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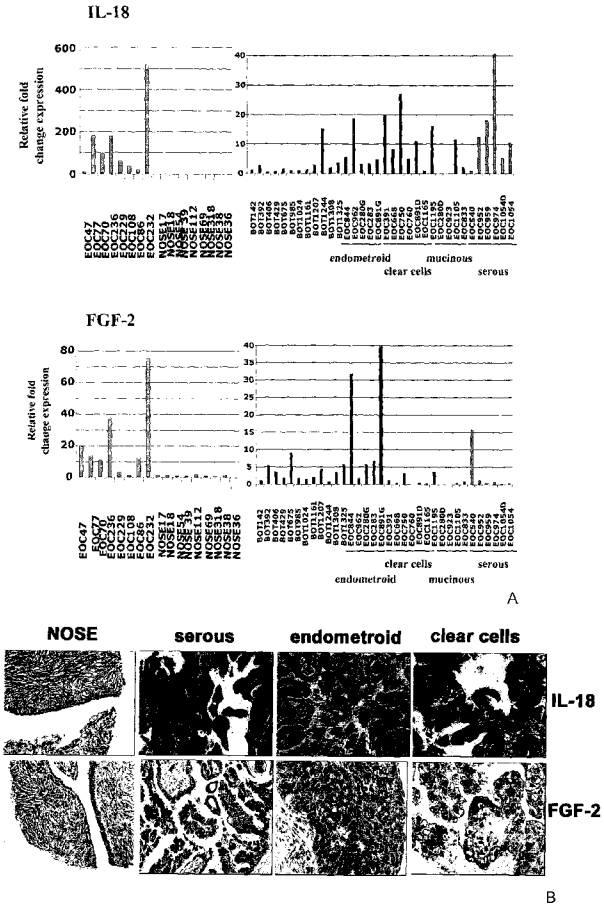
(54) Title: METHODS OF DIAGNOSING OVARIAN CANCER AND KITS THEREFOR



(57) Abstract: A method comprising: providing a biological sample from a subject (subject sample); and detecting the expression level of each of the markers FGF-2 and CA125 in the subject sample. A kit comprising means for detection of an expression level of each of markers CA125 and FGF-2 in a biological sample from a subject (subject sample), and instructions to use said markers in a method of the present invention.

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TITLE OF THE INVENTION

[0001] METHODS OF DIAGNOSING OVARIAN CANCER AND KITS THEREFOR

CROSS REFERENCE TO RELATED APPLICATIONS

[0002] This application claims the benefit of United States Provisional Patent Application No. 60/716,941 filed September 15, 2005, which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0003] The present invention relates to methods of diagnosing ovarian cancer and kits therefor. More particularly, the present invention relates to the identification of markers associated with ovarian cancer and their use to detect ovarian cancer. The invention further relates to methods and reagents for the diagnosis of ovarian cancer.

BACKGROUND OF THE INVENTION

[0004] Epithelial ovarian carcinoma (EOC) is the most common malignant ovarian tumor, representing 80% of all ovarian malignancies (1). EOCs are thought to originate from either the normal ovarian surface epithelium (OSE) itself or from the crypts and inclusion cysts located in the stroma (1). EOCs are heterogeneous and are designated according to their histological subtype: serous, endometrioid, mucinous, clear cell, Brenner, undifferentiated or mixed (association of two or more sub-types) (2, 3). This cancer is often asymptomatic where over 70% of patients with ovarian cancer are diagnosed at an advanced stage of the disease. While up to 80% of the patients will initially respond to treatment, recurrence is generally observed within variable time intervals. Although 10-15% of the patients achieve and maintain a complete response to therapy, the remaining patients show persistent disease or eventually relapse thus requiring additional treatment. In contrast, borderline or low malignant potential (LMP) tumors, which represent 10-20% of all EOCs, have a more favorable prognosis compared to the invasive form of the disease, where the 5-year survival rate falls below 30% (1, 4).

[0005] Currently, there is no reliable method for screening early stage ovarian cancer. The clinically used CA125 serum marker (5) combined with trans-vaginal sonography, 3-dimensional ultrasound or power Doppler have yielded only minimal results (6). The reduced efficacy of CA125 for screening is largely related to its poor specificity. While elevated levels of CA125 are generally associated with the malignant disease, increased serum CA125 levels have also been observed with benign conditions (7), non-neoplastic conditions such as first trimester of pregnancy, menstruation, endometriosis, uterine fibrosis, acute salphingitis, hepatic diseases and inflammation of peritoneum, pericardium or pleura as well as with cancers of other sites. In addition, CA125 levels generally fail to rise in early stage disease, and lower levels are also associated with endometrioid and mucinous ovarian tumors (8). Thus, there is a need to develop reliable screening tools for EOC as these would be extremely valuable for improving cancer detection, clinical management and subsequently impact positively on survival.

[0006] Microarray technology is a powerful method for the analysis of cancer-specific gene expression by measuring tumor-specific expression of thousands of genes in hundreds of tumors (9), which can then be associated with specific clinical parameters. Candidate genes for diagnostic markers can further be characterized in combination with a large-scale quantitative polymerase chain reaction (Q-PCR) of RNA and immunohistochemical (IHC) analysis of protein expression using tissue arrays. However, such diagnostic techniques are difficult to implement since they require surgery to obtain the epithelial ovarian samples. Alternatively, if the differentially expressed gene encodes for a secreted protein circulating in peripheral blood, such a protein represents a potential serum based marker. The most common approach for testing such peripheral blood markers is through an enzyme-linked immunosorbent assay (ELISA). Although previous studies have investigated the potential of prostasin, osteopontin, mesothelin and HE4 (10-13) as diagnostic markers of EOC, no single marker has been shown to be sufficiently sensitive nor specific for proper diagnosis of ovarian cancer. Various combinations of different tumor markers have shown a higher specificity in differentiating benign from malignant disease (13, 14). However the efficacy and/or sensitivity of these markers were limited to advanced stage serous subtype tumors.

[0007] Therefore, ovarian cancer still remains a major source of morbidity and mortality and there is a clear need for the development of novel diagnosis method having the required sensitivity and specificity for early and reliable detection of ovarian cancer.

[0008] The present description refers to a number of documents, the content of which is herein incorporated by reference in their entirety.

[0009] Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of specific embodiments thereof, given by way of example only with reference to the accompanying drawings.

SUMMARY OF THE INVENTION

[0010] The invention relates to markers associated with ovarian cancer and corresponding methods, uses and products (e.g. probes, collections, kits, etc.) for the diagnosis of ovarian cancer.

[0011] Accordingly, in a first aspect, the invention provides a method comprising:

(a) providing a biological sample from a subject (subject sample); and

(b) detecting the expression level of each of the markers FGF-2 and CA125 in the subject sample.

[0012] In an embodiment, the above-mentioned subject is susceptible of having ovarian cancer.

[0013] In an embodiment, the above-mentioned subject is asymptomatic for ovarian cancer.

[0014] In an embodiment, the above-mentioned method further comprises:

(c) comparing the expression level of each of the markers in the subject sample to corresponding pre-determined threshold expression levels for each of the markers, wherein an expression level of each of

the markers in the subject sample that is higher than the pre-determined threshold expression levels for each of the markers is an indication that the subject is affected by ovarian cancer.

[0015] In an embodiment, the above-mentioned method further comprises:

(c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a control sample, wherein an expression level of each of the markers that is higher in the subject sample than in the control sample is an indication that the subject is affected by ovarian cancer

[0016] In an embodiment, the above-mentioned method further comprises:

(c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a sample from the subject at an earlier time, wherein an expression level of each of the markers that is higher in the subject sample than in the sample from the subject at an earlier time is an indication that the subject is affected by ovarian cancer.

[0017] In an embodiment, the above-mentioned method further comprises:

(c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a non-cancerous sample from the subject, wherein an expression level of each of the markers that is higher in the subject sample than in the non-cancerous sample from the subject is an indication that the subject is affected by ovarian cancer.

[0018] In an embodiment, the above-mentioned threshold expression level for each of the markers is determined by Receiver Operator Curves comparing the concentration of each of the markers in an ovarian cancer-free control population with that in a population affected by ovarian cancer.

[0019] In an embodiment, the above-mentioned expression is determined at the polypeptide level. In a further embodiment, the expression is determined using an immunoassay. In a further embodiment, the immunoassay is enzyme-linked immunosorbent assay (ELISA).

[0020] In an embodiment, the expression level of each of the above-mentioned markers is above the following pre-determined threshold expression levels: 50 U/ml for CA125 and 37 pg/ml for FGF-2.

[0021] In an embodiment, step (b) of the above-mentioned further comprises detecting the concentration of marker IL-18 in the sample.

[0022] In an embodiment, step (b) of the above-mentioned further comprises detecting the concentration of marker IL-18 in the sample, and the expression level of IL-18 in the sample is above the pre-determined threshold expression level of 215 pg/ml for this marker.

[0023] In an embodiment, the above-mentioned subject sample is a body fluid sample. In a further embodiment, the above-mentioned subject sample is selected from the group consisting of blood, plasma and serum. In a further embodiment, the above-mentioned subject sample is serum.

[0024] In an embodiment, the above-mentioned subject sample is primary culture cells derived from an ovarian tumor sample from the subject.

[0025] In an embodiment, the above-mentioned method is *in vitro*.

[0026] In an other aspect, the present invention provides a kit comprising means for detection of an expression level of each of markers CA125 and FGF-2 in a biological sample from a subject (subject sample), and instructions to use said markers in a method as recited above.

[0027] In an embodiment, the above-mentioned kit further comprises means for detection of an expression level of marker IL-18.

[0028] In an embodiment, the above-mentioned means for detection of expression level of each of the markers are antibodies.

[0029] In an other aspect, the invention provides a method of assessing the potential efficacy of a test compound for treating or inhibiting ovarian cancer in a subject, said method comprising determining the expression level of each of markers CA125 and FGF-2 in a biological sample from the subject (subject sample), before and after administration of the test compound to the subject, wherein a decrease in the expression level of the markers after administration of the test compound is indicative that said test compound is effective for treating or inhibiting ovarian cancer.

[0030] In an other aspect, the invention provides a method of assessing the potential efficacy of a therapy for treating or inhibiting ovarian cancer in a subject, said method comprising determining the expression level of each of markers CA125 and FGF-2 in a biological sample from the subject (subject sample), before and after administration of said therapy in said subject, wherein a decrease in the expression level of said markers after administration of said therapy is indicative that said therapy is effective for treating or inhibiting ovarian cancer.

[0031] In an embodiment of the above-mentioned methods, the methods further comprise detecting the concentration of marker IL-18 in the sample. In an embodiment, the above-mentioned expression is determined at the polypeptide level. In a further embodiment, the expression is determined using an immunoassay. In a further embodiment, the immunoassay is enzyme-linked immunosorbent assay (ELISA).

[0032] In an embodiment, the above-mentioned sample is a body fluid sample. In a further embodiment, the above-mentioned sample is selected from the group consisting of blood, plasma and serum. In a further embodiment, the above-mentioned sample is serum.

[0033] In an embodiment, the above-mentioned subject is a human.

[0034] In an embodiment, the above-mentioned ovarian cancer is epithelial ovarian carcinoma (EOC).

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] In the appended drawings:

[0036] Figure 1 shows validation of gene expression profiles by Q-PCR on primary culture samples. (A) Two micrograms of RNA extracted from 9 NOSE and 8 primary culture cells of EOC were reverse-transcribed and the levels of IL-18 and FGF-2 quantified using specific primers (left hand panels). Each expression level was normalized to that of the control RNA. Relative fold change expression is the ratio of the NOSE 18 gene expression to that of other samples. Three micrograms of RNA extracted from 12 BOT (benign ovarian tumor) tissues and 22 EOC tissues were reverse-transcribed and the levels of IL-18 and FGF-2 quantified as in the left hand panels (right hand panels). Each expression level was normalized to that of the control RNA. Relative fold change expression is the ratio of the BOT142 gene expression to that of other samples; (B) shows the expression of IL-18 and FGF-2 in normal ovarian surface epithelial (NOSE) tissues and four histopathologies of EOC tissues. IHC was performed using antibodies against indicated proteins (left). Nuclei are counterstained with hematoxylin (blue). Brown color demonstrates specific peroxidase staining;

[0037] Figure 2 shows serum measurement of CA125 (A) IL-18 (B) and FGF-2 (C) by ELISA. Patients sera was tested for all CA125, IL-18 and FGF-2 and threshold levels (dashed lines) were determined for each serum marker. Solid lines show the median level of the serum marker for each group of patients. LMP: low malignant potential tumor patients (n=5). NOSE: normal ovarian surface epithelia patients (n=11). BOT: benign ovarian tumor patients (n=23). TOV: ovarian tumor patients (equivalent to EOC: invasive epithelial ovarian cancer patients) (n=42);

[0038] Figure 3 presents nucleic acid (SEQ ID NO: 1) and polypeptide (SEQ ID NO: 2) sequences for CA125;

[0039] Figure 4 presents nucleic acid (SEQ ID NO: 3) and polypeptide (SEQ ID NO: 4) sequences for IL-18; and

[0040] Figure 5 presents nucleic acid (SEQ ID NO: 5) and polypeptide (SEQ ID NO: 6) sequences for FGF-2.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0041] The present invention concerns markers which can be used to diagnose ovarian cancer in subjects.

[0042] "Selectivity" in the context of the present invention refers to the ability of a marker of the present invention to discriminate between a sample affected by ovarian cancer and one that is not i.e. a marker with high selectivity produces few false positives.

[0043] "Sensitivity" in the context of the present invention refers to the ability of a marker of the present invention to correctly identify a sample affected by ovarian cancer as such i.e. a marker with high sensitivity produces few false negatives.

[0044] "Marker" in the context of the present invention refers to, without being so limited, a nucleic acid or a polypeptide (or fragment thereof), which is differentially present in a sample taken from a subject having ovarian cancer as compared to a comparable sample taken from a control subject (e.g., a person with a negative diagnosis or undetectable cancer, normal or healthy subject).

[0045] "Subject" in the context of the present invention relates to any mammal including a mouse, rat, pig, monkey, horse. In a specific embodiment, it refers to a human.

[0046] As used herein the terms "sample from the subject at an earlier time is meant to refer to a sample from a subject at a time where it was known that the subject was not affected by ovarian cancer.

[0047] The articles "a," "an" and "the" are used herein to refer to one or to more than one (i.e., to at least one) of the grammatical object of the article.

[0048] The term "including" and “comprising” are used herein to mean, and re used interchangeably with, the phrases "including but not limited to" and "comprising but not limited to".

[0049] The term "such as" is used herein to mean, and is used interchangeably with, the phrase "such as but not limited to".

[0050] Optionally, a marker can be modified before analysis to improve its resolution or to determine its identity. For example, the markers may be subject to proteolytic digestion before analysis. Any protease can be used. Proteases, such as trypsin, that are likely to cleave the markers into a discrete number of fragments are particularly useful. The fragments that result from digestion function as a fingerprint for the markers, thereby enabling their detection indirectly. This is particularly useful where there are markers with similar molecular masses that might be confused for the marker in question. Also, proteolytic fragmentation is useful for high molecular weight markers because smaller markers are more easily resolved by mass spectrometry. The markers can also be modified by the attachment of a tag of particular molecular weight that specifically bind to molecular markers, further distinguishing them. Optionally, after detecting such modified markers, the identity of the markers can be further determined by matching the physical and chemical characteristics of the modified markers in a protein database (e.g., SwissProt™).

[0051] Expression levels may in general be detected by either detecting mRNA from the cells and/or detecting expression products, such as polypeptides and proteins. Expression of the transcripts and/or polypeptides encoded by the nucleic acids described herein may be measured by any of a variety of known methods in the art. In general, the nucleic acid sequence of a nucleic acid molecule (e.g., DNA or RNA) in a subject sample can be detected by any suitable method or technique of measuring or detecting gene sequence or expression. Such methods include, but are not limited to, polymerase chain reaction (PCR), reverse transcriptase-PCR (RT-PCR), in situ PCR, quantitative PCR (q-PCR), in situ hybridization, Southern blot, Northern blot, sequence analysis, microarray analysis, detection of a reporter gene, or other DNA/RNA hybridization platforms. For RNA expression, preferred methods include, but are not limited to: extraction of cellular mRNA and Northern blotting using

labeled probes that hybridize to transcripts encoding all or part of one or more of the genes of this invention; amplification of mRNA expressed from one or more of the genes of this invention using gene-specific primers, polymerase chain reaction (PCR), quantitative PCR (q-PCR), and reverse transcriptase-polymerase chain reaction (RT-PCR), followed by quantitative detection of the product by any of a variety of means; extraction of total RNA from the cells, which is then labeled and used to probe cDNAs or oligonucleotides encoding all or part of the genes of this invention, arrayed on any of a variety of surfaces; in situ hybridization; and detection of a reporter gene. The term "quantifying" or "quantitating" when used in the context of quantifying transcription levels of a gene can refer to absolute or to relative quantification. Absolute quantification may be accomplished by inclusion of known concentration(s) of one or more target nucleic acids and referencing the hybridization intensity of unknowns with the known target nucleic acids (e.g., through generation of a standard curve). Alternatively, relative quantification can be accomplished by comparison of hybridization signals between two or more genes, or between two or more treatments to quantify the changes in hybridization intensity and, by implication, transcription level.

[0052] As used herein, "control sample" refers to a sample of the same type, that is, obtained from the same biological source (e.g. body fluid, tissue, etc.) as the tested sample but from a healthy subject, (i.e. who is not afflicted by ovarian cancer, and preferably who is not afflicted by any cancer). The control sample can also be a standard sample that contains the same concentration of the above-mentioned markers that are normally found in a corresponding biological sample obtained from a healthy subject. For example, there can be a standard control sample for the amounts of CA125, IL-18 and FGF-2 normally found in biological samples such as tissue, blood, plasma and serum.

[0053] The methods of the invention can also be practiced, for example, by selecting a combination of the above-mentioned markers and one or more additional markers for which increased or decreased expression correlates with ovarian cancer, such as CA72-4, hK6, hK10, HSCCE, kallikrein 4, kallikrein 5, kallikrein 6, kallikrein 8, kallikrein 9, kallikrein 11, CA15-3, CA19-9, OVX1, lysophosphatidic acid (LPA) or carcinoembryonic antigen (CEA), as well as other markers specific for other types of

cancer. Those skilled in the art will be able to select useful diagnostic markers for detection in combination with CA125, IL-18 and FGF-2. Similarly, four or more or five or more or a multitude of markers can be used together for determining a diagnosis of a patient.

[0054] In an embodiment, the expression level of the above-mentioned markers is determined at the polypeptide level.

[0055] Methods to measure polypeptide expression levels of the markers of this invention, include, but are not limited to: Western blot, immunoblot, enzyme-linked immunosorbant assay (ELISA), radioimmunoassay (RIA), immunoprecipitation, surface plasmon resonance, chemiluminescence, fluorescent polarization, phosphorescence, immunohistochemical analysis, matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, microcytometry, microarray, microscopy, fluorescence activated cell sorting (FACS), flow cytometry, and assays based on a property of the protein including but not limited to DNA binding, ligand binding, or interaction with other protein partners.

