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(54) Title: 25934, A NOVEL FATTY ACID DESATURASE AND USES THEREFOR

(57) Abstract: The invention provides isolated nucleic acids molecules, designated 25934 nucleic acid molecules, which encode a novel desaturase family member. The invention also provides antisense nucleic acid molecules, recombinant expression vectors containing 25934 nucleic acid molecules, host cells into which the expression vectors have been introduced, and nonhuman transgenic animals in which a 25934 gene has been introduced or disrupted. The invention still further provides isolated 25934 proteins, fusion proteins, antigenic peptides and anti-25934 antibodies. Diagnostic methods utilizing compositions of the invention are also provided. The invention also provides methods for modulating fatty acid metabolism utilizing the compositions of the invention. Accordingly, methods of treating, preventing and/or diagnosing cardiovascular disorders, such as atherosclerosis, hypertriglyceridemia, hypercholesterolemia, and hyperlipidemia, are disclosed.

25934, A NOVEL FATTY ACID DESATURASE AND USES THEREFOR

Related Applications

5 This application claims priority to U.S. provisional application number 60/187,455 filed on March 7, 2000, and USSN 09/723,806 filed on November 28, 2000, the contents of all of which are incorporated herein by reference.

Background of the Invention

10 Fatty acid desaturases are critical regulatory enzymes of unsaturated fatty acid biosynthesis and catalyze the conversion of a single bond between two carbon atoms (C-C) to a double bond (C=C) in a fatty acyl chain. The resultant double bond is often referred to as an unsaturated bond. Eukaryotic fatty acid desaturases, typically, are iron-containing enzymes that catalyze the NAD-(P)H and O₂-dependent introduction of double
15 bonds into methylene-interrupted fatty acid chains. Examination of the deduced amino acid sequence from mammals, fungi, insects, higher plants and cyanobacteria has revealed three regions of conserved primary sequence containing HX(3 or 4)H, HX(2 or 3), and HX(2 or 3)HH. This motif is also present in the bacterial membrane enzymes alkaline hydroxylase (omega-hydroxylase) and xylene monooxygenase.

20 There are three types of eukaryotic fatty acid desaturases, acyl-CoA, acyl-ACP, and acyl-lipid desaturases (Ntambi *et al.*, *Biochem. and Biophys. Res. Com.* 266:1-4, 1999). In plants and cyanobacteria, acyl-lipid desaturases catalyzing most desaturation reactions and introduce unsaturated bonds into fatty acids that are in a lipid-bound form. Acyl-ACP desaturases are present in the plastids of plant cells and insert a double bond
25 into fatty acids that are bound to acyl carrier protein (ACP). In animals, yeast and fungal cells, Acyl-CoA introduce unsaturated bonds into fatty acids that are bound to coenzyme A (CoA). A gene cloned from this family is stearoyl-CoA desaturase and this gene has been identified in many organisms including mice, rats, humans, yeast, ovines, and hamsters.

30 Fatty acid desaturases can introduce an unsaturated bond at a specific position in a fatty acyl chain, for example, at the Δ₆, Δ₉, or Δ₁₂ position. Desaturases are typically integral membrane proteins induced in the endoplasmic reticulum by dietary manipulations and then rapidly degraded (Ozols, J. (1997) *MBC Vol. 8* (11): 2281-2290).

Unsaturated fatty acids can be formed from a variety of fatty acids including palmitate and stearate resulting in the formation of unsaturated fatty acids palmitoleate (16:1), and oleate (18:1).

In mammals, the rate limiting step in the biosynthesis of monounsaturated fatty acids is the insertion of an unsaturated bond by stearoyl-CoA desaturase (SCD) in the $\Delta 9$ position of the fatty acid. SCD preferentially catalyzes the synthesis of oleic acid. Oleate enriched low density lipoprotein (LDL) exhibits increased affinity for the vessel wall, and is therefore pro-atherogenic (Rudel, L.L. et al. (1997) *J. Clin. Invest.* 1:100(1):74-83). SCD involvement in generating atherogenic LDL variants and in regulating triglyceride synthesis is further supported by the finding that polyunsaturated fatty acids (PUFA), which protect against atherosclerosis, negatively regulate the expression of the SCD gene (Rudel, LL et al. (1995) *Atheroscler. Thromb. Vasc. Biol.* 15(12):2101-10; Ntambi, JM (1999) *J. Lipid Res.* 40(9):1549-58). Moreover, a mouse deficient for SCD exhibits significant reduction in triglycerides (Miyazaki, M. et al. (2000) *J. Biol. Chem.*, in press).

Unsaturated fatty acids play an important role in normal and diseased organisms. For example, the degree of fatty acid unsaturation in cell membrane lipids determines membrane fluidity. Moreover, the production of monounsaturated fatty acids, which once complexed with lipoproteins such as LDL, show increased affinity for the vessels wall has profound implications for cardiovascular disorders caused by aberrant fatty acid metabolism. Examples of such disorders include atherosclerosis, hypertriglyceridemia, hypercholesterolemia, hyperlipidemia, among others.

