiipfsdgp

  901 iiskwgaisr ssrtgyhttd pvqatasqgs atkpisvsdy vpyvnavdsr wssygneats

  961 sahyverdrf ivtdlsghrk hsstgdllsl elqqaksnsl llqreanala mqqkwnslde

 1021 grhltlnlls keielrngel qsdytedatd tkpdrdiele lsaldtdepd gqsepieeil

 1081 diqlgissqn dqllngmave nghpvqqhqk eppkqkkqsl gedhvileeq ktilpvtscf

 1141 sqplpvsisn asclpittsv sagnlilkth vmsedkndfl kpvangkmvn s
```

hemoglobin subunit beta (e.g., GenBank Accession Number P68871
(SEQ ID NO: 21):

```
    1  mvhltpeeks avtalwgkvn vdevggealg rllvvypwtq rffesfgdls tpdavmgnpk

   61  vkahgkkvlg afsdglahld nlkgtfatls elhcdklhvd penfrllgnv lvcvlahhfg

  121  keftppvqaa yqkvvagvan alahkyh
```

isoform 1 of far upstream element-binding protein 1 (e.g., GenBank
Accession Number Q96AE4-1 (SEQ ID NO: 22):

```
    1  madystvppp ssgsaggggg ggggggvnda fkdalqrarq iaakiggdag tslnsndygy

   61  ggqkrpledg dqpdakkvap qndsfgtqlp pmhqqqsrsv mteeykvpdg mvgfiigrgg

  121  egisriqqes gckiqiapds gglperscml tgtpesvqsa krlldqivek grpapgfhhg

  181  dgpgnavqei mipaskaglv igkggetikq lqeragvkmv miqdgpqntg adkplritgd

  241  pykvqqakem vlelirdqgg frevrneygs riggnegidv piprfavgiv igrngemikk

  301  iqndagvriq fkpddgttpe riaqitgppd rcqhaaeiit dllrsvqagn pggpgpggrg

  361  rgrgqgnwnm gppgglqefn fivptgktgl iigkggetik sisqqsgari elqrnpppna

  421  dpnmklftir gtpqqidyar qlieekiggp vnplgppvph gphgvpgphg ppgppgpgtp

  481  mgpynpapyn pgppgpaphg ppapyapqgw gnayphwqqq appdpakagt dpnsaawaay

  541  yahyyqqqaq pppaapagap tttqtngqgd qqnpapagqv dytkaweeyy kkmgqavpap

  601  tgappggqpd ysaawaeyyr qqaayyaqts pqgmpqhppa pqgq
```

GALECTIN-3 (e.g., GenBank Accession Number P17931 (SEQ ID NO: 23):

```
   1 madnfslhda lsgsgnpnpq gwpgawgnqp agaggypgas ypgaypgqap pgaypgqapp

  61 gayhgapgay pgapapgvyp gppsgpgayp ssggpsapga ypatgpygap agplivpynl

 121 plpggvvprm litilgtvkp nanrialdfq rgndvafhfn prfnennrry ivcntkldnn

 181 wgreergsvf pfesgkpfki qvlvepdhfk vavndahllq ynhrvkklne isklgisgdi

 241 dltsasytmi
```

lysozyme C precursor (e.g., GenBank Accession Number P61626 (SEQ ID NO: 24):

```
   1 mkalivlglv llsvtvqgkv fercelartl krlgmdgyrg islanwmcla kwesgyntra

  61 tnynagdrst dygifqinsr ywcndgktpg avnachlscs allqdniada vacakrvvrd

 121 pqgirawvaw rnrcqnrdvr qyvqgcgv
```

actin, alpha skeletal muscle (e.g., GenBank Accession Number
P68133 (SEQ ID NO: 25):

```
   1 mcdedettal vcdngsglvk agfagddapr avfpsivgrp rhqgvmvgmg qkdsyvgdea

  61 qskrgiltlk ypiehgiitn wddmekiwhh tfynelrvap eehptlltea plnpkanrek

 121 mtqimfetfn vpamyvaiqa vlslyasgrt tgivldsgdg vthnvpiyeg yalphaimrl

 181 dlagrdltdy lmkiltergy sfvttaerei vrdikeklcy valdfenema taasssslek

 241 syelpdgqvi tignerfrcp etlfqpsfig mesagihett ynsimkcdid irkdlyannv

 301 msggttmypg iadrmqkeit alapstmkik iiapperkys vwiggsilas lstfqqmwit

 361 kqeydeagps ivhrkcf
```

isoform M2 of pyruvate kinase isozymes M1/M2 (e.g., GenBank Accession Number P14618-1 (SEQ ID NO: 26):

```
   1 mskphseagt afiqtqqlha amadtflehm crldidsppi tarntgiict igpasrsvet

  61 lkemiksgmn varlnfshgt heyhaetikn vrtatesfas dpilyrpvav aldtkgpeir

 121 tglikgsgta evelkkgatl kitldnayme kcdenilwld yknickvvev gskiyvddgl

 181 islqvkqkga dflvteveng gslgskkgvn lpgaavdlpa vsekdiqdlk fgveqdvdmv

 241 fasfirkasd vhevrkvlge kgknikiisk ienhegvrrf deileasdgi mvargdlgie

 301 ipaekvflaq kmmigrcnra gkpvicatqm lesmikkprp traegsdvan avldgadcim

 361 lsgetakgdy pleavrmqhl iareaeaaiy hlqlfeelrr lapitsdpte atavgaveas

 421 fkccsgaiiv ltksgrsahq varyrprapi iavtrnpqta rqahlyrgif pvlckdpvqe

 481 awaedvdlry nfamnvgkar gffkkgdvvi vltgwrpqsg ftntmrvvpv p
```

AGR2 (e.g., GenBank Accession Number O95994 (SEQ ID NO: 27):

```
   1 mekipvsafl llvalsytla rdttvkpgak kdtkdsrpkl pqtlsrgwgd qliwtqtyee

  61 alyksktsnk plmiihhlde cphsqalkkv faenkeiqkl aeqfvllnlv yettdkhlsp

 121 dgqyvprimf vdpsltvrad itgrysnrly ayepadtall ldnmkkalkl lktel
```

neutrophil defensin 1 precursor (e.g., GenBank Accession Number P59665 (SEQ ID NO: 28);

```
  1 mrtlailaai llvalqaqae plqaradeva aapeqiaadi pevvvslawd eslapkhpgs

 61 rknmacycri paciagerry gtciyqgrlw afcc
```

myeloblastin precursor (e.g., GenBank Accession Number P24158 (SEQ ID NO: 29):

```
   1 mahrppspal asvllallls gaaraaeivg gheaqphsrp ymaslqmrgn pgshfcggtl

  61 ihpsfvltaa hclrdipqrl vnvvlgahnv rtqeptqqhf svaqvflnny daenklndvl

 121 liqlsspanl sasvatvqlp qqdqpvphgt qclamgwgrv gahdppaqvl qelnvtvvtf

 181 fcrphnictf vprrkagicf gdsggplicd giiqgidsfv iwgcatrlfp dfftrvalyv

 241 dwirstlrrv eakgrp
```

uncharacterized protein PSME2 (e.g., GenBank Accession Number Q9UL46 (SEQ ID NO: 30):

```
makpcgvrls gearkqvevf rqnlfgeaee flyrflpqki iylnqllqed  50

slnvadltsl rapldipipd pppkddemet dkqekkevpk cgflpgnekv 100

lsllalvkpe vwtlkekcil vitwiqhlip kiedgndfgv aiqekvlerv 150

navktkveaf qttiskyfse rgdavakask ethvmdyral vherdeaayg 200

elramvldlr afyaelyhii ssnlekivnp kgeekpsmy             239
```

tubulin beta-2C chain (e.g., GenBank Accession Number P68371 (SEQ ID NO: 31):

```
   1 mreivhlqag qcgnqigakf wevisdehgi dptgtyhgds dlqlerinvy yneatggkyv

  61 pravlvdlep gtmdsvrsgp fgqifrpdnf vfgqsgagnn wakghytega elvdsvldvv

 121 rkeaescdcl qgfqlthslg ggtgsgmgtl liskireeyp drimntfsvv pspkvsdtvv
```

-continued

```
 181 epynatlsvh qlventdety cidnealydi cfrtlklttp tygdlnhlvs atmsgvttcl

 241 rfpgqlnadl rklavnmvpf prlhffmpgf apltsrgsqq yraltvpelt qqmfdaknmm

 301 aacdprhgry ltvaavfrgr msmkevdeqm lnvqnknssy fvewipnnvk tavcdipprg

 361 lkmsatfign staiqelfkr iseqftamfr rkaflhwytg egmdemefte aesnmndlvs

 421 eyqqyqdata eeegefeeea eeeva
```

thiosulfate sulfurtransferase (e.g., GenBank Accession Number Q16762 (SEQ ID NO: 32):

```
   1 mvhqvlyral vstkwlaesi rtgklgpglr vldaswyspg trearkeyle rhvpgasffd

  61 ieecrdtasp yemmlpseag faeyvgrlgi snhthvvvyd gehlgsfyap rvwwmfrvfg

 121 hrtvsvlngg frnwlkeghp vtsepsrpep avfkatldrs llktyeqvle nleskrfqlv

 181 dsrsqgrflg tepepdavgl dsghirgavn mpfmdflted gfekgpeelr alfqtkkvdl

 241 sqpliatcrk gvtachvala aylcgkpdva vydgswsewf rrappesrvs qgkseka
```

heat shock 70 kDa protein 1 (e.g., GenBank Accession Number P08107 (SEQ ID NO: 33):

```
   1 makaaaigid lgttyscvgv fqhgkveiia ndqgnrttps yvaftdterl igdaaknqva

  61 lnpqntvfda krligrkfgd pvvqsdmkhw pfqvindgdk pkvqvsykge tkafypeeis

 121 smvltkmkei aeaylgypvt navitvpayf ndsqrqatkd agviaglnvl riineptaaa

 181 iaygldrtgk gernvlifdl gggtfdvsil tiddgifevk atagdthlgg edfdnrlvnh

 241 fveefkrkhk kdisqnkrav rrlrtacera krtlssstqa sleidslfeg idfytsitra

 301 rfeelcsdlf rstlepveka lrdakldkaq ihdlvlvggs tripkvqkll qdffngrdln

 361 ksinpdeava ygaavqaail mgdksenvqd llldvapls lgletaggvm talikrnsti

 421 ptkqtqiftt ysdnqpgvli qvyegeramt kdnnllgrfe lsgippaprg vpqievtfdi

 481 dangilnvta tdkstgkank ititndkgrl skeeiermvq eaekykaede vqrervsakn

 541 alesyafnmk savedeglkg kiseadkkkv ldkcqevisw ldantlaekd efehkrkele

 601 qvcnpiisgl yqgaggpgpg gfgaqgpkgg sgsgptieev d
```

Ig kappa chain V-III region sie (e.g., GenBank Accession Number P01620 (SEQ ID NO: 34)

```
  1 eivitqspgt lslspgerat lscrasqsys nsylawyqqk pgqaprlliy gassratgip

 61 drfsgsgsgt dftltisrle pddfavyycq qygsspqtfg qgskveikr
```

macrophage migration inhibitory factor (e.g., GenBank Accession Number P14174 (SEQ ID NO: 35):

```
  1 mpmfivntnv prasvpdgfl seltqqlaqa tgkppqyiav hvvpdqlmaf ggssepcalc

 61 slhsigkigg aqnrsyskll cgllaerlri spdrvyinyy dmnaanvgwn nstfa
```

isoform 1 of ATP synthase subunit D, mitochondrial (e.g., GenBank Accession Number O75947-1 (SEQ ID NO: 36):

```
   1 magrklalkt idwvafaeii pqnqkaiass lkswnetlts rlaalpenpp aidwayykan

  61 vakaglvddf ekkfnalkvp vpedkytaqv daeekedvks caewvslska riveyekeme

 121 kmknlipfdq mtiedlneaf petkldkkky pywphqpien l
```

uncharacterized protein ENSP00000374051 (e.g., GenBank Accession Number A6NGM3 (SEQ ID NO: 37):

```
mvvdknkrlt kggkkgakkk vvdpfskkdw ydvnapamfn irnigktlvt       50

rtqgtkiasd grvfevslad lqndevafrk fklitedvqg kncltnfhgv      100

dltsdkmcsm vkkwqtmiea hvdvkttdgy llrlfcvgft kkrnnqirkt      150

syaqhqqvlt sqirkkmmei mtrevqtndl kevvnklipd sigkdvekac      200

qsiyplhdvf vrkvkmlkkp kfelgklmel hgegcssgka tgdetgvkve      250

radgyelpvq esv                                              263
```

isocitrate dehydrogenase [NADP] cytoplasmic (e.g., GenBank Accession Number O75874 (SEQ ID NO: 38):

```
    1  mskkisggsv vemqgdemtr iiwelikekl ifpyveldlh sydlgienrd atndqvtkda

   61  aeaikkhnvg vkcatitpde krveefklkq mwkspngtir nilggtvfre aiicknipri

  121  vsgwvkpiii grhaygdqyr atdfvvpgpg kveitytpsd gtqkvtylvh nfeegggvam

  181  gmynqdksie dfahssfqma lskgwplyls tkntilkkyd grfkdifqei ydkqyksqfe

  241  aqkiwyehrl iddmvaqamk seggfiwack nydgdvqsds vaqgygslgm mtsvlvcpdg

  301  ktveaeaahg tvtrhyrmyq kgqetstnpi asifawtrgl ahrakldnnk elaffanale

  361  evsietieag fmtkdlaaci kglpnvqrsd ylntfefmdk lgenlkikla qakl
```

hemoglobin subunit delta (e.g., GenBank Accession Number P02042 (SEQ ID NO: 39):

```
    1  mvhltpeekt avnalwgkvn vdavggealg rllvvypwtq rffesfgdls spdavmgnpk

   61  vkahgkkvlg afsdglahld nlkgtfsqls elhcdklhvd penfrllgnv lvcvlarnfg

  121  keftpqmqaa yqkvvagvan alahkyh
```

isoform 1 of splicing factor, arginine/serine-rich 7 (e.g., GenBank Accession Number Q16629-1 (SEQ ID NO: 40):

```
    1  msrygrygge tkvyvgnlgt gagkgelera fsyygplrtv wiarnppgfa fvefedprda

   61  edavrgldgk vicgsrvrve lstgmprrsr fdrpparrpf dpndrcyecg ekghyaydch

  121  rysrrrrsrs rsrshsrsrg rrysrsrsrs rgrrsrsasp rrsrsislrr srsaslrrsr

  181  sgsikgsryf qspsrsrsrs rsisrprssr sksrspspkr srspsgsprr saspermd
```

isoform 1 of mRNA-capping enzyme (e.g., GenBank Accession Number O60942-1 (SEQ ID NO: 41):

```
    1  mahnkipprw lncprrgqpv agrflplktm lgprydsqva eenrfhpsml snylkslkvk

   61  mgllvdltnt srfydrndie kegikyiklq ckghgecptt entetfirlc erfnernppe

  121  ligvhcthgf nrtgflicaf lvekmdwsie aavatfaqar ppgiykgdyl kelfrrygdi

  181  eeappppllp dwcfeddede dededgkkes epgssasfgk rrkerlklga iflegvtvkg

  241  vtqvttqpkl gevqqkchqf cgwegsgfpg aqpvsmdkqn iklldlkpyk vswkadgtry

  301  mmlidgtnev fmidrdnsvf hvsnlefpfr kdlrmhlsnt lldgemiidr vngqavpryl

  361  iydiikfnsq pvgdcdfnvr lqciereiis prhekmktgl idktqepfsv rnkpffdict

  421  srkllegnfa kevshemdgl ifqptgkykp grcddilkwk ppslnsvdfr lkitrmggeg

  481  llpqnvglly vggyerpfaq ikvtkelkqy dnkiieckfe nnswvfmrqr tdksfpnayn

  541  tamavcnsis npvtkemlfe fidrctaasq gqkrkhhldp dtelmppppp krprplt
```

LON protease homolog, mitochondrial precursor (e.g., GenBank Accession Number P36776 (SEQ ID NO: 42):

```
    1  maastgyvrl wgaarcwvlr rpmlaaaggr vptaagawll rgqrtcdasp pwalwgrgpa

   61  iggqwrgfwe assrgggafs ggedasegga eegaggaggs agagegpvit altpmtipdv

  121  fphlpliait rnpvfprfik iievknkklv ellrrkvrla qpyvgvflkr ddsnesdvve

  181  sldeiyhtgt faqihemqdl gdklrmivmg hrrvhisrql evepeepeae nkhkprrksk

  241  rgkkeaedel sarhpaelam eptpelpaev lmvevenvvh edfqvteevk altaeivkti

  301  rdiialnply resvlqmmqa gqrvvdnpiy lsdmgaaltg aeshelqdvl eetnipkrly

  361  kalsllkkef elsklqqrlg reveekikqt hrkyllqeql kiikkelgle kddkdaieek

  421  frerlkelvv pkhvmdvvde elsklglldn hssefnvtrn yldwltsipw gkysnenldl

  481  araqavleed hygmedvkkr ilefiavsql rgstqgkilc fygppgvgkt siarsiaral

  541  nreyfrfsvg gmtdvaeikg hrrtyvgamp gkiiqclkkt ktenplilid evdkigrgyq

  601  gdpssallel ldpegnanfl dhyldvpvdl skvlfictan vtdtipeplr drmeminvsg

  661  yvaqeklaia erylvpqara lcgldeskak lssdvltlli kqycresgvr nlqkqvekvl

  721  rksaykivsg eaesvevtpe nlqdfvgkpv ftvermydvt ppgvvmglaw tamggstlfv

  781  etslrrpqdk dakgdkdgsl evtgqlgevm kesariaytf araflmqhap andylvtshi

  841  hlhvpegatp kdgpsagcti vtallslamg rpvrqnlamt gevsltgkil pvggikekti

  901  aakragvtci vlpaenkkdf ydlaafiteg levhfvehyr eifdiafpde qaealaver
```

signal recognition particle 54 kDa protein (e.g., GenBank Accession Number P61011 (SEQ ID NO: 43):

```
    1  mvladlgrki tsalrslsna tiineevlna mlkevctall eadvniklvk qlrenvksai

   61  dleemasgln krkmiqhavf kelvklvdpg vkawtptkgk qnvimfvglq gsgktttcsk

  121  layyyqrkgw ktclicadtf ragafdqlkq natkaripfy gsytemdpvi iasegvekfk

  181  nenfeiiivd tsgrhkqeds lfeemlqvan aiqpdnivyv mdasigqace aqakafkdkv

  241  dvasvivtkl dghakgggal savaatkspi ifigtgehid dfepfktqpf iskllgmgdi

  301  eglidkvnel klddnealie klkhgqftlr dmyeqfqnim kmgpfsqilg mipgfgtdfm

  361  skgneqesma rlkklmtimd smndqeldst dgakvfskqp griqrvargs gvstrdvqel

  421  ltqytkfaqm vkkmggikgl fkggdmsknv sqsqmaklnq qmakmmdprv lhhmggmagl

  481  qsmmrqfqqg aagnmkgmmg fnnm
```

isoform long of galectin-9 (e.g., GenBank Accession Number O00182-1 (SEQ ID NO: 44):

```
    1  mafsgsqapy lspavpfsgt iqgglqdglq itvngtvlss sgtrfavnfq tgfsgndiaf

   61  hfnprfedgg yvvcntrqng swgpeerkth mpfqkgmpfd lcflvqssdf kvmvngilfv

  121  qyfhrvpfhr vdtisvngsv qlsyisfqnp rtvpvqpafs tvpfsqpvcf pprprgrrqk

  181  ppgvwpanpa pitqtvihtv qsapgqmfst paippmmyph paypmpfitt ilgglypsks

  241  illsgtvlps aqrfhinlcs gnhiafhlnp rfdenavvrn tqidnswgse erslprkmpf

  301  vrgqsfsvwi lceahclkva vdgqhlfeyy hrlrnlptin rlevggdiql thvqt
```

integrin-linked protein kinase (e.g., GenBank Accession Number Q13418 (SEQ ID NO: 45):

```
    1  mddiftqcre gnavavrlwl dntendlnqg ddhgfsplhw acregrsavv emlimrgari

   61  nvmnrgddtp lhlaashghr divqkllqyk adinavnehg nvplhyacfw gqdqvaedlv

  121  angalvsicn kygempvdka kaplrellre raekmgqnln ripykdtfwk gttrtrprng

  181  tlnkhsgidf kqlnfltkln enhsgelwkg rwqgndivvk vlkvrdwstr ksrdfneecp

  241  rlrifshpnv lpvlgacqsp paphptlith wmpygslynv lhegtnfvvd qsqavkfald

  301  margmaflht lepliprhal nsrsvmided mtarismadv kfsfqcpgrm yapawvapea

  361  lqkkpedtnr rsadmwsfav llwelvtrev pfadlsnmei gmkvaleglr ptippgisph

  421  vcklmkicmn edpakrpkfd mivpilekmq dk
```

bifunctional aminoacyl-tRNA synthetase (e.g., GenBank Accession Number P07814 (SEQ ID NO: 46):

```
    1  matlsltvns gdpplgalla vehvkddvsi sveegkenil hvsenviftd vnsilrylar

   61  vattaglygs nlmehteidh wlefsatkls scdsftstin elnhclslrt ylvgnslsla

  121  dlcvwatlkg naawqeqlkq kkapvhvkrw fgfleaqqaf qsvgtkwdvs ttkarvapek

  181  kqdvgkfvel pgaemgkvtv rfppeasgyl highakaall nqhyqvnfkg klimrfddtn

  241  pekekedfek viledvamlh ikpdqftyts dhfetimkya ekliqegkay vddtpaeqmk

  301  aereqriesk hrknpieknl qmweemkkgs qfghscclra kidmssnngc mrdptlyrck

  361  iqphprtgnk ynvyptydfa cpivdsiegv thalrtteyh drdeqfywii ealgirkpyi

  421  weysrlnlnn tvlskrkltw fvneglvdgw ddprfptvrg vlrrgmtveg lkqfiaaqgs

  481  srsvvnmewd kiwafnkkvi dpvapryval lkkevipvnv peaqeemkev akhpknpevg

  541  lkpvwyspkv fiegadaetf segemvtfin wgnlnitkih knadgkiisl dakfnlenkd

  601  ykkttkvtwl aetthalpip vicvtyehli tkpvlgkded fkqyvnknsk heelmlgdpc

  661  lkdlkkgdii qlqrrgffic dqpyepvspy sckeapcvli yipdghtkem ptsgskektk

  721  veatknetsa pfkerptpsl nnncttseds lvlynrvavq gdvvrelkak kapkedvdaa

  781  vkqllslkae ykektgqeyk pgnppaeigq nissnssasi leskslydev aaqgevvrkl

  841  kaekspkaki neavecllsl kaqykektgk eyipgqppls qssdssptrn sepagletpe

  901  akvlfdkvas qgevvrklkt ekapkdqvdi avqellqlka qyksligvey kpvsatgaed

  961  kdkkkkeken ksekqnkpqk qndgqrkdps knqggglsss gagegqgpkk qtrlgleakk

 1021  eenladwysq vitksemiey hdisgcyilr pwayaiweai kdffdaeikk lgvencyfpm

 1081  fvsqsaleke kthvadfape vawvtrsgkt elaepiairp tsetvmypay akwvqshrdl

 1141  piklnqwcnv vrwefkhpqp flrtreflwq eghsafatme eaaeevlqil dlyaqvyeel

 1201  laipvvkgrk tekekfaggd ytttieafis asgraiqggt shhlgqnfsk mfeivfedpk

 1261  ipgekqfayq nswglttrti gvmtmvhgdn mglvlpprva cvqvviipcg itnalseedk

 1321  ealiakcndy rrrllsvnir vradlrdnys pgwkfnhwel kgvpirlevg prdmkscqfv

 1381  avrrdtgekl tvaeneaetk lqailediqv tlftrasedl kthmvvantm edfqkildsg

 1441  kivqipfcge idcedwikkt tardqdlepg apsmgakslc ipfkplcelq pgakcvcgkn

 1501  pakyytlfgr sy
```

isoform 1 of zinc finger protein 207 (e.g., GenBank Accession Number O43670-1 (SEQ ID NO: 47):

```
    1  mgrkkkkqlk pwcwycnrdf ddekiliqhq kakhfkchic hkklytgpgl aihcmqvhke

   61  tidavpnaip grtdieleiy gmegipekdm derrrlleqk tqesqkkkqq ddsdeydddd

  121  saastsfqpq pvqpqqgyip pmaqpglppv pgapgmppgi pplmpgvppl mpgmppvmpg

  181  mppgmmpmgg mmppgpgipp lmpgmppgmp ppvprpgipp mtqaqavsap gilnrppapt

  241  atvpapqppv tkplfpsagq mgtpvtssst assnseslsa sskalfpsta qaqaavqgpv

  301  gtdfkplnst pattteppkp tfpaytqsta sttsttnsta akpaasitsk patltttsat

  361  sklihpdedi sleerraqlp kyqrnlprpg qapignppvg piggmmppqp gipqqqgmrp

  421  pmpphgqygg hhqgmpgylp gamppygqgp pmvppyqggp prppmgmrpp vmsqggry
```

inorganic pyrophosphatase (e.g., GenBank Accession Number Q15181 (SEQ ID NO: 48):

```
    1  msgfsteera apfsleyrvf lknekgqyis pfhdipiyad kdvfhmvvev prwsnakmei

   61  atkdplnpik qdvkkgklry vanlfpykgy iwnygaipqt wedpghndkh tgccgdndpi

  121  dvceigskvc argeiigvkv lgilamideg etdwkviain vddpdaanyn dindvkrlkp

  181  gyleatvdwf rrykvpdgkp enefafnaef kdkdfaidii ksthdhwkal vtkktngkgi

  241  scmnttlses pfkcdpdaar aivdalpppc esactvptdv dkwfhhqkn
```

calponin-2 (e.g., GenBank Accession Number Q99439 (SEQ ID NO: 49):