[0056] The terms "polypeptide," "peptide" and "protein" are used interchangeably herein to refer to a polymer of amino acid residues. The terms apply to amino acid polymers in which one or more amino acid residue is an artificial chemical mimetic of a corresponding naturally occurring amino acid, as well as to naturally occurring amino acid polymers, those containing modified residues, and non-naturally occurring amino acid polymers.

[0057] In an embodiment, the expression level of the above-mentioned markers is determined using an immunoassay.

[0058] An immunoassay is an assay that uses an antibody to specifically bind an antigen (e.g., a marker). The immunoassay is characterized by the use of specific binding properties of a particular antibody to isolate, target, and/or quantify the antigen. The phrase "specifically (or selectively) binds" to an antibody or "specifically (or selectively) immunoreactive with," when referring to a protein or peptide, refers to

a binding reaction that is determinative of the presence of the protein in a heterogeneous population of proteins and other biologics. Thus, under designated immunoassay conditions, the specified antibodies bind to a particular protein at least two times the background and do not substantially bind in a significant amount to other proteins present in the sample. Specific binding to an antibody under such conditions may require an antibody that is selected for its specificity for a particular protein. For example, polyclonal antibodies raised to a marker from specific species such as rat, mouse, or human can be selected to obtain only those polyclonal antibodies that are specifically immunoreactive with that marker and not with other proteins, except for polymorphic variants and alleles of the marker. This selection may be achieved by subtracting out antibodies that cross-react with the marker molecules from other species.

[0059] Using the purified markers or their nucleic acid sequences, antibodies that specifically bind to a marker can be prepared using any suitable methods known in the art. See, e.g., Harlow & Lane, Antibodies: A Laboratory Manual (1988) and Goding, Monoclonal Antibodies: Principles and Practice (2d ed. 1986). Such techniques include, but are not limited to, antibody preparation by selection of antibodies from libraries of recombinant antibodies in phage or similar vectors, as well as preparation of polyclonal and monoclonal antibodies by immunizing rabbits or mice.

[0060] Generally, a sample obtained from a subject can be contacted with the antibody that specifically binds the marker. Optionally, the antibody can be fixed to a solid support to facilitate washing and subsequent isolation of the complex, prior to contacting the antibody with a sample. Examples of solid supports include glass or plastic in the form of, e.g., a microtiter plate, a stick, a bead, or a microbead. The sample is preferably a biological fluid sample taken from a subject. The sample can be diluted with a suitable eluant before contacting the sample to the antibody.

[0061] After incubating the sample with antibodies, the mixture is washed and the antibody-marker complex formed can be detected. This can be accomplished by incubating the washed mixture with a detection reagent. This detection reagent may be, e.g., a second antibody which is labeled with a detectable label. Exemplary

detectable labels include magnetic beads (e.g., DYNABEADS™), fluorescent dyes, radiolabels, enzymes (e.g., horse radish peroxidase, alkaline phosphatase and others commonly used in an ELISA), and colorimetric labels such as colloidal gold or colored glass or plastic beads. Alternatively, the marker in the sample can be detected using an indirect assay, wherein, for example, a second labeled antibody is used to detect bound marker-specific antibody, and/or in a competition or inhibition assay wherein, for example, a monoclonal antibody which binds to a distinct epitope of the marker is incubated simultaneously with the mixture.

[0062] Methods for measuring the amount of, or presence of, antibody-marker complex include, for example, detection of fluorescence, luminescence, chemiluminescence, absorbance, reflectance, transmittance, birefringence or refractive index (e.g., surface plasmon resonance, ellipsometry, a resonant mirror method, a grating coupler waveguide method or interferometry). Optical methods include microscopy (both confocal and non-confocal), imaging methods and non-imaging methods. Electrochemical methods include voltametry and amperometry methods. Radio frequency methods include multipolar resonance spectroscopy. Methods for performing these assays are readily known in the art. Useful assays include, for example, an enzyme immune assay (EIA) such as enzyme-linked immunosorbent assay (ELISA), a radioimmune assay (RIA), a Western blot assay, or a slot blot assay. These methods are also described in, e.g., Methods in Cell Biology: Antibodies in Cell Biology, volume 37 (Asai, ed. 1993); Basic and Clinical Immunology (Stites & Terr, eds., 7th ed. 1991); and Harlow & Lane, supra.

[0063] In a further embodiment, the above-mentioned immunoassay is an enzyme-linked immunosorbant assay (ELISA).

[0064] The markers can be measured in different types of biological samples. The sample is preferably a biological fluid sample such as blood, plasma and serum. Other typical biological samples include, but are not limited to, tissue biopsy from ovarian tumor, sputum, lymphatic fluid, blood cells (e.g., peripheral blood mononuclear cells), tissue or fine needle biopsy samples, urine, peritoneal fluid, colostrums, breast milk, fetal fluid, tears, pleural fluid, or cells therefrom. Because all of the markers are found in blood serum, blood serum is a preferred sample source

for embodiments of the invention.

[0065] If desired, the sample can be prepared to enhance detectability of the markers. For example, to increase the detectability of markers, a blood serum sample from the subject can be preferably fractionated by, e.g., Cibacron™ blue agarose chromatography and single stranded DNA affinity chromatography, anion exchange chromatography, affinity chromatography (e.g., with antibodies) and the like. The method of fractionation depends on the type of detection method used. Any method that enriches for the protein of interest can be used. Sample preparations, such as pre-fractionation protocols, are optional and may not be necessary to enhance detectability of markers depending on the methods of detection used. For example, sample preparation may be unnecessary if antibodies that specifically bind markers are used to detect the presence of markers in a sample.

[0066] Typically, sample preparation involves fractionation of the sample and collection of fractions determined to contain the markers. Methods of pre-fractionation include, for example, size exclusion chromatography, ion exchange chromatography, heparin chromatography, affinity chromatography, sequential extraction, gel electrophoresis and liquid chromatography. The analytes also may be modified prior to detection. These methods are useful to simplify the sample for further analysis. For example, it can be useful to remove high abundance proteins, such as albumin, from blood before analysis. Examples of methods of fractionation are described in WO/2003/057014.

[0067] The methods for detecting these markers in a sample have many applications. For example, one or more markers can be measured to aid human cancer diagnosis. In another example, the methods for detection of the markers can be used to monitor responses in a subject to cancer treatment. In another example, the methods for detecting markers can be used to assay for and to identify compounds that modulate expression of these markers *in vivo* or *in vitro*.

[0068] In an embodiment, the subject is a human.

[0069] The present invention also relates to a kit for determining the likelihood of ovarian cancer in a subject, said kit comprising means for detection of expression of the markers CA125 and FGF-2 and, in more specific embodiments, the marker IL-18, in a biological sample from said subject together with instructions setting forth the above-mentioned method. Means for detection include probe, primer (or primer pair), or immunological reagent (e.g. antibody) in accordance with the present invention. For example, a compartmentalized kit in accordance with the present invention includes any kit in which reagents are contained in separate containers. Such containers include small glass containers, plastic containers or strips of plastic or paper. Such containers allow the efficient transfer of reagents from one compartment to another compartment such that the samples and reagents are not cross-contaminated and the agents or solutions of each container can be added in a quantitative fashion from one compartment to another. Such containers may for example include a container which will accept the test sample (DNA, protein or cells), a container which contains the primers used in the assay, containers which contain enzymes, containers which contain wash reagents, and containers which contain the reagents used to detect the indicator products.

[0070] Kits for evaluating expression of nucleic acids can include, for example, probes or primers that specifically bind a nucleic acid of interest (e.g., a nucleic acid, the expression of which correlates with increased likelihood of ovarian cancer). The kits for evaluating nucleic acid or polypeptide expression can provide substances useful as standard (e.g., a sample containing a known quantity of a nucleic acid or polypeptide to which test results can be compared, with which one can assess factors that may alter the readout of a diagnostic test, such as variations in an enzyme activity or binding conditions). Kits for assessing nucleic acid or polypeptide expression can further include other reagents useful in assessing levels of expression (e. g. buffers and other reagents for performing amplification reactions, or for detecting binding of a probe to a nucleic acid or binding of an antibody to a polypeptide). The kits can provide instructions for performing the assay used to evaluate gene/polypeptide expression for determining likelihood of ovarian cancer based on the results of the assay. For example, the instructions can indicate that levels of expression of a gene of interest (e.g., relative to a standard or a control), correlate with increased likelihood for ovarian cancer.

[0071] The invention further provides a method of assessing the potential efficacy of a test compound for treating or inhibiting ovarian cancer in a subject, said method comprising determining, in a biological sample from said subject, the expression of the markers CA125 and FGF-2 and, in more specific embodiments, the marker IL-18, before and after administration of said test compound in said subject, wherein a decrease in the expression of said markers after administration of said test compound is indicative that said test compound is effective for treating or inhibiting ovarian cancer.

[0072] In an other aspect, the invention provides a method of assessing the efficacy of a therapy for treating or inhibiting ovarian cancer in a subject, said method comprising determining, in a biological sample from said subject, the expression of the markers CA125 and FGF-2 and, in more specific embodiments, the marker IL-18, before and after administration of said therapy in said subject, wherein a decrease in the expression of said markers after administration of said therapy is indicative that said therapy is effective for treating or inhibiting ovarian cancer.

[0073] In an embodiment, the above-mentioned ovarian cancer is epithelial ovarian carcinoma.

[0074] The present invention is illustrated in further details by the following non-limiting examples.

EXAMPLE 1

Clinical samples

[0075] Tissue samples and sera were obtained with informed consent from participants. Tumor samples were collected from surgeries performed at the Centre Hospitalier de l'Université de Montréal (CHUM). Histopathology, grade and stage of tumors were assigned according to the International Federation of Gynecology and Obstetrics (FIGO) criteria. Normal controls were defined as tumor-free patients. Primary cell cultures from normal ovarian surface epithelia (NOSE) and EOC samples were established as described (15, 16) and used for microarray analysis. Cells in primary culture were maintained in OSE media consisting of 50:50 medium 199:105

(Sigma) supplemented with 10% fetal bovine serum (FBS), 2.5μg/mL amphotericin B and 50 μg/mL gentamicin (15). Independent cohorts for microarray, ELISA and tissue array IHC studies were used and are presented in Table 1 below.

Quantitative PCR

[0076] Linear amplification of RNA from primary culture cells was performed as described previously (17). The cDNA synthesis was done according to the protocol of the SuperScript™ First-Strand Synthesis System for Q-PCR (Invitrogen Life Technologies) with a starting amount of 2 mg RNA and reverse transcription performed with random hexamers. The PCR reaction (temperature, specificity) was performed using conventional PCR conditions with a Rotor-gene™ 3000 Real-Time Centrifugal DNA Amplification System (Corbett tumor tissues Research, NSW, Australia). The Quantitect™ SYBR Green PCR (Qiagen Inc., ON, Canada) reaction mixture was used according to the manufacturer instruction. Serial dilutions were performed to generate a standard curve for each gene tested in order to define the efficiency of the Q-PCR reaction and a melt curve was done to confirm the specificity of the reaction. Based on the stability of its expression in microarray experiments, primers for the ERK1 gene were used as an internal control. Experiments were done in duplicate. Positive and negative controls were introduced in all experiments. The sequences for IL-18 primers are: Fwd 5'-CGCTTCCTCTCGCAACAAACTAT-3' (SEQ ID NO: 7) and Rev 5'-CCGGGGTGCATTATCTCTACAGT-3' (SEQ ID NO: 8); FGF-2: Fwd 5'-CGCGCAGGAGGGAGGAGA-3' (SEQ ID NO: 9) and Rev 5'-ACGCCGCCTGGGGAGAG-3' (SEQ ID NO: 10) and finally ERK1: Fwd 5'-GCGCTGGCTCACCCCTACCT-3' (SEQ ID NO: 11) and Rev 5'-GCCCCAGGGTGCAGAGATGTC-3' (SEQ ID NO: 12). The Pfaffl analysis was used method to measure the relative quantity of gene expression (18).

RNA preparation and microarray

[0077] Total RNA was extracted with TRIzol™ reagent (Gibco / BRL, Life Technologies Inc., Grand Island, NY, USA). RNA was extracted directly from cells grown to 80% confluency. The quality of the RNA was monitored by gel electrophoresis and a 2100 Bioanalyzer using the RNA 6000 Nano LabChip™ kit (Agilent Technologies, Germany). Biotinylated hybridization target was prepared from

total RNA as described (19). HuGeneFI™ 6800 GeneChip™ microarray experiments were performed at the McGill University and Genome Québec Innovation Centre and raw data was processed using the Affymetrix™ MAS4 software. Detailed protocols are known in the art and are available at www.genomequebec.mcgill.ca/center.php. The raw data of each experiment was normalized according to the mean of the global intensity adjusted to 100 units. Arrays with global intensity below 100 were eliminated. After normalization, all values below 20 were considered as technical noise and expression values below this threshold were transformed to this value. All the EST's were next filtered, which had "A" call (ambiguous signal) across all samples. To detect differentially expressed genes in ovarian tumor samples versus normal ovarian cells, two statistical tests were used to identify classifiers. A parametric and a non-parametric (Mann-Whitney (U)) test were performed using GeneSpring™ software (Silicon Genetics). Candidate genes identified in common in the two analyses were selected for further analysis.

Tissue array and IHC

[0078] The following monoclonal antibodies were used in immunohistochemistry (IHC): anti-IL-18 (R&D system), anti-FGF-2 (Santa Cruz Biotechnology). A tissue array containing 94 cores of ovarian epithelial tissues (see Table 1 below) was built and used for IHC studies. Briefly, the tissue array was heated at 60°C for 30 min, deparaffinized in toluene and rehydrated in a gradient of ethanol. To unmask antigen the slides were submerged in 90°C citrate buffer (0.01M citric acid + 500ul tween-20/L adjusted to pH 6.0) (J.T. Baker Philipsburg, NJ) for 15 min. The tissue was blocked with a protein-blocking serum-free reagent (DakoCytomation Inc., Mississauga, ON) and incubated with the different antibodies overnight at 4°C in a humid chamber. The optimal concentration for each primary antibody was determined by serial dilutions. Subsequently, endogenous peroxidase activity was quenched by treatment with 3% H_2O_2. The array was then incubated with a secondary biotinylated antibody (DakoCytomation Inc., Mississauga, ON) for 10 min followed by incubation with a streptavidin-peroxidase complex (Dako Diagnostics Canada Inc.) for 10 min at room temperature. Reaction products were developed using diaminobenzidine (brown stain) containing 0.3% H_2O_2 as a substrate for peroxidase and nuclei were counterstained with diluted hematoxylin (blue stain). Epithelial zones were scored according to the intensity of staining (value of 0 for

absence, 1 for weak, 2 for moderate, 3 for high intensity). Each array was independently analyzed in a blind study by two independent observers. Statistical analyses were performed using the T-test.

ELISA

[0079] Patient's blood was centrifuged for 30 min at 2500 rpm and the separated serum was immediately frozen at –20°C until further use. Before measurement, all sera were re-centrifuged for 10 min at 8000 rpm. The sera were further tested by ELISA for CA125 (Panomics BC1013), FGF-2 (R&D System, item DFB50) and IL-18 (R&D System, item 7620) concentration according to the manufacturer's instructions. The limit of detection for IL-18 was 20 pg/ml, 10 U/ml for CA125 and 20 pg/ml for FGF-2. Independent experiments were calibrated with at least two samples. Statistical analyses were performed using SPSS software. For small sample set sizes (<10) the Mann-Whitney U test was applied, otherwise statistical analysis relied on the T-test.

EXAMPLE 2

Identification of two genes up-regulated in ovarian cancer and encoding for cytokines

[0080] Comparative analysis of gene expression profiles of ovarian epithelial cells was performed using 11 primary cultures of normal ovarian epithelial surface (NOSE) samples and 39 primary cultures of EOC samples. The 39 EOC represented different grades, stages and pathologies of ovarian cancer (see Table 1 below). To gain insight into genes exhibiting dominant expression levels in ovarian tumors, the expression profiles were analyzed using two different supervised classification algorithms. Among a total of 177 candidate genes that were common to both supervised analyses, several genes encoding for secreted proteins were identified but only two genes encoding for cytokines, IL-18 and FGF-2, were present. In order to maximize the chance of sampling differential gene expression in serum, these latter two genes were selected for further study.

[0081] **TABLE 1:** SAMPLE SETS USED IN EACH EXPERIMENT

Histopathology	Sample size	Tumor grade					Tumor stage	
		B	1	2	3	Mixed	Low	high
Microarray set (n=50)								
Normal	11							
Serous	29	6	1	7	15		4	25
Endometroid	7			3	4			7
Mixed	1				1			1
Clear cell	2				2			2
Total tumors	39	6	1	10	22		4	35
Tissue array (n=114)								
Normal	20						NA	NA
Serous	21	4	5	5	7		NA	NA
Endometroid	27		13	7	5	2	NA	NA
Clear cell	17			5	9	3	NA	NA
Mixed	5				3	2	NA	NA
Mucinous	24	21	3				NA	NA
Total tumors	94	25	18	17	24	6	NA	NA
ELISA set (n=70)								
Normal and benign	25							
Serous	29	3	2	3	20	1	3	26
Endometrioid	3		3				2	1
Clear cell	5				4	1	3	2
Mixed	3		1	1	1		0	3
Brenner	2					2	1	1
Mucinous	3	2	1				2	1
Total tumors	45	5	7	4	25	4	11	34
PCR tissues (n=34)								
Normal and benign	12							
Serous	6	1		1	2		2	4
Endometrioid	5		1		4			5
Clear cell	7				5	2	1	6
Mucinous	4	2	1		1		1	2
Total tumors	22	3	2	3	12	2	4	18

Grade B are low malignant potential tumors. Low stage: stage I and II tumors; high stage: stage III and IV tumors.

EXAMPLE 3

Validation of the differential gene expression of IL-18 and FGF-2

[0082] Q-PCR was used to validate the differential expression of the IL-18 and FGF-2 RNA as observed in the microarray analysis. For this purpose, 9 NOSEs and 8 EOCs randomly chosen from the previous set of primary cultures, as well as 12 benign tumors (BOT) and 22 EOCs from fresh tissues, were compared and their expression levels correlated with the results obtained by microarray analysis (Figure 1A, left hand panels). IL-18 and FGF-2 RNA were weakly detectable in NOSE samples while they were readily detectable in the majority of malignant samples serving as an independent confirmation of their differential expression in EOC. To determine IL-18 and FGF-2 expression in tissues, RNAs isolated from 12 benign and 22 malignant ovarian tumor tissues were also tested (Table I). Most malignant tissues, with the exception of two mucinous and one serous tumor, showed an overexpression of IL-18 (Figure 1A, right hand panels). Highest FGF-2 RNA

expression was seen in endometroid tissues, although the difference between benign and malignant tissues was less striking (Figure 1A, right hand panels).

EXAMPLE 4

Protein expression of IL-18 and FGF-2 in ovarian tissue specimens

[0083] To address the expression of FGF-2 and IL-18 in EOC, IHC was performed with IL-18 and FGF-2 specific antibodies on ovarian tissues using a tissue array containing 20 NOSE and 94 EOC tissue cores from 114 independent patients. The 94 EOC cores represented the different grades and pathologies of ovarian cancer with the exception of Brenner tumors (see Table 1 above). Scoring results from the IHC analyses are summarized in Table 2 below. IL-18 and FGF-2 were expressed in NOSE as well as EOC tissues. In NOSE tissues, heterogeneity of staining intensity was observed among the different cores (see Table 2 below). In addition, IL-18 and FGF-2 staining was also present in the stroma of NOSE tissues, which may be due to their direct expression by stromal cells or to the secretion of these cytokines by adjacent epithelial cells. EOC tissues showed a slightly more marked staining of IL-18 and FGF-2. The staining was a significantly stronger for IL-18 in serous, endometrioid and clear cells tumors ($p<0.05$) and for endometrioid and clear cell tumors with FGF-2 (Figure 1B and Table 2).

[0084] **TABLE 2:** INTENSITY OF IMMUNOSTAINING OF TISSUE ARRAY WITH ANTI-IL-18 AND ANTI-FGF-2 ANTIBODIES

Histopathology	*p*	Staining intensity			
		0	1+	2+	3+
Antibody anti-IL-18					
Normal		3	13	4	0
Clear cells	<0.001	0	1	14	2
Endometrioid	0.001	1	9	15	2
Serous	0.03	0	13	8	0
Mixed	0.05	0	2	3	0
Mucinous	0.20	8	11	5	0
Total tumors	0.005	12	36	45	4
Antibody anti-FGF-2					
Normal		5	7	5	3
Clear cells	<0.001	0	2	12	3
Endometrioid	0.01	1	6	15	5
Serous	0.45	7	1	13	0
Mixed	0.33	2	0	3	0
Mucinous	0.08	11	8	6	0
Total tumors	0.14	21	17	49	8

[a]0, absence; 1, weak; 2, moderate; 3, for high intensity.

EXAMPLE 5

Serum IL-18 and FGF-2 proteins as markers of EOC

[0085] IL-18 and FGF-2 were studied as individual markers in comparison to CA125. For this purpose a total of 72 patients was selected: 25 patients were free of cancer and 47 patients had ovarian cancer (see Table 1 above). Among the cancer-free patients, six presented with benign ovarian (BOV) or (benign) tumors. Among the 47 ovarian cancers, five were low malignant potential (LMP) tumors, eight grade 1, four grade 2, and 26 grade 3 tumors (see Table 1 above). Six different pathologies were represented in the set of selected patients with EOC (serous, endometrioid, clear cells, Brenner, mucinous and mixed).

[0086] CA125 was significantly elevated in patients with EOC ($p<0.001$) (see Table 3 below). No significant difference was observed in patients with or without benign tumors ($p=0.31$). Patients with LMP tumors showed a lower level of CA125 (median 75 U/ml) than malignant EOC (median level 350 U/ml) (see Figure 2 and Table 3 below). This observation was consistent with the increased levels of CA125 which correlated with increased tumor grade ($r=0.33$, $p=0.004$) and stage in independent studies (8). The increased level of CA125 also correlated with the histopathology (Spearman's Rho test $p=0.002$) where CA125 was more elevated in serous tumors than in endometrioid and clear cell tumors (see Table 3 below).

[0087] While IL-18 was also significantly more elevated in EOC patients (median level pg/ml $p=0.003$) it was correlated with tumor grade (Spearman's Rho test, $p=0.172$). Serous tumors showed the highest level of IL-18 expression (median level 305 pg/ml) but no significant correlation was observed between IL-18 and pathology disease (Spearman's Rho test, $p=0.173$). As observed with CA125, there was no significant difference between patients with or without benign tumors ($p=0.99$) (see Table 3 below).

[0088] FGF-2 levels were higher in EOC patients compared to cancer free patients although with a weaker significance compared to CA125 or IL-18 ($p=0.04$). In accordance with the results obtained in tissue arrays, serum FGF-2 levels were

highest in association with clear cell tumors. A correlation between increased FGF-2 serum levels and tumor grade was also detected (Spearman's Rho test p=0.02) (Table 3).

[0089] **TABLE 3:** EXPRESSION LEVEL OF MARKERS CA125, IL-18 AND FGF-2 IN SERUM

	CA125 (U/ml) [Median/average (p^*)]	IL-18 (pg/ml) [Median/average (p^*)]	FGF-2 (pg/ml) [Median/average (p^*)]
NOSE+benign	37/92	204/215	29/35
All EOC	306/474 (<0.001)	264/315 (0.001)	39/50 (0.037)
Normal	44/114	203/212	34/43
Benign	32/63 (0.31)	207/219 (0.99)	27/25 (0.31)
LMP	75/100 (0.30)	236/257 (0.31)	68/21 (0.175)
Invasive EOC	350/545 (<0.001)	258/327 (0.003)	49/56 (0.006)
Grade 1	339/336 (0.03)	282/267 (0.04)	31/31 (0.70)
Grade 2	260/285 (0.04)	251/283 (0.008)	43/36 (0.011)
Grade 3	484/683 (<0.001)	307/370 (0.003)	66/68 (0.002)
Low stage	75/419 (0.18)	233/239 (0.62)	39/47 (0.65)
High stage	350/450 (<0.001)	281/282 (<0.001)	44/42 (0.016)
Serous	419/544 (<0.001)	305/358 (<0.001)	44/54 (0.11)
Endometrioid	339/380 (0.16)	281/252 (0.37)	23/23 (0.63)
Mucinous	38/46 (0.79)	263/247 (0.29)	21/32 (0.68)
Clear cells	34/492 (0.55)	242/330 (0.30)	69/49 (0.10)

NOSE, normal ovarian surface epithelia; EOC, epithelial ovarian cancer; LMP, low malignant potential tumor; low stage, stage I and II; high stage, stage III and IV. p^* Mann–Whitney test.

EXAMPLE 6

Diagnostic potential of serum CA125, IL-18 and FGF-2 as markers

[0090] Receiver Operator Curves were used to determine threshold values for the three serum markers to compare the diagnostic potential of the individual cytokine markers with CA125. The greatest accuracy in differential diagnosis of malignant tumors was achieved with a threshold of 50 U/ml for CA125, 215 pg/ml for IL-18 and 37 pg/ml for FGF-2. Sensitivity, namely the fraction of patients correctly diagnosed with ovarian cancer, was more accurate when considering CA125 or IL-18, as individual markers. Sensitivity as determined by CA125 and IL-18 was 82% and 78% respectively, compared to 58% with FGF-2 (Table 4). To ensure that there was no difference in sensitivity between CA125 and IL-18 the number of samples was increased to 97 (data not shown). In this larger set, CA125 and IL-18 sensitivity levels remained similar (75% and 74%, respectively).

[0091] Specificity was defined as the fraction of samples correctly diagnosed

as non-malignant, including serum from patients with normal ovaries or benign disease. Individual analysis of patients with either normal ovaries or benign disease gave similar results (data not shown). Specificity was best provided by FGF-2 (72%). CA125 and IL-18 showed relative low similar specificities of 60% and 64% respectively (Table 4). In the larger set, CA125 and IL-18 specificity levels remained similar (61% and 64% respectively, data not shown).

[0092] **TABLE 4:** SPECIFICITY AND SENSITIVITY OF CA125, IL-18 AND FGF-2 IN UNIVARIATE OR MULTIVARIATE ANALYSIS

Patient type	CA125 (U/ml)		IL-18 (pg/ml)		FGF-2 (pg/ml)		CA125 + IL-18 + FGF2	
	n >50 U/ml	% +	*n* >215 pg/ml	% +	*n* >37 pg/ml	% +	*n*	% +
Specificity								
NOSE + benign	10/25	60	9/25	64	7/25	72	5/25	80
Sensitivity								
All EOC	37/45	82	35/45	78	26/45	58	35/45	78
LMP	3/5	60	3/5	60	1/5	20	3/5	60
Invasive EOC	34/42	81	34/42	81	25/42	60	32/42	76
Low stage	6/11	55	6/11	55	7/11	64	7/11	64
High stage	31/34	91	29/34	85	20/34	59	28/34	73
Serous	28/29	97	26/29	90	19/29	66	27/29	93
Endometroide	2/3	67	2/3	67	1/3	33	1/3	33
Clear cell	1/5	20	3/5	60	4/5	80	3/5	60
Mucinous	1/3	33	2/3	67	1/3	33	1/3	33
Brenner	2/2	100	0/2	0	0/2	0	1/2	50
Mixed	3/3	100	2/3	67	1/3	33	2/3	67

EOC, Epithelial ovarian cancer; LMP, low malignant potential tumor; low stage, stage I-II; high stage, stage III-IV; % +, corresponds to percentage of NOSE + benign which do not score above the threshold (specificity).

EXAMPLE 7

Diagnostic potential of serum IL-18 and FGF-2 as combined markers with CA125

[0093] The estimated correlation among the three serum markers (IL-18, FGF-2 and CA125) were low suggesting that they were complementary to each other and that a multivariate approach might outperform the CA125 assay alone. To validate this hypothesis a multivariate analysis was performed using a logistic binary regression algorithm. As shown in Table 5, FGF-2, but not IL-18, increased the diagnosis potential of CA125 (Odd Ratio from 5.24 to 6). However addition of both FGF-2 and IL-18 achieved a superior diagnostic potential (Odd Ratio= 6.94, 0.95 (1.99-24,39), p=0.002) suggesting that the combination of both IL-18 and FGF-2 with CA125 allows a better sensitivity and specificity.

[0094] Scoring samples as malignant was also tested based on whether ELISA values were above the threshold for at least two of the three markers. In this analysis (Table 4), a sensitivity of 78% was achieved which was similar to that obtained with CA125 or IL-18 alone, but the specificity of diagnosis was dramatically increased from CA125 (60%), IL-18 (64%) or FGF-2 (72%) alone to 80% the combination of these serum markers (Table 4). Similar result was obtained in a larger set of samples (77%, data not shown).

[0095] **TABLE 5:** LOGISTIC BINARY REGRESSION (LBR) ANALYSIS OF MULTIVARIATE ANALYSIS OF CA125, IL-18 AND FGF-2

		p	OR	CI
LBR	CA125	<0.001	5.24	2.07-13.33
	CA125+IL-18	0.002	4.78	1.81-12.66
	CA125+FGF-2	0.002	6	1.93-18.61
	IL-18+FGF-2	0.014	2.25	0.726-6.96
	CA125+IL-18+FGF	0.002	6.94	1.99-24.39

OR+: odd ratio. CI: confidence interval 95%

[0096] Although the present invention has been described hereinabove by way of specific embodiments thereof, it can be modified, without departing from the spirit and nature of the subject invention as defined in the appended claims. Throughout this application, various references are referred to describe more fully the state of the art to which this invention pertains. The disclosures of these references are hereby incorporated by reference into the present disclosure.

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WHAT IS CLAIMED IS:

1. A method comprising:

(a) providing a biological sample from a subject (subject sample); and

(b) detecting the expression level of each of the markers FGF-2 and CA125 in the subject sample.

2. The method as recited in claim 1 wherein said subject is susceptible of having ovarian cancer.

3. The method as recited in any one of claims 1 and 2 wherein said subject is asymptomatic for ovarian cancer.

4. The method as recited in any one of claims 1 to 3, further comprising (c) comparing the expression level of each of the markers in the subject sample to corresponding pre-determined threshold expression levels for each of the markers, wherein an expression level of each of the markers in the subject sample that is higher than the pre-determined threshold expression levels for each of the markers is an indication that the subject is affected by ovarian cancer.

5. The method as recited in any one of claims 1 to 3, further comprising (c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a control sample, wherein an expression level of each of the markers that is higher in the subject sample than in the control sample is an indication that the subject is affected by ovarian cancer.

6. The method as recited in any one of claims 1 to 3, further comprising (c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a sample from the subject at an earlier time, wherein an expression level of each of the markers that is higher in the subject sample than in the sample from the subject at an earlier time is an indication that the subject is affected by ovarian cancer.

7. The method as recited in any one of claims 1 to 3, further comprising (c) comparing the expression level of each of the markers in the subject sample to the expression level of each of the markers in a non-cancerous sample from the subject, wherein an expression level of each of the markers that is higher in the subject sample than in the non-cancerous sample from the subject is an indication that the subject is affected by ovarian cancer.

8. The method as recited in claim 4, wherein the threshold expression level for each of the markers is determined by Receiver Operator Curves comparing the concentration of each of the markers in an ovarian cancer-free control population with that in a population affected by ovarian cancer.

9. The method as recited in any one of claims 1 to 8, wherein the expression is determined at the polypeptide level.

10. The method as recited in claim 9, wherein the expression is determined using an immunoassay.

11. The method as recited in claim 10, wherein said immunoassay is enzyme-linked immunosorbent assay (ELISA).

12. The method as recited in claim 10, wherein the expression level of each of the markers is above the following pre-determined threshold expression levels: 50 U/ml for CA125 and 37 pg/ml for FGF-2.

13. The method as recited in any one of claims 1 to 12, wherein step (b) further comprises detecting the concentration of marker IL-18 in the sample.

14. The method as recited in claim 12, wherein step (b) further comprises detecting the concentration of marker IL-18 in the sample, and wherein the expression level of IL-18 in the sample is above the pre-determined threshold expression level of 215 pg/ml for this marker.

15. The method as recited in any one of claims 1-14, wherein the

subject sample is a body fluid sample.

16. The method as recited claim 15, wherein the subject sample is selected from the group consisting of blood, plasma and serum.

17. The method as recited in claim 15, wherein said subject sample is serum.

18. The method as recited in any one of claims 1-17, wherein the subject sample is primary culture cells derived from an ovarian tumor sample from the subject.

19. The method as recited in any one of claims 1-18, wherein said subject is a human.

20. The method as recited in any one of claims 1-19, wherein said ovarian cancer is epithelial ovarian carcinoma (EOC).

21. The method as recited in any one of claims 1-20, wherein said method is *in vitro*.

22. A kit comprising means for detection of an expression level of each of markers CA125 and FGF-2 in a biological sample from a subject (subject sample), and instructions to use said markers in a method as recited in any one of claims 1 to 21.

23. The kit as recited in claim 22, further comprising means for detection of an expression level of marker IL-18.

24. The kit as recited in any one of claims 22 and 23, wherein said biological sample is selected from the group consisting of blood, plasma and serum.

25. The kit as recited in claim 24, wherein said biological sample is serum.

26. The kit as recited in any one of claims 22-25, wherein said subject is a human.

27. The kit as recited in any one of claims 22-26, wherein said ovarian cancer is epithelial ovarian carcinoma (EOC).

28. The kit as recited in any one of claims 22-27, wherein the means for detection of expression level of each of the markers are antibodies.

29. A method of assessing the potential efficacy of a test compound for treating or inhibiting ovarian cancer in a subject, said method comprising determining the expression level of each of markers CA125 and FGF-2 in a biological sample from the subject (subject sample), before and after administration of the test compound to the subject, wherein a decrease in the expression level of the markers after administration of the test compound is indicative that said test compound is effective for treating or inhibiting ovarian cancer.

30. A method of assessing the potential efficacy of a therapy for treating or inhibiting ovarian cancer in a subject, said method comprising determining the expression level of each of markers CA125 and FGF-2 in a biological sample from the subject (subject sample), before and after administration of said therapy in said subject, wherein a decrease in the expression level of said markers after administration of said therapy is indicative that said therapy is effective for treating or inhibiting ovarian cancer.

31. The method as recited in any one of claims 29 to 30, further comprising detecting the concentration of marker IL-18 in the sample.

32. The method as recited in any one of claims 29 to 31, wherein said expression level is determined at the polypeptide level.

33. The method as recited in claim 32, wherein said expression level is

determined using an immunoassay.

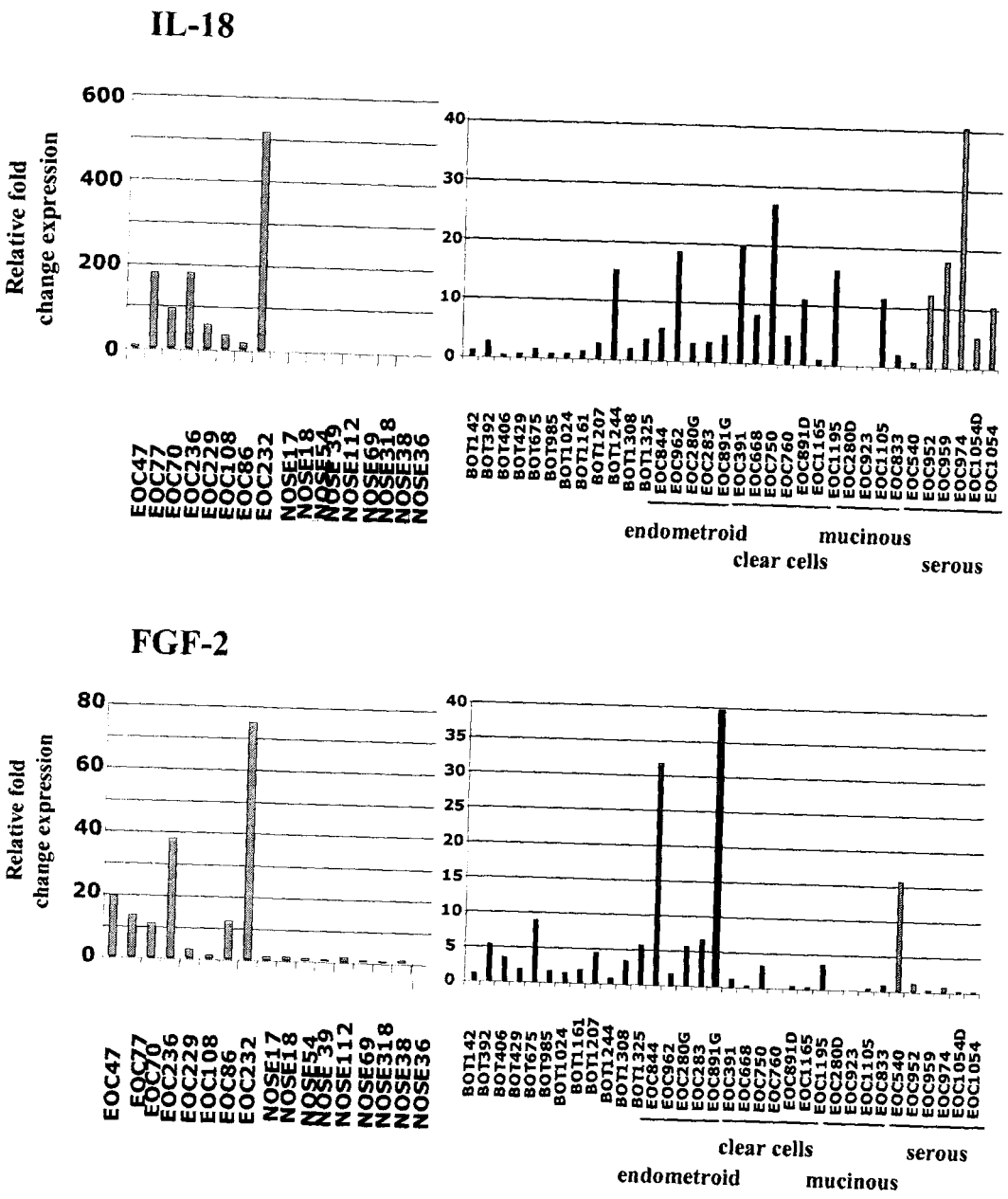
34. The method as recited in claim 33, wherein said expression level is determined using enzyme-linked immunosorbent assay (ELISA).