```
    1  msstqfnkgp syglsaevkn rllskydpqk eaelrtwieg ltglsigpdf qkglkdgtil

   61  ctlmnklqpg svpkinrsmq nwhqlenlsn fikamvsygm npvdlfeand lfesgnmtqv

  121  qvsllalagk aktkglqsgv digvkysekq ernfddatmk agqcviglqm gtnkcasqsg

  181  mtaygtrrhl ydpknhilpp mdhstislqm gtnkcasqvg mtapgtrrhi ydtklgtdkc

  241  dnssmslqmg ytqganqsgq vfglgrqiyd pkycpqgtva dgapsgtgdc pdpgevpeyp

  301  pyyqeeagy
```

isoform 1 of muscleblind-like protein 3 (e.g., GenBank Accession Number Q9NUK0-1 (SEQ ID NO: 50):

```
    1  mtavnvalir dtkwltlevc refqrgtcsr adadckfahp prvchvengr vvacfdslkg

   61  rctrenckyl hppphlktql eingrnnliq qktaaamfaq qmqlmlqnaq msslgsfpmt

  121  psipanppma fnpyiphpgm glvpaelvpn tpvlipgnpp lampgavgpk lmrsdklevc

  181  refqrgnctr gendcryahp tdasmieasd ntvticmdyi kgrcsrekck yfhppahlqa

  241  rlkaahhqmn hsaasamalq pgtlqlipkr salekpngat pvfnptvfhc qqaltnlqlp

  301  qpafipagpi lcmapasniv pmmhgatptt vsaattpats vpfaapttgn qlkf
```

cathepsin G precursor (e.g., GenBank Accession Number P08311 (SEQ ID NO: 51):

```
    1  mqpllllaf llptgaeage iiggresrph srpymaylqi qspagqsrcg gflvredfvl

   61  taahcwgsni nvtlgahniq rrentqqhit arrairhpqy nqrtiqndim llqlsrrvrr

  121  nrnvnpvalp raqeglrpgt lctvagwgrv smrrgtdtlr evqlrvqrdr qclrifgsyd

  181  prrqicvgdr rerkaafkgd sggpllcnnv ahgivsygks sgvppevftr vssflpwirt

  241  tmrsfkslldq metpl
```

zinc finger and BTB domain-containing protein 34 (e.g., GenBank Accession Number Q8NCN2 (SEQ ID NO: 52):

```
    1  msvemdsssf iqfdvpeyss tvlsqlnelr lqgklcdiiv hiqgqpfrah kavlaasspy

   61  frdhsalstm sglsisvikn pnvfeqllsf cytgrmslql kdvvsfltaa sflqmqcvid

  121  kctqilesih skisvgdvds vtvgaeenpe srngvkdssf fanpveispp ycsqgrqpta

  181  ssdlrmettp skalrsrlqe eghsdrgssg syseyeiqie gdheqgdllv resqitevkv

  241  kmeksdrpsc sdssslgddg yhtemvdgeq vvavnvgsyg svlqhaysys qaasqptnvs

  301  eafgslsnss psrsmlscfr ggrarqkral svhlhsdlqg lvqgsdseam mnnpgyessp

  361  rersarghwy pynerliciy cgksfnqkgs ldrhmrlhmg icpfvckfcg kkytrkdqle

  421  yhirghtddk pfrceicgkc fpfqgtlnqh lrknhpgvae vrsriesper tdvyveqkle

  481  ndasasemgl dsrmeihtvs dapd
```

adenine phosphoribosyltransferase (e.g., GenBank Accession Number P07741 (SEQ ID NO: 53):

```
  1madselqlve qrirsfpdfp tpgvvfrdis pvlkdpasfr aaigllarhl kathggridy

 61iagldsrgfl fgpslaqelg lgcvlirkrg klpgptlwas ysleygkael eiqkdalepg

121qrvvvvddll atggtmnaac ellgrlqaev lecvslvelt slkgreklap vpffsllqye
```

40S ribosomal protein S9 (e.g., GenBank Accession Number P46781 (SEQ ID NO: 54):

```
  1mpvarswvcr ktyvtprrpf eksrldqelk ligeyglrnk revwrvkftl akirkaarel

 61ltldekdprr lfegnallrr lvrigvldeg kmkldyilgl kiedflerrl qtqvfklgla

121ksihharvli rqrhirvrkq vvnipsfivr ldsqkhidfs lrspygggrp grvkrknakk

181gqggagagdd eeed
```

TALIN-1 (e.g., GenBank Accession Number Q9Y490 (SEQ ID NO: 55):

```
   1 mvalslkisi gnvvktmqfe pstmvydacr iireripeap agppsdfglf lsdddpkkgi

  61 wleagkaldy ymlrngdtme yrkkqrplki rmldgtvkti mvddsktvtd mlmticarig

 121 itnhdeyslv relmeekkee itgtlrkdkt llrdekkmek lkqklhtdde lnwldhgrtl

 181 reqgveehet lllrrkffys dqnvdsrdpv qlnllyvqar ddilngshpv sfdkacefag

 241 fqcqiqfgph neqkhkagfl dlkdflpkey vkqkgerkif qahkncgqms eieakvryvk

 301 larslktygv sfflvkekmk gknklvprll gitkecvmrv dektkeviqe wnltnikrwa

 361 aspksftldf gdyqdgyysv qttegeqiaq liagyidiil kkkkskdhfg legdeestml

 421 edsvspkkst vlqqqynrvg kvehgsvalp aimrsgasgp enfqvgsmpp aqqqitsgqm

 481 hrghmpplts aqqaltgtin ssmqavqaaq atlddfdtlp plgqdaaska wrknkmdesk

 541 heihsqvdai tagtasvvnl tagdpaetdy tavgcavtti ssnltemsrg vkllaalled

 601 eggsgrpllq aakglagays ellrsaqpas aeprqnllqa agnvgqasge llqqigesdt

 661 dphfqdalmq lakavasaaa alvlkaksva qrtedsglqt qviaaatqca lstsqlvact

 721 kvvaptissp vcqeqlveag rlvakavegc vsasqaated gqllrgvgaa atavtqalne

 781 llqhvkahat gagpagrydq atdtiltvte nifssmgdag emvrqarila qatsdlvnai
```

-continued

```
 841 kadaegesdl ensrkllsaa kiladatakm veaakgaaah pdseeqqqrl reaaeglrma

 901 tnaaaqnaik kklvqrleha akqaaasatq tiaaaqhaas tpkasagpqp llvqsckava

 961 eqipllvqgv rgsqaqpdsp saqlaliaas qsflqpggkm vaaakasvpt iqdqasamql

1021 sqcaknlgta laelrtaaqk aqeacgplem dsalsvvqnl ekdlqevkaa ardgklkplp

1081 getmekctqd lgnstkavss aiaqllgeva qgnenyagia ardvagglrs laqaargvaa

1141 ltsdpavqai vldtasdvld kasslieeak kaaghpgdpe sqqrlaqvak avtqalnrcv

1201 sclpgqrdvd nalravgdas krllsdslpp stgtfqeaqs rlneaaagln qaatelvqas

1261 rgtpqdlara sgrfgqdfst fleagvemag qapsqedraq vvsnlkgism sssklllaak

1321 alstdpaapn lksqlaaaar avtdsinqli tmctqqapgq kecdnalrel etvrellenp

1381 vqpindmsyf gcldsvmens kvlgeamtgi sqnakngnlp efgdaistas kalcgfteaa

1441 aqaaylvgvs dpnsqagqqg lveptqfara nqaiqmacqs lgepgctqaq vlsaativak

1501 htsalcnscr lasarttnpt akrqfvqsak evanstanlv ktikaldgaf teenraqcra

1561 ataplleavd nlsafasnpe fssipaqisp egraamepiv isaktmlesa ggliqtaral

1621 avnprdppsw svlaghsrtv sdsikklits mrdkapgqle cetaiaalns clrdldqasl

1681 aavsqqlapr egisqealht qmltavqeis hlieplanaa raeasqlghk vsqmaqyfep

1741 ltlaavgaas ktlshpqqma lldqtktlae salqllytak eaggnpkqaa htqealeeav

1801 qmmteavedl tttlneaasa agvvggmvds itqainqlde gpmgepegsf vdyqttmvrt

1861 akaiavtvqe mvtksntspe elgplanqlt sdygrlasea kpaavaaene eigshikhrv

1921 qelghgcaal vtkagalqcs psdaytkkel iecarrvsek vshvlaalqa gnrgtqacit

1981 aasavsgiia dldttimfat agtlnregte tfadhregil ktakvlvedt kvlvqnaags

2041 qeklaqaaqs svatitrlad vvklgaaslg aedpetqvvl inavkdvaka lgdlisatka

2101 aagkvgddpa vwqlknsakv mvtnvtsllk tvkavedeat kgtraleatt ehirqelavf

2161 cspeppakts tpedfirmtk gitmatakav aagnscrqed viatanlsrr aiadmlrack

2221 eaayhpevap dvrlralhyg recangylel ldhvlltlqk pspelkqqlt ghskrvagsv

2281 teliqaaeam kgtewvdped ptviaenell gaaaaieaaa kkleqlkpra kpkeadesln

2341 feeqileaak siaaatsalv kaasaaqrel vaqgkvgaip analddgqws qglisaarmv

2401 aaatnnlcea anaavqghas qeklissakq vaastaqllv ackvkadqds eamkrlqaag

2461 navkrasdnl vkaaqkaaaf eeqenetvvv kekmvggiaq iiaaqeemlr kereleeark

2521 klaqirqqqy kflpselrde h
```

leucine-rich repeat-containing protein 59 (e.g., GenBank Accession Number Q96AG4 (SEQ ID NO: 56):

```
   1mtkagskggn lrdkldgnel dlslsdlnev pvkelaalpk atildlscnk lttlpsdfcg

  61lthlvkldls knklqqlpad fgrlvnlqhl dllnnklvtl pvsfaqlknl kwldlkdnpl

 121dpvlakvagd cldekqckqc ankvlqhmka vqadqererq rrlevereae kkreakqrak

 181eaqerelrkr ekaeekerrr keydalkaak reqekkpkke anqapksksg srprkppprk

 241htrswavlkl lllllfgva gglvacrvte lqqqplctsv ntiydnavqg lrrheilqwv

 301lqtdsqq
```

ATP synthase subunit alpha, mitochondrial precursor (e.g., GenBank Accession Number P25705 (SEQ ID NO: 57):

```
  1mlsvrvaaav vralprragl vsrnalgssf iaarnfhasn thlqktgtae mssileeril

 61gadtsvdlee tgrvlsigdg iarvhglrnv qaeemvefss glkgmslnle pdnvgvvvfg

121ndklikegdi vkrtgaivdv pvgeellgrv vdalgnaidg kgpigsktrr rvglkapgii

181prisvrepmq tgikavdslv pigrgqreli igdrqtgkts iaidtiinqk rfndgsdekk

241klyciyvaig qkrstvaqlv krltdadamk ytivvsatas daaplqylap ysgcsmgeyf

301rdngkhalii yddlskqava yrqmslllrr ppgreaypgd vfylhsrlle raakmndafg

361ggsltalpvi etqagdvsay iptnvisitd gqifletelf ykgirpainv glsysrvgsa

421aqtramkqva gtmklelaqy revaafaqfg sdldaatqql lsrgvrltel lkqgqyspma

481ieeqvaviya gvrgyldkle pskitkfena flshvvsqhq allgtiradg kiseqsdakl

541keivtnflag fea
```

isoform 7 of protein transport protein SEC31A (e.g., GenBank Accession Number O94979-7 (SEQ ID NO: 58):

```
    1 mklkevdrta mqawspagnh piylatgtsa qqldatfstn asleifeldl sdpsldmksc

   61 atfssshryh kliwgpykmd skgdvsgvli aggengniil ydpskiiagd kevviaqndk

  121 htgpvraldv nifqtnlvas ganeseiyiw dlnnfatpmt pgaktqpped isciawnrqv

  181 qhilasasps gratvwdlrk nepiikvsdh snrmhcsgla whpdvatqmv laseddrlpv

  241 iqmwdlrfas splrvlenha rgilaiawsm adpelllscg kdakilcsnp ntgevlyelp

  301 tntqwcfdiq wcprnpavls aasfdgrisv ysimggstdg lrqkqvdkls ssfgnldpfg

  361 tgqplpplqi pqqtaqhsiv lplkkppkwi rrpvgasfsf ggklvtfenv rmpshqgaeq

  421 qqqqhhvfis qvvtekefls rsdqlqqavg sqgfinycqk kidasqtefe knvwsflkvn

  481 feddsrgkyl ellgyrkedl gkkialalnk vdganvalkd sdqvaqsdge espaaeeqll

  541 gehikeekee seflpssggt fnisvsgdid glitqalltg nfesavdlcl hdnrmadaii

  601 laiaggqell artqkkyfak sqskitrlit avvmknwkei vescdlknwr ealaavltya

  661 kpdefsalcd llgtrleneg dsllqtqacl cyicagnvek lvacwtkaqd gshplslqdl

  721 iekvvilrka vqltqamdts tvgvllaakm sqyanllaaq gsiaaalafl pdntnqpnim

  781 qlrdrlcraq gepvaghesp kipyekqqlp kyrpgpvagh hqmprvqtqq yyphgenppp

  841 pgfimhgnvn pnaagqlpts pghmhtqvpp ypqpqpyqpa qpypfgtggs amyrpqqpva

  901 pptsnaypnt pyissassyt gqsqlyaaqh gassptsspa tsfppppssg asfqhggpga

  961 ppsssayalp pgttgtlpaa selpasqrtg pqngwndppa lnrvpkkkkm penfmppvpi

 1021 tspimnplgd pqsqmlqqqp sapvplssqs sfpqphlpgg qpfhgvqqpl gqtgmppsfs

 1081 kpniegapga pigntfqhvq slptkkitkk pipdehlilk ttfedliqrc lssatdpqtk

 1141 rklddaskrl eflydklreq tlsptitsgl hniarsietr nysegltmht hivstsnfse

 1201 tsafmpvlkv vltqanklgv
```

dihydroxyacetone kinase (e.g., GenBank Accession Number Q3LXA3 (SEQ ID NO: 59):

```
  1 mtskklvnsv agcaddalag lvacnpnlql lqghrvalrs dldslkgrva llsgggsghe

 61 pahagfigkg mltgviagav ftspavgsil aairavaqag tvgtallvkn ytgdrlnfgl
```

-continued

121areqaraegi pvemvvigdd saftvlkkag rrglcgtvli hkvagalaea gvgleeiakq

181vnvvtkamgt lgvslsscsv pgskptfels adevelglgi hgeagvrrik matadeivkl

241mldhmtnttn ashvpvqpgs svvmmvnnlg glsflelgii adatvrsleg rgvkiaralv

301gtfmsalemp gisltlllvd epllklidae ttaaawpnva avsitgrkrs rvapaepqea

361pdstaaggsa skrmalvler vcstllglee hlnaldraag dgdcgtthsr aaraiqewlk

421egpppaspaq llsklsvlll ekmggssgal yglfltaaaq plkaktslpa wsaamdagle

481amqkygkaap gdrtmldslw aagqelqawk spgadllqvl tkavksaeaa aeatknmeag

541agrasyissa rleqpdpgav aaaailrail evlqs

similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2). ISOFORM 4 ENSEMBL Accession Number ENST0000342709 (SEQ ID NO: 60)(see also, GenBank Accession No.: NM_004500.3 and UNIPARC Accession Number IPI00868835):
masnvtnktdprsmnsrvfignlntlvvkksdveaifskygkivgcsvhkgfaffqyvnernaraavagedgrmiagq

vldinlaaepkvnrgkagykrsaaemygssfdldcdfqrdyydrmysyparvpppppiaraaikreltqikqkvdsfl

enlekiekeqskqavemnnvkseeeqssssvkkdetnvkmeseggaddsaeegdlldddnedggmtsws

18 kDa protein UNIPARC Accession Number IPI00796554 (SEQ ID NO: 61):
marsrtsssp aisqetevgg grkaiiifvp vpqlksfqki qvrlvrelek kfsgkhvvfi

aqrrilpkpt qksrtknkqk cprsrtltav hdafledlvf pseivgkrip vkldssrlik

vhldkaqqnn vehkvetfsg vykkltgkdv nfefpefql

cold agglutinin FS-1 L-chain (e.g., GenBank Accession Number A2NB45: (SEQ ID NO: 62)
divmtqspls lpvtpgepas iscrssqsll hsngfnylhw ylqkpgqspr 50

lliylgsnra sgvpdrfsgs gsgtdftlki srveaddvgi yycmqalqsp 100

ytfgqgtkle ikr 113

isoform 1 of heterogeneous nuclear ribonucleoprotein d0 (e.g., GenBank Accession Number Q14103-1 (SEQ ID NO: 63):
1mseeqfggdg aaaaataavg gsageqegam vaatqgaaaa agsgagtggg tasggteggs

61aesegakida skneedeghs nssprhseaa taqreewkmf igglswdttk kdlkdyfskf

121gevvdctlkl dpitgrsrgf gfvlfkeses vdkvmdqkeh klngkvidpk rakamktkep

181vkkifvggls pdtpeekire yfggfgeves ielpmdnktn krrgfcfitf keeepvkkim

241ekkyhnvgls kceikvamsk eqyqqqqqwg srggfagrar grgggpsqnw nqgysnywnq

301gygnygynsq gyggyggydy tgynnyygyg dysnqqsgyg kvsrrgghqn sykpy

DAZAP1/MEF2D fusion protein (e.g., GenBank Accession Number Q5IRN2 (SEQ ID NO: 64):
1mnnsgadeig klfvggldws ttqetlrsyf sqygevvdcv imkdkttnqs rgfgfvkfkd

61pncvgtvlas rphtldgrni dpkpctprgm qpertrpkeg wqkgprsdns ksnkifvggi

121phncgetelr eyfkkfgvvt evvmiydaek qrprgngyvs araspgllpv angnslnkvi

181paksppppth stqlgapsrk pdlrvitsqa gkglmhhlte dhldlnnaqr lgvsqsthsl

-continued

241ttpvvsvatp sllsqglpfs smptayntdy qltsaelssl pafsspggls lgnvtawqqp

301qqpqqpqqpq ppqqqppqpq qpqpqqpqqp qqppqqqshl vpvslsnlip gsplphvgaa

361ltvtthphis iksepvspsr erspappppa vfpaarpepg dglsspaggs yetgdrddgr

421gdfgptlgll rpapepeaeg savkrmrldt wtlk

POTE2 (e.g., GenBank Accession Number NP 001077007 (SEQ ID NO: 65)):

1 mvvevdsmpa assvkkpfgl rskmgkwccr cfpcyresgk snvgtsgdhd dsamktlrsk

61 mgkwchhcfp ccrgsgksnv gasgdhddsa mktlrnkmgk wcchcfpccr gsgkskvgaw

121 gdyddsafme pryhvrgedl dklhraawwg kvprkdlivm lrdtdvnkkd kqkrtalhla

181 sangnsevvk llldrrcqln vldnkkrtal ikavqcqede calmllehgt dpnipdeygn

241 ttlhyaiyne dklmakalll ygadiesknk hgltplllgv heqkqqvvkf likkkanlna

301 ldrygrtali lavccgsasi vsllleqnid vssqdlsgqt areyavsshh hvicqllsdy

361 kekqmlkiss ensnpeqelk ltseeesqrf kgsensqpek msqeleinkd gdreveeemk

421 khesnnvgll enltngvtag ngdnglipqr ksrtpenqqf pdneseeyhr icellsdyke

481 kqmpkyssen snpeqdlklt seeesqrlkg sengqpekrs qepeinkdgd relenfmaie

541 emkkhgsthv gfpenltnga tagngddgli pprksrtpes qqfpdtenee yhsdeqndtq

601 kqfceeqntg ilhdeilihe ekqievvekm nselslsckk ekdvlhenst lreeiamlrl

661 eldtmkhqsq lrekkyledi esvkkkndnl lkalqlnelt mdddtavlvi dngsgmckag

721 fagddaprav fpsivgrprq qgmmggmhqk esyvgkeaqs krgiltlkyp mehgiitnwd

781 dmekiwhhtf ynelrvapee hpillteapl npkanrekmt qimfetfntp amyvaiqavp

841 slytsgrttg ivmdsgdgvt htvpiyegna lphatlrldl agrelpdylm kiltergyrf

901 ttmaereivr dikeklcyva ldfeqemata asssskeksy elpdgqviti gnerfrcpea

961 lfqpcflgme scgihettfn simksdvdir kdlytntvls ggttmypgma hrmqkeiaal

1021 apsmmkirii appkrkysvw vggsilasls tfqqmwiskq eydesgpsiv hrkcf

Keratin 18 (KRT18) (e.g., GenBank Accession Number NP 000215
(SEQ ID NO: 66)):

1msfttrstfs tnyrslgsvq apsygarpvs saasvyagag gsgsrisvsr stsfrggmgs

61gglatgiagg lagmggiqne ketmqslndr lasyldrvrs letenrrles kirehlekkg

121pqvrdwshyf kiiedlraqi fantvdnari vlqidnarla addfrvkyet elamrqsven

181dihglrkvid dtnitrlqle teiealkeel lfmkknheee vkglqaqias sgltvevdap

241ksqdlakima diraqydela rknreeldky wsqqieestt vvttqsaevg aaettltelr

301rtvqsleidl dsmrnlkasl enslrevear yalqmeqlng illhlesela qtraegqrqa

361qeyeallnik vkleaeiaty rrlledgedf nlgdaldssn smqtiqkttt rrivdgkvvs

421etndtkvlrh

PSME4 Isoform 1 of Proteasome activator complex subunit 4 (e.g.,
GenBank Accession Number NP 055429 (SEQ ID NO: 67)):

1 mepaeragvg eppepggrpe pgprgfvpqk eivynkllpy aerldaesdl glaqikcnlg

61 ravqlqelwp gglfwtrkls tyirlygrkf skedhvlfik llyelvsipk leismmqgfa

121 rllinllkkk ellsradlel pwrplydmve rilysktehl glnwfpnsve nilktlvksc

-continued

181 rpyfpadata emleewrplm cpfdvtmqka ityfeiflpt slppelhhkg fklwfdelig

241 lwvsvqnlpq wegqlvnlfa rlatdnigyi dwdpyvpkif trilrslnlp vgssqvlvpr

301 fltnaydigh aviwitammg gpsklvqkhl aglfnsitsf yhpsnngrwl nklmkllqrl

361 pnsvvrrlhr erykkpswlt pvpdshkltd qdvtdfvqci iqpvllamfs ktgsleaaqa

421 lqnlalmrpe lvippvlert ypaletltep hqltatlscv igvarslvsg grwfpegpth

481 mlpllmralp gvdpndfskc mitfqfiatf stlvplvdcs svlqerndlt everelcsat

541 aefedfvlqf mdrcfglies stleqtreet etekmthles lvelglsstf stiltqcske

601 ifmvalqkvf nfstshifet rvagrmvadm craavkccpe eslklfvphc csvitqltmn

661 ddvlndeeld kellwnlqll seitrvdgrk lllyreqlvk ilqrtlhltc kqgytlscnl

721 lhhllrsttl iypteycsvp ggfdkppsey fpikdwgkpg dlwnlgiqwh vpsseevsfa

781 fylldsflqp elvklqhcgd gklemsrddi lqsltivhnc ligsgnllpp lkgepvtnlv

841 psmvsleetk lytgleydls renhreviat virkllnhil dnseddtksl fliikiigdl

901 lqfqgshkhe fdsrwksfnl vkksmenrlh gkkqhirall idrvmlghel rtltvegcey

961 kkihqdmird llrlstssys qvrnkaqqtf faalgaynfc crdiiplvle flrpdrqgvt

1021 qqqfkgalyc llgnhsgvcl anlhdwdciv qtwpaivssg lsqamslekp sivrlfddla

1081 ekihrqyeti gldftipksc veiaellqqs knpsinqill spekikegik rqqeknadal

1141 rnyenlvdtl ldgveqrnlp wkfehigigl lflllrddrv lplrairffv enlnhdaivv

1201 rkmaisavag ilkqlkrthk kltinpceis gcpkptqiia gdrpdnhwlh ydsktiprtk

1261 kewesscfve kthwgyytwp knmvvyagve eqpklgrsre dmteaeqiif dhfsdpkfve

1321 qlitflsled rkgkdkfnpr rfclfkgifr nfddaflpvl kphlehlvad shestqrcva

1381 eiiaglirgs khwtfekvek lwellcpllr talsnitvet yndwgaciat scesrdprkl

1441 hwlfellles plsgeggsfv dacrlyvlqg glaqqewrvp ellhrllkyl epkltqvykn

1501 vrerigsvlt yifmidvslp nttptisphv peftarilek lkplmdvdee iqnhvmeeng

1561 igeedertqg ikllktilkw lmasagrsfs tavteqlqll plffkiapve ndnsydelkr

1621 daklclslms qgllyphqvp lvlqvlkqta rssswharyt vltylqtmvf ynlfiflnne

1681 davkdirwlv islledeqle vremaattls gllqcnfltm dspmqihfeq lcktklpkkr

1741 krdpgsvgdt ipsaelvkrh agvlglgacv lsspydvptw mpqllmnlsa hlndpqpiem

1801 tvkktlsnfr rthhdnwqeh kqqftddqll vltdllvspc yya

Mitogen-activated protein kinase-activated protein kinase (MAPKAPK3) (e.g., GenBank Accession Number NP 004626 (SEQ ID NO: 68)):

1mdgetaeeqg gpvpppvapg gpglggapgg rrepkkyavt ddyqlskqvl glgvngkvle

61cfhrrtgqkc alkllydspk arqevdhhwq asggphivci ldvyenmhhg krclliimec

121meggelfsri qergdqafte reaaeimrdi gtaiqflhsh niahrdvkpe nllytskekd

181avlkltdfgf akettqnalq tpcytpyyva pevlgpekyd kscdmwslgv imyillcgfp

241pfysntgqai spgmkrrirl gqygfpnpew sevsedakql irlllktdpt erltitqfmn

301hpwinqsmvv pqtplhtarv lqedkdhwde vkeemtsala tmrvdydqvk ikdlktsnnr

361llnkrrkkqa gsssasqgcn nq

Complement component 1, s subcomponent (C1S) (e.g.,
GenBank Accession Number NP 001725 (SEQ ID NO: 69)):