35. The method as recited in any one of claims 29-34, wherein said subject sample is selected from the group consisting of blood, plasma and serum.

36. The method as recited in claim 35, wherein said biological sample is serum.

37. The method as recited in any one of claims 29-36, wherein said subject is a human.

38. The method as recited in any one of claims 29-37, wherein said ovarian cancer is epithelial ovarian carcinoma.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clear cells
serous
FGF-2
Relative fold change expression
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serous
endometroid
mucinous

Figure 1a

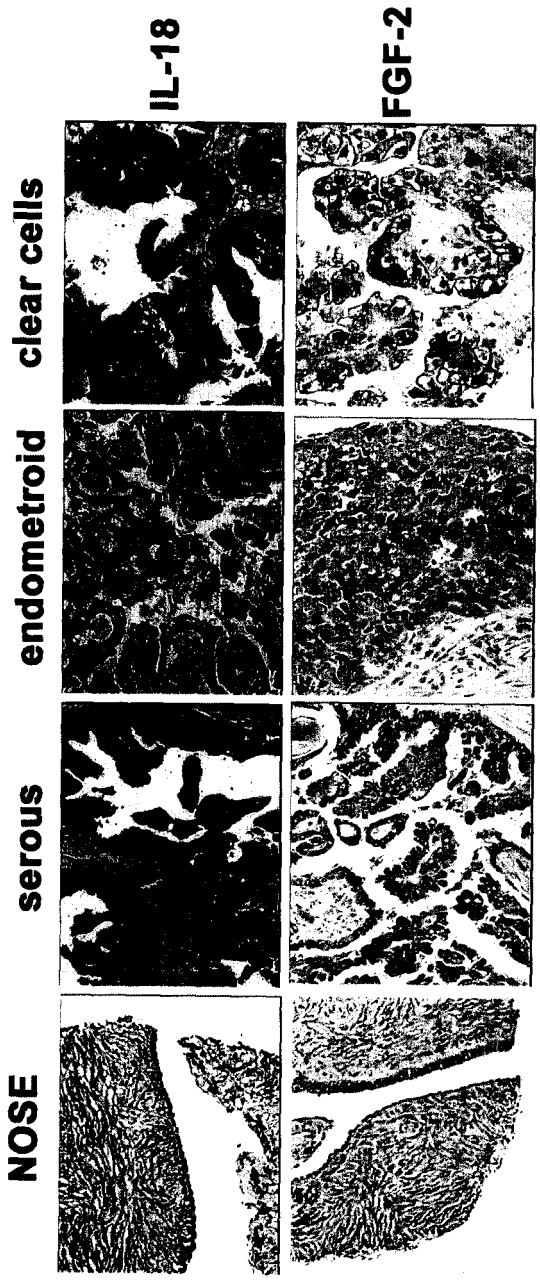
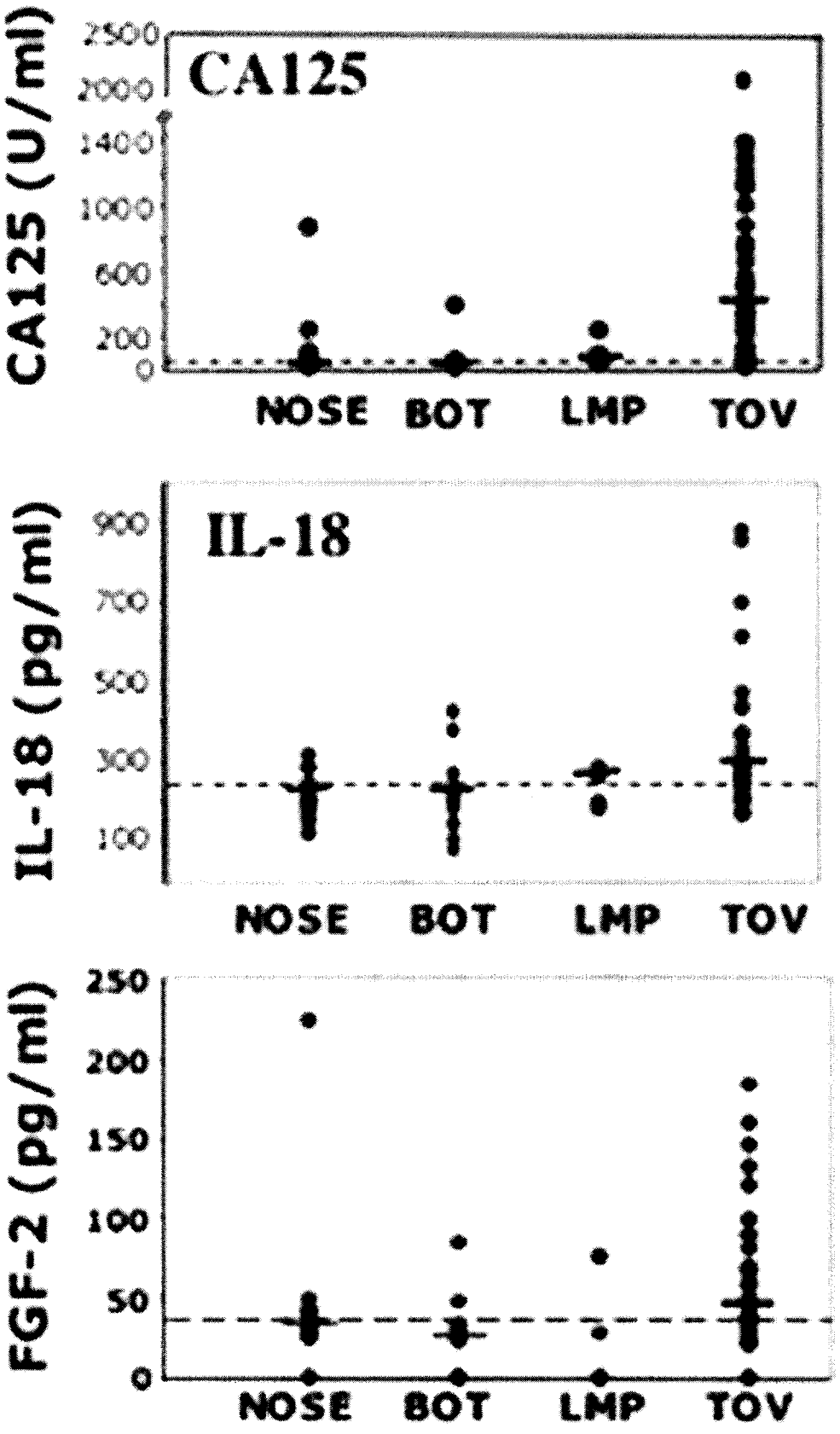


Figure 1b


CA125 (U/ml)
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2000
1400
1000
600
200
0
CA125
NOSE
BOT
LMP
TOV
IL-18 (pg/ml)
900
700
500
300
100
IL-18
NOSE
BOT
LMP
TOV
FGF-2 (pg/ml)
250
200
150
100
50
0
NOSE
BOT
LMP
TOV

Figure 2

Nucleic acid and polypeptide sequences of CA125

Nucleic acid sequence (SEQ ID No:1)

```
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 121 gggagctcag aagctctgca gaggccaccc tctctgaggg gattcttctt agacctccat
 181 ccagaggcaa atgttgacct gtccatgctg aaaccctcag gccttcctgg gtcatcttct
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 301 ggactgacag gagccacctt gtcacctaag acatctacag gtgcaatcgt ggtgacagaa
 361 catactctgc cctttacttc cccagataag accttggcca gtcctacatc ttcggttgtg
 421 ggaagaacca cccagtcttt gggggtgatg tcctctgctc tccctgagtc aacctctaga
 481 ggaatgacac actccgagca aagaaccagc ccatcgctga gtccccaggt caatggaact
 541 ccctctagga actaccctgc tacaagcatg gtttcaggat tgagttcccc aaggaccagg
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Figure 3A

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Figure 3A (continued)

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10261 ggagggacca caggggacac acatgtctct ctgagcacat cttccaatat ccttgaagac
10321 cctgtaacca gcccaaactc tgtgagctca ttgacagata aatccaaaca taaaaccgag
10381 acatgggtaa gcaccacagc cattccctcc actgtcctga ataataagat aatggcagct
10441 gaacaacaga caagtcgatc tgtggatgag gcttattcat caactagttc ttggtcagat
10501 cagacatctg ggagtgacat cacccttggt gcatctcctg atgtcacaaa cacattatac
10561 atcacctcca cagcacaaac cacctcacta gtgtctctgc cctctggaga ccaaggcatt
10621 acaagcctca ccaatccctc aggaggaaaa acaagctctg cgtcatctgt cacatctcct
10681 tcaatagggc ttgagactct gagggccaat gtaagtgcag tgaaaagtga cattgcccct
10741 actgctgggc atctatctca gacttcatct cctgcggaag tgagcatcct ggacgtaacc
10801 acagctccta ctccaggtat ctccaccacc atcaccacca tgggaaccaa ctcaatctca
```

Figure 3A (continued)

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10861 actaccacac ccaacccaga agtgggtatg agtaccatgg acagcacccc ggccacagag
10921 aggcgcacaa cttctacaga acacccttcc acctggtctt ccacagctgc atcagattcc
10981 tggactgtca cagacatgac ttcaaacttg aaagttgcaa gatctcctgg aacaatttcc
11041 acaatgcata caacttcatt cttagcctca agcactgaat tagactccat gtctactccc
11101 catggccgta taactgtcat tggaaccagc ctggtcactc catcctctga tgcttcagct
11161 gtaaagacag agaccagtac aagtgaaaga acattgagtc cttcagacac aactgcatct
11221 actcccatct caacttttc tcgtgtccag aggatgagca tctcagttcc tgacatttta
11281 agtacaagtt ggactcccag tagtacagaa gcagaagatg tgcctgtttc aatggtttct
11341 acagatcatg ctagtacaaa gactgaccca aatacgcccc tgtccacttt tctgtttgat
11401 tctctgtcca ctcttgactg ggacactggg agatctctgt catcagccac agccactacc
11461 tcagctcctc agggggccac aactccccag gaactcactt tggaaaccat gatcagccca
11521 gctacctcac agttgccctt ctctataggg cacattacaa gtgcagtcac accagctgca
11581 atggcaagga gctctggagt tacttttca agaccagatc ccacaagcaa aaaggcagag
11641 cagacttcca ctcagcttcc caccaccact tctgcacatc cagggcaggt gcccagatca
11701 gcagcaacaa ctctggatgt gatcccacac acagcaaaaa ctccagatgc aacttttcag
11761 agacaagggc agacagctct tacaacagag gcaagagcta catctgactc ctggaatgag
11821 aaagaaaaat caaccccaag tgcaccttgg atcactgaga tgatgaattc tgtctcagaa
11881 gataccatca aggaggttac cagctcctcc agtgtattaa aggaccctga atacgctgga
11941 cataaacttg gaatctggga cgacttcatc cccaagtttg gaaaagcagc ccatatgaga
12001 gagttgcccc ttctgagtcc accacaggac aaagaggcaa ttcacccttc tacaaacaca
12061 gtagagacca caggctgggt cacaagttcc gaacatgctt ctcattccac tatcccagcc
12121 cactcagcgt catccaaact cacatctcca gtggttacaa cctccaccag ggaacaagca
12181 atagtttcta tgtcaacaac cacatggcca gagtctacaa gggctagaac agagcctaat
12241 tccttcttga ctattgaact gagggacgtc agcccttaca tggacaccag ctcaaccaca
12301 caaacaagta ttatctcttc cccaggttcc actgcgatca ccaaggggcc tagaacagaa
12361 attacctcct ctaagagaat atccagctca ttccttgccc agtctatgag gtcgtcagac
12421 agcccctcag aagccatcac caggctgtct aactttcctg ccatgacaga atctggagga
12481 atgatccttg ctatgcaaac aagtccacct ggcgctacat cactaagtgc acctactttg
12541 gatacatcag ccacagcctc ctggacaggg actccactgg ctacgactca gagatttaca
12601 tactcagaga agaccactct ctttagcaaa ggtcctgagg atacatcaca gccaagccct
12661 ccctctgtgg aagaaaccag ctcttcctct tccctggtac ctatccatgc tacaacctcg
12721 ccttccaata ttttgttgac atcacaaggg cacagtccct cctctactcc acctgtgacc
12781 tcagttttct tgtctgagac ctctggcctg gggaagacca cagacatgtc gaggataagc
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13261 acatccatct caagccctca tcagtttata acttctacca acacatttac agatgtgagc
13321 accaacccct ccacctctct gataatgaca gaatcttcag gagtgaccat caccacccaa
13381 acaggtccta ctggagctgc aacacagggt ccatatctct tggacacatc aaccatgcct
13441 tacttgacag agactccatt agctgtgact ccagatttta tgcaatcaga gaagaccact
13501 ctcataagca aaggtcccaa ggatgtgacc tggacaagcc ctccctctgt ggcagaaacc
13561 agctatccct cttccctgac acctttcttg gtcacaacca tacctcctgc cacttccacg
13621 ttacaagggc aacatacatc ctctcctgtt tctgcgactt cagttcttac ctctggactg
13681 gtgaagacca cagatatgtt gaacacaagc atggaacctg tgaccaattc acctcaaaat
13741 ttgaacaatc catcaaatga gatactggcc actttggcag ccaccacaga tatagagact
13801 attcatcctt ccataaacaa agcagtgacc aatatgggga ctgccagttc agcacatgta
13861 ctgcattcca ctctcccagt cagctcagaa ccatctacag ccacatctcc aatggttcct
13921 gcctccagca tgggggacgc tcttgcttct atatcaatac ctggttctga gaccacagac
13981 attgagggag agccaacatc ctcccctgact gctggacgaa aagagaacag caccctccag
14041 gagatgaact caactacaga gtcaaacatc atcctctcca atgtgtctgt gggggctatt
14101 actgaagcca caaaaatgga agtcccctct tttgatgcaa cattcatacc aactcctgct
14161 cagtcaacaa agttcccaga tattttctca gtagccagca gtagactttc aaactctcct
14221 cccatgacaa tatctaccca catgaccacc acccagacag ggtcttctgg agctacatca
14281 aagattccac ttgccttaga cacatcaacc ttggaaacct cagcagggac tccatcagtg
14341 gtgactgagg ggtttgccca ctcaaaaata accactgcaa tgaacaatga tgtcaaggac
14401 gtgtcacaga caaaccctcc ctttcaggat gaagccagct ctccctcttc tcaagcacct
14461 gtccttgtca caaccttacc ttcttctgtt gctttcacac cgcaatggca cagtacctcc
14521 tctcctgttt ctatgtcctc agttcttact tcttcactgg taaagaccgc aggcaaggtg
14581 gatacaagct tagaaacagt gaccagttca cctcaaagta tgagcaacac tttggatgac
14641 atatcggtca cttcagcagc caccacagat atagagacaa cgcatccttc cataaacaca
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Figure 3A (continued)

14701 gtagttacca atgtggggac caccggttca gcatttgaat cacattctac tgtctcagct
14761 tacccagagc catctaaagt cacatctcca aatgttacca cctccaccat ggaagacacc
14821 acaatttccc gatcaatacc taaatcctct aagactacaa gaactgagac tgagacaact
14881 tcctccctga ctcctaaact gagggagacc agcatctccc aggagatcac ctcgtccaca
14941 gagacaagca ctgttcctta caaagagctc actggtgcca ctaccgaggt atccaggaca
15001 gatgtcactt cctctagcag tacatccttc cctggccctg atcagtccac agtgtcacta
15061 gacatctcca cagaaaccaa caccaggctg tctacctccc caataatgac agaatctgca
15121 gaaataacca tcaccaccca aacaggtcct catggggcta catcacagga tacttttacc
15181 atggacccat caaatacaac cccccaggca gggatccact cagctatgac tcatggattt
15241 tcacaattgg atgtgaccac tcttatgagc agaattccac aggatgtatc atggacaagt
15301 cctccctctg tggataaaac cagctccccc tcttcctttc tgtcctcacc tgcaatgacc
15361 acaccttccc tgatttcttc taccttacca gaggataagc tctcctctcc tatgacttca
15421 cttctcacct ctggcctagt gaagattaca gacatattac gtacacgctt ggaacctgtg
15481 accagctcac ttccaaattt cagcagcacc tcagataaga tactggccac ttctaaagac
15541 agtaaagaca caaaggaaat ttttccttct ataaacacag aagagaccaa tgtgaaagcc
15601 aacaactctg gacatgaatc ccattcccct gcactggctg actcagagac acccaaagcc
15661 acaactcaaa tggttatcac caccactgtg ggagatccag ctccttccac atcaatgcca
15721 gtgcatggtt cctctgagac tacaaacatt aagagagagc caacatattt cttgactcct
15781 agactgagag agaccagtac ctctcaggag tccagctttc ccacggacac aagttttcta
15841 ctttccaaag tccccactgg tactattact gaggtctcca gtacaggggt caactcttct
15901 agcaaaattt ccaccccaga ccatgataag tccacagtgc cacctgacac cttcacagga
15961 gagatcccca gggtcttcac ctcctctatt aagacaaaat ctgcagaaat gacgatcacc
16021 acccaagcaa gtcctcctga gtctgcatcg cacagtaccc ttcccttgga cacatcaacc
16081 acactttccc agggagggac tcattcaact gtgactcagg gattcccata ctcagaggtg
16141 accactctca tgggcatggg tcctgggaat gtgtcatgga tgacaactcc ccctgtggaa
16201 gaaaccagct ctgtgtcttc cctgatgtct tcacctgcca tgacatcccc ttctcctgtt
16261 tcctccacat caccacagag catcccctcc tctcctcttc ctgtgactgc acttcctact
16321 tctgttctgg tgacaaccac agatgtgttg ggcacaacaa gcccagagtc tgtaaccagt
16381 tcacctccaa atttgagcag catcactcat gagagaccgg ccacttacaa agacactgca
16441 cacacagaag ccgccatgca tcattccaca aacaccgcag tgaccaatgt agggacttcc
16501 gggtctggac ataaatcaca atcctctgtc ctagctgact cagagacatc gaaagccaca
16561 cctctgatga gtaccacctc caccctgggg gacacaagtg tttccacatc aactcctaat
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17221 accaccaatg tattgggcac aacaagccca gagaccgtaa cgagttcacc tccaaattta
17281 agcagcccca cacaggagag actgaccact tacaaagaca ctgcgcacac agaagccatg
17341 catgcttcca tgcatacaaa cactgcagtg gccaacgtcg ggacctccat ttctggacat
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17521 agaattcaga ctgaatcaac atcctctttg attcctggat taagggacac caggacgtct
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17641 actactgagg tctccaggac agaagttatc acttccagca gaacaaccat ctcagggcct
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17821 atctcacagg ctacccttac cctggacaca tcaagcacag cttcctggga agggactcac
17881 tcacctgtga ctcagagatt tccacactca gaggagacca ctactatgag cagaagtact
17941 aagggcgtgt catggcaaag ccctccctct gtggaagaaa ccagttctcc ttcttcccca
18001 gtgcctttac ctgcaataac ctcacattca tctctttatt ccgcagtatc aggaagtagc
18061 cccacttctg ctctccctgt gacttccctt ctcacctctg gcaggaggaa gaccatagac
18121 atgttggaca cacactcaga acttgtgacc agctccttac caagtgcaag tagcttctca
18181 ggtgagatac tcacttctga agcctccaca aatacagaga caattcactt ttcagagaac
18241 acagcagaaa ccaatatggg gaccaccaat tctatgcata aactacattc ctctgtctca

Figure 3A (continued)

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18301 atccactccc agccatccgg acacacacct ccaaaggtta ctggatctat gatggaggac
18361 gctattgttt ccacatcaac acctggttct cctgagacta aaaatgttga cagagactca
18421 acatcccctc tgactcctga actgaaagag gacagcaccg ccctggtgat gaactcaact
18481 acagagtcaa acactgtttt ctccagtgtg tccctggatg ctgctactga ggtctccagg
18541 gcagaagtca cctactatga tcctacattc atgccagctt ctgctcagtc aacaaagtcc
18601 ccagacattt cacctgaagc cagcagcagt cattctaact ctcctccctt gacaatatct
18661 acacacaaga ccatcgccac acaaacaggt ccttctgggg tgacatctct tggccaactg
18721 accctggaca catcaaccat agccacctca gcaggaactc catcagccag aactcaggat
18781 tttgtagatt cagaaacaac cagtgtcatg aacaatgatc tcaatgatgt gttgaagaca
18841 agccctttct ctgcagaaga agccaactct ctctcttctc aggcacctct ccttgtgaca
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19081 gatacacaca caatgcatcc ttctataaac acagcaatgg ccaatgtggg gaccaccagt
19141 tcaccaaatg aattctattt tactgtctca cctgactcag acccatataa agccacatcc
19201 gcagtagtta tcacttccac ctcgggggac tcaatagttt ccacatcaat gcctagatcc
19261 tctgcgatga aaaagattga gtctgagaca actttctccc tgatatttag actgagggag
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19741 tcctcttccc ttctgtcttt accagcaata acctcaccgt cccctgtacc tactacatta
19801 ccagaaagta ggccgtcttc tcctgttcat ctgacttcac tccccacctc tggcctagtg
19861 aagaccacag atatgctggc atctgtggcc agtttacctc caaacttggg cagcacctca
19921 cataagatac cgactacttc agaagacatt aaagatacag agaaaatgta tccttccaca
19981 aacatagcag taaccaatgt ggggaccacc acttctgaaa aggaatctta ttcgtctgtc
20041 ccagcctact cagaaccacc caaagtcacc tctccaatgg ttacctcttt caacataagg
20101 gacaccattg tttccacatc catgcctggc tcctctgaga ttacaaggat tgagatggag
20161 tcaacattct ccgtggctca tgggctgaag ggaaccagca cctcccagga ccccatcgta
20221 tccacagaga aaagtgctgt ccttcacaag ttgaccactg gtgctactga gacctctagg
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21181 tctggtagaa catccatccc tggcccttct cagtccacag ttttgccaga aatatccaca
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21661 tcacctccaa agctgagcca cacttcagat gagagactga ccactggcaa ggacaccaca
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21781 tttggacatg aatccccttc ctctgcctta gctgactcag agacatccaa agccacatca
21841 ccaatgttta ttacctccac ccaggaggat acaactgttg ccatatcaac ccctcacttc
21901 ttggagacta gcagaattca gaaagagtca atttcctccc tgagccctaa attgagggag
21961 acaggcagtt ctgtggagac aagctcagcc atagagacaa gtgctgtcct ttctgaagtg
22021 tccattggtg ctactactga gatctccagg acagaagtca cctcctctag cagaacatcc
22081 atctctggtt ctgctgagtc cacaatgttg ccagaaatat ccaccacaag aaaaatcatt
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Figure 3A (continued)

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22141 aagttcccta cttcccccat cctggcagaa tcatcagaaa tgaccatcaa gacccaaaca
22201 agtcctcctg ggtctacatc agagagtacc tttacattag acacatcaac cactccctcc
22261 ttggtaataa cccattcgac tatgactcag agattgccac actcagagat aaccactctt
22321 gtgagtagag gtgctgggga tgtgccacgg cccagctctc tccctgtgga agaaacaagc
22381 cctccatctt cccagctgtc tttatctgcc atgatctcac cttctcctgt ttcttccaca
22441 ttaccagcaa gtagccactc ctcttctgct tctgtgactt cacctctcac accaggccaa
22501 gtgaagacta ctgaggtgtt ggacgcaagt gcagaacctg aaaccagttc acctccaagt
22561 ttgagcagca cctcagttga aatactggcc acctctgaag tcaccacaga tacggagaaa
22621 attcatcctt tcccaaacac ggcagtaacc aaagttggaa cttccagttc tggacatgaa
22681 tccccttcct ctgtcctacc tgactcagag acaaccaaag ccacatcggc aatgggtacc
22741 atctccatta tgggggatac aagtgtttct acattaactc ctgccttatc taacactagg
22801 aaaattcagt cagagccagc ttcctcactg accaccagat tgagggagac cagcacctct
22861 gaagagacca gcttagccac agaagcaaac actgttcttt ctaaagtgtc cactggtgct
22921 actactgagg tctccaggac agaagccatc tcctttagca gaacatccat gtcaggccct
22981 gagcagtcca caatgtcaca agacatctcc ataggaacca tccccaggat ttctgcctcc
23041 tctgtcctga cagaatctgc aaaaatgacc atcacaaccc aaacaggtcc ttcggagtct
23101 acactagaaa gtacccttaa tttgaacaca gcaaccacac cctcttgggt ggaaacccac
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23341 ccccctctc cccttcctgt gacttcactt ctcacctctg gcccggcgac aaccacagat
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23461 catgagagac tgaccactta caaagacact gcacatacag aagccgtgca tccttccaca
23521 aacacaggag ggaccaatgt ggcaaccacc agctctggat ataaatcaca gtcctctgtc
23581 ctagctgact catctccaat gtgtaccacc tccaccatgg gggatacaag tgttctcaca
23641 tcaactcctg ccttccttga gactaggagg attcagacag agctagcttc ctccctgacc
23701 cctggattga gggagtccag tggctctgaa gggaccagct caggcaccaa gatgagcact
23761 gtcctctcta aagtgcccac tggtgctact actgagatct ccaaggaaga cgtcacctcc
23821 atcccaggtc ccgctcaatc cacaatatca ccagacatct ccacaagaac cgtcagctgg
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25921 acctcaactt ctttttctct cgcattacca gagagcatct cctcctctcc tcatcctgtg
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Figure 3A (continued)

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Figure 3A (continued)

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Figure 3A (continued)

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37741 gtgcccacca ccagcactcc tgggacctcc acagtggacc ttggaacctc agggactcca
37801 ttctccctcc caagccccgc aactgctggc cctctcctgg tgctgttcac cctcaacttc

Figure 3A (continued)

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38461 tgcagactga ccttgctcag gtccgagaag gatggagcag ccactggagt ggatgccatc
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39481 agccctggac tcaacagaga gcagctgtac tgggagctga gccagctgac ccatggcatc
39541 aaagagctgg gcccctacac cctggacagg aacagtctct atgtcaatgg tttcacccat
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41641 cctggttcca ggaagttcaa caccacggag agggttctgc agggtctgct caagcccttg
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Figure 3A (continued)

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Figure 3A (continued)

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Figure 3A (continued)

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53401 ttcaagagca ccagtgttgg ccctctgtac tctggctgca gactgacctt gctcaggcct
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Figure 3A (continued)

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57361 ctctatgtca atggtttcac ccatcagaac tctgtgccca ccaccagtac tcctgggacc

Figure 3A (continued)

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Figure 3A (continued)

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64741 cccacaggcc ctgggctgga cagagagcag ctgtatttgg agctgagcca gctgacccac
64801 agcatcactg agctgggccc ctacacactg gacagggaca gtctctatgt caatggtttc
64861 acccatcgga gctctgtacc caccaccagc accggggtgg tcagcgagga gccattcaca
64921 ctgaacttca ccatcaacaa cctgcgctac atggcggaca tgggccaacc cggctccctc
64981 aagttcaaca tcacagacaa cgtcatgaag cacctgctca gtcctttgtt ccagaggagc
65041 agcctgggtg cacggtacac aggctgcagg gtcatcgcac taaggtctgt gaagaacggt
65101 gctgagacac gggtggacct cctctgcacc tacctgcagc ccctcagcgg cccaggtctg
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Figure 3A (continued)