```
  1mwcivlfsll awvyaeptmy geilspnypq aypseveksw dievpegygi hlyfthldie

 61lsencaydsv qiisgdteeg rlcgqrssnn phspiveefq vpynklqvif ksdfsneerf

121tgfaayyvat dinectdfvd vpcshfcnnf iggyfcscpp eyflhddmkn cgvncsgdvf

181taligeiasp nypkpypens rceyqirlek gfqvvvtlrr edfdveaads agncldslvf

241vagdrqfgpy cghgfpgpln ietksnaldi ifqtdltgqk kgwklryhgd pmpcpkedtp

301nsvwepakak yvfrdvvqit cldgfevveg rvgatsfyst cqsngkwsns klkcqpvdcg

361ipesiengkv edpestlfgs virytceepy yymengggge yhcagngswv nevlgpelpk

421cvpvcgvpre pfeekqriig gsdadiknfp wqvffdnpwa ggalineywv ltaahvvegn

481reptmyvgst svqtsrlaks kmltpehvfi hpgwkllevp egrtnfdndi alvrlkdpvk

541mgptvspicl pgtssdynlm dgdlglisgw grtekrdrav rlkaarlpva plrkckevkv

601ekptadaeay vftpnmicag gekgmdsckg dsggafavqd pndktkfyaa glvswgpqcg

661tyglytrvkn yvdwimktmq enstpred
```

Lysozyme C precursor (LYZ) (e.g., GenBank Accession Number NP 000230
(SEQ ID NO: 70)):

```
  1mkalivlglv llsvtvqgkv fercelartl krlgmdgyrg islanwmcla kwesgyntra

 61tnynagdrst dygifqinsr ywcndgktpg avnachlscs allqdniada vacakrvvrd

121pqgirawvaw rnrcqnrdvr qyvqgcgv
```

Keritin Type Cytoskeletal 20 (KRT20) (e.g., GenBank Accession Number
NP 061883 (SEQ ID NO: 71)):

```
  1mdfsrrsfhr slssslqapv vstvgmqrlg ttpsvyggag grgirisnsr htvnygsdlt

 61gggdlfvgne kmamqnlndr lasylekvrt leqsnsklev qikqwyetna pragrdysay

121yrqieelrsq ikdaqlqnar cvlqidnakl aaedfrlkye tergirltve adlqglnkvf

181ddltlhktd1 eiqieelnkd lallkkehqe evdglhkhlg ntvnvevdaa pglnlgvimn

241emrqkyevma qknlqeakeq ferqtavlqq qvtvnteelk gtevqltelr rtsqsleiel

301qshlsmkesl ehtleetkar yssqlanlqs llssleaqlm girsnmerqn neyhilldik

361trleqeiaty rrllegedvk tteyqlstle erdikktrki ktvvqevvdg kvvssevkev

421eeni
```

RNASE3 (e.g., GenBank Accession Number NP 002926 (SEQ ID NO: 72)):

```
  1mvpklftsqi clllllglmg vegslharpp qftraqwfai qhislnpprc tiamrainny

 61rwrcknqntf lrttfanvvn vcgnqsircp hnrtlnnchr srfrvpllhc dlinpgaqni

121snctyadrpg rrfyvvacdn rdprdspryp vvpvhldtti
```

Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1) (e.g.,
GenBank Accession Number NP 000683 (SEQ ID NO: 73)):

```
  1mlrflaprll slqgrtarys saaalpspil npdipynqlf innewqdavs kktfptvnpt

 61tgevighvae gdradvdrav kaareafrlg spwrrmdase rgrllnrlad lverdrvyla

121sletldngkp fqesyaldld evikvyryfa gwadkwhgkt ipmdgqhfcf trhepvgvcg

181qiipwnfplv mqgwklapal atgntvvmkv aeqtplsaly laslikeagf ppgvvniitg
```

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241ygptagaaia qhvdvdkvaf tgstevghli qkaagdsnlk rvtlelggks psivladadm

301ehaveqchea lffnmgqccc agsrtfvees iyneflertv ekakqrkvgn pfeldtqqgp

361qvdkeqferv lgyiqlgqke gakllcgger fgergffikp tvfggvqddm riakeeifgp

421vqplfkfkki eevverannt ryglaaavft rdldkamyft qalqagtvwv ntynivtcht

481pfggfkesgn grelgedglk aytevktvti kvpqkns

CDNA FLJ25506 fis, clone CBR05185 (e.g., GenBank Accession Number Q8N7I6 (SEQ ID NO: 74)):

1mwicpggggg gggggggggg dredarpapl ccgrcwrsgc aarpprmvsi glrgavrgar

61gchlgrpfsp svllcvgrpg saagaerghs lgsrefghrr gplpwcpanr rgspptagvp

121rqppgfpaap aprgpgpltr llgrreagsk sqkllfrsar vqgggqfcps gsaflgvere

181ptaglggaer rnarfwrger gqgrqakrpa psqpasplpg ggtwagcvgl vwmgtgfcga

241pef

Isoform B of fibulin-1 precursor (FBLN1) (e.g., GenBank Accession Number P23142-2 (SEQ ID NO: 75)):

1meraapsrrv plpllllggl allaagvdad vlleaccadg hrmathqkdc slpyateske

61crmvqeqcch sqleelhcat gislaneqdr catphgdnas leatfvkrcc hccllgraaq

121aqgqsceysl mvgyqcgqvf raccvksqet gdldvgglqe tdkiieveee qedpylndrc

181rgggpckqqc rdtgdevvcs cfvgyqllsd gvscedvnec itgshscrlg escintvgsf

241rcqrdsscgt gyeltednsc kdidecesgi hnclpdficq ntlgsfrcrp klqcksgfiq

301dalgncidin eclsisapcp ightcinteg sytcqknvpn cgrgyhlnee gtrcvdvdec

361appaepcgkg hrcvnspgsf rcecktgyyf dgisrmcvdv necqrypgrl cghkcentlg

421sylcscsvgf rlsvdgrsce dinecssspc sqecanvygs yqcycrrgyq lsdvdgvtce

481didecalptg ghicsyrcin ipgsfqcscp ssgyrlapng rncqdidecv tgihncsine

541tcfniqggfr clafecpeny rrsaatlqqe ktdtvrciks crpndvtcvf dpvhtishtv

601islptfreft rpeeiiflra itpphpasqa niifditegn lrdsfdiikr ymdgmtvgvv

661rqvrpivgpf havlklemny vvggvvshrn vvnvrifvse ywf

Nucleobindin 1 (NUCB1) (e.g., GenBank Accession Number NP 006175 (SEQ ID NO: 76)):

1mppsgprgtl lllplllll lravlavple rgapnkeetp atespdtgly yhrylqevid

61vletdghfre klqaanaedi ksgklsreld fvshhvrtkl delkrqevsr lrmllkakmd

121aeqdpnvqvd hlnllkqfeh ldpqnqhtfe ardlelliqt atrdlaqyda ahheefkrye

181mlkeherrry leslgeeqrk eaerkleeqq rrhrehpkvn vpgsqaqlke vweeldgldp

241nrfnpktffi lhdinsdgvl deqelealft kelekvydpk needdmreme eerlrmrehv

301mknvdtnqdr lvtleeflas tqrkefgdtg egwetvemhp ayteeelrrf eeelaareae

361lnakaqrlsq etealgrsqg rleaqkrelq gavlhmeqrk qqqqqqqghk apaahpegql

421kfhpdtddvp vpapagdqke vdtsekklle rlpevevpqh l

Histone cluster 2, H2ba (HIST2H2BA) (e.g., GenBank Accession Number NP 001019770 (SEQ ID NO: 77)):

1mpdpaksapa pkkgskkavt kvqkkdgkkr krsrkesysv yvykvlkqvh pdtgisskam

61gimnsfvndi feriageasr lahynkrsti tsreiqtavr lllpgelakh avsegtkavt

121kytssk

Tripartite motif-containing 28 (TRIM28) (e.g., GenBank Accession Number NP 005753 (SEQ ID NO: 78)):

1maasaaaasa aaasaasgsp gpgegsagge krstapsaaa sasasaaass pagggaeale

61llehcgvcre rlrpereprl lpclhsacsa clgpaapaaa nssgdggaag dgtvvdcpvc

121kqqcfskdiv enyfmrdsgs kaatdaqdan qcctscedna patsycvecs eplcetcvea

181hqrvkytkdh tvrstgpaks rdgertvycn vhkheplvlf cescdtltcr dcqlnahkdh

241qyqfledavr nqrkllaslv krlgdkhatl qkstkevrss irqvsdvqkr vqvdvkmail

301qimkelnkrg rvlvndaqkv tegqqerler qhwtmtkiqk hqehilrfas walesdnnta

361lllskkliyf qlhralkmiv dpvephgemk fqwdlnawtk saeafgkiva erpgtnstgp

421apmapprapg plskqgsgss qpmevqegyg fgsgddpyss aephvsgvkr srsgegevsg

481lmrkvprvsl erldldltad sqppvfkvfp gsttedynli viergaaaaa tgqpgtapag

541tpgapplagm aivkeeetea aigapptate gpetkpvlma laegpgaegp rlaspsgsts

601sglevvapeg tsapgggpgt lddsaticrv cqkpgdlvmc nqcefcfhld chlpalqdvp

661geewscslch vlpdlkeedg slsldgadst gvvaklspan qrkcervlla lfchepcrpl

721hqlatdstfs ldqpggtldl tlirarlqek lsppysspqe faqdvgrmfk qfnkltedka

781dvqsiiglqr ffetrmneaf gdtkfsavlv epppmslpga glssqelsgg pgdgp

Peroxisomal D3, D2 enoyl-CoA isomerase (PECI) (e.g., GenBank Accession Number NP 006108 (SEQ ID NO: 79)):

1mnrtamrasq kdfensmnqv kllkkdpgne vklklyalyk qategpcnmp kpgvfdlink

61akwdawnalg slpkeaarqn yvdlvsslsp slesssqvep gtdrkstgfe tlvvtsedgi

121tkimfnrpkk knaintemyh eimralkaas kddsiitvlt gngdyyssgn dltnftdipp

181ggveekaknn avllrefvgc fidfpkplia vvngpavgis vtllglfdav yasdratfht

241pfshlgqspe gcssytfpki mspakateml ifgkkltage acaqglvtev fpdstfqkev

301wtrlkafakl ppnalriske virkrerekl havnaeecnv lqgrwlsdec tnavvnflsr

361kskl

Peptidylprolyl isomerase B (PPIB) (e.g., GenBank Accession Number NP 000933 (SEQ ID NO: 80)):

1mlrlsernmk vllaaaliag svffllpgp saadekkkgp kvtvkvyfdl rigdedvgrv

61ifglfgktvp ktvdnfvala tgekgfgykn skfhrvikdf miqggdftrg dgtggksiyg

121erfpdenfkl khygpgwvsm anagkdtngs qffittvkta wldgkhvvfg kvlegmevvr

181kvestktdsr dkplkdviia dcgkievekp faiake

Similar to 40S ribosomal protein S17 (e.g., GenBank Accession Number IP00743305 (SEQ ID NO: 81)):

mgrvrtktykkaarviiekyytrlgndfhtnkrvceeiaiipskklrnk

ipeilgtdrrtsdwrgdqlscipvpfpnstmelakglqdnsrscvhssk

tccryhtvgppqlakigstgqvdqsgrprppnradlamepshaekdnhs

alstpeagqsthg

Eukaryotic translation elongation factor 1 gamma (EEF1G) (e.g., GenBank Accession Number IPI00747497 (SEQ ID NO: 82)):

avgtlytypenwrafkaliaaqysgaqvrvlsapphfhfgqtnrtpefl

rkfpagkvpafegddgfcvfesnaiayyvsneelrgstpeaaaqvvqwv

-continued

sfadsdivppastwvfptlgimhhnkqatenakeevrrilglldaylkt

rtflvgervtladitvvctllwlykqvlepsfrqafpntnrwfltcinq

pqfravlgevklcekmaqfdakkfaetqpkkdtprkekgsreekqkpqa

erkeekkaaapapeeemdeceqalaaepkakdpfahlpkstfvldefkr

kysnedtlsvalpyfwehfdkdqwslwyseyrfpeeltqtfmscnlitg

mfqrldklrknafasvilfgtnnsssisgvwvfrgqelafplspdwqvd

yesytwrkldpgseetqtlvreyfswegafqhvgkafnqgkifk

Keratin 8 (KRT8) (e.g., GenBank Accession Number NP 002264 (SEQ ID NO: 83)):

1 msirvtqksy kvstsgpraf ssrsytsgpg srissssfsr vgssnfrgql gggyggasgm

61 ggitavtvnq sllsplvlev dpniqavrtq ekeqiktlnn kfasfidkvr fleqqnkmle

121 tkwsllqqqk tarsnmdnmf esyinnlrrq letlgqeklk leaelgnmqg lvedfknkye

181 deinkrteme nefvlikkdv deaymnkvel esrlegltde inflrqlyee eirelqsqis

241 dtsvvlsmdn srsldmdsii aevkaqyedi anrsraeaes myqikyeelq slagkhgddl

301 rrtkteisem nrnisrlqae ieglkgqras leaaiadaeq rgelaikdan aklseleaal

361 qrakqdmarq lreyqelmnv klaldieiat yrkllegees rlesgmqnms ihtkttsgya

421 gglssayggl tspglsyslg ssfgsgagss sfsrtsssra vvvkkietrd gklvsessdv

481 lpk

Fibulin 2 (FBLN2) (e.g., GenBank Accession Number NP 001989 (SEQ ID NO: 84)):

1 mvllwepaga wlalglalal gpsvaaaapr qdctgvecpp lencieeale pgaccatcvq

61 qgcacegyqy ydclqggfvr grvpagqsyf vdfgstecsc ppgggkiscq fmlcpeippn

121 cieavvvads cpqcgqvgcv haghkyaagh tvhlppcrac hcpdaggeli cyqlpgchgn

181 fsdaeegdpe rhyedpysyd qevaeveaat alggevqaga vqagaggppa algggsqpls

241 tiqappwpav lprptaaaal gppapvqaka rrvtedseee eeeeeereem avteqlaagg

301 hrgldglptt apagpslpiq eeraeagara eagarpeenl ildaqatsrs tgpegvthap

361 slgkaalvpt qavpgsprdp vkpsphnils tslpdaawip ptrevprkpq vlphshveed

421 tdpnsvhsip rsspegstkd lietccaagq qwaidndecl eipesgtedn vcrtaqrhcc

481 vsylqekscm agvlgakege tcgaedndsc gislykqccd ccglglrvra egqscesnpn

541 lgypcnhvml sccegeepli vpevrrppep aaaprrvsea emagrealsl gteaelpnsl

601 pgddqdecll lpgelcqhlc intvgsyhca cfpgfslqdd grtcrpeghp pqpeapqepa

661 lksefsqvas ntiplplpqp ntckdngpck qvcstvggsa icscfpgyai madgvscedi

721 necvtdlhtc srgehcvntl gsfhcykalt cepgyalkdg ecedvdecam gthtcqpgfl

781 cqntkgsfyc qarqrcmdgf lqdpegncvd inectslsep crpgfscint vgsytcqrnp

841 licargyhas ddgtkcvdvn ecetgvhrcg egqvchnlpg syrcdckagf qrdafgrgci

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```
  901 dvnecwaspg rlcqhtcent lgsyrcscas gfllaadgkr cedvneceaq rcsqecaniy

  961 gsvqcycrqg yqlaedghtc tdidecaqga gilctfrcln vpgsyqcacp eqgytmtang

 1021 rsckdvdeca lgthncseae tchniqgsfr clrfecppny vqvsktkcer ttchdflecq

 1081 nsparithyq lnfqtgllvp ahifrigpap aftgdtialn iikgneegyf gtrrlnaytg

 1141 vvylqravle prdfaldvem klwrqgsvtt flakmhifft tfal
```

VIM (e.g., GenBank Accession Number NP 003371 (SEQ ID NO: 85)):

```
    1 mstrsyssss yrrmfggpgt asrpsssrsy vttstrtysl gsalrpstsr slyasspggv

   61 yatrssavrl rssvpgvrll qdsvdfslad aintefkntr tnekvelqel ndrfanyidk

  121 vrfleqqnki llaeleqlkg qgksrlgdly eeemrelrrq vdqltndkar veverdnlae

  181 dimrlreklq eemlqreeae ntlqsfrqdv dnaslarldl erkveslqee iaflkklhee

  241 eigelqaqiq eqhvqidvdv skpdltaalr dvrqqyesva aknlqeaeew ykskfadlse

  301 aanrnndalr qakqesteyr rqvqsltdev dalkgtnesl erqmremeen faveaanyqd

  361 tigrlqdeiq nmkeemarhl reyqdllnvk maldieiaty rkllegeesr islplpnfss

  421 lnlretnlds lplvdthskr tlliktvetr dgqvinetsq hhddle
```

Fibrinogen alpha chain (FGA) (e.g., GenBank Accession Number NP 000499 (SEQ ID NO: 86)):

```
    1 mfsmrivclv lsvvgtawta dsgegdflae gggvrgprvv erhqsackds dwpfcsdedw

   61 nykcpsgcrm kglidevnqd ftnrinklkn slfeyqknnk dshslttnim eilrgdfssa

  121 nnrdntynrv sedlrsriev lkrkviekvq hiqllqknvr aqlvdmkrle vdidikirsc

  181 rgscsralar evdlkdyedq qkqleqviak dllpsrdrqh lplikmkpvp dlvpgnfksq

  241 lqkvppewka ltdmpqmrme lerpggneit rggstsygtg setesprnps sagswnsgss

  301 gpgstgnrnp gssgtggtat wkpgssgpgs tgswnsgssg tgstgnqnpg sprpgstgtw

  361 npgssergsa ghwtsessvs gstgqwhses gsfrpdspgs gnarpnnpdw gtfeevsgnv

  421 spgtrreyht eklvtskgdk elrtgkekvt sgsttttrrs csktvtktvi gpdghkevtk

  481 evvtsedgsd cpeamdlgtl sgigtldgfr hrhpdeaaff dtastgktfp gffspmigef

  541 vsetesrgse sgiftntkes sshhpgiaef psrgksssys kqftsstsyn rgdstfesks

  601 ykmadeagse adhegthstk rghaksrpvr dcddvlqthp sgtqsgifni klpgsskifs

  661 vycdqetslg gwlliqqrmd gslnfnrtwq dykrgfgsln degegefwlg ndylhlltqr

  721 gsvlrveled wagneayaey hfrvgseaeg yalqvssyeg tagdaliegs veegaeytsh

  781 nnmqfstfdr dadqweenca evygggwwyn ncqaanlngi yypggsydpr nnspyeieng

  841 vvwvsfrgad yslravrmki rplvtq
```

Annexin A2 (ANXA2) (e.g., GenBank Accession Number NP 001002858 (SEQ ID NO: 87)):

```
    1 mgrqlagcgd agkkasfkms tvheilckls legdhstpps aygsvkaytn fdaerdalni

   61 etaiktkgvd evtivniltn rsnaqrqdia fayqrrtkke lasalksals ghletvilgl

  121 lktpaqydas elkasmkglg tdedslieii csrtnqelqe inrvykemyk tdlekdiisd

  181 tsgdfrklmv alakgrraed gsvidyelid qdardlydag vkrkgtdvpk wisimtersv
```

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241 phlqkvfdry ksyspydmle sirkevkgdl enaflnlvqc iqnkplyfad rlydsmkgkg

301 trdkvlirim vsrsevdmlk irsefkrkyg kslyyyiqqd tkgdyqkall ylcggdd

H2A histone family, member J (H2AFJ) (e.g., GenBank Accession Number NP 808760 (SEQ ID NO: 88)):

1 msgrgkqggk vrakaksrss raglqfpvgr vhrllrkgny aervgagapv ylaavleylt

61 aeilelagna ardnkktrii prhlqlairn deelnkllgk vtiaqggvlp niqavllpkk

121 tesqktksk

Actin alpha, cardiac muscle 1 (ACTC1) (e.g., GenBank Accession Number NP 005150 (SEQ ID NO: 89)):

1 mcddeettal vcdngsglvk agfagddapr avfpsivgrp rhqgvmvgmg qkdsyvgdea

61 qskrgiltlk ypiehgiitn wddmekiwhh tfynelrvap eehptlltea plnpkanrek

121 mtqimfetfn vpamyvaiqa vlslyasgrt tgivldsgdg vthnvpiyeg yalphaimrl

181 dlagrdltdy lmkiltergy sfvttaerei vrdikeklcy valdfenema taassslek

241 syelpdgqvi tignerfrcp etlfqpsfig mesagihett ynsimkcdid irkdlyannv

301 lsggttmypg iadrmqkeit alapstmkik iiapperkys vwiggsilas lstfqqmwis

361 kqeydeagps ivhrkcf

Keratin 19 (KRT19) (e.g., GenBank Accession Number NP 002267 (SEQ ID NO: 90)):

1 mtsysyrqss atssfgglgg gsvrfgpgva frapsihggs ggrgvsvssa rfvsssssga

61 ygggyggvlt asdgllagne kltmqnlndr lasyldkvra leaangelev kirdwyqkqg

121 pgpsrdyshy yttiqdlrdk ilgatiensr ivlqidnarl aaddfrtkfe teqalrmsve

181 adinglrrvl deltlartdl emqieglkee laylkknhee eistlrgqvg gqvsvevdsa

241 pgtdlakils dmrsqyevma eqnrkdaeaw ftsrteelnr evaghteqlq msrsevtdlr

301 rtlqgleiel qsqlsmkaal edtlaetear fgaqlahiqa lisgieaqlg dvradserqn

361 qeyqrlmdik srlegeiaty rsllegqedh ynnlsaskvl

Immunoglobin lambda locus(IGL@protein) (e.g., GenBank Accession Number Q6PIQ7 (SEQ ID NO: 91)):

1 mawallllsl ltqgtgswaq saltqprsys gspgqsvtip ctgtssdvgn ynyvswyrqh

61 pgkapklmiy dvnkrpsgvp drfsgsksgn tasltisglq aedeadyycc syagtytfgv

121 fggqtkltvl gqpkaapsvt lfppsseelq ankatlvcli sdfypgavtv awkadsspvk

181 agvetttpsk qsnnkyaass ylsltpeqwk shksyscqvt hegstvektv aptecs

Immunoglobulin heavy constant mu (IGHM) (e.g., GenBank Accession Number Q8WUK1 (SEQ ID NO: 92)):

1 mefglswvfl vallrgvqcq vglvesgggv vqpgrslrls caasgftfss ygmhwvrqap

61 gkglewvavi sydgsnkyya dsvkgrftis rdnskntlyl qmnslraedt avyycakdws

121 egvetfdiwg qgtmvtvssg sasaptlfpl vscenspsdt ssvavgclaq dflpdsitfs

181 wkyknnsdis strgfpsvlr ggkyaatsqv llpskdvmqg tdehvvckvq hpngnkeknv

241 plpviaelpp kvsvfvpprd gffgnprksk licqatgfsp rqiqvswlre gkqvgsgvtt

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```
 301 dqvqaeakes gpttykvtst ltikesdwls qsmftcrvdh rgltfqqnas smcvpdqdta

 361 irvfaippsf asifltkstk ltclvtdltt ydsvtiswtr qngeavktht niseshpnat

 421 fsavgeasic eddwnsgerf tctvthtdlp splkqtisrp kgvalhrpdv yllppareql

 481 nlresatitc lvtgfspadv fvqwmqrgqp lspekyvtsa pmpepqapgr yfahsiltvs

 541 eeewntgety tcvvahealp nrvtertvdk stegevsade egfenlwata stfivlflls

 601 lfysttvtlf kvk
```

EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1) (e.g., GenBank Accession Number Q12805-3 (SEQ ID NO: 93)):

```
   1 mlkalfltml tlalvksqdt eetitytqct dgyewdpvrq qckdidecdi vpdackggmk

  61 cvnhyggylc lpktaqiivn neqpqqetqp aegtsgattg vvaassmats gvlpgggfva

 121 saaavagpem qtgrnnfvir rnpadpqrip snpshriqca agyeqsehnv cqdidectag

 181 thncradqvc inlrgsfacq cppgyqkrge qcvdidecti ppychqrcvn tpgsfycqcs

 241 pgfqlaanny tcvdinecda snqcaqqcyn ilgsficqcn qgyelssdrl ncedidecrt

 301 ssylcqyqcv nepgkfscmc pqgyqvvrsr tcqdinecet tnecredemc wnyhggfrcy

 361 prnpcqdpyi ltpenrcvcp vsnamcrelp qsivykymsi rsdrsvpsdi fqiqattiya

 421 ntintfriks gnengefylr qtspvsamlv lvkslsgpre hivdlemltv ssigtfrtss

 481 vlrltiivgp fsf
```

Tripartite motif-containing protein 34 (e.g., GenBank Accession Number NP 067629 (SEQ ID NO: 94)):

```
   1 maskillnvq eevtcpicle llteplsldc ghslcracit vsnkeavtsm ggksscpvcg

  61 isysfehlqa nqhlaniver lkevklspdn gkkrdlcdhh gekllfcke drkvicwlce

 121 rsqehrghht vlteevfkec qeklqavlkr lkkeeeeaek leadireekt swkyqvqter

 181 qriqtefdql rsilnneeqr elqrleeeek ktldkfaeae delvqqkqlv relisdvecr

 241 sqwstmellq dmsgimkwse iwrlkkpkmv skklktvfha pdlsrmlqmf reltavrcyw

 301 vdvtlnsvnl nlnlvlsedq rqvisvpiwp fqcynygvlg sqyfssgkhy wevdvskkta

 361 wilgvycrty srhmkyvvrr canrqnlytk yrplfgywvi glqnkckygv feeslssdpe

 421 vltlsmavpp crvgvfldye agivsffnvt shgsliykfs kccfsqpvyp yfnpwncpap

 481 mtlcppss
```

Isoform 3 of AP1-subunit Gamma Binding Protein 1 (e.g., GenBank Accession Number NP 542117(SEQ ID NO: 95)):

```
    1  malrpgagsg gggaagagag saggggfmfp vaggirppqa glmpmqqqgf pmvsvmqpnm

   61  qgimgmnyss qmsqgpiamq agipmgpmpa agmpylgqap flgmrppgpq ytpdmqkqfa

  121  eeqqkrfeqq qklleeerkr rgfeeqkqkl rllssvkpkt geksrddale aikgnldgfs

  181  rdakmhptpa shpkkpgpsl eekflvscdi stsgqeqikl ntsevghkal gpgsskkyps

  241  lmasngvavd gcvsgtttae aentsdqnls ieesgvgvfp sqdpaqprmp pwiyneslvp

  301  daykkilett mtptgidtak lypilmssgl pretlgqiwa lanrttpgkl tkeelytvla

  361  miavtqrgvp amspdalnqf paapiptlsg fsmtlptpvs qptvipsgpa gsmplslgqp

  421  vmginlvgpv ggaaaqassg fiptypanqv vkpeeddfqd fqdasksgsl ddsfsdfqel
```

-continued