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65161 cctatcaagc aggtgttcca tgagctgagc cagcagaccc atggcatcac ccggctgggc
65221 ccctactctc tggacaaaga cagcctctac cttaacggtt acaatgaacc tggtctagat
65281 gagcctccta caactcccaa gccagccacc acattcctgc ctcctctgtc agaagccaca
65341 acagccatgg ggtaccacct gaagaccctc acactcaact tcaccatctc caatctccag
65401 tattcaccag atatgggcaa gggctcagct acattcaact ccaccgaggg ggtccttcag
65461 cacctgctca gacccttgtt ccagaagagc agcatgggcc ccttctactt gggttgccaa
65521 ctgatctccc tcaggcctga gaaggatggg gcagccactg gtgtggacac cacctgcacc
65581 taccaccctg accctgtggg ccccgggctg gacatacagc agctttactg ggagctgagt
65641 cagctgaccc atggtgtcac ccaactgggc ttctatgtcc tggacaggga tagcctcttc
65701 atcaatggct atgcacccca gaatttatca atccggggcg agtaccagat aaatttccac
65761 attgtcaact ggaacctcag taatccagac cccacatcct cagagtacat caccctgctg
65821 agggacatcc aggacaaggt caccacactc tacaaaggca gtcaactaca tgacacattc
65881 cgcttctgcc tggtcaccaa cttgacgatg gactccgtgt tggtcactgt caaggcattg
65941 ttctcctcca atttggaccc cagcctggtg gagcaagtct ttctagataa gaccctgaat
66001 gcctcattcc attggctggg ctccacctac cagttggtgg acatccatgt gacagaaatg
66061 gagtcatcag tttatcaacc aacaagcagc tccagcaccc agcacttcta cctgaatttc
66121 accatcacca acctaccata ttcccaggac aaagcccagc caggcaccac caattaccag
66181 aggaacaaaa ggaatattga ggatgcgctc aaccaactct tccgaaacag cagcatcaag
66241 agttattttt ctgactgtca agtttcaaca ttcaggtctg tccccaacag gcaccacacc
66301 ggggtggact ccctgtgtaa cttctcgcca ctggctcgga gagtagacag agttgccatc
66361 tatgaggaat ttctgcggat gacccggaat ggtacccagc tgcagaactt caccctggac
66421 aggagcagtg tccttgtgga tgggtattct cccaacagaa atgagccctt aactgggaat
66481 tctgaccttc ccttctgggc tgtcatcctc atcggcttgg caggactcct gggactcatc
66541 acatgcctga tctgcggtgt cctggtgacc acccgccggc ggaagaagga aggagaatac
66601 aacgtccagc aacagtgccc aggctactac cagtcacacc tagacctgga ggatctgcaa
66661 tgactggaac ttgccggtgc ctggggtgcc tttcccccag ccagggtcca aagaagcttg
66721 gctggggcag aaataaacca tattggtcgg aaaaaaaaaa aaaaa
```

Figure 3A (continued)

Polypeptide sequence (SEQ ID No:2)

MLKPSGLPGSSSPTRSLMTGSRSTKATPEMDSGLTGATLSPKTS
TGAIVVTEHTLPFTSPDKTLASPTSSVVGRTTQSLGVMSSALPESTSRGMTHSEQRTS
PSLSPQVNGTPSRNYPATSMVSGLSSPRTRTSSTEGNFTKEASTYTLTVETTSGPVTE
KYTVPTETSTTEGDSTETPWDTRYIPVKITSPMKTFADSTASKENAPVSMTPAETTVT
DSHTPGRTNPSFGTLYSSFLDLSPKGTPNSRGETSLELILSTTGYPFSSPEPGSAGHS
RISTSAPLSSSASVLDNKISETSIFSGQSLTSPLSPGVPEARASTMPNSAIPFSMTLS
NAETSAERVRSTISSLGTPSISTKQTAETILTFHAFAETMDIPSTHIAKTLASEWLGS
PGTLGGTSTSALTTTSPSTTLVSEETNTHHSTSGKETEGTLNTSMTPLETSAPGEESE
MTATLVPTLGFTTLDSKIRSPSQVSSSHPTRELRTTGSTSGRQSSSTAAHGSSDILRA
TTSSTSKASSWTSESTAQQFSEPQHTQWVETSPSMKTERPPASTSVAAPITTSVPSVV
SGFTTLKTSSTKGIWLEETSADTLIGESTAGPTTHQFAVPTGISMTGGSSTRGSQGTT
HLLTRATASSETSADLTLATNGVPVSVSPAVSKTAAGSSPPGGTKPSYTMVSSVIPET
SSLQSSAFREGTSLGLTPLNTRHPFSSPEPDSAGHTKISTSIPLLSSASVLEDKVSAT
STFSHHKATSSITTGTPEISTKTKPSSAVLSSMTLSNAATSPERVRNATSPLTHPSPS
GEETAGSVLTLSTSAETTDSPNIHPTGTLTSESSESPSTLSLPSVSGVKTTFSSSTPS
THLFTSGEETEETSNPSVSQPETSVSRVRTTLASTSVPTPVFPTMDTWPTRSAQFSSS
HLVSELRATSSTSVTNSTGSALPKISHLTGTATMSQTNRDTFNDSAAPQSTTWPETSP
RFKTGLPSATTTVSTSATSLSATVMVSKFTSPATSSMEATSIREPSTTILTTETTNGP
GSMAVASTNIPIGKGYITEGRLDTSHLPIGTTASSETSMDFTMAKESVSMSVSPSQSM
DAAGSSTPGRTSQFVDTFSDDVYHLTSREITIPRDGTSSALTPQMTATHPPSPDPGSA
RSTWLGILSSSPSSPTPKVTMSSTFSTQRVTTSMIMDTVETSRWNMPNLPSTTSLTPS
NIPTSGAIGKSTLVPLDTPSPATSLEASEGGLPTLSTYPESTNTPSIHLGAHASSESP
STIKLTMASVVKPGSYTPLTFPSIETHIHVSTARMAYSSGSSPEMTAPGETNTGSTWD
PTTYITTTDPKDTSSAQVSTPHSVRTLRTTENHPKTESATPAAYSGSPKISSSPNLTS
PATKAWTITDTTEHSTQLHYTKLAEKSSGFETQSAPGPVSVVIPTSPTIGSSTLELTS
DVPGEPLVLAPSEQTTITLPMATWLSTSLTEEMASTDLDISSPSSPMSTFAIFPPMST
PSHELSKSEADTSAIRNTDSTTLDQHLGIRSLGRTGDLTTVPITPLTTTWTSVIEHST
QAQDTLSATMSPTHVTQSLKDQTSIPASASPSHLTEVYPELGTQGRSSSEATTFWKPS
TDTLSREIETGPTNIQSTPPMDNTTTGSSSSGVTLGIAHLPIGTSSPAETSTNMALER
RSSTATVSMAGTMGLLVTSAPGRSISQSLGRVSSVLSESTTEGVTDSSKGSSPRLNTQ
GNTALSSSLEPSYAEGSQMSTSIPLTSSPTTPDVEFIGGSTFWTKEVTTVMTSDISKS
SARTESSSATLMSTALGSTENTGKEKLRTASMDLPSPTPSMEVTPWISLTLSNAPNTT
DSLDLSHGVHTSSAGTLATDRSLNTGVTRASRLENGSDTSSKSLSMGNSTHTSMTDTE
KSEVSSSIHPRPETSAPGAETTLTSTPGNRAISLTLPFSSIPVEEVISTGITSGPDIN
SAPMTHSPITPPTIVWTSTGTIEQSTQPLHAVSSEKVSVQTQSTPYVNSVAVSASPTH
ENSVSSGSSTSSPYSSASLESLDSTISRRNAITSWLWDLTTSLPTTTWPSTSLSEALS
SGHSGVSNPSSTTTEFPLFSAASTSAAKQRNPETETHGPQNTAASTLNTDASSVTGLS
ETPVGASISSEVPLPMAITSRSDVSGLTSESTANPSLGTASSAGTKLTRTISLPTSES
LVSFRMNKDPWTVSIPLGSHPTTNTETSIPVNSAGPPGLSTVASDVIDTPSDGAESIP
TVSFSPSPDTEVTTISHFPEKTTHSFRTISSLTHELTSRVTPIPGDWMSSAMSTKPTG
ASPSITLGERRTITSAAPTTSPIVLTASFTETSTVSLDNETTVKTSDILDARKTNELP
SDSSSSSDLINTSIASSTMDVTKTASISPTSISGMTASSSPSLFSSDRPQVPTSTTET
NTATSPSVSSNTYSLDGGSNVGGTPSTLPPFTITHPVETSSALLAWSRPVRTFSTMVS
TDTASGENPTSSNSVVTSVPAPGTWASVGSTTDLPAMGFLKTSPAGEAHSLLASTIEP
ATAFTPHLSAAVVTGSSATSEASLLTTSESKAIHSSPQTPTTPTSGANWETSATPESL
LVVTETSDTTLTSKILVTDTILFSTVSTPPSKFPSTGTLSGASFPTLLPDTPAIPLTA
TEPTSSLATSFDSTPLVTIASDSLGTVPETTLTMSETSNGDALVLKTVSNPDRSIPGI
TIQGVTESPLHPSSTSPSKIVAPRNTTYEGSITVALSTLPAGTTGSLVFSQSSENSET
TALVDSSAGLERASVMPLTTGSQGMASSGGIRSGSTHSTGTKTFSSLPLTMNPGEVTA
MSEITTNRLTATQSTAPKGIPVKPTSAESGLLTPVSASSSPSKAFASLTTAPPSTWGI
PQSTLTFEFSEVPSLDTKSASLPTPGQSLNTIPDSDASTASSSLSKSPEKNPRARMMT

Figure 3B

STKAISASSFQSTGFTETPEGSASPSMAGHEPRVPTSGTGDPRYASESMSYPDPSKAS
SAMTSTSLASKLTTLFSTGQAARSGSSSSPISLSTEKETSFLSPTASTSRKTSLFLGP
SMARQPNILVHLQTSALTLSPTSTLNMSQEEPPELTSSQTIAEEEGTTAETQTLTFTP
SETPTSLLPVSSPTEPTARRKSSPETWASSISVPAKTSLVETTDGTLVTTIKMSSQAA
QGNSTWPAPAEETGTSPAGTSPGSPEVSTTLKIMSSKEPSISPEIRSTVRNSPWKTPE
TTVPMETTVEPVTLQSTALGSGSTSISHLPTGTTSPTKSPTENMLATERVSLSPSPPE
AWTNLYSGTPGGTRQSLATMSSVSLESPTARSITGTGQQSSPELVSKTTGMEFSMWHG
STGGTTGDTHVSLSTSSNILEDPVTSPNSVSSLTDKSKHKTETWVSTTAIPSTVLNNK
IMAAEQQTSRSVDEAYSSTSSWSDQTSGSDITLGASPDVTNTLYITSTAQTTSLVSLP
SGDQGITSLTNPSGGKTSSASSVTSPSIGLETLRANVSAVKSDIAPTAGHLSQTSSPA
EVSILDVTTAPTPGISTTITTMGTNSISTTTPNPEVGMSTMDSTPATERRTTSTEHPS
TWSSTAASDSWTVTDMTSNLKVARSPGTISTMHTTSFLASSTELDSMSTPHGRITVIG
TSLVTPSSDASAVKTETSTSERTLSPSDTTASTPISTFSRVQRMSISVPDILSTSWTP
SSTEAEDVPVSMVSTDHASTKTDPNTPLSTFLFDSLSTLDWDTGRSLSSATATTSAPQ
GATTPQELTLETMISPATSQLPFSIGHITSAVTPAAMARSSGVTFSRPDPTSKKAEQT
STQLPTTTSAHPGQVPRSAATTLDVIPHTAKTPDATFQRQGQTALTTEARATSDSWNE
KEKSTPSAPWITEMMNSVSEDTIKEVTSSSSVLKDPEYAGHKLGIWDDFIPKFGKAAH
MRELPLLSPPQDKEAIHPSTNTVETTGWVTSSEHASHSTIPAHSASSKLTSPVVTTST
REQAIVSMSTTTWPESTRARTEPNSFLTIELRDVSPYMDTSSTTQTSIISSPGSTAIT
KGPRTEITSSKRISSSFLAQSMRSSDSPSEAITRLSNFPAMTESGGMILAMQTSPPGA
TSLSAPTLDTSATASWTGTPLATTQRFTYSEKTTLFSKGPEDTSQPSPPSVEETSSSS
SLVPIHATTSPSNILLTSQGHSPSSTPPVTSVFLSETSGLGKTTDMSRISLEPGTSLP
PNLSSTAGEALSTYEASRDTKAIHHSADTAVTNMEATSSEYSPIPGHTKPSKATSPLV
TSHIMGDITSSTSVFGSSETTEIETVSSVNQGLQERSTSQVASSATETSTVITHVSSG
DATTHVTKTQATFSSGTSISSPHQFITSTNTFTDVSTNPSTSLIMTESSGVTITTQTG
PTGAATQGPYLLDTSTMPYLTETPLAVTPDFMQSEKTTLISKGPKDVTWTSPPSVAET
SYPSSLTPFLVTTIPPATSTLQGQHTSSPVSATSVLTSGLVKTTDMLNTSMEPVTNSP
QNLNNPSNEILATLAATTDIETIHPSINKAVTNMGTASSAHVLHSTLPVSSEPSTATS
PMVPASSMGDALASISIPGSETTDIEGEPTSSLTAGRKENSTLQEMNSTTESNIILSN
VSVGAITEATKMEVPSFDATFIPTPAQSTKFPDIFSVASSRLSNSPPMTISTHMTTTQ
TGSSGATSKIPLALDTSTLETSAGTPSVVTEGFAHSKITTAMNNDVKDVSQTNPPFQD
EASSPSSQAPVLVTTLPSSVAFTPQWHSTSSPVSMSSVLTSSLVKTAGKVDTSLETVT
SSPQSMSNTLDDISVTSAATTDIETTHPSINTVVTNVGTTGSAFESHSTVSAYPEPSK
VTSPNVTTSTMEDTTISRSIPKSSKTTRTETETTSSLTPKLRETSISQEITSSTETST
VPYKELTGATTEVSRTDVTSSSSTSFPGPDQSTVSLDISTETNTRLSTSPIMTESAEI
TITTQTGPHGATSQDTFTMDPSNTTPQAGIHSAMTHGFSQLDVTTLMSRIPQDVSWTS
PPSVDKTSSPSSFLSSPAMTTPSLISSTLPEDKLSSPMTSLLTSGLVKITDILRTRLE
PVTSSLPNFSSTSDKILATSKDSKDTKEIFPSINTEETNVKANNSGHESHSPALADSE
TPKATTQMVITTTVGDPAPSTSMPVHGSSETTNIKREPTYFLTPRLRETSTSQESSFP
TDTSFLLSKVPTGTITEVSSTGVNSSSKISTPDHDKSTVPPDTFTGEIPRVFTSSIKT
KSAEMTITTQASPPESASHSTLPLDTSTTLSQGGTHSTVTQGFPYSEVTTLMGMGPGN
VSWMTTPPVEETSSVSSLMSSPAMTSPSPVSSTSPQSIPSSPLPVTALPTSVLVTTTD
VLGTTSPESVTSSPPNLSSITHERPATYKDTAHTEAAMHHSTNTAVTNVGTSGSGHKS
QSSVLADSETSKATPLMSTTSTLGDTSVSTSTPNISQTNQIQTEPTASLSPRLRESST
SEKTSSTTETNTAFSYVPTGAITQASRTEISSSRTSISDLDRPTIAPDISTGMITRLF
TSPIMTKSAEMTVTTQTTTPGATSQGILPWDTSTTLFQGGTHSTVSQGFPHSEITTLR
SRTPGDVSWMTTPPVEETSSGFSLMSPSMTSPSPVSSTSPESIPSSPLPVTALLTSVL
VTTTNVLGTTSPETVTSSPPNLSSPTQERLTTYKDTAHTEAMHASMHTNTAVANVGTS
ISGHESQSSVPADSHTSKATSPMGITFAMGDTSVSTSTPAFFETRIQTESTSSLIPGL
RDTRTSEEINTVTETSTVLSEVPTTTTTEVSRTEVITSSRTTISGPDHSKMSPYISTE
TITRLSTFPFVTGSTEMAITNQTGPIGTISQATLTLDTSSTASWEGTHSPVTQRFPHS
EETTTMSRSTKGVSWQSPPSVEETSSPSSPVPLPAITSHSSLYSAVSGSSPTSALPVT
SLLTSGRRKTIDMLDTHSELVTSSLPSASSFSGEILTSEASTNTETIHFSENTAETNM
GTTNSMHKLHSSVSIHSQPSGHTPPKVTGSMMEDAIVSTSTPGSPETKNVDRDSTSPL
TPELKEDSTALVMNSTTESNTVFSSVSLDAATEVSRAEVTYYDPTFMPASAQSTKSPD
ISPEASSSHSNSPPLTISTHKTIATQTGPSGVTSLGQLTLDTSTIATSAGTPSARTQD

Figure 3B (continued)

FVDSETTSVMNNDLNDVLKTSPFSAEEANSLSSQAPLLVTTSPSPVTSTLQEHSTSSL
VSVTSVPTPTLAKITDMDTNLEPVTRSPQNLRNTLATSEATTDTHTMHPSINTAMANV
GTTSSPNEFYFTVSPDSDPYKATSAVVITSTSGDSIVSTSMPRSSAMKKIESETTFSL
IFRLRETSTSQKIGSSSDTSTVFDKAFTAATTEVSRTELTSSSRTSIQGTEKPTMSPD
TSTRSVTMLSTFAGLTKSEERTIATQTGPHRATSQGTLTWDTSITTSQAGTHSAMTHG
FSQLDLSTLTSRVPEYISGTSPPSVEKTSSSSSLLSLPAITSPSPVPTTLPESRPSSP
VHLTSLPTSGLVKTTDMLASVASLPPNLGSTSHKIPTTSEDIKDTEKMYPSTNIAVTN
VGTTTSEKESYSSVPAYSEPPKVTSPMVTSFNIRDTIVSTSMPGSSEITRIEMESTFS
VAHGLKGTSTSQDPIVSTEKSAVLHKLTTGATETSRTEVASSRRTSIPGPDHSTESPD
ISTEVIPSLPISLGITESSNMTIITRTGPPLGSTSQGTFTLDTPTTSSRAGTHSMATQ
EFPHSEMTTVMNKDPEILSWTIPPSIEKTSFSSSLMPSPAMTSPPVSSTLPKTIHTTP
SPMTSLLTPSLVMTTDTLGTSPEPTTSSPPNLSSTSHVILTTDEDTTAIEAMHPSTST
AATNVETTCSGHGSQSSVLTDSEKTKATAPMDTTSTMGHTTVSTSMSVSSETTKIKRE
STYSLTPGLRETSISQNASFSTDTSIVLSEVPTGTTAEVSRTEVTSSGRTSIPGPSQS
TVLPEISTRTMTRLFASPTMTESAEMTIPTQTGPSGSTSQDTLTLDTSTTKSQAKTHS
TLTQRFPHSEMTTLMSRGPGDMSWQSSPSLENPSSLPSLLSLPATTSPPPISSTLPVT
ISSSPLPVTSLLTSSPVTTTDMLHTSPELVTSSPPKLSHTSDERLTTGKDTTNTEAVH
PSTNTAASNVEIPSFGHESPSSALADSETSKATSPMFITSTQEDTTVAISTPHFLETS
RIQKESISSLSPKLRETGSSVETSSAIETSAVLSEVSIGATTEISRTEVTSSSRTSIS
GSAESTMLPEISTTRKIIKFPTSPILAESSEMTIKTQTSPPGSTSESTFTLDTSTTPS
LVITHSTMTQRLPHSEITTLVSRGAGDVPRPSSLPVEETSPPSSQLSLSAMISPSPVS
STLPASSHSSSASVTSPLTPGQVKTTEVLDASAEPETSSPPSLSSTSVEILATSEVTT
DTEKIHPFPNTAVTKVGTSSSGHESPSSVLPDSETTKATSAMGTISIMGDTSVSTLTP
ALSNTRKIQSEPASSLTTRLRETSTSEETSLATEANTVLSKVSTGATTEVSRTEAISF
SRTSMSGPEQSTMSQDISIGTIPRISASSVLTESAKMTITTQTGPSESTLESTLNLNT
ATTPSWVETHSIVIQGFPHPEMTTSMGRGPGGVSWPSPPFVKETSPPSSPLSLPAVTS
PHPVSTTFLAHIPPSPLPVTSLLTSGPATTTDILGTSTEPGTSSSSSLSTTSHERLTT
YKDTAHTEAVHPSTNTGGTNVATTSSGYKSQSSVLADSSPMCTTSTMGDTSVLTSTPA
FLETRRIQTELASSLTPGLRESSGSEGTSSGTKMSTVLSKVPTGATTEISKEDVTSIP
GPAQSTISPDISTRTVSWFSTSPVMTESAEITMNTHTSPLGATTQGTSTLATSSTTSL
TMTHSTISQGFSHSQMSTLMRRGPEDVSWMSPPLLEKTRPSFSLMSSPATTSPSPVSS
TLPESISSSPLPVTSLLTSGLAKTTDMLHKSSEPVTNSPANLSSTSVEILATSEVTTD
TEKTHPSSNRTVTDVGTSSSGHESTSFVLADSQTSKVTSPMVITSTMEDTSVSTSTPG
FFETSRIQTEPTSSLTLGLRKTSSSEGTSLATEMSTVLSGVPTGATAEVSRTEVTSSS
RTSISGFAQLTVSPETSTETITRLPTSSIMTESAEMMIKTQTDPPGSTPESTHTVDIS
TTPNWVETHSTVTQRFSHSEMTTLVSRSPGDMLWPSQSSVEETSSASSLLSLPATTSP
SPVSSTLVEDFPSASLPVTSLLTPGLVITTDRMGISREPGTSSTSNLSSTSHERLTTL
EDTVDTEDMQPSTHTAVTNVRTSISGHESQSSVLSDSETPKATSPMGTTYTMGETSVS
ISTSDFFETSRIQIEPTSSLTSGLRETSSSERISSATEGSTVLSEVPSGATTEVSRTE
VISSRGTSMSGPDQFTISPDISTEAITRLSTSPIMTESAESAITIETGSPGATSEGTL
TLDTSTTTFWSGTHSTASPGFSHSEMTTLMSRTPGDVPWPSLPSVEEASSVSSSLSSP
AMTSTSFFSALPESISSSPHPVTALLTLGPVKTTDMLRTSSEPETSSPPNLSSTSAEI
LATSEVTKDREKIHPSSNTPVVNVGTVIYKHLSPSSVLADLVTTKPTSPMATTSTLGN
TSVSTSTPAFPETMMTQPTSSLTSGLREISTSQETSSATERSASLSGMPTGATTKVSR
TEALSLGRTSTPGPAQSTISPEISTETITRISTPLTTTGSAEMTITPKTGHSGASSQG
TFTLDTSSRASWPGTHSAATHRSPHSGMTTPMSRGPEDVSWPSRPSVEKTSPPSSLVS
LSAVTSPSPLYSTPSESSHSSPLRVTSLFTPVMMKTTDMLDTSLEPVTTSPPSMNITS
DESLATSKATMETEAIQLSENTAVTQMGTISARQEFYSSYPGLPEPSKVTSPVVTSST
IKDIVSTTIPASSEITRIEMESTSTLTPTPRETSTSQEIHSATKPSTVPYKALTSATI
EDSMTQVMSSSRGPSPDQSTMSQDISSEVITRLSTSPIKAESTEMTITTQTGSPGATS
RGTLTLDTSTTFMSGTHSTASQGFSHSQMTALMSRTPGDVPWLSHPSVEEASSASFSL
SSPVMTSSSPVSSTLPDSIHSSSLPVTSLLTSGLVKTTELLGTSSEPETSSPPNLSST
SAEILATTEVTTDTEKLEMTNVVTSGYTHESPSSVLADSVTTKATSSMGITYPTGDTN
VLTSTPAFSDTSRIQTKSKLSLTPGLMETSISEETSSATEKSTVLSSVPTGATTEVSR
TEAISSSRTSIPGPAQSTMSSDTSMETITRISTPLTRKESTDMAITPKTGPSGATSQG
TFTLDSSSTASWPGTHSATTQRFPQSVVTTPMSRGPEDVSWPSPLSVEKNSPPSSLVS
SSSVTSPSPLYSTPSGSSHSSPVPVTSLFTSIMMKATDMLDASLEPETTSAPNMNITS
DESLATSKATTETEAIHVFENTAASHVETTSATEELYSSSPGFSEPTKVISPVVTSSS
IRDNMVSTTMPGSSGITRIEIESMSSLTPGLRETRTSQDITSSTETSTVLYKMSSGAT

Figure 3B (continued)

PEVSRTEVMPSSRTSIPGPAQSTMSLDISDEVVTRLSTSPIMTESAEITITTQTGYSL
ATSQVTLPLGTSMTFLSGTHSTMSQGLSHSEMTNLMSRGPESLSWTSPRFVETTRSSS
SLTSLPLTTSLSPVSSTLLDSSPSSPLPVTSLILPGLVKTTEVLDTSSEPKTSSSPNL
SSTSVEIPATSEIMTDTEKIHPSSNTAVAKVRTSSSVHESHSSVLADSETTITIPSMG
ITSAVDDTTVFTSNPAFSETRRIPTEPTFSLTPGFRETSTSEETTSITETSAVLYGVP
TSATTEVSMTEIMSSNRTHIPDSDQSTMSPDIITEVITRLSSSSMMSESTQMTITTQK
SSPGATAQSTLTLATTTAPLARTHSTVPPRFLHSEMTTLMSRSPENPSWKSSPFVEKT
SSSSSLLSLPVTTSPSVSSTLPQSIPSSSFSVTSLLTPGMVKTTDTSTEPGTSLSPNL
SGTSVEILAASEVTTDTEKIHPSSSMAVTNVGTTSSGHELYSSVSIHSEPSKATYPVG
TPSSMAETSISTSMPANFETTGFEAEPFSHLTSGFRKTNMSLDTSSVTPTNTPSSPGS
THLLQSSKTDFTSSAKTSSPDWPPASQYTEIPVDIITPFNASPSITESTGITSFPESR
FTMSVTESTHHLSTDLLPSAETISTGTVMPSLSEAMTSFATTGVPRAISGSGSPFSRT
ESGPGDATLSTIAESLPSSTPVPFSSSTFTTTDSSTIPALHEITSSSATPYRVDTSLG
TESSTTEGRLVMVSTLDTSSQPGRTSSTPILDTRMTESVELGTVTSAYQVPSLSTRLT
RTDGIMEHITKIPNEAAHRGTIRPVKGPQTSTSPASPKGLHTGGTKRMETTTTALKTT
TTALKTTSRATLTTSVYTPTLGTLTPLNASRQMASTILTEMMITTPYVFPDVPETTSS
LATSLGAETSTALPRTTPSVLNRESETTASLVSRSGAERSPVIQTLDVSSSEPDTTAS
WVIHPAETIPTVSKTTPNFFHSELDTVSSTATSHGADVSSAIPTNISPSELDALTPLV
TISGTDTSTTFPTLTKSPHETETRTTWLTHPAETSSTIPRTIPNFSHHESDATPSIAT
SPGAETSSAIPIMTVSPGAEDLVTSQVTSSGTDRNMTIPTLTLSPGEPKTIASLVTHP
EAQTSSAIPTSTISPAVSRLVTSMVTSLAAKTSTTNRALTNSPGEPATTVSLVTHPAQ
TSPTVPWTTSIFFHSKSDTTPSMTTSHGAESSSAVPTPTVSTEVPGVVTPLVTSSRAV
ISTTIPILTLSPGEPETTPSMATSHGEEASSAIPTPTVSPGVPGVVTSLVTSSRAVTS
TTIPILTFSLGEPETTPSMATSHGTEAGSAVPTVLPEVPGMVTSLVASSRAVTSTTLP
TLTLSPGEPETTPSMATSHGAEASSTVPTVSPEVPGVVTSLVTSSSGVNSTSIPTLIL
SPGELETTPSMATSHGAEASSAVPTPTVSPGVSGVVTPLVTSSRAVTSTTIPILTLSS
SEPETTPSMATSHGVEASSAVLTVSPEVPGMVTSLVTSSRAVTSTTIPTLTISSDEPE
TTTSLVTHSEAKMISAIPTLAVSPTVQGLVTSLVTSSGSETSAFSNLTVASSQPETID
SWVAHPGTEASSVVPTLTVSTGEPFTNISLVTHPAESSSTLPRTTSRFSHSELDTMPS
TVTSPEAESSSAISTTISPGIPGVLTSLVTSSGRDISATFPTVPESPHESEATASWVT
HPAVTSTTVPRTTPNYSHSEPDTTPSIATSPGAEATSDFPTITVSPDVPDMVTSQVTS
SGTDTSITIPTLTLSSGEPETTTSFITYSETHTSSAIPTLPVSPGASKMLTSLVISSG
TDSTTTFPTLTETPYEPETTAIQLIHPAETNTMVPKTTPKFSHSKSDTTLPVAITSPG
PEASSAVSTTTISPDMSDLVTSLVPSSGTDTSTTFPTLSETPYEPETTVTWLTHPAET
STTVSGTIPNFSHRGSDTAPSMVTSPGVDTRSGVPTTTIPPSIPGVVTSQVTSSATDT
STAIPTLTPSPGEPETTASSATHPGTQTGFTVPIRTVPSSEPDTMASWVTHPPQTSTP
VSRTTSSFSHSSPDATPVMATSPRTEASSAVLTTISPGAPEMVTSQITSSGAATSTTV
PTLTHSPGMPETTALLSTHPRTGTSKTFPASTVFPQVSETTASLTIRPGAETSTALPT
QTTSSLFTLLVTGTSRVDLSPTASPGVSAKTAPLSTHPGTETSTMIPTSTLSLGLLET
TGLLATSSSAETSTSTLTLTVSPAVSGLSSASITTDKPQTVTSWNTETSPSVTSVGPP
EFSRTVTGTTMTLIPSEMPTPPKTSHGEGVSPTTILRTTMVEATNLATTGSSPTVAKT
TTTFNTLAGSLFTPLTTPGMSTLASESVTSRTSYNHRSWISTTSSYNRRYWTPATSTP
VTSTFSPGISTSSIPSSTAATVPFMVPFTLNFTITNLQYEEDMRHPGSRKFNATEREL
QGLLKPLFRNSSLEYLYSGCRLASLRPEKDSSAMAVDAICTHRPDPEDLGLDRERLYW
ELSNLTNGIQELGPYTLDRNSLYVNGFTHRSSMPTTSTPGTSTVDVGTSGTPSSSPSP
TAAGPLLMPFTLNFTITNLQYEEDMRRTGSRKFNTMESVLQGLLKPLFKNTSVGPLYS
GCRLTLLRPEKDGAATGVDAICTHRLDPKSPGLNREQLYWELSKLTNDIEELGPYTLD
RNSLYVNGFTHQSSVSTTSTPGTSTVDLRTSGTPSSLSSPTIMAAGPLLVPFTLNFTI
TNLQYGEDMGHPGSRKFNTTERVLQGLLGPIFKNTSVGPLYSGCRLTSLRSEKDGAAT
GVDAICIHHLDPKSPGLNRERLYWELSQLTNGIKELGPYTLDRNSLYVNGFTHRTSVP
TTSTPGTSTVDLGTSGTPFSLPSPATAGPLLVLFTLNFTITNLKYEEDMHRPGSRKFN
TTERVLQTLLGPMFKNTSVGLLYSGCRLTLLRSEKDGAATGVDAICTHRLDPKSPGLD
REQLYWELSQLTNGIKELGPYTLDRNSLYVNGFTHWIPVPTSSTPGTSTVDLGSGTPS
SLPSPTAAGPLLVPFTLNFTITNLQYEEDMHHPGSRKFNTTERVLQGLLGPMFKNTSV
GLLYSGCRLTLLRSEKDGAATGVDAICTHRLDPKSPGVDREQLYWELSQLTNGIKELG
PYTLDRNSLYVNGFTHQTSAPNTSTPGTSTVDLGTSGTPSSLPSPTSAGPLLVPFTLN
FTITNLQYEEDMRHPGSRKFNTTERVLQGLLKPLFKSTSVGPLYSGCRLTLLRSEKDG
AATGVDAICTHRLDPKSPGVDREQLYWELSQLTNGIKELGPYTLDRNSLYVNGFTHQT
SAPNTSTPGTSTVDLGTSGTPSSLPSPTSAGPLLVPFTLNFTITNLQYEEDMHHPGSR

Figure 3B (continued)

KFNTTERVLQGLLGPMFKNTSVGLLYSGCRLTLLRPEKNGAATGMDAICSHRLDPKSP
GLNREQLYWELSQLTHGIKELGPYTLDRNSLYVNGFTHRSSVAPTSTPGTSTVDLGTS
GTPSSLPSPTTAVPLLVPFTLNFTITNLQYGEDMRHPGSRKFNTTERVLQGLLGPLFK
NSSVGPLYSGCRLISLRSEKDGAATGVDAICTHHLNPQSPGLDREQLYWQLSQMTNGI
KELGPYTLDRNSLYVNGFTHRSSGLTTSTPWTSTVDLGTSGTPSPVPSPTTAGPLLVP
FTLNFTITNLQYEEDMHRPGSRKFNTTERVLQGLLSPIFKNSSVGPLYSGCRLTSLRP
EKDGAATGMDAVCLYHPNPKRPGLDREQLYWELSQLTHNITELGPYSLDRDSLYVNGF
THQNSVPTTSTPGTSTVYWATTGTPSSFPGHTEPGPLLIPFTFNFTITNLHYEENMQH
PGSRKFNTTERVLQGLLKPLFKNTSVGPLYSGCRLTSLRPEKDGAATGMDAVCLYHPN
PKRPGLDREQLYWELSQLTHNITELGPYSLDRDSLYVNGFTHQNSVPTTSTPGTSTVY
WATTGTPSSFPGHTEPGPLLIPFTFNFTITNLHYEENMQHPGSRKFNTTERVLQGLLK
PLFKNTSVGPLYSGCRLTLLRPEKHEAATGVDTICTHRVDPIGPGLDRERLYWELSQL
TNSITELGPYTLDRDSLYVNGFNPRSSVPTTSTPGTSTVHLATSGTPSSLPGHTAPVP
LLIPFTLNFTITNLHYEENMQHPGSRKFNTTERVLQGLLKPLFKNTSVGPLYSGCRLT
LLRPEKHEAATGVDTICTHRVDPIGPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLY
VNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTSAGPLLVPFTLNFTITNLQYEE
DMHHPGSRKFNTTERVLQGLLGPMFKNTSVGLLYSGCRLTLLRPEKNGAATGMDAICS
HRLDPKSPGLDREQLYWELSQLTHGIKELGPYTLDRNSLYVNGFTHRSSVAPTSTPGT
STVDLGTSGTPSSLPSPTTAVPLLVPFTLNFTITNLQYGEDMRHPGSRKFNTTERVLQ
GLLGPLFKNSSVGPLYSGCRLISLRSEKDGAATGVDAICTHHLNPQSPGLDREQLYWQ
LSQMTNGIKELGPYTLDRNSLYVNGFTHRSSGLTTSTPWTSTVDLGTSGTPSPVPSPT
TAGPLLVPFTLNFTITNLQYEEDMHRPGSRKFNATERVLQGLLSPIFKNSSVGPLYSG
CRLTSLRPEKDGAATGMDAVCLYHPNPKRPGLDREQLYWELSQLTHNITELGPYSLDR
DSLYVNGFTHQSSMTTTRTPDTSTMHLATSRTPASLSGPTTASPLLVLFTINCTITNL
QYEEDMRRTGSRKFNTMESVLQGLLKPLFKNTSVGPLYSGCRLTLLRPKKDGAATGVD
AICTHRLDPKSPGLNREQLYWELSKLTNDIEELGPYTLDRNSLYVNGFTHQSSVSTTS
TPGTSTVDLRTSGTPSSLSSPTIMXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNT
TERVLQGLLRPLFKNTSVSSLYSGCRLTLLRPEKDGAATRVDAACTYRPDPKSPGLDR
EQLYWELSQLTHSITELGPYTLDRVSLYVNGFNPRSSVPTTSTPGTSTVHLATSGTPS
SLPGHTXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTERVLQGLLKPLFRNSSL
EYLYSGCRLASLRPEKDSSAMAVDAICTHRPDPEDLGLDRERLYWELSNLTNGIQELG
PYTLDRNSLYVNGFTHRSSGLTTSTPWTSTVDLGTSGTPSPVPSPTTAGPLLVPFTLN
FTITNLQYEEDMHRPGSRRFNTTERVLQGLLTPLFKNTSVGPLYSGCRLTLLRPEKQE
AATGVDTICTHRVDPIGPGLDRERLYWELSQLTNSITELGPYTLDRDSLYVNGFNPWS
SVPTTSTPGTSTVHLATSGTPSSLPGHTAPVPLLIPFTLNFTITDLHYEENMQHPGSR
KFNTTERVLQGLLKPLFKSTSVGPLYSGCRLTLLRPEKHGAATGVDAICTLRLDPTGP
GLDRERLYWELSQLTNSVTELGPYTLDRDSLYVNGFTHRSSVPTTSIPGTSAVHLETS
GTPASLPGHTAPGPLLVPFTLNFTITNLQYEEDMRHPGSRKFSTTERVLQGLLKPLFK
NTSVSSLYSGCRLTLLRPEKDGAATRVDAVCTHRPDPKSPGLDRERLYWKLSQLTHGI
TELGPYTLDRHSLYVNGFTHQSSMTTTRTPDTSTMHLATSRTPASLSGPTTASPLLVL
FTINFTITNLRYEENMHHPGSRKFNTTERVLQGLLRPVFKNTSVGPLYSGCRLTTLRP
KKDGAATKVDAICTYRPDPKSPGLDREQLYWELSQLTHSITELGPYTQDRDSLYVNGF
THRSSVPTTSIPGTSAVHLETSGTPASLPGHTAPGPLLVPFTLNFTITNLQYEEDMRH
PGSRKFNTTERVLQGLLKPLFKSTSVGPLYSGCRLTLLRPEKRGAATGVDTICTHRLD
PLNPGLDREQLYWELSKLTRGIIELGPYLLDRGSLYVNGFTHRTSVPTTSTPGTSTVD
LGTSGTPFSLPSPAXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTERVLQTLLG
PMFKNTSVGLLYSGCRLTLLRSEKDGAATGVDAICTHRLDPKSPGVDREQLYWELSQL
TNGIKELGPYTLDRNSLYVNGFTHWIPVPTSSTPGTSTVDLGSGTPSSLPSPTTAGPL
LVPFTLNFTITNLKYEEDMHCPGSRKFNTTERVLQSLLGPMFKNTSVGPLYSGCRLTL
LRSEKDGAATGVDAICTHRLDPKSPGVDREQLYWELSQLTNGIKELGPYTLDRNSLYV
NGFTHQTSAPNTSTPGTSTVDLGTSGTPSSLPSPTXXXPLLXPFTXNXTITNLXXXXX
MXXPGSRKFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICXH
XXXPKXPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHWIPVPTSSTPGTS
TVDLGSGTPSSLPSPTTAGPLLVPFTLNFTITNLKYEEDMHCPGSRKFNTTERVLQSL
LGPMFKNTSVGPLYSGCRLTSLRSEKDGAATGVDAICTHRVDPKSPGVDREQLYWELS
QLTNGIKELGPYTLDRNSLYVNGFTHQTSAPNTSTPGTSTVXXGTSGTPSSXPXXTSA
GPLLVPFTLNFTITNLQYEEDMHHPGSRKFNTTERVLQGLLGPMFKNTSVGLLYSGCR

Figure 3B (continued)

LTLLRPEKNGATTGMDAICTHRLDPKSPGLXXEXLYWELSXLTXXIXELGPYTLDRXS
LYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXTITNLXX
XXXMXXPGSRKFNTTERVLQGLLKPLFRNSSLEYLYSGCRLASLRPEKDSSAMAVDAI
CTHRPDPEDLGLDRERLYWELSNLTNGIQELGPYTLDRNSLYVNGFTHRSSMPTTSTP
GTSTVDVGTSGTPSSSPSPTTAGPLLIPFTLNFTITNLQYGEDMGHPGSRKFNTTERV
LQGLLGPIFKNTSVGPLYSGCRLTSLRSEKDGAATGVDAICIHHLDPKSPGLNRERLY
WELSQLTNGIKELGPYTLDRNSLYVNGFTHRTSVPTTSTPGTSTVDLGTSGTPFSLPS
PATAGPLLVLFTLNFTITNLKYEEDMHRPGSRKFNTTERVLQTLLGPMFKNTSVGLLY
SGCRLTLLRSEKDGAATGVDAICTHRLDPKSPGLXXEXLYWELSXLTXXIXELGPYTL
DRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXTIT
NLXXXXXMXXPGSRKFNTTERVLQGLLRPVFKNTSVGPLYSGCRLTLLRPKKDGAATK
VDAICTYRPDPKSPGLDREQLYWELSQLTHSITELGPYTQDRDSLYVNGFTHRSSVPT
TSIPGTSAVHLETTGTPSSFPGHTEPGPLLIPFTFNFTITNLRYEENMQHPGSRKFNT
TERVLQGLLTPLFKNTSVGPLYSGCRLTLLRPEKQEAATGVDTICTHRVDPIGPGLDR
ERLYWELSQLTNSITELGPYTLDRDSLYVDGFNPWSSVPTTSTPGTSTVHLATSGTPS
PLPGHTAPVPLLIPFTLNFTITDLHYEENMQHPGSRKFNTTERVLQGLLKPLFKSTSV
GPLYSGCRLTLLRPEKHGAATGVDAICTLRLDPTGPGLDRERLYWELSQLTNSITELG
PYTLDRDSLYVNGFNPWSSVPTTSTPGTSTVHLATSGTPSSLPGHTTAGPLLVPFTLN
FTITNLKYEEDMHCPGSRKFNTTERVLQSLHGPMFKNTSVGPLYSGCRLTLLRSEKDG
AATGVDAICTHRLDPKSPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHXX
SXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXTITNLXXXXXMXXPGSR
KFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICXHXXXPKXP
GLXXEXLYWELSXLTNSITELGPYTLDRDSLYVNGFTHRSSMPTTSIPGTSAVHLETS
GTPASLPGHTAPGPLLVPFTLNFTITNLQYEEDMRHPGSRKFNTTERVLQGLLKPLFK
STSVGPLYSGCRLTLLRPEKRGAATGVDTICTHRLDPLNPGLXXEXLYWELSXLTXXI
XELGPYTLDRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXP
FTXNXTITNLXXXXXMXXPGSRKFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRX
EKXGAATGXDAICXHXXXPKXPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGF
HPRSSVPTTSTPGTSTVHLATSGTPSSLPGHTAPVPLLIPFTLNFTITNLHYEENMQH
PGSRKFNTTERVLQGLLGPMFKNTSVGLLYSGCRLTLLRPEKNGAATGMDAICSHRLD
PKSPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHXXSXPTTSTPGTSTVX
XGTSGTPSSXPXXTXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTEXVLQGLLX
PXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICXHXXXPKXPGLXXEXLYWELSXL
TXXIXELGPYTLDRXSLYVNGFTHQNSVPTTSTPGTSTVYWATTGTPSSFPGHTEPGP
LLIPFTFNFTITNLHYEENMQHPGSRKFNTTERVLQGLLTPLFKNTSVGPLYSGCRLT
LLRPEKQEAATGVDTICTHRVDPIGPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLY
VNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXTITNLXXXX
XMXXPGSRKFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICX
HXXXPKXPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHRSSVPTTSSPGT
STVHLATSGTPSSLPGHTAPVPLLIPFTLNFTITNLHYEENMQHPGSRKFNTTERVLQ
GLLKPLFKSTSVGPLYSGCRLTLLRPEKHGAATGVDAICTLRLDPTGPGLXXEXLYWE
LSXLTXXIXELGPYTLDRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXT
XXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTEXVLQGLLXPXFKNXSVGXLYSG
CRLTXLRXEKXGAATGXDAICXHXXXPKXPGLXXEXLYWELSXLTXXIXELGPYTLDR
XSLYVNGFTHRTSVPTTSTPGTSTVHLATSGTPSSLPGHTAPVPLLIPFTLNFTITNL
QYEEDMHRPGSRKFNTTERVLQGLLSPIFKNSSVGPLYSGCRLTSLRPEKDGAATGMD
AVCLYHPNPKRPGLDREQLYCELSQLTHNITELGPYSLDRDSLYVNGFTHQNSVPTTS
TPGTSTVYWATTGTPSSFPGHTXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTE
XVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICXHXXXPKXPGLXXEX
LYWELSXLTXXIXELGPYTLDRXSLYVNGFTHWSSGLTTSTPWTSTVDLGTSGTPSPV
PSPTTAGPLLVPFTLNFTITNLQYEEDMHRPGSRKFNATERVLQGLLSPIFKNTSVGP
LYSGCRLTLLRPEKQEAATGVDTICTHRVDPIGPGLXXEXLYWELSXLTXXIXELGPY
TLDRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXT
ITNLXXXXXMXXPGSRKFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAA
TGXDAICXHXXXPKXPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHRSFG
LTTSTPWTSTVDLGTSGTPSPVPSPTTAGPLLVPFTLNFTITNLQYEEDMHRPGSRKF

Figure 3B (continued)

NTTERVLQGLLTPLFRNTSVSSLYSGCRLTLLRPEKDGAATRVDAVCTHRPDPKSPGL
XXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGT
PSSXPXXTXXXPLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTEXVLQGLLXPXFKNX
SVGXLYSGCRLTXLRXEKXGAATGXDAICXHXXXPKXPGLXXEXLYWELSXLTXXIXE
LGPYTLDRXSLYVNGFTHWIPVPTSSTPGTSTVDLGSGTPSSLPSPTTAGPLLVPFTL
NFTITNLQYGEDMGHPGSRKFNTTERVLQGLLGPIFKNTSVGPLYSGCRLTSLRSEKD
GAATGVDAICIHHLDPKSPGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHX
XSXPTTSTPGTSTVXXGTSGTPSSXPXXTXXXPLLXPFTXNXTITNLXXXXXMXXPGS
RKFNTTEXVLQGLLXPXFKNXSVGXLYSGCRLTXLRXEKXGAATGXDAICXHXXXPKX
PGLXXEXLYWELSXLTXXIXELGPYTLDRXSLYVNGFTHQTFAPNTSTPGTSTVDLGT
SGTPSSLPSPTSAGPLLVPFTLNFTITNLQYEEDMHHPGSRKFNTTERVLQGLLGPMF
KNTSVGLLYSGCRLTLLRPEKNGAATRVDAVCTHRPDPKSPGLXXEXLYWELSXLTXX
IXELGPYTLDRXSLYVNGFTHXXSXPTTSTPGTSTVXXGTSGTPSSXPXXTAPVPLLI
PFTLNFTITNLHYEENMQHPGSRKFNTTERVLQGLLKPLFKSTSVGPLYSGCRLTLLR
PEKHGAATGVDAICTLRLDPTGPGLDRERLYWELSQLTNSVTELGPYTLDRDSLYVNG
FTQRSSVPTTSIPGTSAVHLETSGTPASLPGHTAPGPLLVPFTLNFTITNLQYEVDMR
HPGSRKFNTTERVLQGLLKPLFKSTSVGPLYSGCRLTLLRPEKRGAATGVDTICTHRL
DPLNPGLDREQLYWELSKLTRGIIELGPYLLDRGSLYVNGFTHRNFVPITSTPGTSTV
HLGTSETPSSLPRPIVPGPLLVPFTLNFTITNLQYEEAMRHPGSRKFNTTERVLQGLL
RPLFKNTSIGPLYSSCRLTLLRPEKDKAATRVDAICTHHPDPQSPGLNREQLYWELSQ
LTHGITELGPYTLDRDSLYVDGFTHWSPIPTTSTPGTSIVNLGTSGIPPSLPETTXXX
PLLXPFTXNXTITNLXXXXXMXXPGSRKFNTTERVLQGLLKPLFKSTSVGPLYSGCRL
TLLRPEKDGVATRVDAICTHRPDPKIPGLDRQQLYWELSQLTHSITELGPYTLDRDSL
YVNGFTQRSSVPTTSTPGTFTVQPETSETPSSLPGPTATGPVLLPFTLNFTITNLQYE
EDMHRPGSRKFNTTERVLQGLLMPLFKNTSVSSLYSGCRLTLLRPEKDGAATRVDAVC
THRPDPKSPGLDRERLYWKLSQLTHGITELGPYTLDRHSLYVNGFTHQSSMTTTRTPD
TSTMHLATSRTPASLSGPTTASPLLVLFTINFTITNLRYEENMHHPGSRKFNTTERVL
QGLLRPVFKNTSVGPLYSGCRLTLLRPKKDGAATKVDAICTYRPDPKSPGLDREQLYW
ELSQLTHSITELGPYTLDRDSLYVNGFTQRSSVPTTSIPGTPTVDLGTSGTPVSKPGP
SAASPLLVLFTLNFTITNLRYEENMQHPGSRKFNTTERVLQGLLRSLFKSTSVGPLYS
GCRLTLLRPEKDGTATGVDAICTHHPDPKSPRLDREQLYWELSQLTHNITELGHYALD
NDSLFVNGFTHRSSVSTTSTPGTPTVYLGASKTPASIFGPSAASHLLILFTLNFTITN
LRYEENMWPGSRKFNTTERVLQGLLRPLFKNTSVGPLYSGSRLTLLRPEKDGEATGVD
AICTHRPDPTGPGLDREQLYLELSQLTHSITELGPYTLDRDSLYVNGFTHRSSVPTTS
TGVVSEEPFTLNFTINNLRYMADMGQPGSLKFNITDNVMKHLLSPLFQRSSLGARYTG
CRVIALRSVKNGAETRVDLLCTYLQPLSGPGLPIKQVFHELSQQTHGITRLGPYSLDK
DSLYLNGYNEPGLDEPPTTPKPATTFLPPLSEATTAMGYHLKTLTLNFTISNLQYSPD
MGKGSATFNSTEGVLQHLLRPLFQKSSMGPFYLGCQLISLRPEKDGAATGVDTTCTYH
PDPVGPGLDIQQLYWELSQLTHGVTQLGFYVLDRDSLFINGYAPQNLSIRGEYQINFH
IVNWNLSNPDPTSSEYITLLRDIQDKVTTLYKGSQLHDTFRFCLVTNLTMDSVLVTVK
ALFSSNLDPSLVEQVFLDKTLNASFHWLGSTYQLVDIHVTEMESSVYQPTSSSSTQHF
YLNFTITNLPYSQDKAQPGTTNYQRNKRNIEDALNQLFRNSSIKSYFSDCQVSTFRSV
PNRHHTGVDSLCNFSPLARRVDRVAIYEEFLRMTRNGTQLQNFTLDRSSVLVDGYSPN
RNEPLTGNSDLPFWAVILIGLAGLLGLITCLICGVLVTTRRRKKEGEYNVQQQCPGYY
QSHLDLEDLQ

Figure 3B (Continued)

Nucleic acid and polypeptide sequences of IL-18

Nucleic acid sequence (SEQ ID No:3)

```
   1 attctctccc cagcttgctg agccctttgc tcccctggcg actgcctgga cagtcagcaa
  61 ggaattgtct cccagtgcat tttgccctcc tggctgccaa ctctggctgc taaagcggct
 121 gccacctgct gcagtctaca cagcttcggg aagaggaaag gaacctcaga ccttccagat
 181 cgcttcctct cgcaacaaac tatttgtcgc aggaataaag atggctgctg aaccagtaga
 241 agacaattgc atcaactttg tggcaatgaa atttattgac aatacgcttt actttatagc
 301 tgaagatgat gaaaacctgg aatcagatta ctttggcaag cttgaatcta aattatcagt
 361 cataagaaat ttgaatgacc aagttctctt cattgaccaa ggaaatcggc ctctatttga
 421 agatatgact gattctgact gtagagataa tgcaccccgg accatattta ttataagtat
 481 gtataaagat agccagccta gaggtatggc tgtaactatc tctgtgaagt gtgagaaaat
 541 ttcaactctc tcctgtgaga acaaaattat ttcctttaag gaaatgaatc ctcctgataa
 601 catcaaggat acaaaaagtg acatcatatt ctttcagaga agtgtcccag gacatgataa
 661 taagatgcaa tttgaatctt catcatacga aggatacttt ctagcttgtg aaaaagagag
 721 agacctttt aaactcattt tgaaaaaaga ggatgaattg ggggatagat ctataatgtt
 781 cactgttcaa aacgaagact agctattaaa atttcatgcc gggcgcagtg gctcacgcct
 841 gtaatcccag ccctttggga ggctgaggcg ggcagatcac cagaggtcag gtgttcaaga
 901 ccagcctgac caacatggtg aaacctcatc tctactaaaa atacaaaaaa ttagctgagt
 961 gtagtgacgc atgccctcaa tcccagctac tcaagaggct gaggcaggag aatcacttgc
1021 actccggagg tagaggttgt ggtgagccga gattgcacca ttgcgctcta gcctgggcaa
1081 caacagcaaa actccatctc aaaaaataaa ataaataaat aaacaaataa aaaattcata
1141 atgtg
```

Figure 4A

Polypeptide sequence (SEQ ID No:4)

MAAEPVEDNCINFVAMKFIDNTLYFIAEDDENLESDYFGKLESKLSVIRNLNDQVLFIDQGNRPLFEDM
TDSDCRDNAPRTIFIISMYKDSQPRGMAVTISVKCEKISTLSCENKIISFKEMNPPDNIKDTKSDIIFF
QRSVPGHDNKMQFESSSYEGYFLACEKERDLFKLILKKEDELGDRSIMFTVQNED

Figure 4B

Nucleic acid and polypeptide sequences of FGF-2

Nucleic acid sequence (SEQ ID No:5)