```
  481 passktsnsq hgnsapsllm plpgtkalps mdkyavfkgi aadkssentv ppgdpgdkys

  541 afrelegtae nkplgesfae frsagtddgf tdfktadsys plepptkdkt fppsfpsgti

  601 qqkqqtqvkn plnladldmf ssvncssekp lsfsavfsts ksystpqstg saatmtalaa

  661 tktssladdf gefslfgeys glapvgeqdd fadfmafsns sisseqkpdd kydalkeeas

  721 pvpltsnvgs tvkggqnsta astkydvfrq lslegsglgv edlkdntpsg ksdddfadfh

  781 sskfssinsd kslgekavaf rhtkedsasv ksldlpsigg ssvgkedsed alavqfdmkl

  841 advggdlkhv msdssldlpt vsgqhppaad iedlkyaafg syssnfavst ltsydwsdrd

  901 datqgrklsp fvlsagsgsp satsilqkke tsfgssenit mtslskvttf vsedalpett

  961 fpalasfkdt ipqtseqkey enrdykdftk qdlptaersq eatcpspass gasqetpnec

 1021 sddfgefqse kpkiskfdfl vatsqskmks seemiksela tfdlsvqgsh krslslgdke

 1081 isrsspspal eqpfrdrsnt lnekpalpvi rdkykdltge veeneryaye wqrclgsaln

 1141 vikkandtln gissssvcte viqsaggmey llgvvevyrv tkrvelgika tavcseklqq

 1201 llkdidkvwn nligfmslat ltpdensldf sscmlrpgik naqelacgvc llnvdsrsra

 1261 fnsetdsfkl aygghqyhas canfwincve pkppglvlpd ll
```

Proflin-1 (e.g., GenBank Accession Number NP 005013 (SEQ ID NO: 96)):

```
    1  magwnayidn lmadgtcqda aivgykdsps vwaavpgktf vnitpaevgv lvgkdrssfy

   61  vngltlggqk csvirdsllq dgefsmdlrt kstggaptfn vtvtktdktl vllmgkegvh

  121  gglinkkcye mashlrrsqy
```

Histone H4 (e.g., GenBank Accession Number
NP 001029249 (SEQ ID NO: 97)):

```
   1  msgrgkggkg lgkggakrhr kvlrdniqgi tkpairrlar rggvkrisgl iyeetrgvlk

  61  vflenvirda vtytehakrk tvtamdvvya lkrqgrtlyg fgg
```

Hemoglobin subunit alpha (e.g., GenBank Accession Number NP 000549
(SEQ ID NO: 98)):

```
   1mvlspadktn vkaawgkvga hageygaeal ermflsfptt ktyfphfdls hgsaqvkghg

  61kkvadaltna vahvddmpna lsalsdlhah klrvdpvnfk llshcllvtl aahlpaeftp

 121avhasldkfl asvstvltsk yr
```

Transgelin (e.g., GenBank Accession Number NP 001001522
(SEQ ID NO: 99)):

```
   1mankgpsygm srevqskiek kydeeleerl vewiivqcgp dvgrpdrgrl gfqvwlkngv

  61ilsklvnsly pdgskpvkvp enppsmvfkq meqvaqflka aedygviktd mfqtvdlfeg

 121kdmaavqrtl malgslavtk ndghyrgdpn wfmkkaqehk reftesqlqe gkhviglqmg

 181snrgasqagm tgygrprqii s
```

Lumican precursor (e.g., GenBank Accession Number NP 002336
(SEQ ID NO: 100)):

```
  1 mslsaftlfl aliggtsgqy ydydfplsiy gqsspncape cncpesypsa mycdelklks

 61 vpmvppgiky lylrnnqidh idekafenvt dlqwlildhn llenskikgr vfsklkqlkk
```

-continued

121lhinhnnlte svgplpksle dlqlthnkit klgsfeglvn ltfihlqhnr lkedavsaaf

181kglksleyld lsfnqiarlp sglpvslltl yldnnkisni pdeyfkrfna lqylrlshne

241ladsgipgns fnvsslveld lsynklknip tvnenlenyy levnqlekfd iksfckilgp

301lsyskikhlr ldgnrisets lppdmyeclr vanevtln

Hemoglobin Beta (e.g., GenBank Accession Number NP 000509 (SEQ ID NO: 101)):

1mvhltpeeks avtalwgkvn vdevggealg rllvvypwtq rffesfgdls tpdavmgnpk

61vkahgkkvlg afsdglahld nlkgtfatls elhcdklhvd penfrllgnv lvcvlahhfg

121keftppvqaa yqkvvagvan alahkyh

Fibrinogen Beta Chain Precursor (e.g., GenBank Accession Number NP 005132 (SEQ ID NO: 102)):

1mkrmvswsfh klktmkhlll lllcvflvks qgvndneegf fsarghrpld kkreeapslr

61papppisggg yrarpakaaa tqkkverkap daggclhadp dlgvlcptgc qlqeallqqe

121rpirnsvdel nnnveavsqt ssssfqymyl lkdlwqkrqk qvkdnenvvn eysselekhq

181lyidetvnsn iptnlrvlrs ilenirskiq klesdvsaqm eycrtpctvs cnipvvsgke

241ceeiirkgge tsemyliqpd ssvkpyrvyc dmntenggwt viqnrqdgsv dfgrkwdpyk

301qgfgnvatnt dgknycglpg eywlgndkis qltrmgptel liemedwkgd kvkahyggft

361vqneankyqi svnkyrgtag nalmdgasql mgenrtmtih ngmffstydr dndgwltsdp

421rkqcskedgg gwwynrchaa npngryywgg qytwdmakhg tddgvvwmnw kgswysmrkm

481smkirpffpq q

Immunoglobulin kappa constant (IGKC) (e.g., GenBank Accession Number Q6GMX8 (SEQ ID NO: 103)):

1mdmrvpaqll glllwfpgs rcdiqmtqsp ssvsasvgdr vtitcrasqg isswlawyqq

61kpgkapklli yaasslqsgv psrfsgsgsg tdftltissl qpedfatyyc qqahsfpftf

121gpgtkvdikr tvaapsvfif ppsdeqlksg tasvvcllnn fypreakvqw kvdnalqsgn

181sqesvteqds kdstyslsst ltlskadyek hkvyacevth qglsspvtks fnrgec

Uncharacterized Protein ALB (e.g., GenBank Accession Number Q56G89 (SEQ ID NO: 104)):

1mkwvtfisll flfssaysrg vfrrdahkse vahrfkdlge enfkalvlia faqylqqcpf

61edhvklvnev tefaktcvad esaencdksl htlfgdklct vatlretyge madccakqep

121ernecflqhk ddnpnlprlv rpevdvmcta fhdneetflk kylyeiarrh pyfyapellf

181fakrykaaft eccqaadkaa cllpkldelr degkassakq glkcaslqkf gerafkawav

241arlsqrfpka efaevsklvt dltkvhtecc hgdllecadd radlakyice nqdsissklk

301eccekpllek shciaevend empadlpsla adfvgskdvc knyaeakdvf lgmflyeyar

361rhpdysvvll lrlaktyett lekccaaadp hecyakvfde fkplveepqn likqncelfe

421qlgeykfqna llvrytkkvp qvstptlvev srnlgkvgsk cckhpeakrm pcaedclsvf

481lnqlcvlhek tpvsdrvtkc cteslvngrp cfsalevdet yvpkefnaet ftfhadictl

541sekerqikkg talvelvkhk pkatkeqlka vmddfaafve kcckaddket cfaeegkklv

601aasqaalgl

ApoA1 (e.g., GenBank Accession Number P02647 (SEQ ID NO: 105)):
MKAAVLTLAV LFLTGSQARH FWQQDEPPQS PWDRVKDLAT VYVDVLKDSG RDYVSQFEGS

ALGKQLNLKL LDNWDSVTST FSKLREQLGP VTQEFWDNLE KETEGLRQEM SKDLEEVKAK

VQPYLDDFQK KWQEEMELYR QKVEPLRAEL QEGARQKLHE LQEKLSPLGE EMRDRARAHV

DALRTHLAPY SDELRQRLAA RLEALKENGG ARLAEYHAKA TEHLSTLSEK AKPALEDLRQ

GLLPVLESFK VSFLSALEEY TKKLNTQ

C4A (e.g., GenBank Accession Number P0C0L4 (SEQ ID NO: 106)):
MRLLWGLIWA SSFFTLSLQK PRLLLFSPSV VHLGVPLSVG VQLQDVPRGQ VVKGSVFLRN

PSRNNVPCSP KVDFTLSSER DFALLSLQVP LKDAKSCGLH QLLRGPEVQL VAHSPWLKDS

LSRTTNIQGI NLLFSSRRGH LFLQTDQPIY NPGQRVRYRV FALDQKMRPS TDTITVMVEN

SHGLRVRKKE VYMPSSIFQD DFVIPDISEP GTWKISARFS DGLESNSSTQ FEVKKYVLPN

FEVKITPGKP YILTVPGHLD EMQLDIQARY IYGKPVQGVA YVRFGLLDED GKKTFFRGLE

SQTKLVNGQS HISLSKAEFQ DALEKLNMGI TDLQGLRLYV AAAIIESPGG EMEEAELTSW

YFVSSPFSLD LSKTKRHLVP GAPFLLQALV REMSGSPASG IPVKVSATVS SPGSVPEVQD

IQQNTDGSGQ VSIPIIIPQT ISELQLSVSA GSPHPAIARL TVAAPPSGGP GFLSIERPDS

RPPRVGDTLN LNLRAVGSGA TFSHYYYMIL SRGQIVFMNR EPKRTLTSVS VFVDHHLAPS

FYFVAFYYHG DHPVANSLRV DVQAGACEGK LELSVDGAKQ YRNGESVKLH LETDSLALVA

LGALDTALYA AGSKSHKPLN MGKVFEAMNS YDLGCGPGGG DSALQVFQAA GLAFSDGDQW

TLSRKRLSCP KEKTTRKKRN VNFQKAINEK LGQYASPTAK RCCQDGVTRL PMMRSCEQRA

ARVQQPDCRE PFLSCCQFAE SLRKKSRDKG QAGLQRALEI LQEEDLIDED DIPVRSFFPE

NWLWRVETVD RFQILTLWLP DSLTTWEIHG LSLSKTKGLC VATPVQLRVF REFHLHLRLP

MSVRRFEQLE LRPVLYNYLD KNLTVSVHVS PVEGLCLAGG GGLAQQVLVP AGSARPVAFS

VVPTAAAAVS LKVVARGSFE FPVGDAVSKV LQIEKEGAIH REELVYELNP LDHRGRTLEI

PGNSDPNMIP DGDFNSYVRV TASDPLDTLG SEGALSPGGV ASLLRLPRGC GEQTMIYLAP

TLAASRYLDK TEQWSTLPPE TKDHAVDLIQ KGYMRIQQFR KADGSYAAWL SRDSSTWLTA

FVLKVLSLAQ EQVGGSPEKL QETSNWLLSQ QQADGSFQDP CPVLDRSMQG GLVGNDETVA

LTAFVTIALH HGLAVFQDEG AEPLKQRVEA SISKANSFLG EKASAGLLGA HAAAITAYAL

SLTKAPVDLL GVAHNNLMAM AQETGDNLYW GSVTGSQSNA VSPTPAPRNP SDPMPQAPAL

WIETTAYALL HLLLHEGKAE MADQASAWLT RQGSFQGGFR STQDTVIALD ALSAYWIASH

TTEERGLNVT LSSTGRNGFK SHALQLNNRQ IRGLEEELQF SLGSKINVKV GGNSKGTLKV

LRTYNVLDMK NTTCQDLQIE VTVKGHVEYT MEANEDYEDY EYDELPAKDD PDAPLQPVTP

LQLFEGRRNR RRREAPKVVE EQESRVHYTV CIWRNGKVGL SGMAIADVTL LSGFHALRAD

LEKLTSLSDR YVSHFETEGP HVLLYFDSVP TSRECVGFEA VQEVPVGLVQ PASATLYDYY

NPERRCSVFY GAPSKSRLLA TLCSAEVCQC AEGKCPRQRR ALERGLQDED GYRMKFACYY

PRVEYGFQVK VLREDSRAAF RLFETKITQV LHFTKDVKAA ANQMRNFLVR ASCRLRLEPG

KEYLIMGLDG ATYDLEGHPQ YLLDSNSWIE EMPSERLCRS TRQRAACAQL NDFLQEYGTQ

GCQV

C3 187 kDa protein (e.g., GenBank Accession Number P01024
(SEQ ID NO: 107)):
MGPTSGPSLL LLLLTHLPLA LGSPMYSIIT PNILRLESEE TMVLEAHDAQ GDVPVTVTVH

DFPGKKLVLS SEKTVLTPAT NHMGNVTFTI PANREFKSEK GRNKFVTVQA TFGTQVVEKV

VLVSLQSGYL FIQTDKTIYT PGSTVLYRIF TVNHKLLPVG RTVMVNIENP EGIPVKQDSL

SSQNQLGVLP LSWDIPELVN MGQWKIRAYY ENSPQQVFST EFEVKEYVLP SFEVIVEPTE

KFYYIYNEKG LEVTITARFL YGKKVEGTAF VIFGIQDGEQ RISLPESLKR IPIEDGSGEV

VLSRKVLLDG VQNPRAEDLV GKSLYVSATV ILHSGSDMVQ AERSGIPIVT SPYQIHFTKT

PKYFKPGMPF DLMVFVTNPD GSPAYRVPVA VQGEDTVQSL TQGDGVAKLS INTHPSQKPL

SITVRTKKQE LSEAEQATRT MQALPYSTVG NSNNYLHLSV LRTELRPGET LNVNFLLRMD

RAHEAKIRYY TYLIMNKGRL LKAGRQVREP GQDLVVLPLS ITTDFIPSFR LVAYYTLIGA

SGQREVVADS VWVDVKDSCV GSLVVKSGQS EDRQPVPGQQ MTLKIEGDHG ARVVLVAVDK

GVFVLNKKNK LTQSKIWDVV EKADIGCTPG SGKDYAGVFS DAGLTFTSSS GQQTAQRAEL

QCPQPAARRR RSVQLTEKRM DKVGKYPKEL RKCCEDGMRE NPMRFSCQRR TRFISLGEAC

KKVFLDCCNY ITELRRQHAR ASHLGLARSN LDEDIIAEEN IVSRSEFPES WLWNVEDLKE

PPKNGISTKL MNIFLKDSIT TWEILAVSMS DKKGICVADP FEVTVMQDFF IDLRLPYSVV

RNEQVEIRAV LYNYRQNQEL KVRVELLHNP AFCSLATTKR RHQQTVTIPP KSSLSVPYVI

VPLKTGLQEV EVKAAVYHHF ISDGVRKSLK VVPEGIRMNK TVAVRTLDPE RLGREGVQKE

DIPPADLSDQ VPDTESETRI LLQGTPVAQM TEDAVDAERL KHLIVTPSGC GEQNMIGMTP

TVIAVHYLDE TEQWEKFGLE KRQGALELIK KGYTQQLAFR QPSSAFAAFV KRAPSTWLTA

YVVKVFSLAV NLIAIDSQVL CGAVKWLILE KQKPDGVFQE DAPVIHQEMI GGLRNNNEKD

MALTAFVLIS LQEAKDICEE QVNSLPGSIT KAGDFLEANY MNLQRSYTVA IAGYALAQMG

RLKGPLLNKF LTTAKDKNRW EDPGKQLYNV EATSYALLAL LQLKDFDFVP PVVRWLNEQR

YYGGGYGSTQ ATFMVFQALA QYQKDAPDHQ ELNLDVSLQL PSRSSKITHR IHWESASLLR

SEETKENEGF TVTAEGKGQG TLSVVTMYHA KAKDQLTCNK FDLKVTIKPA PETEKRPQDA

KNTMILEICT RYRGDQDATM SILDISMMTG FAPDTDDLKQ LANGVDRYIS KYELDKAFSD

RNTLIIYLDK VSHSEDDCLA FKVHQYFNVE LIQPGAVKVY AYYNLEESCT RFYHPEKEDG

KLNKLCRDEL CRCAEENCFI QKSDDKVTLE ERLDKACEPG VDYVYKTRLV KVQLSNDFDE

YIMAIEQTIK SGSDEVQVGQ QRTFISPIKC REALKLEEKK HYLMWGLSSD FWGEKPNLSY

IIGKDTWVEH WPEEDECQDE ENQKQCQDLG AFTESMVVFG CPN

Actin, Cytoplasmic 1 (actin beta)
(e.g., GenBank Accession Number
NP 001092 (SEQ ID NO: 108):
>refseqp|NP_001092|NP_001092 beta actin
[*Homo sapiens*].
MDDDIAALVVDNGSGMCKAGFAGDDAPRAVFPSIVGRPRHQGVMVGMGQ

KDSYVGDEAQSKRGILTLKYPIEHGIVTNWDDMEKIWHHTFYNELRVAP

EEHPVLLTEAPLNPKANREKMTQIMFETFNTPAMYVAIQAVLSLYASGR

TTGIVMDSGDGVTHTVPIYEGYALPHAILRLDLAGRDLTDYLMKILTER

GYSFTTTAEREIVRDIKEKLCYVALDFEQEMATAASSSSLEKSYELPDG

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QVITIGNERFRCPEALFQPSFLGMESCGIHETTFNSIMKCDVDIRKDLY

ANTVLSGGTTMYPGIADRMQKEITALAPSTMKIKIIAPPERKYSVWIGG

SLASLSTFQQMWISKQEYDESGPSIVHRKCF

Hemoglobin beta (e.g., GenBank Accession
Number O95408 (SEQ ID NO: 109):
>uniprot|O95408|O95408_HUMAN Beta globin;
MVHLTPEEKSAVTALWGKVNVDEVGGEALGRLLVIYPWTQRFFESFGDL

STPDAVMG

Hemoglobin subunit alpha (e.g., GenBank Accession Number P69905 (SEQ ID NO: 110):
>uniprot|P69905|HBA_HUMAN Hemoglobin subunit alpha;
MVLSPADKTNVKAAWGKVGAHAGEYGAEALERMFLSFPTTKTYFPHFDL

SHGSAQVKGHGKKVADALTNAVAHVDDMPNALSALSDLHAHKLRVDPVN

FKLLSHCLLVTLAAHLPAEFTPAVHASLDKFLASVSTVLTSKYR

POTE-2 alpha actin (e.g., GenBank Accession Number A5A3E0 (SEQ ID NO: 111):
>uniprot|A5A3E0|POTEF_HUMAN POTE ankyrin domain family member F;
MVVEVDSMPAASSVKKPFGLRSKMGKWCCRCFPCCRESGKSNVGTSGDH

DDSAMKTLRSKMGKWCRHCFPCCRGSGKSNVGASGDHDDSAMKTLRNKM

GKWCCHCFPCCRGSSKSKVGAWGDYDDSAFMEPRYHVRGEDLDKLHRAA

WWGKVPRKDLIVMLRDTDVNKQDKQKRTALHLASANGNSEVVKLLLDRR

CQLNVLDNKKRTALIKAVQCQEDECALMLLEHGTDPNIPDEYGNTTLHY

AIYNEDKLMAKALLLYGADIESKNKHGLTPLLLGVHEQKQQVVKFLIKK

KANLNALDRYGRTALILAVCCGSASIVSLLLEQNIDVSSQDLSGQTARE

YAVSSHHHVICQLLSDYKEKQMLKISSENSNPEQDLKLTSEEESQRFKG

SENSQPEKMSQEPEINKDGDREVEEEMKKHESNNVGLLENLTNGVTAGN

GDNGLIPQRKSRTPENQQFPDNESEEYHRICELLSDYKEKQMPKYSSEN

SNPEQDLKLTSEEESQRLKGSENGQPEKRSQEPEINKDGDRELENFMAI

EEMKKHRSTHVGFPENLTNGATAGNGDDGLIPPRKSRTPESQQFPDTEN

EEYHSDEQNDTQKQFCEEQNTGILHDEILIHEEKQIEVVEKMNSELSLS

CKKEKDILHENSTLREEIAMLRLELDTMKHQSQLREKKYLEDIESVKKR

NDNLLKALQLNELTMDDDTAVLVIDNGSGMCKAGFAGDDAPRAVFPSIV

GRPRQQGMMGGMHQKESYVGKEAQSKRGILTLKYPMEHGIITNWDDMEK

IWHHTFYNELRVAPEEHPVLLTEATLNPKANREKMTQIMFETFNTPAMY

VAIQAVLSLYTSGRTTGIVMDSGDGVTHTVPIYEGNALPHATLRLDLAG

RELPDYLMKILTEHGYRFTTMAEREIVRDIKEKLCYVALDFEQEMATVA

SSSSLEKSYELPDGQVITIGNERFRCPEALFQPCFLGMESCGIHETTFN

-continued

SIMKSDVDIRKDLYTNTVLSGGTTMYPGMAHRMQKEIAALAPSMMKIRI

IAPPKRKYSVWVGGSILASLSTFQQMWISKQEYDESGPSIVHRKCL

SLC4A10 (e.g., GenBank Accession Number Q6U841 (SEQ ID NO: 112):
>uniprot|Q6U841|S4A10_HUMAN Sodium-driven chloride bicarbonate exchanger;
MEIKDQGAQMEPLLPTRNDEEAVVDRGGTRSILKTHFEKEDLEGHRTLF

IGVHVPLGGRKSHRRHRHRGHKHRKRDRERDSGLEDGRESPSFDTPSQR

VQFILGTEDDDEEHIPHDLFTELDEICWREGEDAEWRETARWLKFEEDV

EDGGERWSKPYVATLSLHSLFELRSCILNGTVLLDMHANTLEEIADMVL

DQQVSSGQLNEDVRHRVHEALMKQHHHQNQKKLTNRIPIVRSFADIGKK

QSEPNSMDKNAGQVVSPQSAPACVENKNDVSRENSTVDFSKGLGGQQKG

HTSPCGMKQRHEKGPPHQQEREVDLHFMKKIPPGAEASNILVGELEFLD

RTVVAFVRLSPAVLLQGLAEVPIPTRFLFILLGPLGKGQQYHEIGRSIA

TLMTDEVFHDVAYKAKDRNDLVSGIDEFLDQVTVLPPGEWDPSIRIEPP

KNVPSQEKRKIPAVPNGTAAHGEAEPHGGHSGPELQRTGRIFGGLILDI

KRKAPYFWSDFRDAFSLQCLASFLFLYCACMSPVITFGGLLGEATEGRI

SAIESLFGASMTGIAYSLFGGQPLTILGSTGPVLVFEKILFKFCKEYGL

SYLSLRASIGLWTATLCIILVATDASSLVCYITRFTEEAFASLICIIFI

YEALEKLFELSEAYPINMHNDLELLTQYSCNCVEPHNPSNGTLKEWRES

NISASDIIWENLTVSECKSLHGEYVGRACGHDHPYVPDVLFWSVILFFS

TVTLSATLKQFKTSRYFPTKVRSIVSDFAVFLTILCMVLIDYAIGIPSP

KLQVPSVFKPTRDDRGWFVTPLGPNPWWTVIAAIIPALLCTILIFMDQQ

ITAVIINRKEHKLKKGCGYHLDLLMVAVMLGVCSIMGLPWFVAATVLSI

THVNSLKLESECSAPGEQPKFLGIREQRVTGLMIFILMGSSVFMTSILK

FIPMPVLYGVFLYMGASSLKGIQFFDRIKLFWMPAKHQPDFIYLRHVPL

RKVHLFTIIQMSCLGLLWIIKVSRAAIVFPMMVLALVFVRKLMDLLFTK

RELSWLDDLMPESKKKKLEDAEKEEEQSMLAMEDEGTVQLPLEGHYRDD

PSVINISDEMSKTALWRNLLITADNSKDKESSFPSKSSPS

Ribonuclease P Protein Subunit P20 (POP7) (e.g., GenBank Accession Number Q75817 (SEQ ID NO: 113)
>uniprot|075817|POP7_HUMAN Ribonuclease P protein subunit p20;
MAENREPRGAVEAELDPVEYTLRKRLPSRLPRRPNDIYVNMKTDFKAQLARCQKLLDGGA

RGQNACSEIYIHGLGLAINRAINIALQLQAGSFGSLQVAANTSTVELVDELEPETDTREP

LTRIRNNSAIHIRVFRVTPK

Nuclear RNA export factor 1 (NXF1)(e.g., GenBank Accession Number Q59E96 (SEQ ID NO: 114):
>uniprot|Q59E96|Q59E96_HUMAN Nuclear RNA export factor 1 variant;
RPAPEPALDLRCGMADEGKSYSEHDDERVNFPQRKKKGRGPFRWKYGEGNRRSGRGGSGI

RSSRLEEDDGDVAMSDAQDGPRVRYNPYTTRPNRRGDTWHDRDRIHVTVRRDRAPPERGG

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AGTSQDGTSKNWFKITIPYGRKYDNAWLLSMIQSKCSVPFTPIEFHYENTRAQFFVEDAS

TASALEAVNYKILDRENRRISIIINSSAPPHTILNELKPEQVEQLKLIMSKRYDGSQQAL

DLKGLRSDPDLVAQNIDVVLNRRSCMAATLRIIEENIPELLSLNLSNNRLYRLDDMSSIV

QKAPNLKILNLSGNELKSERELDKIKGLKLEELWLDGNSLCDTFRDQSTYIRSVVACVSP

PGDLHPLGG

UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA (e.g., GenBank Accession Number Q05DB3 (SEQ ID NO: 115):
>uniprot|Q05DB3|Q05DB3_HUMAN UACA protein;
MMNCWFSCTPKNRHAADWNKYDDRLMKAAERGDVEKVTSILAKKGVNPGKLDVEGRSVFH

VVTSKGNLECLNAILIHGVDITTSDTAGRNALHLAAKYGHALCLQKLLQYNCPTEHADLQ

GRTALHDAAMADCPSSIQLLCDHGASVNAKDVDGRTPLVLATQMSRPTICQLLIDRGADV

NSRDKQNRTALMLGCEYGCRDAVEVLIKNGADISLLDALGHDSSYYARIGDNLDILTLLK

TASENTNKGRELWKKGPSLQQRNLTHMQDEVNVKSHQREHQNIQDLEIENEDLKERLRKI

QQEQRILLDKVNGLQLQLNEEVMVADDLESEREKLKSLLAAKEKQHEESLRTIEALKNRF

KYFESDHLGSGSHFSNRKEDMLLKQGQMYMADSQCTSPGIPAHMQSRSMLRPLELSLPSQ

TSYSENEILKKFLEAMRTFCESAKQDRLKLQNELAHKVAECKALALECERVKEDSDEQIK

QLEDALKDVQKRMYESEGKVKQMQTHFLALKEHLTSEAASGNHRLTEELKDQLKDLKVKY

EGASAEVGKLRNQIKQNEMIVEEFKRDEGKLIEENKRLQKELSMCEMEREKKGRKVTEME

GQAKELSAKLALSIPAEKFENMKSSLSNEVNEKAKKKK

Uncharacterized Protein C13ORF27 (e.g., GenBank Accession Number Q5JUR7(SEQ ID NO: 116):
>uniprot|Q5JUR7|CM027_HUMAN Uncharacterized protein C13orf27;
MSHTEVKLKIPFGNKLLDAVCLVPNKSLTYGIILTHGASGDMNLPHLMSLASHLASHGFF

CLRFTCKGLNIVHRIKAYKSVLNYLKTSGEYKLAGVFLGGRSMGSRAAASVMCHIEPDDG

DDFVRGLICISYPLHHPKQQHKLRDEDLFRLKEPVLFVSGSADEMCEKNLLEKVAQKMQA

PHKIHWIEKANHSMAVKGRSTNDVFKEINTQILFWIQEITEMDKKCH

Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor (e.g., GenBank Accession Number Q8TER0 (SEQ ID NO: 117):
>swissprot|Q8TER0|SNED1_HUMAN Sushi, nidogen and EGF-like domain-containing protein 1;
MRHGVAWALLVAAALGLGARGVRGAVALADFYPFGAERGDAVTPKQDDGGSGLRPLSVPF

PFFGAEHSGLYVNNNGIISFLKEVSQFTPVAFPIAKDRCVVAAFWADVDNRRAGDVYYRE

ATDPAMLRRATEDVRHYFPELLDFNATWVFVATWYRVTFFGGSSSSPVNTFQTVLITDGK

LSFTIFNYESIVWTTGTHASSGGNATGLGGIAAQAGFNAGDGQRYFSIPGSRTADMAEVE

TTTNVGVPGRWAFRIDDAQVRVGGCGHTTSVCLALRPCLNGGKCIDDCVTGNPSYTCSCL

SGFTGRRCHLDVNECASQPCQNGGTCTHGINSFRCQCPAGFGGPTCETAQSPCDTKECQH

GGQCQVENGSAVCVCQAGYTGAACEMDVDDCSPDPCLNGGSCVDLVGNYTCLCAEPFKGL

RCETGDHPVPDACLSAPCHNGGTCVDADQGYVCECPEGFMGLDCRERVPDDCECRNGGRC

LGANTTLCQCPLGFFGLLCEFEITAMPCNMNTQCPDGGYCMEHGGSYLCVCHTDHNASHS

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LPSPCDSDPCFNGGSCDAHDDSYTCECPRGFHGKHCEKARPHLCSSGPCRNGGTCKEAGG

EYHCSCPYRFTGRHCEIGKPDSCASGPCHNGGTCFHYIGKYKCDCPPGFSGRHCEIAPSP

CFRSPCVNGGTCEDRDTDFFCHCQAGYMGRRCQAEVDCGPPEEVKHATLRFNGTRLGAVA

LYACDRGYSLSAPSRIRVCQPHGVWSEPPQCLEIDECRSQPCLHGGSCQDRVAGYLCLCS

TGYEGAHCELERDECRAHPCRNGGSCRNLPGAYVCRCPAGFVGVHCETEVDACDSSPCQH

GGRCESGGGAYLCVCPESFFGYHCETVSDPCFSSPCGGRGYCLASNGSHSCTCKVGYTGE

DCAKELFPPTALKMERVEESGVSISWNPPNGPAARQMLDGYAVTYVSSDGSYRRTDFVDR

TRSSHQLQALAAGRAYNISVFSVKRNSNNKNDISRPAVLLARTRPRPVEGFEVTNVTAST

ISVQWALHRIRHATVSGVRVSIRHPEALRDQATDVDRSVDRFTFRALLPGKRYTIQLTTL

SGLRGEEHPTESLATAPTHVWTRPLPPANLTAARVTATSAHVVWDAPTPGSLLEAYVINV

TTSQSTKSRYVPNGKLASYTVRDLLPGRRYQLSVIAVQSTELGPQHSEPAHLYIITSPRD

GADRRWHQGGHHPRVLKNRPPPARLPELRLLNDHSAPETPTQPPRFSELVDGRGRVSARF

GGSPSKAATVRSQPTASAQLENMEEAPYRVSLALQLPEHGSKDIGNVPGNCSENPCQNGG

TCVPGADAHSCDCGPGFKGRRCELACIKVSRPCTRLFSETKAFPVWEGGVCHHVYKRVYR

VHQDICFKESCESTSLKKTPNRKQSKSQTLEKS

Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10):
(e.g., GenBank Accession Number Q8IVF4 (SEQ ID NO: 118):
>uniprot|Q8IVF4|DYR10_HUMAN Dynein heavy chain 10, axonemal;
MVPEEVEVEIDEIPVLSEEGEEEEETYSQKVESVDKVRAKRVSLRTESLGQPLNREDEEM

DKEISEKLPSKRTAKHIMEKMHLHMLCTPLPEEFLDQNVVFFLRNTKEAISEATDMKEAM

EIMPETLEYGIINANVLHFLKNIICQVFLPALSFNQHRTSTTVGVTSGEVSNSSEHESDL

PPMPGEAVEYHSIQLIRDEFLMNVQKFASNIQRTMQQLEGELKLEMPIISVEGEVSDLAA

DPETVDILEQCVINWLNQISTAVEAQLKKTPQGKGPLAEIEFWRERNATLSALHEQTKLP

IVRKVLDVIKESDSMLVANLQPVFTELFKFHTEASDNVRFLSTVERYFKNITHGSGFHVV

LDTIPAMMSALRMVWIISRHYNKDERMIPLMERIAWEIAERVCRVVNLRTLFKENRASAQ

SKTLEARNTLRLWKKAYFDTRAKTEASGREDRWEFDRKRLFERTDYMATICQDLSDVLQV

LEEFYNIFGPELKAVTGDPKRIDDVLCRVDGLVTPMENLTFDPFSIKSSQFWKYVMDEFK

IEVLIDIINKIFVQNLENPPLYKNHPPVAGAIYWERSLFFRIKHTILRFQEVQEILDSDR

GQEVKQKYLEVGRTMKEYEDRKYEQWMEVTEQVLPALMKKSLLTKSSIATEEPSTLERGA

VFAINFSPALREIINETKYLEQLGFTVPELARNVALQEDKFLRYTAGIQRMLDHYHMLIG

TLNDAESVLLKDHSQELLRVFRSGYKRLNWNSLGTGDYITGCKQAIGKFESLVHQIHKNA

DDISSRLTLIEAINLFKYPAAKSEEELPGVKEFFEHIERERASDVDHMVRWYLAIGPLLT

KVEGLVVHTNTGKAPKLASYYKYWEKKIYEVLTKLILKNLQSFNSLILGNVPLFHTETIL

TAPEIILHPNTNEIDKMCFHCVRNCVEITKHFVRWMNGSCIECPPQKGEEEEVVIINFYN

DISLNPQIIEQAVMIPQNVHRILINLMKYLQKWKRYRPLWKLDKAIVMEKFAAKKPPCVA

YDEKLQFYSKIAYEVMRHPLIKDEHCIRLQLRHLANTVQENAKSWVISLGKLLNESAKEE

LYNLHEEMEHLAKNLRKIPNTLEDLKFVLATIAEIRSKSLVMELRYRDVQERYRTMAMYN

LFPPDAEKELVDKIESIWSNLFNDSVNVEHALGDIKRTFTELTRGEIMMYRVQIEEFAKR

FYSEGPGSVGDDLDKGVELLGVYERELARHEKSRQELANAEKLFDLPITMYPELLKVQKE

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MSGLRMIYELYEGLKVAKEEWSQTLWINLNVQILQEGIEGFLRALRKLPRPVRGLSVTYY

LEAKMKAFKDSIPLLLDLKNEALRDRHWKELMEKTSVFFEMTETFTLENMFAMELHKHTD

VLNEIVTAAIKEVAIEKAVKEILDTWENMKFTVVKYCKGTQERGYILGSVDEIIQSLDDN

TFNLQSISGSRFVGPFLQTVHKWEKTLSLIGEVIEIWMLVQRKWMYLESIFIGGDIRSQL

PEEAKKFDNIDKVFKRIMGETLKDPVIKRCCEAPNRLSDLQNVSEGLEKCQKSLNDYLDS

KRNAFPRFFFISDDELLSILGSSDPLCVQEHMIKMYDNIASLRFNDGDSGEKLVSAMISA

EGEVMEFRKIVRAEGRVEDWMTAVLNEMRRTNRLITKEAIFRYCEDRSRVDWMLLYQGMV

VLAASQVWWTWEVEDVFHKAQKGEKQAMKNYGRKMHRQIDELVTRITMPLSKNDRKKYNT

VLIIDVHARDIVDSFIRGSILEAREFDWESQLRFYWDREPDELNIRQCTGTFGYGYEYMG

LNGRLVITPLTDRIYLTLTQALSMYLGGAPAGPAGTGKTETTKDLAKALGLLCVVTNCGE

GMDYRAVGKIFSGLAQCGAWGCFDEFNRIDASVLSVISSQIQTIRNALIHQLTTFQFEGQ

EISLDSRMGIFITMNPGYAGRTELPESVKALFRPVVVIVPDLQQICEIMLFSEGFLEAKT

LAKKMTVLYKLAREQLSKQYHYDFGLRALKSVLVMAGELKRGSSDLREDVVLMRALRDMN

LPKFVFEDVPLFLGLISDLFPGLDCPRVRYPDFNDAVEQVLEENGYAVLPIQVDKVVQMF

ETMLTRHTTMVVGPTRGGKSVVINTLCQAQTKLGLTTKLYILNPKAVSVIELYGILDPTT

RDWTDGVLSNIFREINKPTDKKERKYILFDGDVDALWVENMNSVMDDNRLLTLANGERIR

LQAHCALLFEVGDLQYASPATVSRCGMVYVDPKNLKYRPYWKKWVNQIPNKVEQYNLNSL

FEKYVPYLMDVIVEGIVDGRQAEKLKTIVPQTDLNMVTQLAKMLDALLEGEIEDLDLLEC

YFLEALYCSLGASLLEDGRMKFDEYIKRLASLSTVDTEGVWANPGELPGQLPTLYDFHFD

NKRNQWVPWSKLVPEYIHAPERKFINILVHTVDTTRTTWILEQMVKIKQPVIFVGESGTS

KTATTQNFLKNLSEETNIVLMVNFSSRTTSMDIQRNLEANVEKRTKDTYGPPMGKRLLVF

MDDMNMPRVDEYGTQQPIALLKLLLEKGYLYDRGKELNCKSIRDLGFIAAMGKAGGGRNE

VDPRFISLFSVFNVPFPSEESLHLIYSSILKGHTSTFHESIVAVSGKLTFCTLALYKNIV

QDLPPTPSKFHYIFNLRDLSRVFNGLVLTNPERFQTVAQMVRVWRNECLRVFHDRLISET

DKQLVQQHIGSLVVEHFKDDVEVVMRDPILFGDFQMALHEGEPRIYEDIQDYEAAKALFQ

EILEEYNESNTKMNLVLFDDALEHLTRVHRIIRMDRGHALLVGVGGSGKQSLSRLAAFTA

SCEVFEILLSRGYSENSFREDLKSLYLKLGIENKAMIFLFTDAHVAEEGFLELINNMLTS

GIVPALFSEEEKESILSQIGQEALKQGMGPAKESVWQYFVNKSANNLHIVLGMSPVGDTL

RTWCRNFPGMVNNTGIDWFMPWPPQALHAVAKSFLGYNPMIPAENIENVVKHVVLVHQSV

DHYSQQFLQKLRRSNYVTPKNYLDFINTYSKLLDEKTQCNIAQCKRLDGGLDKLKEATIQ

LDELNQKLAEQKIVLAEKSAACEALLEEIAVNTAVAEEKKKLAEEKAMEIEEQNKVIAME

KAEAETTLAEVMPILEAAKLELQKLDKSDVTEIRSFAKPPKQVQTVCECILIMKGYKELN

WKTAKGVMSDPNFLRSLMEIDFDSITQSQVKNIKGLLKTLNTTTEEMEAVSKAGLGMLKF

VEAVMGYCDVFREIKPKREKVARLERNFYLTKRELERIQNELAAIQKELETLGAKYEAAI

LEKQKLQEEAEIMERRLIAADKLISGLGSENIRWLNDLDELMHRRVKLLGDCLLCAAFLS

YEGAFTWEFRDEMVNRIWQNDILEREIPLSQPFRLESLLTDDVEISRWGSQGLPPDELSV

QNGILTTRASRFPLCIDPQQQALNWIKRKEEKNNLRVASFNDPDFLKQLEMSIKYGTPFL

FRDVDEYIDPVIDNVLEKNIKVSQGRQFIILGDKEVDYDSNFRLYLNTKLANPRYSPSVF

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GKAMVINYTVTLKGLEDQLLSVLVAYERRELEEQREHLIQETSENKNLLKDLEDSLLREL

ATSTGNMLDNVDLVHTLEETKSKATEVSEKLKLAEKTALDIDRLRDGYRPAARRGAILFF

VLSEMALVNSMYQYSLIAFLEVFRLSLKKSLPDSILMKRLRNIMDTLTFSIYNHGCTGLF

ERHKLLFSFNMTIKIEQAEGRVPQEELDFFLKGNISLEKSKRKKPCAWLSDQGWEDIILL

SEMFSDNFGQLPDDVENNQTVWQEWYDLDSLEQFPVPLGYDNNITPFQKLLILRCFRVDR

VYRAVTDYVTVTMGEKYVQPPMISFEAIFEQSTPHSPIVFILSPGSDPATDLMKLAERSG

FGGNRLKFLAMGQGQEKVALQLLETAVARGQWLMLQNCHLLVKWLKDLEKSLERITKPHP

DFRLWLTTDPTKGFPIGILQKSLKVVTEPPNGLKLNMRATYFKISHEMLDQCPHPAFKPL

VYVLAFFHAVVQERRKFGKIGWNVYYDFNESDFQVCMEILNTYLTKAFQQRDPRIPWGSL

KYLIGEVMYGGRAIDSFDRRILTIYMDEYLGDFIFDTFQPFHFFRNKEVDYKIPVGDEKE

KFVEAIEALPLANTPEVFGLHPNAEIGYYTQAARDMWAHLLELQPQTGESSSGISRDDYI

GQVAKEIENKMPKVFDLDQVRKRLGTGLSPTSVVLLQELERFNKLVVRMTKSLAELQRAL

AGEVGMSNELDDVARSLFIGHIPNIWRRLAPDTLKSLGNWMVYFLRRFSQYMLWVTESEP

SVMWLSGLHIPESYLTALVQATCRKNGWPLDRSTLFTQVTKFQDADEVNERAGQGCFVSG

LYLEGADWDIEKGCLIKSKPKVLVVDLPILKIIPIEAHRLKLQNTFRTPVYTTSMRRNAM

GVGLVFEADLFTTRHISHWVLQGVCLTLNSD

Gap junction alpha-1 protein (GJA1/Connexion 43) (e.g.,
GenBank Accession Number P17302 (SEQ ID NO: 119):
>uniprot|P17302|CXA1_HUMAN Gap junction alpha-1 protein;
MGDWSALGKLLDKVQAYSTAGGKVWLSVLFIFRILLLGTAVESAWGDEQSAFRCNTQQPG