```
   1 cggccccaga aaacccgagc gagtaggggg cggcgcgcag gagggaggag aactgggggc
  61 gcgggaggct ggtgggtgtc gggggtggag atgtagaaga tgtgacgccg cggcccggcg
 121 ggtgccagat tagcggacgc gctgcccgcg gttgcaacgg gatcccgggc gctgcagctt
 181 gggaggcggc tctccccagg cggcgtccgc ggagacaccc atccgtgaac cccaggtccc
 241 gggccgccgg ctcgccgcgc accaggggcc ggcggacaga agagcggccg agcggctcga
 301 ggctgggggа ccgcgggcgc ggccgcgcgc tgccgggcgg gaggctgggg ggccggggcc
 361 ggggccgtgc cccggagcgg gtcggaggcc ggggccgggg ccgggggacg gcggctcccc
 421 gcgcggctcc agcggctcgg ggatcccggc cgggccccgc agggaccatg gcagccggga
 481 gcatcaccac gctgcccgcc ttgcccgagg atggcggcag cggcgccttc ccgcccggcc
 541 acttcaagga ccccaagcgg ctgtactgca aaaacggggg cttcttcctg cgcatccacc
 601 ccgacggccg agttgacggg gtccgggaga agagcgaccc tcacatcaag ctacaacttc
 661 aagcagaaga gagaggagtt gtgtctatca aaggagtgtg tgctaaccgt tacctggcta
 721 tgaaggaaga tggaagatta ctggcttcta aatgtgttac ggatgagtgt ttctttttg
 781 aacgattgga atctaataac tacaatactt accggtcaag gaaatacacc agttggtatg
 841 tggcactgaa acgaactggg cagtataaac ttggatccaa aacaggacct gggcagaaag
 901 ctatactttt tcttccaatg tctgctaaga gctgatttta atggccacat ctaatctcat
 961 ttcacatgaa agaagaagta tattttagaa atttgttaat gagagtaaaa gaaaataaat
1021 gtgtatagct cagtttggat aattggtcaa acaatttttt atccagtagt aaaatatgta
1081 accattgtcc cagtaaagaa aaataacaaa agttgtaaaa tgtatattct ccctttttata
1141 ttgcatctgc tgttacccag tgaagcttac ctagagcaat gatctttttc acgcatttgc
1201 tttattcgaa aagaggcttt taaaatgtgc atgtttagaa acaaaatttc ttcatggaaa
1261 tcatatacat tagaaaatca cagtcagatg tttaatcaat ccaaaatgtc cactatttct
1321 tatgtcattc gttagtctac atgtttctaa acatataaat gtgaatttaa tcaattcctt
1381 tcatagtttt ataattctct ggcagttcct tatgatagag tttataaaac agtcctgtgt
1441 aaactgctgg aagttcttcc acagtcaggt caattttgtc aaacccttct ctgtacccat
1501 acagcagcag cctagcaact ctgctggtga tgggagttgt attttcagtc ttcgccaggt
1561 cattgagatc catccactca catcttaagc attcttcctg gcaaaaattt atggtgaatg
1621 aatatggctt taggcggcag atgatataca tatctgactt cccaaaagct ccaggatttg
1681 tgtgctgttg ccgaatactc aggacggacc tgaattctga ttttatacca gtctcttcaa
1741 aaacttctcg aaccgctgtg tctcctacgt aaaaaaagag atgtacaaat caataataat
1801 tacactttta gaaactgtat catcaaagat tttcagttaa agtagcatta tgtaaaggct
1861 caaaacatta ccctaacaaa gtaaagtttt caatacaaat tctttgcctt gtggatatca
1921 agaaatccca aaatattttc ttaccactgt aaattcaaga agcttttgaa atgctgaata
1981 tttctttggc tgctacttgg aggcttatct acctgtacat ttttggggtc agctcttttt
2041 aacttcttgc tgctcttttt cccaaaaggt aaaaatatag attgaaaagt taaaacattt
2101 tgcatggctg cagttccttt gtttcttgag ataagattcc aaagaactta gattcatttc
2161 ttcaacaccg aaatgctgga ggtgtttgat cagttttcaa gaaacttgga atataaataa
2221 ttttataatt caacaaaggt tttcacattt tataaggttg atttttcaat taaatgcaaa
2281 tttgtgtggc aggattttta ttgccattaa catatttttg tggctgcttt ttctacacat
2341 ccagatggtc cctctaactg ggctttctct aattttgtga tgttctgtca ttgtctccca
2401 aagtatttag gagaagccct ttaaaaagct gccttcctct accactttgc tggaaagctt
2461 cacaattgtc acagacaaag atttttgttc caatactcgt tttgcctcta tttttcttgt
2521 ttgtcaaata gtaaatgata tttgcccttg cagtaattct actggtgaaa aacatgcaaa
2581 gaagaggaag tcacagaaac atgtctcaat tcccatgtgc tgtgactgta gactgtctta
2641 ccatagactg tcttacccat cccctggata tgctcttgtt ttttccctct aatagctatg
2701 gaaagatgca tagaaagagt ataatgtttt aaaacataag gcattcatct gccatttttc
2761 aattacatgc tgacttccct tacaattgag atttgcccat aggttaaaca tggttagaaa
2821 caactgaaag cataaaagaa aaatctaggc cgggtgcagt ggctcatgcc tatattccct
2881 gcactttggg aggccaaagc aggaggatcg cttgagccca ggagttcaag accaacctgg
2941 tgaaaccccg tctctacaaa aaaacacaaa aaatagccag gcatggtggc gtgtacatgt
```

Figure 5A

3001 ggtctcagat acttgggagg ctgaggtggg agggttgatc acttgaggct gagaggtcaa
3061 ggttgcagtg agccataatc gtgccactgc agtccagcct aggcaacaga gtgagacttt
3121 gtctcaaaaa aagagaaatt ttccttaata agaaaagtaa tttttactct gatgtgcaat
3181 acatttgtta ttaaatttat tatttaagat ggtagcacta gtcttaaatt gtataaaata
3241 tcccctaaca tgtttaaatg tccatttta ttcattatgc tttgaaaaat aattatgggg
3301 aaatacatgt ttgttattaa atttattatt aaagatagta gcactagtct taaatttgat
3361 ataacatctc ctaacttgtt taaatgtcca tttttattct ttatgcttga aaataaatta
3421 tggggatcct atttagctct tagtaccact aatcaaaagt tcggcatgta gctcatgatc
3481 tatgctgttt ctatgtcgtg gaagcaccgg atgggggtag tgagcaaatc tgccctgctc
3541 agcagtcacc atagcagctg actgaaaatc agcactgcct gagtagtttt gatcagttta
3601 acttgaatca ctaactgact gaaaattgaa tgggcaaata agtgcttttg tctccagagt
3661 atgcgggaga cccttccacc tcaagatgga tatttcttcc ccaaggattt caagatgaat
3721 tgaaattttt aatcaagata gtgtgcttta ttctgttgta ttttttatta ttttaatata
3781 ctgtaagcca aactgaaata acatttgctg ttttataggt ttgaagaaca taggaaaaac
3841 taagaggttt tgtttttatt tttgctgatg aagagatatg tttaaatatg ttgtattgtt
3901 ttgtttagtt acaggacaat aatgaaatgg agtttatatt tgttatttct attttgttat
3961 atttaataat agaattagat tgaaataaaa tataatggga aataatctgc agaatgtggg
4021 tttcctggtg tttcctctga ctctagtgca ctgatgatct ctgataaggc tcagctgctt
4081 tatagttctc tggctaatgc agcagatact cttcctgcca gtggtaatac gatttttaa
4141 gaaggcagtt tgtcaatttt aatcttgtgg ataccttat actcttaggg tattatttta
4201 tacaaaagcc ttgaggattg cattctattt tctatatgac cctcttgata tttaaaaaac
4261 actatggata acaattcttc atttacctag tattatgaaa gaatgaagga gttcaaacaa
4321 atgtgtttcc cagttaacta gggtttactg tttgagccaa tataaatgtt taactgtttg
4381 tgatggcagt attcctaaag tacattgcat gttttcctaa atacagagtt taaataattt
4441 cagtaattct tagatgattc agcttcatca ttaagaatat cttttgtttt atgttgagtt
4501 agaaatgcct tcatatagac atagtctttc agacctctac tgtcagtttt catttctagc
4561 tgctttcagg gttttatgaa ttttcaggca aagctttaat ttatactaag cttaggaagt
4621 atggctaatg ccaacggcag tttttttctt cttaattcca catgactgag gcatatatga
4681 tctctgggta ggtgagttgt tgtgacaacc acaagcactt ttttttttt taaagaaaaa
4741 aaggtagtga atttttaatc atctggactt taagaaggat tctggagtat acttaggcct
4801 gaaattatat atatttggct tggaaatgtg tttttcttca attacatcta caagtaagta
4861 cagctgaaat tcagaggacc cataagagtt cacatgaaaa aaatcaattc atttgaaaag
4921 gcaagatgca ggagagagga agccttgcaa acctgcagac tgctttttgc ccaatataga
4981 ttgggtaagg ctgcaaaaca taagcttaat tagctcacat gctctgctct cacgtggcac
5041 cagtggatag tgtgagagaa ttaggctgta gaacaaatgg ccttctcttt cagcattcac
5101 accactacaa aatcatcttt tatatcaaca gaagaataag cataaactaa gcaaaaggtc
5161 aataagtacc tgaaaccaag attggctaga gatatatctt aatgcaatcc attttctgat
5221 ggattgttac gagttggcta tataatgtat gtatggtatt ttgatttgtg taaaagtttt
5281 aaaaatcaag ctttaagtac atggacattt ttaaataaaa tatttaaaga caatttagaa
5341 aattgcctta atatcattgt tggctaaata gaataggga catgcatatt aaggaaaagg
5401 tcatggagaa ataatattgg tatcaaacaa atacattgat ttgtcatgat acacattgaa
5461 tttgatccaa tagtttaagg aataggtagg aaaatttggt ttctattttt cgatttcctg
5521 taaatcagtg acataaataa ttcttagctt attttatatt tccttgtctt aaatactgag
5581 ctcagtaagt tgtgttaggg gattatttct cagttgagac tttcttatat gacattttac
5641 tatgttttga cttcctgact attaaaaata aatagtagaa acaattttca taaagtgaag
5701 aattatataa tcactgcttt ataactgact ttattatatt tatttcaaag ttcatttaaa
5761 ggctactatt catcctctgt gatggaatgg tcaggaattt gttttctcat agtttaattc
5821 caacaacaat attagtcgta tccaaaataa cctttaatgc taaactttac tgatgtatat
5881 ccaaagcttc tccttttcag acagattaat ccagaagcag tcataaacag aagaataggt
5941 ggtatgttcc taatgatatt atttctacta atggaataaa ctgtaatatt agaaattatg
6001 ctgctaatta tatcagctct gaggtaattt ctgaaatgtt cagactcagt cggaacaaat
6061 tggaaaattt aaatttttat tcttagctat aaagcaagaa agtaaacaca ttaatttcct
6121 caacattttt aagccaatta aaaatataaa agatacacac caatatcttc ttcaggctct
6181 gacaggcctc ctggaaactt ccacatattt ttcaactgca gtataaagtc agaaaataaa
6241 gttaacataa ctttcactaa cacacacata tgtagatttc acaaaatcca cctataattg
6301 gtcaaagtgg ttgagaatat atttttttagt aattgcatgc aaaatttttc tagcttccat
6361 cctttctccc tcgtttcttc tttttttggg ggagctggta actgatgaaa tcttttccca
6421 cctttttctct tcaggaaata taagtggttt tgtttggtta acgtgataca ttctgtatga
6481 atgaaacatt ggagggaaac atctactgaa tttctgtaat ttaaaatatt ttgctgctag
6541 ttaactatga acagatagaa gaatcttaca gatgctgcta taaataagta gaaaatataa
6601 atttcatcac taaaatatgc tattttaaaa tctatttcct atattgtatt tctaatcaga
6661 tgtattactc ttattatttc tattgtatgt gttaatgatt ttatgtaaaa atgtaattgc
6721 ttttcatgag tagtatgaat aaaattgatt agtttgtgtt ttcttgtctc ccgaaaaaaa
6781 aaaaaaaaaa aaaaaaaaaa aaa

Figure 5A (continued)

Polypeptide sequence (SEQ ID No:5)

MVGVGGGDVEDVTPRPGGCQISGRAARGCNGIPGAAAWEAALPRRRPRRHPSVNPRSR
AAGSPRTRGRRTEERPSGSRLGDRGRGRALPGGRLGGRGRGRAPERVGGRGRGRGTAA
PRAAPAARGSRPGPAGTMAAGSITTLPALPEDGGSGAFPPGHFKDPKRLYCKNGGFFL
RIHPDGRVDGVREKSDPHIKLQLQAEERGVVSIKGVCANRYLAMKEDGRLLASKCVTD
ECFFFERLESNNYNTYRSRKYTSWYVALKRTGQYKLGSKTGPGQKAILFLPMSAKS

Figure 5B

专利名称(译)	诊断卵巢癌的方法及其试剂盒		
公开(公告)号	EP1924710A2	公开(公告)日	2008-05-28
申请号	EP2006790705	申请日	2006-09-15
[标]申请(专利权)人(译)	VAL CHUM发EÇ 麦吉尔大学		
申请(专利权)人(译)	VAL-CHUM，S.E.C. 麦吉尔大学		
当前申请(专利权)人(译)	VAL-CHUM，S.E.C. 麦吉尔大学		
[标]发明人	LE PAGE CECILE MES MASSON ANNE MARIE PROVENCHER DIANE TONIN PATRICIA HUDSON THOMAS		
发明人	LE PAGE, CÉCILE MES-MASSON, ANNE-MARIE PROVENCHER, DIANE TONIN, PATRICIA HUDSON, THOMAS		
IPC分类号	C12Q1/68 C12Q1/04 G01N33/574 G01N33/53		
CPC分类号	C12Q1/6886 C12Q2600/112 C12Q2600/136 C12Q2600/158 G01N33/57449 G01N2500/10		
优先权	60/716941 2005-09-15 US		
其他公开文献	EP1924710A4 EP1924710B1		
外部链接	Espacenet		

摘要(译)

一种诊断卵巢癌的方法，包括提供来自受试者（受试者样品）的生物样品，并检测受试者样品中的每种标志物FGF-2，CA125和IL-18的表达水平。检测来自受试者（受试者样品）的生物样品中的每种标志物CA 125，FGF-2和IL-18的表达水平，以及在本发明的方法中使用所述标志物的说明书。