CENVCYDKSFPISHVRFWVLQIIFVSVPTLLYLAHVFYVMRKEEKLNKKEEELKVAQTDG

VNVDMHLKQIEIKKFKYGIEEHGKVKMRGGLLRTYIISILFKSIFEVAFLLIQWYIYGFS

LSAVYTCKRDPCPHQVDCFLSRPTEKTIFIIFMLVVSLVSLALNIIELFYVFFKGVKDRV

KGKSDPYHATSGALSPAKDCGSQKYAYFNGCSSPTAPLSPMSPPGYKLVTGDRNNSSCRN

YNKQASEQNWANYSAEQNRMGQAGSTISNSHAQPFDFPDDNQNSKKLAAGHELQPLAIVD

QRPSSRASSRASSRPRPDDLEI

Isoform 1 Of Kinesin-Like Protein KIF25(KIF25) (e.g.,
GenBank Accession Number Q5SZU8 (SEQ ID NO: 120):
>uniprot|Q5SZU8|Q5SZU8_HUMAN Kinesin family member 25;
CRAVGSASKLMELVHGGLQLRAKHPTLVHADSSRSHLIITVTLTTASCSDSTADQACSAT

LPREQTEAGRAGRSRRASQGALAPQLVPGNPAGHAEQVQARLQLVDSAGSECVGGDAKLL

VILCISPSQRHLAQTLQGLGFGIRARQVQRGPARKKPPSSQTEGKRRPD

GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase
(e.g., GenBank Accession Number P04406 (SEQ ID NO: 121):
>uniprot|P04406|G3P_HUMAN Glyceraldehyde-3-phosphate dehydrogenase;
MGKVKVGVNGFGRIGRLVTRAAFNSGKVDIVAINDPFIDLNYMVYMFQYDSTHGKFHGTV

KAENGKLVINGNPITIFQERDPSKIKWGDAGAEYVVESTGVFTTMEKAGAHLQGGAKRVI

ISAPSADAPMFVMGVNHEKYDNSLKIISNASCTTNCLAPLAKVIHDNFGIVEGLMTTVHA

ITATQKTVDGPSGKLWRDGRGALQNIIPASTGAAKAVGKVIPELNGKLTGMAFRVPTANV

SVVDLTCRLEKPAKYDDIKKVVKQASEGPLKGILGYTEHQVVSSDFNSDTHSSTFDAGAG

IALNDHFVKLISWYDNEFGYSNRVVDLMAHMASKE

Uncharacterized Protein ALB (e.g.,
GenBank Accession Number P02768 (SEQ ID NO: 122):
>uniprot|P02768|ALBU_HUMAN Serum albumin;
MKWVTFISLLFLFSSAYSRGVFRRDAHKSEVAHRFKDLGEENFKALVLIAFAQYLQQCPF

EDHVKLVNEVTEFAKTCVADESAENCDKSLHTLFGDKLCTVATLRETYGEMADCCAKQEP

ERNECFLQHKDDNPNLPRLVRPEVDVMCTAFHDNEETFLKKYLYEIARRHPYFYAPELLF

FAKRYKAAFTECCQAADKAACLLPKLDELRDEGKASSAKQRLKCASLQKFGERAFKAWAV

ARLSQRFPKAEFAEVSKLVTDLTKVHTECCHGDLLECADDRADLAKYICENQDSISSKLK

ECCEKPLLEKSHCIAEVENDEMPADLPSLAADFVESKDVCKNYAEAKDVFLGMFLYEYAR

RHPDYSVVLLLRLAKTYETTLEKCCAAADPHECYAKVFDEFKPLVEEPQNLIKQNCELFE

QLGEYKFQNALLVRYTKKVPQVSTPTLVEVSRNLGKVGSKCCKHPEAKRMPCAEDYLSVV

LNQLCVLHEKTPVSDRVTKCCTESLVNRRPCFSALEVDETYVPKEFNAETFTFHADICTL

SEKERQIKKQTALVELVKHKPKATKEQLKAVMDDFAAFVEKCCKADDKETCFAEEGKKLV

AASQAALGL

Galectin-3, LGALS3 (e.g., GenBank Accession
Number NP_002297(SEQ ID NO: 123)
>refseqp|NP_002297|NP_002297 galectin 3 [*Homo sapiens*].
MADNFSLHDALSGSGNPNPQGWPGAWGNQPAGAGGYPGASYPGAYPGQAPPGAYPGQAPP

GAYPGAPGAYPGAPAPGVYPGPPSGPGAYPSSGQPSATGAYPATGPYGAPAGPLIVPYNL

PLPGGVVPRMLITILGTVKPNANRIALDFQRGNDVAFHFNPRFNENNRRVIVCNTKLDNN

WGREERQSVFPFESGKPFKIQVLVEPDHFKVAVNDAHLLQYNHRVKKLNEISKLGISGDI

DLTSASYTMI

Similar To NAC-Alpha Domain-Containing Protein 1 (NACAD)
(e.g., GenBank Accession Number O15069 (SEQ ID NO: 124):
>uniprot|O15069|NACAD_HUMAN NAC-alpha domain-containing
protein 1;
MPGEAARAELLLPEADRPGPRTDLSCDAAAATTILGGDRREPCALTPGPSHLALTFLPSK

PGARPQPEGASWDAGPGGAPSAWADPGEGGPSPMLLPEGLSSQALSTEAPLPATLEPRIV

MGEETCQALLSPRAARTALRDQEGGHASPDPPPELCSQGDLSVPSPPPDPDSFFTPPSTP

TKTTYALLPACGPHGDARDSEAELRDELLDSPPASPSGSYITADGDSWASSPSCSLSLLA

PAEGLDFPSGWGLSPQGSMVDERELHPAGTPEPPSSESSLSADSSSSWGQEGHFFDLDFL

ANDPMIPAALLPFQGSLIFQVEAVEVTPLSPEEEEEEAVADPDPGGDLAGEGEEDSTSAS

FLQSLSDLSITEGMDEAFAFRDDTSAASSDSDSASYAEADDERLYSGEPHAQATLLQDSV

QKTEEESGGGAKGLQAQDGTVSWAVEAAPQTSDRGAYLSQRQELISEVTEEGLALGQEST

ATVTPHTLQVAPGLQVEVATRVTPQAGEEETDSTAGQESAAMAMPQPSQEGISEILGQES

VTAEKLPTPQEETSLTLCPDSPQNLKEEGGLDLPSGRKPVAAATIVPRQAKEDLTLPQDS

AMTPPLPLQDTDLSSAPKPVAAATIVSQQAEEGLTLPQDSVMTPPLPLQDTELSSAPKPV

AAATLVSQQAEEGLTLPQDSAMTPPLPLQDTDLSSAPKPVAAATLVSQQAEEGLTLPQDS

AMTPPLPLQDTDLSSAPKPVAAATLVSQQAEEGLTLPQDSAMTPPLPLQDTDLSSAPKPV

AAATIVSQQAEEGLTLPQDSAMTPPLPLQDTDLSSAPKPVAAATIVSQQAEEGLTLPQDS

AMTPPLPLQDTDLSSAPKPVAAATPVSQQAEEGLTLPQDSAMTPPLPLQDTDLSSAPKPV

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AAATPVSQQAEEGLTLPQDSAMTAPLPLQDTGPTSGPEPLAVATPQTLQAEAGCAPGTEP

VATMAQQEVGEALGPRPAPEEKNAALPTVPEPAALDQVQQDDPQPAAEAGTPWAAQEDAD

STLGMEALSLPEPASGAGEEIAEALSRPGREACLEARAHTGDGAKPDSPQKETLEVENQQ

EGGLKLLAQEHGPRSALGGAREVPDAPPAACPEVSQARLLSPAREERGLSGKSTPEPTLP

SAVATEASLDSCPESSVGAVSSLDRGCPDAPAPTSAPTSQQPEPVLGLGSVEQPHEVPSV

LGTPLLQPPENLAKGQPSTPVDRPLGPDPSAPGTLAGAALPPLEPPAPCLCQDPQEDSVE

DEEPPGSLGLPPPQAGVQPAAAAVSGTTQPLGTGPRVSLSPHSPLLSPKVASMDAKDLAL

QILPPCQVPPPSGPQSPAGPQGLSAPEQQEDEDSLEEDSPRALGSGQHSDSHGESSAELD

EQDILAPQTVQCPAQAPAGGSEETIAKAKQSRSEKKARKAMSKLGLRQIQGVTRITIQKS

KNILFVIAKPDVFKSPASDTYVVFGEAKIEDLSQQVHKAAAEKFKVPSEPSALVPESAPR

PRVRLECKEEEEEEEEEVDEAGLELRDIELVMAQANVSRAKAVRALRDNHSDIVNAIMEL

TM

Acetyl-CoA Acetyltransferase, Mitochondrial , ACATI (e.g., GenBank Accession Number NP_000010 (SEQ ID NO: 125):
>refseqp|NP_000010|NP_000010 acetyl-Coenzyme A acetyltransferase 1 precursor [*Homo sapiens*].
MAVLAALLRSGARSRSPLLRRLVQEIRYVERSYVSKPTLKEVVIVSATRTPIGSFLGSLS

LLPATKLGSIAIQGAIEKAGIPKEEVKEAYMGNVLQGGEGQAPTRQAVLGAGLPISTPCT

TINKVCASGMKAIMMASQSLMCGHQDVMVAGGMESMSNVPYVMNRGSTPYGGVKLEDLIV

KDGLTDVYNKIHMGSCAENTAKKLNIARNEQDAYAINSYTRSKAAWEAGKFGNEVIPVTV

TVKGQPDVVVKEDEEYKRVDFSKVPKLKTVFQKENGTVTAANASTLNDGAAALVLMTADA

AKRLNVTPLARIVAFADAAVEPIDFPIAPVYAASMVLKDVGLKKEDIAMWEVNEAFSLVV

LANIKMLEIDPQKVNINGGAVSLGHPIGMSGARIVGHLTHALKQGEYGLASICNGGGGAS

AMLIQKL

KH-Type Splicing Regulatory Protein, FUBP2 (e.g., GenBank Accession Number NP_003676 (SEQ ID NO: 126):
>refseqp|NP_003676|NP_003676 KH-type splicing regulatory protein (FUSE binding protein 2) [*Homo sapiens*].
MSDYSTGGPPPGPPPPAGGGGGAGGAGGGPPPGPPGAGDRGGGGPGGGGPGGGSAGGPSQ

PPGGGGPGIRKDAFADAVQRARQIAAKIGGDAATTVNNSTPDFGFGGQKRQLEDGDQPES

KKLASQGDSISSQLGPIHPPPRTSMTEEYRVPDGMVGLIIGRGGEQINKIQQDSGCKVQI

SPDSGGLPERSVSLTGAPESVQKAKMMLDDIVSRGRGGPPGQFHDNANGGQNGTVQEIMI

PAGKAGLVIGKGGETIKQLQERAGVKMILIQDGSQNTNVDKPLRIIGDPYKVQQACEMVM

DILRERDQGGFGSRNEYGSRIGGGIDVPVPRHSVGVVIGRSGEMIKKIQNDAGVRIQFKQ

DDGTGPEKIAHIMGPPDRCEHAARIINDLLQSLRSGPPGPPGGPGPMPPGGRGRGRGQGNW

GPPGGEMTFSIPTHKCGLVIGRGGENVKAINQQTGAFVEISRQLPPNGDPNFKLFIIRGS

PQQIDHAKQLIEEKIEGPLCPVGPGPGGPGPAGPMGPFNPGPFNQGPPGAPPHAGGPPPH

QYPPQGWGNTYPQWQPPAPHDPSKAAAAAADPNAAWAAYYSHYYQQPPGPVPGPAPAPAA

PPAQGEPPQPPPTGQSDYTKAWEEYYKKIGQQPQQPGAPPQQDYTKAWEEYYKKQAQVAT

GGGPGAPPGSQPDYSAAWAEYYRQQAAYYGQTPGPGGPQPPPTQQGQQQAQ

Profilin 1(PFN1) (e.g., GenBank Accession Number NP_005013 (SEQ ID NO: 127):
>refseqp|NP_005013|NP_005013 profilin 1 [*Homo sapiens*].
MAGWNAYIDNLMADGTCQDAAIVGYKDSPSVWAAVPGKTFVNITPAEVGVLVGKDRSSFY

VNGLTLGGQKCSVIRDSLLQDGEFSMDLRTKSTGGAPTFNVTVTKTDKTLVLLMGKEGVH

GGLINKKCYEMASHLRRSQY

Chloride intracellular Channel Protein 1, CLIC1 (e.g., GenBank Accession Number NP_001279 (SEQ ID NO: 128):
>refseqp|NP_001279|NP_001279 chloride intracellular channel 1 [*Homo sapiens*].
MAEEQPQVELFVKAGSDGAKIGNCPFSQRLFMVLWLKGVTFNVTTVDTK

RRTETVQKLCPGGQLPFLLYGTEVHTDTNKIEEFLEAVLCPPRYPKLAA

LNPESNTAGLDIFAKFSAYIKNSNPALNDNLEKGLLKALKVLDNYLTSP

LPEEVDETSAEDEGVSQRKFLDGNELTLADCNLLPKLHIVQVVCKKYRG

FTIPEAFRGVHRYLSNAYAREEFASTCPDDEEIELAYEQVAKALK

Zinc Finger Protein 831 (e.g., GenBank Accession Number NP_848552 (SEQ ID NO: 129):
>refseqp|NP_848552|NP_848552 zinc finger protein 831 [*Homo sapiens*].
MEVPEPTCPAPPARDQPAPTPGPPGAPGGQASPHLTLGPVLLPPEQGLA

PPTVFLKALPIPLYHTVPPGGLQPRAPLVTGSLDGGNVPFILSPVLQPE

GPGPTQVGKPAAPTLTVNIVGTLPVLSPGLGPTLGSPGKVRNAGKYLCP

HCGRDCLKPSVLEKHIRSHTGERPFPCATCGIAFKTQSNLYKHRRTQTH

LNNSRLSSESEGAGGGLLEEGDKAGEPPRPEGRGESRCQGMHEGASERP

LSPGAHVPLLAKNLDVRTEAAPCPGSAFADREAPWDSAPMASPGLPAAS

TQPWRKLPEQKSPTAGKPCALQRQQATAAEKPWDAKAPEGRLRKCESTD

SGYLSRSDSAEQPHAPCSPLHSLSEHSAESEGEGGPGPGPGVAGAEPGA

REAGLELEKKRLEERIAQLISINQAVVDDAQLDNVRPRKTGLSKQGSID

LPTPYTYKDSFHFDIRALEPGRRRAPGPVRSTWTPPDKSRPLFFHSVPT

QLSTTVECVPVTRSNSLPFVEGSRTWLEPREPRDPWSRTQKPLSPRPGP

ARLGCRSGLSSTDVPSGHPRALVRQAAVEDLPGTPIGDALVPAEDTDAK

RTAAREAMAGKGRAGGRKCGQRRLKMFSQEKWQVYGDETFKRIYQKMKA

SPHGGKKAREVGMGSGAELGFPLQKEAAGSSGTVPTQDRRTPVHEDISA

GATPEPWGNPPALEASLVTEPTKHGETVARRGDSDRPRVEEAVSSPALG

GRDSPCSGSRSPLVSPNGRLELGWQMPPAPGPLKGGDVEAPRPVWPDPK

LEGGARGVGDVQETCLWAQTVLRWPSRGSGEDKLPSERKKLKVEDLHSW

KQPEPVSAETPGGPTQPASLSSQKQDADPGEVPGGSKESARQVGEPLES

SGASLAAASVALKRVGPRDKATPLHPAAPAPAEHPSLATPPQAPRVLSA

LADNAFSPKYLLRLPQAETPLPLPIPWGPRHSQDSLCSSGWPEERASFV

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GSGLGTPLSPSPASGPSPGEADSILEDPSCSRPQDGRKGAQLGGDKGDR

MATSRPAARELPISAPGAPREATSSPPTPTCEAHLVQDMEGDSHRIHRL

CMGSTLARARLSGDVLNPWVPNWELGEPPGNAPEDPSSGPLVGPDPCSP

LQPGSFLTALTRPQGVPPGWPELALSSHSGTSRSHSTRSPHSTQNPFPS

LKAEPRLTWCCLSRSVPLPAEQKAKAASVYLAVHFPGSSLRDEGPNGPP

GSNGGWTWTSPGEGGPAQMSKFSYPTVPGVMPQHQVSEPEWKKGLPWRA

KMSRGNSKQRKLKINPKRYKGNFLQSCVQLRASRLRTPTWVRRRSRHPP

ALEGLKPCRTPGQTSSEIAGLNLQEEPSCATSESPPCCGKEEKKEGDCR

QTLGTLSLGTSSRIVREMDKRTVKDISPSAGEHGDCTTHSTAATSGLSL

QSDTCLAVVNDVPLPPGKGLDLGLLETQLLASQDSVSTDPKPYIFSDAQ

RPSSFGSKGTFPHHDIATSVAAVCISLPVRTDHIAQEIHSAESRDHSQT

AGRTLTSSSPDSKVTEEGRAQTLLPGRPSSGQRISDSVPLESTEKTHLE

IPASGPSSASSHHKEGRHKTFFPSRGQYGCGEMTVPCPSLGSDGRKRQV

SGLITRKDSVVPSKPEQPIEIPEAPSKSLKKRSLEGMRKQTRVEFSDTS

SDDEDRLVIEI

Endoplasmin (e.g., GenBank Accession Number NP_003290 (SEQ ID NO: 130):
>refseqp|NP_003290|NP_003290 heat shock protein 90 kDa beta, member 1 [*Homo sapiens*].
MRALWVLGLCCVLLTFGSVRADDEVDVDGTVEEDLGKSREGSRTDDEVV

QREEEAIQLDGLNASQIRELREKSEKFAFQAEVNRMMKLIINSLYKNKE

IFLRELISNASDALDKIRLISLTDENALSGNEELTVKIKCDKEKNLLHV

TDTGVGMTREELVKNLGTIAKSGTSEFLNKMTEAQEDGQSTSELIGQFG

VGFYSAFLVADKVIVTSKHNNDTQHIWESDSNEFSVIADPRGNTLGRGT

TITLVLKEEASDYLELDTIKNLVKKYSQFINFPIYVWSSKTETVEEPME

EEEAAKEEKEESDDEAAVEEEEEEKKPKTKKVEKTVWDWELMNDIKPIW

QRPSKEVEEDEYKAFYKSFSKESDDPMAYIHFTAEGEVTFKSILFVPTS

APRGLFDEYGSKKSDYIKLYVRRVFITDDFHDMMPKYLNFVKGVVDSDD

LPLMVSRETLQQHKLLKVIRKKLVRKTLDMIKKIADDKYNDTFWKEFGT

NIKLGVIEDHSNRTRLAKLLRFQSSHHPTDITSLDQYVERMKEKQDKIY

FMAGSSRKEAESSPFVERLLKKGYEVIYLTEPVDEYCIQALPEFDGKRF

QNVAKEGVKFDESEKTKESREAVEKEFEPLLNWMKDKALKDKIEKAVVS

-continued

QRLTESPCALVASQYGWSGNMERIMKAQAYQTGKDISTNYYASQKKTFE

INPRHPLIRDMLRRIKEDEDDKTVLDLAVVLFETATLRSGYLLPDTKAY

GDRIERMLRLSLNIDPDAKVEEEPEEEPEETAEDTTEDTEQDEDEEMDV

GTDEEEETAKESTAEKDEL

Ribosomal Protein S10 (RPS10)
(e.g., GenBank Accession Number P46783
(SEQ ID NO: 131):
>uniprot|P46783|RS10_HUMAN 40S ribosomal
protein S10;
MLMPKKNRIAIYELLFKEGVMVAKKDVHMPKHPELADKNVPNLHVMKAM

QSLKSRGYVKEQFAWRHFYWYLTNEGIQYLRDYLHLPPEIVPATLRRSR

PETGRPRPKGLEGERPARLTRGEADRDTYRRSAVPPGADKKAEAGAGSA

TEFQFRGGFGRGRGQPPQ

Splicing Factor, Arginine/Serine-Rich 3
(e.g., GenBank Accession Number NP_003008
(SEQ ID NO: 132):
>refseqp|NP_003008|NP_003008 splicing factor,
arginine/serine-rich 3 [*Homo sapiens*].
MHRDSCPLDCKVYVGNLGNNGNKTELERAFGYYGPLRSVWVARNPPGFA

FVEFEDPRDAADAVRELDGRTLCGCRVRVELSNGEKRSRNRGPPPSWGR

RPRDDYRRRSPPPRRRSPRRRSFSRSRSRSLSRDRRRERSLSRERNHKP

SRSFSRSRSRSRSNERK

ACTA2 Protein (alpha actin, smooth muscle)
(e.g., GenBank Accession Number P62736
(SEQ ID NO: 133):
>uniprot|P62736|ACTA_HUMAN Actin, aortic smooth
muscle;
MCEEEDSTALVCDNGSGLCKAGFAGDDAPRAVFPSIVGRPRHQGVMVGM

GQKDSYVGDEAQSKRGILTLKYPIEHGIITNWDDMEKIWHHSFYNELRV

APEEHPTLLTEAPLNPKANREKMTQIMFETFNVPAMYVAIQAVLSLYAS

GRTTGIVLDSGDGVTHNVPIYEGYALPHAIMRLDLAGRDLTDYLMKILT

ERGYSFVTTAEREIVRDIKEKLCYVALDFENEMATAASSSSLEKSYELP

DGQVITIGNERFRCPETLFQPSFIGMESAGIHETTYNSIMKCDIDIRKD

LYANNVLSGGTTMYPGIADRMQKEITALAPSTMKIKIIAPPERKYSVWI

GGSILASLSTFQQMWISKQEYDEAGPSIVHRKCF

Isoform 1 Of Sodium Channel Protein Type 8
Subunit Alpha, SCN8A (e.g., GenBank Accession
Number NP_055006 SEQ ID NO: 134):
>refseqp|NP_2355006|NP_055006 sodium channel,
voltage gated, type VIII, alpha [*Homo sapiens*].
MAARLLAPPGPDSFKPFTPESLANIERRIAESKLKKPPKADGSHREDDE

DSKPKPNSDLEAGKSLPFIYGDIPQGLVAVPLEDFDPYYLTQKTFVVLN

RGKTLFRFSATPALYILSPFNLIRRIAIKILIHSVFSMIIMCTILTNCV

FMTFSNPPDWSKNVEYTFTGIYTFESLVKIIARGFCIDGFTFLRDPWNW

-continued

LDFSVIMMAYITEFVNLGNVSALRTFRVLRALKTISVIPGLKTIVGALI

QSVKKLSDVMILTVFCLSVFALIGLQLFMGNLRNKCVVWPINFNESYLE

NGTKGFDWEEYINNKTNFYTVPGMLEPLLCGNSSDAGQCPEGYQCMKAG

RNPNYGYTSFDTFSWAFLALFRLMTQDYWENLYQLTLRAAGKTYMIFFV

LVIFVGSFYLVNLILAVVAMAYEEQNQATLEEAEQKEAEFKAMLEQLKK

QQEEAQAAAMATSAGTVSEDAIEEEGEEGGGSPRSSSEISKLSSKSAKE

RRNRRKKRKQKELSEGEEKGDPEKVFKSESEDGMRRKAFRLPDNRIGRK

FSIMNQSLLSIPGSPFLSRHNSKSSIFSFRGPGRFRDPGSENEFADDEH

STVEESEGRRDSLFIPIRARERRSSYSGYSGYSQGSRSSRIFPSLRRSV

KRNSTVDCNGVVSLIGGPGSHIGGRLLPEATTEVEIKKKGPGSLLVSMD

QLASYGRKDRINSIMSVVTNTLVEELEESQRKCPPCWYKFANTFLIWEC

HPYWIKLKEIVNLIVMDPFVDLAITICIVLNTLFMAMEHHPMTPQFEHV

LAVGNLVFTGIFTAEMFLKLIAMDPYYYFQEGWNIFDGFIVSLSLMELS

LADVEGLSVLRSFRLLRVFKLAKSWPTLNMLIKIIGNSVGALGNLTLVL

AIIVFIFAVVGMQLFGKSYKECVCKINQDCELPRWHMHDFFHSFLIVFR

VLCGEWIETMWDCMEVAGQAMCLIVFMMVMVIGNLVVLNLFLALLLSSF

SADNLAATDDDGEMNNLQISVIRIKKGVAWTKLKVHAFMQAHFKQREAD

EVKPLDELYEKKANCIANHTGADIHRNGDFQKNGNGTTSGIGSSVEKYI

IDEDHMSFINNPNLTVRVPIAVGESDFENLNTEDVSSESDPEGSKDKLD

DTSSSEGSTIDIKPEVEEVPVEQPEEYLDPDACFTEGCVQRFKCCQVNI

EEGLGKSWWILRKTCFLIVEHNWFETFIIFMILLSSGALAFEDIYIEQR

KTIRTILEYADKVFTYIFILEMLLKWTAYGFVKFFTNAWCWLDFLIVAV

SLVSLIANALGYSELGAIKSLRTLRALRPLRALSRFEGMRVVVNALVGA

IPSIMNVLLVCLIFWLIFSIMGVNLFAGKYHYCFNETSEIRFEIEDVNN

KTECEKLMEGNNTEIRWKNVKINFDNVGAGYLALLQVATFKGWMDIMYA

AVDSRKPDEQPKYEDNIYMYIYFVIFIIFGSFFTLNLFIGVIIDNFNQQ

KKKFGGQDIFMTEEQKKYYNAMKKLGSKKPQKPIPRPLNKIQGIVFDFV

TQQAFDIVIMMLICLNMVTMMVETDTQSKQMENILYWINLVFVIFFTCE

CVLKMFALRHYYFTIGWNIFDFVVVILSIVGMFLADIIEKYFVSPTLFR

VIRLARIGRILRLIKGAKGIRTLLFALMMSLPALFNIGLLLFLVMFIFS

IFGMSNFAYVKHEAGIDDMFNFETFGNSMICLFQITTSAGWDGLLLPIL

NRPPDCSLDKEHPGSGFKGDCGNPSVGIFFFVSYIIISFLIVVNMYIAI

ILENFSVATEESADPLSEDDFETFYEIWEKFDPDATQFIEYCKLADFAD

ALEHPLRVPKPNTIELIAMDLPMVSGDRIHCLDILFAFTKRVLGDSGEL

DILRQQMEERFVASNPSKVSYEPITTTLRRKQEEVSAVVLQRAYRGHLA

RRGFICKKTTSNKLENGGTHREKKESTPSTASLPSYDSVTKPEKEKQQR

AEEGRRERAKRQKEVRESKC

Isoform Long Of Galectin-9 (e.g., GenBank Accession Number NP_033665 SEQ ID NO: 135):
>refseqp|NP_033665|NP_033665 galectin-9 isoform long [*Homo sapiens*].
MAFSGSQAPYLSPAVPFSGTIQGGLQDGLQITVNGTVLSSSGTRFAVNF

QTGFSGNDIAFHFNPRIEDGGYVVCNTRQNGSWGPEERKTHMPFQKGMP

FDLCFLVQSSDFKVMVNGILFVQYFHRVPFHRVDTISVNGSVQLSYISF

QNPRTVPVQPAFSTVPFSQPVCFPPRPRGRRQKPPGVWPANPAPITQTV

IHTVQSAFGQMFSTPAIPPMMYTHPAYPMPFITTILGGLYPSKSILLSG

TVLPSAQRFHINLCSGNHIAFHLNPRFDENAVVRNTQIDNSWGSEERSL

PRKMPFVRGQSFSVWILCEAHCLKVAVDGQHLFEYYHRLRNLPTINRLE

VGGDIQLTHVQT

T-Complex Protein 1 Subunit Epsilon, CCT5 (e.g., GenBank Accession Number NP_036205 (SEQ ID NO: 136):
>refseqp|NP_036205|NP_036205 chaperonin containing TCP1, subunit 5 (epsilon) [*Homo sapiens*].
MASMGTLAFDEYGRPFLIIKDQDRKSRLMGLEALKSHIMAAKAVANTMR

TSLGPNGLDKMMVDKDGDVTVTNDGATILSMMDVDHQIAKLMVELSKSQ

DDEIGDGTTGVVVLAGALLEEAEQLLDRGIHPIRIADGYEQAARVAIEH

LDKISDSVLVDIKDTEPLIQTAKTTLGSKVVNSCHRQMAEIAVNAVLTV

ADMERRDVDFELIKVEGKVGGRLEDTKLIKGVIVDKDFSHPQMPKKVED

YAKIAILTCPFEPPKPKTKHKLDVTSVEDKALQKYEKEKFEEMIQQIKE

TGANLAICQWGFDDEANHLLLQNNLPAVRWVGGPEIELIAIATGGRIVP

RFSELTAEKLGFAGINQEISFGTTKDKMLVIEQCKNSRAVTIFIRGGNK

MIIEEAKRSLHDALCVIRNLIRDNRVVYGGGAAEISCALAVSQEADKCP

TLEQYAMRAFADALEVIPMALSENSGMNPIQTMTEVRARQVKEMNPALG

IDCLHKGTNDMKQQHVIETLIGKKQQISLATQMVRMILKIDDIRKPGES

EE

Alpha-Enolase, Lung Specific (e.g., GenBank Accession Number CALA47179 (SEQ ID NO: 137):
MSILKIIHARDIFESRGNPTVEVDLYTNKGGLFGRAAVPSGASTGIYEA

LLELRDNDKTRYMGGKGVSKAVEHIINKTIAPALISKNVNVVEQDKIDN

LMLDMDGSENKSKFGANAILGVSLAVCSNAGATAEKGVPLYRHIADLAG

NNPEVILPVPAFNVINGGSHAGNKLAMQEFMIPPCGADRFNDAIRIGAE

VYHNLKNVIKEKYGKDATNVGDEGGFAPNILENKEALELLKTAIGKAGY

SDKVVIGMDVAASEFYRDGKYDLDFNSPDDPSRYISPDQLADLYKGFVL

GHAVKNYPVGVSIEDPPFDQDDWGAWKKLFTGSLVGIQVVGDDLTVTKP

EARIAKAVEEVKACNCLLLLKVNQIGSVTESLQACKLAQSNGWGVMPVS

HRLSGETEDTFMADLVVGLCTGQIKTGPTCRSERLAKYNQLLRIEEAEA

GSKARFAGRNFRNPRIN

Proto-Oncogene Serine/Threonine-Protein Kinase MOS (e.g., GenBank Accession Number NP_005363 (SEQ ID NO: 138):
>refseqp|NP_005363|NP_005363 v-mos Moloney murine sarcoma viral oncogene homolog [*Homo sapiens*]
MPSPLALRPYLRSEFSPSVDARPCSSPSELPAKLLLGATLPRAPRLPRR

LAWCSIDWEQVCLLQRLGAGGFGSVYKATYRGVPVAIKQVNKCTKNRLA

SRRSFWAELNVARLRHDNIVRVVAASTRTPAGSNSLGTIIMEFGGNVTL

HQVIYGAAGHPEGDAGEPHCRTGGQLSLGKCLKYSLDVVNGLLFLHSQS

IVHLDLKPANILISEQDVCKISDFGCSEKLEDLLCFQTPSYPLGGTYTH

RAPELLKGEGVTPKADIYSFAITLWQMTTKQAPYSGERQHILYAVVAYD

LRPSLSAAVFEDSLPGQRLGDVIQRCWRPSAAQRPSARLLLVDLTSLKA

ELG

Isoform 1 Of Beta-Adducin (ADD2) (e.g., GenBank Accession Number NP_001608 (SEQ ID NO: 139):
>refseqp|NP_001608|NP_001608 adducin 2 isoform a [*Homo sapiens*].
MSEETVPEAASPPPPQGQPYFDRFSEDDPEYMRLRNRAADLRQDFNLME

PQKKRVTMILQSSFREELEGLIQEQMKKGNNSSNIWALRQIADFMASTS

HAVFPTSSMNVSMMTPINDLHTADSLNLAKGERLMRCKISSVYRLLDLY

GWAQLSDTYVTLRVSKEQDHFLISPKGVSCSEVTASSLIKVNILGEVVE

KGSSCFPVDTTGFCLHSAIYAARPDVRCIIHLHTPATAAVSAMKWGLLP

VSHNALLVGDMAYYDFNGEMEQEADRINLQKCLGPTCKILVLRNHGVVA

LGDTVEEAFYKIFHLQAACEDQVSALSSAGGVENLILLEQEKHRPHEVG

SVQWAGSTFGPMQKSRLGEHEFEALMRMLDNLGYRTGYTYRHPFVQEKT

KHKSEVEIPATVTAFVFEEDGAPVPALRQHAQKQQKEKTRWLNTPNTYL

RVNVADEVQRSMGSPRPKTTWMKADEVEKSSSGMPIRIENPNQFVPLYT

DPQEVLEMRNKIREQNRQDVKSAGPQSQLLASVIAEKSRSPSTESQLMS

KGDEDTKDDSEETVPNPFSQLTDQELEEYKKEVERKKLELDGEKETAPE

EPGSPAKSAPASPVQSPAKEAETKSPLVSPSKSLEEGTKETETSKAATT

EPETTQPEGVVVNGREEEQTAEEILSKGLSQMTTSADTDVDTSKDKTES

VTSGPMSPEGSPSKSPSKKKKKFRTPSFLKKSKKKEKVES

Apolipoprotein E (APOE) (e.g., GenBank Accession Number NP_000032 SEQ ID NO : 140):
>refseqp|NP_00032|NP_000032 apolipoprotein E precursor [*Homo sapiens*].
MKVLWAALLVTFLAGCQAKVEQAVETEPEPELRQQTEWQSGQRWELALG

RFWDYLRWVQTLSEQVQEELLSSQVTQELRALMDETMKELKAYKSELEE

QLTPVAEETRARLSKELQAAQARLGADMEDVCGRLVQYRGEVQAMLGQS

TEELRVRLASHLRKLRKRLLRDADDLQKRLAVYQAGAREGAERGLSAIR

ERLGPLVEQGRVRAATVGSLAGQPLQERAQAWGERLRARMEEMGSRTRD

RLDEVKEQVAEVRAKLEEQAQQIRLQAEAFQARLKSWFEPLVEDMQRQW

AGLVEKVQAAVGTSAAPVPSDNH

Ubiquilin-4 (UBQLN4)
(ataxin-1 ubiquitin-like interacting protein)
(e.g. , GenBank Accession Number NP_064516
(SEQ ID NO: 41):
>refseqp|NP_064516|NP_064516 ataxin-1 ubiquitin-like interacting protein [*Homo sapiens*].
MAEPSGAETRPPIRVTVKTPKDKEEIVICDRASVKEFKEETSRRFKAQQ

DQLVLIFAGKILKDGDTLNQHGIKDGLTVHLVIKTPQKAQDPAAATASS

PSTPDPASAPSTTPASPATPAQPSTSGSASSDAGSGSRRSSGGGPSPGA

GEGSPSATASILSGFGGILGLGSLGLGSANFMELQQQMQRQLMSNPEML

SQIMENPLVQDMMSNPDLMRHMIMANPQMQQLMERNPEISHMLNNPELM

RQTMELARNPAMMQEMMRNQDRALSNLESIPGGYNALRRMYTDIQEPMF

SAAREQFGNMPFSSLAGNSDSSSSOPLRTENREPLPNPWSPSPPTSQAP

GSGGEGTGGSGTSQVHPTVSNPFGINAASLGSGMFNSPEMQALLQQISE

NPQLMQNVISAPYMRSMMQTLAQNPDFAAQMMVNVPLFAGNPQLQEQLR

-continued

LQLPVFLQQMQNPESLSILTNPRAMQALLQIQQGLQTLQTEAPGLVPSL

GSFGISRTPAPSAGSNAGSTPEAPTSSPATPATSSPTGASSAQQQLMQQ

MIQLLAGSGNSQVQTPEVRFQQQLEQLNSMGFINREANLQALIATGGDI

NAAIERLLGSQLS

Sumo-Conjugating Enzyme UB21
(URC9 homolog in yeast)
(e.g., GenBank Accession Number NP_003336
(SEQ ID NO: 142):
>refseqp|NP_003336|NP_003336 ubiquitin-conjugating enzyme E2I [*Homo sapiens*].
MSGIALSRLAQERKAWRKDHPFGFVAVPTKNPDGTMNLMNWECAIPGKK

GTPWEGGLFKLRLMLFKDDYPSSPPKCKFEPPLFHPNVYPSGTVCLSIL

EEDKDWRPAITIKQILLGIQELLNEPNIQDPAQAEAYTIYCQNRVEYEK

RVRAQAKKFAPS

Myosin-15(MYH15) (e.g., GenBank Accession Number NP_055796
(SEQ ID NO: 143):
>refseqp|NP_055796|NP_055796 myosin, heavy polypeptide 15 [*Homo sapiens*].
MVESCLLTFRAFFWWIALIKMDLSDLGEAAAFLRRSEAELLLLQATALDGKKKCWIPDGE

NAYIEAEVKGSEDDGTVIVETADGESLSIKEDKIQQMNPPEFEMIEDMAMLTHLNEASVL

HTLKRRYGQWMIYTYSGLFCVTINPYKWLPVYQKEVMAAYKGKRRSEAPPHIFAVANNAF

QDMLHNRENQSILFTGESGAGKTVNSKHIIQYFATIAAMIESRKKQGALEDQIMQANTIL

EAFGNAKTLRNDNSSRFGKFIRMHFGARGMLSSVDIDIYLLEKSRVIFQQAGERNYHIFY

QILSGQKELHDLLLVSANPSDFHFCSCGAVTVESLDDAEELLATEQAMDILGFLPDEKYG

CYKLTGAIMHFGNMKFKQKPREEQLEADGTENADKAAFLMGINSSELVKCLIHPRIKVGN

EYVTRGQTIEQVTCAVGALSKSMYERMFKWLVARINRALDAKLSRQFFIGILDITGFEIL

EYNSLEQLCINFTNEKLQQFFNWHMFVLEQEEYKKESIEWVSIGFGLDLQACIDLIEKPM

GILSILEEECMFPKATDLTFKTKLFDNHFGKSVHLQKPKPDKKKFEAHFELVHYAGVVPY

NISGWLEKNKDLLNETVVAVFQKSSNRLLASLFENYMSTDSAIPFGEKKRKKGASFQTVA

SLHKENLNKLMTNLKSTAPHFVRCINPNVNKIPGILDPYLVLQQLRCNGVLEGTRICREG

FPNRLQYADFKQRYCILNPRTFPKSKFVSSRKAAEELLGSLEIDHTQYRFGITKVFFKAG

FLGQLEAIRDERLSKVFTLFQARAQGKLMRIKFQKILEERDALILIQWNIRAFMAVKNWP

WMRLFFKIKPLVKSSEVGEEVAGLKEECAQLQKALEKSEFQREELKAKQVSLTQEKNDLI

LQLQAEQETLANVEEQCEWLIKSKIQLEARVKELSERVEEEEEINSELTARGRKLEDECF

ELKKEIDDLETMLVKSEKEKRTTEHKVENLTEEVEFLNEDISKLNRAAEVVQEAHQQTLD

DLHMEEEKLSSLSKANLKLEQQVDELEGALEQERKARMNCERELHKLEGNLKLNRESMEN

LESSQRHLAEELRKKELELSQMNSKVENEKGLVAQLQKTVKELOTQIKDLKEKLEAERTT

RAKMERERADLTQDLADLNERLEEVGGSSLAQLEITKKQETKFQKLHRDMEEATLHFETT

SASLKKRHADSLAELEGQVENLQQVKQKLEKDKSDLQLEVDDLLTRVEQMTRAKANAEKL

CTLYEERLHEATAKLDKVTQLANDLAAQKTKLWSESGEFLRRLEEKEALINQLSREKSNF

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TRQIEDLRGQLEKETKSQSALAHALQKAQRDCDLLREQYEEEQEVKAELHRTLSKVNAEM

VQWRMKYENNVIQRTEDLEDAKKELAIRLQEAAEAMGVANARNASLERARHQLQLELGDA

LSDLGKVRSAAARLDQKQLQSGKALADWKQKHEESQALLDASQKEVQALSTELLKLKNTY

EESIVGQETLRRENKNLQEEISNLTNQVREGTKNLTEMEKVKKLIEEEKTEVQVTLEETE

GALERNESKILHFQLELLEAKAELERKLSEKDEEIENFRRKQQCTIDSLQSSLDSEAKSR

IEVTRLKKKMEEDLNEMELQLSCANRQVSEATKSLGQLQIQIKDLQMQLDDSTQLNSDLK

EQVAVAERRNSLLQSELEDLRSLQEQTERGRRLSEEELLEATERINLFYTQNTSLLSQKK

KLEADVARMQKEAEEVVQECQNAEEKAKKAAIEAANLSEELKKKQDTIAHLERTRENMEQ

TITDLQKRLAEAEQMALMGSRKQIQKLESRVRELEGELEGEIRRSAEAQRGARRLERCIK

ELTYQAEEDKKNLSRMQTQMDKLQLKVQNYKQQVEVAETQANQYLSKYKKQQHELNEVKE

RAEVAESQVNKLKIKAREFGKKVQEE

FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK)
(e.g. , GenBank Accession Number NP_057392 (SEQ ID NO: 144):
refseqp|NP_057392|NP_057392 UMP-CMP kinase 1 isoform a
[*Homo sapiens*].
MLSRCRSGLLHVLGLSFLLQTRRPILLCSPRLMKPLVVFVLGGPGAGKGTQCARIVEKYG

YTHLSAGELLRDERKNPDSQYGELIEKYIKEGKIVPVEITISLLKREMDQTMAANAQKNK

FLIDGFPRNQDNLQGWNKTMDGKADVSFVLFFDCNNEICIERCLERGKSSGRSDDNRESL

EKRIQTYLQSTKPIIDLYEEMGKVKKIDASKSVDEVFDEVVQIFKEG

Intelectin-1 (ITLN1) (e.g., GenBank Accession
Number NP_060095 (SEQ ID NO: 145):
>refseqp|NP_060095|NP_060095 intelectin [*Homo sapiens*].
MNQLSFLLFLIATTRGWSTDEANTYFKEWTCSSSPSLPRSCKEIKDECPSAFDGLYFLRT

ENGVIYQTFCDMTSGGGGWTLVASVHENDMRGKCTVGDRWSSQQGSKAVYPEGDGNWANY

NTFGSAEAATSDDYKNPGYYDIQAKDLGIWHVPNKSPMQHWRNSSLLRYRTDTGFLQTLG

HNLFGIYQKYPVKYGEGKCWTDNGPVIPVVYDFGDAQKTASYYSPYGQREFTAGFVQFRV

FNNERAANALCAGMRVTGCNTEHHCIGGGGYFPEASPQQCGDFSGFDWSGYGTHVGYSSS

REITEAAVLLFYR

Apolipoprotein A-IV (APOA4) (e.g., GenBank Accession
Number Q13784 (SEQ ID NO: 146):
>uniprot|Q13784|Q13784_HUMAN APOA4 protein;
LEPYADQLRTQVNTQAEQLRRQLDPLAQRMERVLRENADSLQASLRPHADELKAKIDQNV

EELKGRLTPYADEFKVKIDQTVEELRRSLAPYAQDTQEKLNHQLEGLTPQMKKNAEELKA

RISASAEELRQRLAPLAEDVRGNLKGNTEGLQKSLAELGGHLDQQVEEFRRRVEPYGENF

NKALVQQMEQLRQKLGPHAGDVEGHLSFLEKDLRDKVNSFFSTFKEKESQDKTLSLPELE

QQQE

Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1)
(e.g., GenBank Accession Number P0559 (SEQ ID NO: 147):
>uniprot|P08559|ODPA_HUMAN Pyruvate dehydrogenase E1 component
subunit alpha, somatic form, mitochondrial;
MRKMLAAVSRVLSGASQKPASRVLVASRNFANDATFEIKKCDLHRLEEGPPVTTVLTRED

GLKYYRMMQTVRRMELKADQLYKQKIIRGFCHLCDGQEACCVGLEAGINPTDHLITAYRA

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HGFTFTRGLSVREILAELTGRKGGCAKGKGGSMHMYAKNFYGGNGIVGAQVPLGAGIALA

CKYNGKDEVCLTLYGDGAANQGQIFEAYNMAALWKLPCIFICENNRYGMGTSVERAAAST

DYYKRGDFIPGLRVDGMDILCVREATRFAAAYCRSGKGPILMELQTYRYHGHSMSDPGVS

YRTREEIQEVRSKSDPIMLLKDRMVNSNLASVEELKEIDVEVRKEIEDAAQFATADPEPP

LEELGYHIYSSDPPFEVRGANQWIKFKSVS

Leucine-Rich Repeat-Containing Protein 59 (LRRC59)
(e.g., GenBank Accession Number NP_060979 (SEQ ID NO: 148):
>refseqp|NP_060979|NP_060979 leucine rich repeat containing 59
[*Homo sapiens*]
MTKAGSKGGNLRDKLDGNELDLSLSDLNEVPVKELAALPKATILDLSCNKLTTLPSDFCG

LTHLVKLDLSKNKLQQLPADFGRLVNLQHLDLLNNKLVTLPVSFAQLKNLKWLDLKDNPL

DPVLAKVAGDCLDEKQCKQCANKVLQHMKAVQADQERERQRRLEVEREAEKKREAKQRAK

EAQERELRKREKAEEKERRRKEYDALKAAKREQEKKPKKEANQAPKSKSGSRPREPPPRK

HTRSWAVLKLLLLLLLFGVAGGLVACRVTELQQQPLCTSVNTIYDNAVQGLRRHEILQWV

LQTDSQQ

60S Ribosomal Protein L37A. (RPL37A)
(e.g., GenBank Accession Number NP_000989 (SEQ ID NO: 149):
>refseqp|NP_000989|NP_000989 ribosomal protein L37a
[*Homo sapiens*].
MAKRTKKVGIVGKYGTRYGASTRKMVKKIEISQHAKYTCSFCGKTKMKRRAVGIWHCGSC

MKTVAGGAWTYNTTSAVTVKSAIRRLKELKDQ

Uridine-Cytidine Kinase 1-like 1 (UCKL1).
(e.g., GenBank Accession Number Q53HM1 (SEQ ID NO: 150):
>uniprot|Q53HM1|Q53HM1_HUMAN Uridine kinase;
MAAPPARADADPSPTSPPTARDTPGRQAEKSETACEDRSNAESLDRLLPPVGTGRSPRKR

TTSQCKSEPPLLRTSKRTIYTAGRPPWYNEHGTQSKEAFAIGLGGGSASGKTTVARMIIE

ALDVPWVVLLSMDSFYKVLTEQQQEQAAHNNFNFDHPDAFDFDLIIFTLKKLKQGKSVKV

PIYDFTTHSRKKDWKTLYGANVIIFEGIMAFADKTLLELLDMKIFVDTDSDIRLVRRLRR

DISERGRDIEGVIKQYNKFVKPSFDQYIQPTMRLADIVVPRGSGNTVAIDLIVQHVHSQL

EERELSVRAALASAHQCHPLPRTLSVLKSTPQVRGMHTIIRDKETSRDEFIFYSKRLMRL

LIEHALSFLPFQDCVVQTPQGQDYAGKCYAGKQITGVSILRAGETMEPALRAVCKDVRIG

TILIQTNQLTGEPELHYLRLPKDISDDHVILMDCTVSTGAAAMMAVRVLLDHDVPEDKIF

LLSLLMAEMGVHSVAYAFPRVRIITTAVDKRVNDLFRIIPGIGNFGDRYFGTDAVPDGSD

EEEVAYTG

Aldehyde Dehydrogenase 9A1 (ALDH9A1)
(e.g., GenBank Accession Number NP_00687 (SEQ ID NO: 151):
>refseqp|NP_000687|NP_000687 aldehyde dehydrogenase 9A1
[*homo sapiens*].
MFLRAGLAALSPLLRSLRPSPVAAMSTGTFVVSQPLNYRGGARVEPADASGTEKAFEPAT

GRVIATFTCSGEKEVNLAVQNAKAAFKIWSQKSGMERCRILLEAARIIREREDEIATMEC

INNGKSIFEARLDIDISWQCLEYYAGLAASMAGEHIQLPGGSFGYTRREPLGVCVGIGAW

NYPFQIASWKSAPALACGNAMVFKPSPFTPVSALLLAEIYSEAGVPPGLFNVVQGGAATG

-continued

QFLCQHPDVAKVSFTGSVPTGMKIMEMSAKGIKPVTLELGGKSPLIIFSDCDMNNAVKGA

LMANFLTQGQVCCNGTRVFVQKEILDKFTEEVVKQTQRIKIGDPLLEDTRMGPLINRPHL

ERVLGFVKVAKEQGAKVLCGGDIYVPEDPKLKDGYYMRPCVLTNCRDDMTCVKEEIFGPV

MSILSFDTEAEVLERANDTTFGLAAGVFTRDIQRAHRVVAELQAGTCFINNYNVSPVELP

FGGYKKSGFGRENGRVTIEYYSQLKTVCVEMGDVESAF

Isoform 3 Of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1)
(e.g., GenBank Accession Number Q16881 (SEQ ID NO: 152):
>uniprot|Q16881|TRXR1_HUMAN Thioredoxin reductase 1, cytoplasmic;
MGCAEGKAVAAAAPTELQTKGKNGDGRRRSAKDHHPGKTLPENPAGFTSTATADSRALLQ

AYIDGHSVVIFSRSTCTRCTEVKKLFKSLCVPYFVLELDQTEDGRALEGTLSELAAETDL

PVVFVKQRKIGGHGPTLKAYQEGRLQKLLKMNGPEDLPKSYDYDLIIIGGGSGGLAAAKE

AAQYGKKVMVLDFVTPTPLGTRWGLGGTCVNVGCIPKKLMHQAALLGQALQDSRNYGWKV

EETVKHDWDRMIEAVQNHIGSLNWGYRVALREKKVVYENAYGQFIGPHRIKATNNKGKEK

IYSAERFLIATGERPRYLGIPGDKEYCISSDDLFSLPYCPGKTLVVGASYVALECAGFLA

GIGLDVTVMVRSILLRGFDQDMANKIGEHMEEHGIKFIRQFVPIKVEQIEAGTPGRLRVV

AQSTNSEEIIEGEYNTVMLAIGRDACTRKIGLETVGVKINEKTGKIPVTDEEQTNVPYIY

AIGDILEDKVELTPVAIQAGRLLAQRLYAGSTVKCDYENVPTTVFTPLEYGACGLSEEKA

VEKFGEENIEVYHSYFWPLEWTIPSRDNNKCYAKIICNTKDNERVVGFHVLGPNAGEVTQ

GFAAALKCGLTKKQLDSTIGIHPVCAEVFTTLSVTKRSGASILQAGCUG

Nuclear Receptor Subfamily 2 Group E Member 1(NR2E1)
(e.g. , GenBank Accession Number NP_003260 (SEQ ID NO: 153):
>refseqp|NP_003260|NP_003260 nuclear receptor subfamily 2,
group E,member 1 [*Homo sapiens*].
MSKPAGSTSRILDIPCKVCGDRSSGKHYGVYACDGCSGFFKRSIRRNRTYVCKSGNQGGC

PVDKTHRNQCRACRLKKCLEVNMNKDAVQHERGPRTSTIRKQVALYFRGHKEENGAAAHF

PSAALPAPAFFTAVTQLEPHGLELAAVSTTPERQTLVSLAQPTPKYPHEVNGTPMYLYEV

ATESVCESAARLLFMSIKWAKSVPAFSTLSLQDQLMLLEDAWRELFVLGIAQWAIPVDAN

TLLAVSGMNGDNTDSQKLNKIISEIQALQEVVARFRQLRLDATEFACLKCIVTFKAVPTH

SGSELRSFRNAAAIAALQDEAQLTLNSYIHTRYPTQPCRFGKLLLLLPALRSISPSTIEE

VFFKKTIGNVPITRLLSDMYKSSDI

Cation Channel Sperm-Associated Protein 3 (CATSPER3)
(e.g., GenBank Accession Number NP 821138 (SEQ ID NO: 154):
>refseqp|NP_821138|NP_821138 cation channel, sperm associated 3
[*Homo sapiens*].
MSQHRHQRHSRVISSSPVDTTSVGFCPTFKKFKRNDDECRAFVKRVIMSRFFKIIMISTV

TSNAFFMALWTSYDIRYRLFRLLEFSEIFFVSICTSELSMKVYVDPINYWKNGYNLLDVI

IIIVMFLPYALRQLMGKQFTYLYIADGMQSLRILKLIGYSQGIRTLITAVGQTVYTVASV

LLLLFLLMYIFAILGFCLFGSPDNGDHDNWGNLAAAFFTLFSLATVDGWTDLQKQLDNRE

FALSRAFTIIFILLASFIFLNMFVGVMIMHTEDSIRKFERELMLEQQEMLMGEKQVILQR

QQEEISRLMHIQKNADCTSFSELVENFKKTLSHTDPMVLDDFGTSLPFIDIYFSTLDYQD

TTVHKLQELYYEIVHVLSLMLEDLPQEKPQSLEKVDEK

Transmembrane EMP24 Domain-Containing Protein 1 (TMED1)
(e.g., GenBank Accession Number NP_006849 (SEQ ID NO: 155):
>refseqp|NP_006849|NP_006849 interleukin 1 receptor-like 1
ligand precursor [*Homo sapiens*]
MMAAGAALALALWLLMPPVEVGGAGPPPIQDGEFTFLLPAGRKQCFYQSAPANASLETEY

QVIGGAGLDVDFTLESPQGVLLVSESRKADGVHTVEPTEAGDYKLCFDNSFSTISEKLVF

FELIFDSLQDDEEVEGWAEAVEPEEMLDVKMEDIKESIETMRTRLERSIQMLTLLRAFEA

RDRNLQEGNLERVNFWSAVNVAVLLLVAVLQVCTLKRFFQDKRPVPT

Protein FAM154A(FAM154A)
(e.g., GenBank Accession Number NP_714218 (SEQ ID NO: 156):
>refseqp|NP_714918|NP_714918 hypothetical protein LOC158297
[*Homo sapiens*].
MKTKCICELCSCGRHHCPHLPTKIYDETEKPCLLSEYTENYPFYHSYLPRESFKPRREYQ

KGSIPMEGLTTSRRDFGPHKVAPVKVHQYDQFVPSEENMDLLTTYKKDYNPYPVCRVDPI

KPRDSKYPCSDKMECLPTYKADYLPWNQPRREPLRLEHKYQPASVRFDNRTTHQDDYPIK

GLVKTISCKPLAMPKLCNIPLEDVTNYKMSYVAHPVEKRFVHEAEKFRPCEIPFESLTTQ

KQSYRGLMGEPAKSLKPLARPPGLDMPFCNTTEFRDKYQAWPMPRMFSKAPITYVPPEDR

MDLLTTVQAHYTCPKGAPAQSCRPALQIKKCGRFEGSSTTKDDYKQWSSMRTEPVKPVPQ

LDLPTEPLDCLTTTRAHYVPHLPINTKSCKPHWSGPRGNVPVESQTTYTISFTPKEMGRC

LASYPEPPGYTFEEVDALGHRIYKPVSQAGSQQSSHLSVDDSENPNQRELEVLA

Isoform 1 Of Transcriptional Repressor NF-X1 (NFX1)
(e.g., GenBank Accession Number NP_002495 (SEQ ID NO: 157):
>refseqp|NP_002495|NP_002495 nuclear transcription factor,
X-box binding 1 isoform 1 [*Homo sapiens*].
MAEAPPVSGTFKFNTDAAEFIPQEKKNSGLNCGTQRRLDSNRIGRRNYSSPPPCHLSRQV

PYDEISAVHQHSYHPSGSKPKSQQTSFQSSPCNKSPKSHGLQNQPWQKLRNEKHHIRVKK

AQSLAEQTSDTAGLESSTRSESGTDLREHSPSESEKEVVGADPRGAKPKKATQFVYSYGR

GPKVKGKLKCEWSNRTTPKPEDAGPESTKPVGVFHPDSSEASSRKGVLDGYGARRNEQRR

YPQKRPPWEVEGARPRPGRNPPKQEGHRHTNAGHRNNMGPIPKDDLNERPAKSTCDSENL

AVINKSSRRVDQEKCTVRRQDPQVVSPFSRGKQNHVLKNVETHTGSLIEQLTTEKYECMV

CCELVRVTAPVWSCQSCYHVFHLNCIKKWARSPASQADGQSGWRCPACQNVSAHVPNTYT

CFCGKVKNPEWSRNEIPHSCGEVCRKKQPGQDCPHSCNLLCHPGPCPPCPAFMTKTCECG

RTRHTVRCGQAVSVHCSNPCENILNCGQHQCAELCHGGQCQPCQIILNQVCYCGSTSRDV

LCGTDVGKSDGFGDFSCLKICGKDLKCGNHTCSQVCHPQPCQQCPRLPQLVRCCPCGQTP

LSQLLELGSSSRKTCMDPVPSCGKVCGKPLPCGSLDFIHTCEKLCHEGDCGPCSRTSVIS

CRCSFRTKELPCTSLKSEDATFMCDKRCNKKRLCGRHKCNEICCVDKEHKCPLICGRKLR

CGLHRCEEPCHRGNCQTCWQASFDELTCHCGASVIYPPVPCGTRPPECTQTCARVHECDH

PVYHSCHSEEKCPPCTFLTQKWCMGKHEFRSNIPCHLVDISCGLPCSATLPCGMHKCQRL

CHKGECLVDEPCKQPCTTPRADCGHPCMAPCHTSSPCPVTACKAKVELQCECGRRKEMVI

CSEASSTYQRIAAISMASKITDMQLGGSVEISKLITKKEVHQARLECDEECSALERKKRL

AEAFHISEDSDPFNIRSSGSKFSDSLKEDARKDLKFVSDVEKEMETLVEAVNKGKNSKKS

HSFPPMNRDHRRIIHDLAQVYGLESVSYDSEPKRNVVVTAIRGKSVCPPTTLTGVLEREM

QARPPPPIPHHRHQSDKNPGSSNLQKITKEPIIDYFDVQD

[0157] The invention illustratively described herein suitably can be practiced in the absence of any element or elements, limitation or limitations that are not specifically disclosed herein. Thus, for example, in each instance herein any of the terms "comprising", "consisting essentially of", and "consisting of" may be replaced with either of the other two terms, while retaining their ordinary meanings. The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention that in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by embodiments, optional features, modification and variation of the concepts herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention as defined by the description and the appended claims.

[0158] In addition, where features or aspects of the invention are described in terms of Markush groups or other grouping of alternatives, those skilled in the art will recognize that the invention is also thereby described in terms of any individual member or subgroup of members of the Markush group or other group.

EXAMPLES

Example 1

Paired Autologous Colon Adenocarcinoma and Healthy Tissue Specimens.

[0159] Colon adenocarcinoma stages I-IV and autologous healthy tissue from regions of the large bowel adjacent to the tumors were obtained from the Asterand XpressBank (Detroit, Mich.). The samples provided by Asterand had been harvested and quick frozen to preserve intact any potential antigen that was present at the time of harvest. Minimal degradation of the tissues was confirmed by the RNA profile. The tissues were stored at −80° C. until used.

Tissue and Sample Preparation for Generation of Polyclonal Antibodies in Chickens (YPAbs).

[0160] Approximately 50 mg of the frozen stages I-IV colon cancer tissue specimens were separately shaved, thawed on ice, and homogenized. The protein concentration of the samples were adjusted to 1 mg/ml, mixed with Freund's Complete Adjuvant and used to immunize and boost 2 chickens per sample. Colon cancer stages I-IV-specific immune YPAbs, obtained from the eggs three weeks following the following final boost, were tested for reactivity using western blotting against the corresponding stage-specific tumor tissue homogenate (data not shown). Strong and broadly reactive YPabs were purified from 6 eggs per chicken, aliquoted and stored at 4° C. until used. Only results for Stage IV colon cancer tissues are shown.

Assessment of Reactivity of Stage IV YPAbs with Pooled Sera of Patients Diagnosed with Stage IV Colon Cancer.

[0161] Reactivity was assessed using a dot immunoblot assay. The results, shown in FIG. **1**, indicate differential reactivity of spotted pooled sera from stage IV colon cancer patients when compared with spots of control serum from age, gender and ethnicity-matched healthy patients (spot 4), BSA (spot 3), and homogenates of healthy tissue (spot 1). A homogenate of stage IV cancer tissue was the positive control (spot 2).

Subtraction of Antibodies Reactive with Proteins Expressed by Healthy Tissue.

[0162] The high titer, broadly reactive YPAbs elicited by homogenates of tumor tissue from each of the 4 stages of colon cancer were repeatedly adsorbed using homogenates of healthy bowel tissue obtained from the autologous host. The proteins in the homogenate were bound to a solid support and the YPAbs were allowed to incubate overnight with gentle rocking at 4° C. Unbound antibodies were recovered and the adsorption process was repeated twice more until ELISA and western blots showed essentially no reactivity with proteins present in healthy tissue. Remaining antibodies were recovered and purified for use in the following steps. Alternatively, in one study, antibodies raised against stage IV tumor tissue were subtracted with serum from healthy subjects. The subtraction was performed by binding the serum components to a solid support and treating the antibody preparation as described above.

Change Mediated Antigen Capture and Protein Identification.

[0163] Unadsorbed antibodies were recovered, purified, and covalently bound to Dynabeads M-280 Tosyl-activated according to the manufacturer's (Dynal Biotech) directions to create "charged" magnetic beads. For immunocapture, homogenates (1 mg/ml) of the staged tumors were matched to their appropriately staged charged beads. Five ml of homogenates were incubated with 0.5 ml of charged beads for 1 h at 4° C. with tilt rotation. Following immunocapture, charged beads were washed with 10 bead volumes of wash buffer (PBS-0.2% NOG). Specifically bound proteins were elated with 1 M acetic acid. Many shed proteins were identified (sec SEQ ID NOs:1-157). The negative control consisted of elutants from an identical volume of uncharged beads used to immunocapture proteins from the homogenates. Proteins specifically bound by charged beads and controls were fractionated on 1D SDS-PAGE, stained with Coomassie blue, and sliced into sections. Protein bands contained in each gel slice were digested in-gel using the enzyme trypsin, eluted from the gel slice, and identified by GeLC-MS/MS and Mascot database searching (IP1 human protein database) at the University of Florida Interdisciplinary Center for Biotechnology Research (ICBR).

[0164] A similar format was used to pan serum of stage IV cancer patients for shed change mediated proteins. One ml of scrum from five patients (5 ml total) was pooled and incubated with 0.5 ml of charged beads for 1 h at 4° C. with tilt rotation. Following immunocapture, charged beads were washed with 10 bead volumes of wash buffer (PBS-0.2% NOG). Specifically bound proteins were eluted with 1 M acetic acid. Three shed proteins were identified, the details of which are shown in Table 1.

TABLE 1

PCMAT-identified shed proteins in pooled serum of patients with stage IV colon carcinoma

#	Protein	# of peptides	Comments
1 SEQ ID NO: 105	ApoA1	2	Associated with colon adenocarcinoma progression, and a confirmed marker of aggression
2 SEQ ID NO: 106	C4A	8	Complement component 4A of the classical activation pathway
3 SEQ ID NO: 107	C3 187 kDa protein	7	Complement component C3, which plays a central role in activation of both the classical and alternate complement systems

SEQUENCE LISTING

The patent application contains a lengthy "Sequence Listing" section. A copy of the "Sequence Listing" is available in electronic form from the USPTO web site (http://seqdata.uspto.gov/?pageRequest=docDetail&DocID=US20110151490A1). An electronic copy of the "Sequence Listing" will also be available from the USPTO upon request and payment of the fee set forth in 37 CFR 1.19(b)(3).

We claim:

1. A method of detecting cancer or a predisposition to developing cancer in a subject, comprising determining an expression level of a cancer-associated protein, polypeptide or polynucleotide selected from the group consisting of myeloblastin precursor (e.g., SEQ ID NO:29); Titin; HBA1; Insulin-like growth factor 1 receptor (IGF1R); Isoform 3 of zonadhesin precursor; latent transforming growth factor beta binding protein 4 (LTBP4); ASXL1 (additional sex combs like 1); beta globin (HBB); BMP15-bone morphogenetic protein; TRIM49; DNAJ homolog subfamily B member 11 precursor; uncharacterized hematopoietic stem/progenitor cells protein MDS027; uncharacterized protein ALB; isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor; isoform 2 of peripherin; mitochondrial 28S ribosomal protein S22; translation initiation factor EIF-2B subunit epsilon; estradiol 17-beta-dehydrogenase 1; XRCC6BP1; brain-specific angiogenesis inhibitor 1 precursor; isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2; hemoglobin subunit beta; isoform 1 of far upstream element-binding protein 1; GALECTIN-3; lysozyme C precursor; actin, alpha skeletal muscle; isoform M2 of pyruvate kinase isozymes M1/M2; AGR2; neutrophil defensin 1 precursor; uncharacterized protein PSME2; tubulin beta-2C chain; thiosulfate sulfurtransferase; heat shock 70 kDa protein 1; Ig kappa chain V-III region sie; macrophage migration inhibitory factor; isoform 1 of ATP synthase subunit D, mitochondrial; uncharacterized protein ENSP00000374051; isocitrate dehydrogenase [NADP] cytoplasmic; hemoglobin subunit delta; isoform 1 of splicing factor, arginine/serine-rich 7; isoform 1 of mRNA-capping enzyme; LON protease homolog, mitochondrial precursor; signal recognition particle 54 kDa protein; isoform long of galectin-9; integrin-linked protein kinase; bifunctional aminoacyl-tRNA synthetase; isoform 1 of zinc finger protein 207; inorganic pyrophosphatase; calponin-2; isoform 1 of muscleblind-like protein 3; cathepsin G precursor; zinc finger and BTB domain-containing protein 34; adenine phosphoribosyltransferase; 40S ribosomal protein S9; TALIN-1; leucine-rich repeat-containing protein 59; ATP synthase subunit alpha, mitochondrial precursor; isoform 7 of protein transport protein SEC31A; dihydroxyacetone kinase; protein similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2) isoform 4; 18 kDa protein (e.g., UNIPARC Accession Number IP100796554; cold agglutinin FS-1 L-chain; isoform 1 of heterogeneous nuclear ribonucleoprotein d0; DAZAP1/MEF2D fusion protein; POTE2; Keratin 18 (KRT18); PSME4 Isoform 1 of Proteasome activator complex subunit; Mitogen-activated protein kinase-activated protein kinase (MAPKAPK33); Complement component 1, s subcomponent (C1S); Lysozyme C precursor (LYZ); Keritin Type Cytoskeletal 20 (KRT20); RNASE3; Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1); CDNA FLJ25506 fis, clone CBR05185; Isoform B of fibulin-1 precursor (FBLN1); Nucleobindin 1 (NUCB1); Histone cluster 2, H2ba (HIST2H2BA); Tripartite motif-containing 28 (TRIM28); Peroxisomal D3, D2 enoyl-CoA isomerase (PECI); Peptidylprolyl isomerase B (PPIB); Similar to 40S ribosomal protein S17; Eukaryotic translation elongation factor 1 gamma (EEF1G); Keratin 8 (KRT8); Fibulin 2 (FBLN2); VIM; Fibrinogen alpha chain (FGA); Annexin A2 (ANXA2); H2A histone family, member J (H2AFJ); Actin alpha, cardiac muscle 1 (ACTC1); Keratin 19 (KRT19); Immunoglobin lambda locus (IGL@protein); Immunoglobulin heavy constant mu (IGHM); EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1); Tripartite motif-containing protein 34; Isoform 3 of AP1-subunit Gamma Binding Protein 1; Proflin-1; Histone H4; Hemoglobin subunit alpha; Transgelin); Lumican precursor; Hemoglobin Beta; Fibrinogen Beta Chain Precursor; Immunoglobulin kappa constant (IGKC); Uncharacterized Protein ALB; ApoA1; C4A; C3 187 kDa protein; Actin, Cytoplasmic 1 (actin beta); Hemoglobin beta; Hemoglobin subunit alpha; POTE-2 alpha actin; SLC4A10; Ribonuclease P Protein Subunit P20 (POP7); Nuclear RNA export factor 1 (NXF1); UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA; Uncharacterized Protein C13ORF27; Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor; Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10); Gap junction alpha-1 protein (GJA1/Connexion 43); Isoform 1 Of Kinesin-Like Protein KIF25 (KIF25); GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase; Uncharacterized Protein ALB; Galectin-3, LGALS3; Similar to NAC-Alpha Domain-Containing Protein 1 (NACAD); Acetyl-CoA Acetyltransferase, Mitochondrial, ACAT1; KH-Type Splicing Regulatory Protein, FUBP2; Profilin 1(PFN1); Chloride Intracellular Channel Protein 1, CLIC1; Zinc Finger Protein 831; Endoplasmin; Ribosomal Protein S10 (RPS10); Splicing Factor, Arginine/Serine-Rich 3; ACTA2 Protein (alpha actin, smooth muscle); Isoform 1 of Sodium Channel Protein Type 8 Subunit Alpha, SCN8A; Isoform Long of Galectin-9; T-Complex Protein 1 Subunit Epsilon, CCT5; Alpha-Enolase, Lung Specific; Proto-Oncogene Serine/Threonine-Protein Kinase MOS; Isoform 1 Of Beta-Adducin (ADD2); Apolipoprotein E (APOE); Ubiquilin-4 (UBQLN4) (ataxin-1 ubiquitin-like interacting protein); Sumo-Conjugating Enzyme UB21 (UBC9 homolog in yeast); Myosin-15 (MYH15); FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK); Intelectin-1 (ITLN1); Apolipoprotein A-IV (APOA4); Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1); Leucine-Rich Repeat-Containing Pro-

tein 59 (LRRC59); 60S Ribosomal Protein L37A (RPL37A); Uridine-Cytidine Kinase 1-like 1 (UCKL1); Aldehyde Dehydrogenase 9A1 (ALDH9A1); Isoform 3 of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1); Nuclear Receptor Subfamily 2 Group E Member 1 (NR2E1); Cation Channel Sperm-Associated Protein 3 (CATSPER3); Transmembrane EMP24 Domain-Containing Protein 1 (TMED1); Protein FAM154A (FAM154A); and Isoform 1 of Transcriptional Repressor NF-X1 (NFX1) or any combinations thereof; in a biological sample from the subject, wherein an increase of the expression level of the cancer-associated protein, polypeptide, or polynucleotide in the biological sample as compared to a control sample indicates that the subject has cancer or has a predisposition to developing cancer.

2. The method of claim **1**, wherein the protein or polypeptide comprises an amino acid sequence set forth as SEQ ID NO:1-157.

3. The method of claim **1**, wherein the cancer is colorectal cancer.

4. The method of claim **1**, wherein the method further comprises determining the expression level of two or more of the cancer-associated proteins, polypeptides, or polynucleotides.

5. The method of claim **1**, wherein the expression level of the cancer-associated polynucleotide, polypeptide or protein is determined by a method selected from group consisting of: (a) detecting the presence or amount of the polypeptide, protein, or polynucleotide, (b) detecting mRNA of the cancer-associated polynucleotide, and (c) detecting the biological activity of the protein or polypeptide encoded by the cancer-associated polynucleotide.

6. The method of claim **1**, wherein the biological sample comprises cells, cell extracts, tissue, bodily fluid, bodily fluid substantially lacking cells, serum, urine, tears, milk, seminal fluid, prostatic fluid, lung lavage fluid, saliva, mucosal cells, tumor cells, cancer cells, a biopsy sample, a lavage sample, a sputum sample, a serum sample, a plasma sample, a blood sample, a fecal sample, a lymph node sample, a bone marrow sample, a urine sample, a tissue sample, a colorectal tissue sample, or a pleural effusion sample.

7. The method of claim **5**, wherein the expression level of the cancer-associated protein or polypeptide is determined by detecting the level of the polypeptide expression in the sample using an antibody or antigen-binding fragment thereof that specifically binds to the polypeptide.

8. An isolated antibody, or antigen-binding fragment thereof, that specifically binds to a protein or polypeptide selected from the group consisting of Titin; HBA1; Insulin-like growth factor 1 receptor (IGF1R); Isoform 3 of zonadhesin precursor; latent transforming growth factor beta binding protein 4 (LTBP4); ASXL1 (additional sex combs like 1); beta globin (HBB); BMP15-bone morphogenetic protein; TRIM49; DNAJ homolog subfamily B member 11 precursor; uncharacterized hematopoietic stem/progenitor cells protein MDS027; uncharacterized protein ALB; isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor; isoform 2 of peripherin; mitochondrial 28S ribosomal protein S22; translation initiation factor EIF-2B subunit epsilon; estradiol 17-beta-dehydrogenase 1; XRCC6BP1; brain-specific angiogenesis inhibitor 1 precursor; isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2; hemoglobin subunit beta; isoform 1 of far upstream element-binding protein 1; GALECTIN-3; lysozyme C precursor; actin, alpha skeletal muscle; isoform M2 of pyruvate kinase isozymes M1/M2; AGR2; neutrophil defensin 1 precursor; myeloblastin precursor; uncharacterized protein PSME2; tubulin beta-2C chain; thiosulfate sulfurtransferase; heat shock 70 kDa protein 1; Ig kappa chain V-III region sie; macrophage migration inhibitory factor; isoform 1 of ATP synthase subunit D, mitochondrial; uncharacterized protein ENSP00000374051; isocitrate dehydrogenase [NADP] cytoplasmic; hemoglobin subunit delta; isoform 1 of splicing factor, arginine/serine-rich 7; isoform 1 of mRNA-capping enzyme; LON protease homolog, mitochondrial precursor; signal recognition particle 54 kDa protein; isoform long of galectin-9; integrin-linked protein kinase; bifunctional aminoacyl-tRNA synthetase; isoform 1 of zinc finger protein 207; inorganic pyrophosphatase; calponin-2; isoform 1 of muscleblind-like protein 3; cathepsin G precursor; zinc finger and BTB domain-containing protein 34; adenine phosphoribosyltransferase; 40S ribosomal protein S9; TALIN-1; leucine-rich repeat-containing protein 59; ATP synthase subunit alpha, mitochondrial precursor; isoform 7 of protein transport protein SEC31A; dihydroxyacetone kinase; protein similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2) isoform 4; 18 kDa protein (e.g., UNIPARC Accession Number IP100796554; cold agglutinin FS-1 L-chain; isoform 1 of heterogeneous nuclear ribonucleoprotein d0; DAZAP1/MEF2D fusion protein; POTE2; Keratin 18 (KRT18); PSME4 Isoform 1 of Proteasome activator complex subunit; Mitogen-activated protein kinase-activated protein kinase (MAPKAPK33); Complement component 1, s subcomponent (C1S); Lysozyme C precursor (LYZ); Keritin Type Cytoskeletal 20 (KRT20); RNASE3; Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1); CDNA FLJ25506 fis, clone CBR05185; Isoform B of fibulin-1 precursor (FBLN1); Nucleobindin 1 (NUCB1); Histone cluster 2, H2ba (HIST2H2BA); Tripartite motif-containing 28 (TRIM28); Peroxisomal D3, D2 enoyl-CoA isomerase (PECI); Peptidylprolyl isomerase B (PPIB); Similar to 40S ribosomal protein S17; Eukaryotic translation elongation factor 1 gamma (EEF1G); Keratin 8 (KRT8); Fibulin 2 (FBLN2); VIM; Fibrinogen alpha chain (FGA); Annexin A2 (ANXA2); H2A histone family, member J (H2AFJ); Actin alpha, cardiac muscle 1 (ACTC1); Keratin 19 (KRT19); Immunoglobin lambda locus (IGL@protein); Immunoglobulin heavy constant mu (IGHM); EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1); Tripartite motif-containing protein 34; Isoform 3 of AP1-subunit Gamma Binding Protein 1; Proflin-1; Histone H4; Hemoglobin subunit alpha; Transgelin); Lumican precursor; Hemoglobin Beta; Fibrinogen Beta Chain Precursor; Immunoglobulin kappa constant (IGKC); Uncharacterized Protein ALB; ApoA1; C4A; C3 187 kDa protein; Actin, Cytoplasmic 1 (actin beta); Hemoglobin beta; Hemoglobin subunit alpha; POTE-2 alpha actin; SLC4A10; Ribonuclease P Protein Subunit P20 (POP7); Nuclear RNA export factor 1 (NXF1); UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA; Uncharacterized Protein C13ORF27; Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor; Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10); Gap junction alpha-1 protein (GJA1/Connexion 43); Isoform 1 Of Kinesin-Like Protein KIF25 (KIF25); GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase; Uncharacterized Protein ALB; Galectin-3, LGALS3; Similar to NAC-Alpha Domain-Containing Protein 1 (NACAD); Acetyl-CoA Acetyltransferase, Mitochondrial, ACAT1; KH-Type Splicing Regula-

tory Protein, FUBP2; Profilin 1 (PFN1); Chloride Intracellular Channel Protein 1, CLIC1; Zinc Finger Protein 831; Endoplasmin; Ribosomal Protein S10 (RPS10); Splicing Factor, Arginine/Serine-Rich 3; ACTA2 Protein (alpha actin, smooth muscle); Isoform 1 of Sodium Channel Protein Type 8 Subunit Alpha, SCN8A; Isoform Long of Galectin-9; T-Complex Protein 1 Subunit Epsilon, CCT5; Alpha-Enolase, Lung Specific; Proto-Oncogene Serine/Threonine-Protein Kinase MOS; Isoform 1 Of Beta-Adducin (ADD2); Apolipoprotein E (APOE); Ubiquilin-4 (UBQLN4) (ataxin-1 ubiquitin-like interacting protein); Sumo-Conjugating Enzyme UB21 (UBC9 homolog in yeast); Myosin-15 (MYH15); FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK); Intelectin-1 (ITLN1); Apolipoprotein A-IV (APOA4); Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1); Leucine-Rich Repeat-Containing Protein 59 (LRRC59); 60S Ribosomal Protein L37A (RPL37A); Uridine-Cytidine Kinase 1-like 1 (UCKL1); Aldehyde Dehydrogenase 9A1 (ALDH9A1); Isoform 3 of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1); Nuclear Receptor Subfamily 2 Group E Member 1 (NR2E1); Cation Channel Sperm-Associated Protein 3 (CATSPER3); Transmembrane EMP24 Domain-Containing Protein 1 (TMED1); Protein FAM154A (FAM154A); and Isoform 1 of Transcriptional Repressor NF-X1 (NFX1) or any combination thereof.

9. The isolated antibody of claim **8**, wherein the protein or polypeptide comprises an amino acid sequence set forth as SEQ ID NO:1-157.

10. The isolated antibody of claim **8**, wherein the antibody is a monoclonal antibody, a polyclonal antibody, a single-chain antibody, a monospecific single-chain antibody, a bispecific single-chain antibody, a bivalent single-chain antibody, a tetravalent single-chain antibody, a chimeric antibody, an antigen-binding fragment of an antibody, or a humanized antibody.

11. (canceled)

12. (canceled)

13. (canceled)

14. (canceled)

15. A kit for the detection of cancer in a mammal, the kit comprising (a) an antibody or antigen-binding fragment thereof, wherein in the antibody or antigen-binding fragment thereof specifically binds an epitope of a protein or polypeptide selected from the group consisting of Titin; HBA1; Insulin-like growth factor 1 receptor (IGF1R); Isoform 3 of zonadhesin precursor; latent transforming growth factor beta binding protein 4 (LTBP4); ASXL1 (additional sex combs like 1); beta globin (HBB); BMP15-bone morphogenetic protein; TRIM49; DNAJ homolog subfamily B member 11 precursor; uncharacterized hematopoietic stem/progenitor cells protein MDS027; uncharacterized protein ALB; isoform 3 of sushi, nidogen and EGF-like domain-containing protein 1 precursor; isoform 2 of peripherin; mitochondrial 28S ribosomal protein S22; translation initiation factor EIF-2B subunit epsilon; estradiol 17-beta-dehydrogenase 1; XRCC6BP1; brain-specific angiogenesis inhibitor 1 precursor; isoform 2 of ring finger and CCCH-type zinc finger domain-containing protein 2; hemoglobin subunit beta; isoform 1 of far upstream element-binding protein 1; GALECTIN-3; lysozyme C precursor; actin, alpha skeletal muscle; isoform M2 of pyruvate kinase isozymes M1/M2; AGR2; neutrophil defensin 1 precursor; myeloblastin precursor; uncharacterized protein PSME2; tubulin beta-2C chain; thiosulfate sulfurtransferase; heat shock 70 kDa protein 1; Ig kappa chain V-III region sie; macrophage migration inhibitory factor; isoform 1 of ATP synthase subunit D, mitochondrial; uncharacterized protein ENSP00000374051; isocitrate dehydrogenase [NADP] cytoplasmic; hemoglobin subunit delta; isoform 1 of splicing factor, arginine/serine-rich 7; isoform 1 of mRNA-capping enzyme; LON protease homolog, mitochondrial precursor; signal recognition particle 54 kDa protein; isoform long of galectin-9; integrin-linked protein kinase; bifunctional aminoacyl-tRNA synthetase; isoform 1 of zinc finger protein 207; inorganic pyrophosphatase; calponin-2; isoform 1 of muscleblind-like protein 3; cathepsin G precursor; zinc finger and BTB domain-containing protein 34; adenine phosphoribosyltransferase; 40S ribosomal protein S9; TALIN-1; leucine-rich repeat-containing protein 59; ATP synthase subunit alpha, mitochondrial precursor; isoform 7 of protein transport protein SEC31A; dihydroxyacetone kinase; protein similar to heterogeneous nuclear ribonucleoproteins C1/C2 (HNRNP C1/HNRNP C2) isoform 4; 18 kDa protein (e.g., UNIPARC Accession Number IP100796554; cold agglutinin FS-1 L-chain; isoform 1 of heterogeneous nuclear ribonucleoprotein d0; DAZAP1/MEF2D fusion protein; POTE2; Keratin 18 (KRT18); PSME4 Isoform 1 of Proteasome activator complex subunit; Mitogen-activated protein kinase-activated protein kinase (MAPKAPK33); Complement component 1, s subcomponent (C1S); Lysozyme C precursor (LYZ); Keritin Type Cytoskeletal 20 (KRT20); RNASE3; Aldehyde dehydrogenase X, mitochondrial precursor (ALDH1B1); CDNA FLJ25506 fis, clone CBR05185; Isoform B of fibulin-1 precursor (FBLN1); Nucleobindin 1 (NUCB1); Histone cluster 2, H2ba (HIST2H2BA); Tripartite motif-containing 28 (TRIM28); Peroxisomal D3, D2 enoyl-CoA isomerase (PECI); Peptidylprolyl isomerase B (PPIB); Similar to 40S ribosomal protein S17; Eukaryotic translation elongation factor 1 gamma (EEF1G); Keratin 8 (KRT8); Fibulin 2 (FBLN2); VIM; Fibrinogen alpha chain (FGA); Annexin A2 (ANXA2); H2A histone family, member J (H2AFJ); Actin alpha, cardiac muscle 1 (ACTC1); Keratin 19 (KRT19); Immunoglobin lambda locus (IGL@protein); Immunoglobulin heavy constant mu (IGHM); EGF-containing fibulin-like extracellular matrix protein 1 (EFEMP1); Tripartite motif-containing protein 34; Isoform 3 of AP1-subunit Gamma Binding Protein 1; Proflin-1; Histone H4; Hemoglobin subunit alpha; Transgelin); Lumican precursor; Hemoglobin Beta; Fibrinogen Beta Chain Precursor; Immunoglobulin kappa constant (IGKC); Uncharacterized Protein ALB; ApoA1; C4A; C3 187 kDa protein; Actin, Cytoplasmic 1 (actin beta); Hemoglobin beta; Hemoglobin subunit alpha; POTE-2 alpha actin; SLC4A10; Ribonuclease P Protein Subunit P20 (POP7); Nuclear RNA export factor 1 (NXF1); UVEAL Autoantigen With Coiled-Coil Domains And Ankyrin Repeats, UACA; Uncharacterized Protein C13ORF27; Isoform 3 of Sushi, Nidogen And EGF-Like Domain-Containing Protein 1 Precursor; Isoform 1 Of Dynein Heavy Chain 10, Axonemal (DNAH10); Gap junction alpha-1 protein (GJA1/Connexion 43); Isoform 1 Of Kinesin-Like Protein KIF25 (KIF25); GAPDH-Glyceraldehyde-3-Phosphate Dehydrogenase; Uncharacterized Protein ALB; Galectin-3, LGALS3; Similar to NAC-Alpha Domain-Containing Protein 1 (NACAD); Acetyl-CoA Acetyltransferase, Mitochondrial, ACAT1; KH-Type Splicing Regulatory Protein, FUBP2; Profilin 1 (PFN1); Chloride Intracellular Channel Protein 1, CLIC1; Zinc Finger Protein 831; Endoplasmin; Ribosomal Protein S10 (RPS10); Splic-

ing Factor, Arginine/Serine-Rich 3; ACTA2 Protein (alpha actin, smooth muscle); Isoform 1 of Sodium Channel Protein Type 8 Subunit Alpha, SCN8A; Isoform Long of Galectin-9; T-Complex Protein 1 Subunit Epsilon, CCT5; Alpha-Enolase, Lung Specific; Proto-Oncogene Serine/Threonine-Protein Kinase MOS; Isoform 1 Of Beta-Adducin (ADD2); Apolipoprotein E (APOE); Ubiquilin-4 (UBQLN4) (ataxin-1 ubiquitin-like interacting protein); Sumo-Conjugating Enzyme UB21 (UBC9 homolog in yeast); Myosin-15 (MYH15); FLJ93091, *Homo Sapiens* UMP-CMP Kinase (UMP-CMPK); Intelectin-1 (ITLN1); Apolipoprotein A-IV (APOA4); Mitochondrial pyruvate dehydrogenase (lipoamide) alpha 1 (PDHA1); Leucine-Rich Repeat-Containing Protein 59 (LRRC59); 60S Ribosomal Protein L37A (RPL37A); Uridine-Cytidine Kinase 1-like 1 (UCKL1); Aldehyde Dehydrogenase 9A1 (ALDH9A1); Isoform 3 of Thioredoxin Reductase 1, Cytoplasmic (TXNRD1); Nuclear Receptor Subfamily 2 Group E Member 1 (NR2E1); Cation Channel Sperm-Associated Protein 3 (CATSPER3); Transmembrane EMP24 Domain-Containing Protein 1 (TMED1); Protein FAM154A (FAM154A); and Isoform 1 of Transcriptional Repressor NF-X1 (NFX1) or any combinations thereof; and (b) one or more reagents for detecting a binding reaction between the antibody and the polypeptide.

16. The kit of claim **15**, wherein the protein or polypeptide comprises an amino acid sequence set forth as SEQ ID NO:1-157.

17.-**50**. (canceled)

51. The isolated antibody or antigen-binding fragment thereof of claim **8**, wherein the isolated antibody or antigen-binding fragment thereof specifically binds to the protein or polypeptide with a binding affinity K_a of 10^7 l/mol or more.

52. The isolated antibody or antigen-binding fragment thereof of claim **8**, wherein the isolated antibody or antigen-binding fragment thereof is bound to a support.

53. The isolated antibody or antigen-binding fragment thereof of claim **8**, wherein the isolated antibody or antigen-binding fragment is labeled.

54. The method of claim **1**, wherein the biological sample is obtained from the subject before, during, or after treatment for cancer.

55. The method of claim **7**, wherein the antibody or antigen-binding fragment thereof is labeled.

56. The method of claim **7**, wherein the antibody or antigen-binding fragment thereof is bound to a support.

57. The method of claim **7**, wherein the antibody or antigen-binding fragment thereof specifically binds to the polypeptide with a binding affinity K_a of 10^7 l/mol or more.

58. The method of claim **1**, wherein the expression level of the cancer-associated protein or polypeptide is detected using mass spectrometry, an ELISA, an immunohistochemical assay, an immunocytochemical assay, or a flow cytometry assay of antibody-labeled cells.

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专利名称(译)	用于检测和治疗结肠直肠癌的组合物		
公开(公告)号	US20110151490A1	公开(公告)日	2011-06-23
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[标]申请(专利权)人(译)	奥洁克公司		
申请(专利权)人(译)	ORAGENICS INC.		
当前申请(专利权)人(译)	ORAGENICS INC.		
[标]发明人	HILLMAN JEFFREY D JOHN MANOHAR		
发明人	HILLMAN, JEFFREY D. JOHN, MANOHAR		
IPC分类号	G01N33/53 C07K16/18 C07K16/22 C07K16/26		
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摘要(译)

本发明提供鉴定在一种环境条件下而不是在第二种环境条件下由细胞表达的蛋白质和多肽及其同源多核苷酸的方法。本发明还提供用于治疗和检测癌症（包括结肠直肠癌）的组合物。