Summary of the Invention

The present invention is based, in part, on the discovery of a novel fatty acid desaturase, referred to herein as "25934". The nucleotide sequence of a cDNA encoding 25934 is shown in SEQ ID NO:1, and the amino acid sequence of a 25934 polypeptide is shown in SEQ ID NO:2. In addition, the nucleotide sequences of the coding region are depicted in SEQ ID NO:3.

Accordingly, in one aspect, the invention features a nucleic acid molecule which encodes a 25934 protein or polypeptide, e.g., a biologically active portion of the 25934 protein. In a preferred embodiment the isolated nucleic acid molecule encodes a polypeptide having the amino acid sequence of SEQ ID NO:2. In other embodiments, the invention provides isolated 25934 nucleic acid molecules having the nucleotide sequence

shown in SEQ ID NO:1, SEQ ID NO:3, or the sequence of the DNA insert of the plasmid deposited with ATCC Accession Number _____. In still other embodiments, the invention provides nucleic acid molecules that are substantially identical (e.g., naturally occurring allelic variants) to the nucleotide sequence shown in SEQ ID NO:1, SEQ ID
5 NO:3, or the sequence of the DNA insert of the plasmid deposited with ATCC Accession Number _____. In other embodiments, the invention provides a nucleic acid molecule which hybridizes under stringent hybridization conditions to a nucleic acid molecule comprising the nucleotide sequence of SEQ ID NO:1 or 3, or the sequence of the DNA insert of the plasmid deposited with ATCC Accession Number _____, wherein the nucleic
10 acid encodes a full length 25934 protein or an active fragment thereof.

In a related aspect, the invention further provides nucleic acid constructs which include a 25934 nucleic acid molecule described herein. In certain embodiments, the nucleic acid molecules of the invention are operatively linked to native or heterologous regulatory sequences. Also included, are vectors and host cells containing the 25934
15 nucleic acid molecules of the invention e.g., vectors and host cells suitable for producing 25934 nucleic acid molecules and polypeptides.

In another related aspect, the invention provides nucleic acid fragments suitable as primers or hybridization probes for the detection of 25934-encoding nucleic acids.

In still another related aspect, isolated nucleic acid molecules that are antisense to
20 a 25934 encoding nucleic acid molecule are provided.

In another aspect, the invention features, 25934 polypeptides, and biologically active or antigenic fragments thereof that are useful, e.g., as reagents or targets in assays applicable to treatment and diagnosis of 25934 mediated or related disorders, e.g., a cardiovascular disorder. In another embodiment, the invention provides 25934
25 polypeptides having a 25934 activity. Preferred polypeptides are 25934 proteins including at least one desaturase domain, and, preferably, having a 25934 activity, e.g., a 25934 activity as described herein.

In other embodiments, the invention provides 25934 polypeptides, e.g., a 25934 polypeptide having the amino acid sequence shown in SEQ ID NO:2; the amino acid
30 sequence encoded by the cDNA insert of the plasmid deposited with ATCC Accession Number ____; an amino acid sequence that is substantially identical to the amino acid sequence shown in SEQ ID NO:2; or an amino acid sequence encoded by a nucleic acid molecule having a nucleotide sequence which hybridizes under stringent hybridization

conditions to a nucleic acid molecule comprising the nucleotide sequence of SEQ ID NO:1 or 3, or the sequence of the DNA insert of the plasmid deposited with ATCC Accession Number _____, wherein the nucleic acid encodes a full length 25934 protein or an active fragment thereof.

5 In a related aspect, the invention further provides nucleic acid constructs which include a 25934 nucleic acid molecule described herein.

 In a related aspect, the invention provides 25934 polypeptides or fragments operatively linked to non-25934 polypeptides to form fusion proteins.

10 In another aspect, the invention features antibodies and antigen-binding fragments thereof, that react with, or more preferably specifically bind 25934 polypeptides.

 In another aspect, the invention provides methods of screening for compounds that modulate the expression or activity of the 25934 polypeptides or nucleic acids.

15 In still another aspect, the invention provides a process for modulating 25934 polypeptide or nucleic acid expression or activity, e.g. using the screened compounds. In certain embodiments, the methods involve treatment or prophylaxis of conditions related to activity or expression of the 25934 polypeptides or nucleic acids, such as cardiovascular, neurological, metabolic, reproductive (e.g., ovarian), renal and hepatic disorders.

20 Examples of cardiovascular disorders include e.g., atherosclerosis, thrombosis, heart failure, ischemic heart disease, angina pectoris, myocardial infarction, sudden cardiac death, hypertensive heart disease; non-coronary vessel disease, such as arteriosclerosis, small vessel disease, nephropathy, hypertriglyceridemia, hypercholesterolemia, hyperlipidemia, xanthomatosis, asthma, hypertension, emphysema and chronic pulmonary disease; or a cardiovascular condition associated with
25 interventional procedures ("procedural vascular trauma"), such as restenosis following angioplasty, placement of a shunt, stet, stent, synthetic or natural excision grafts, indwelling catheter, valve or other implantable devices.

30 In a preferred embodiment, the cardiovascular disorder is caused by aberrant fatty acid metabolism. Examples of disorders involving aberrant fatty acid metabolism include, but are not limited to, atherosclerosis, arteriosclerosis, hypertriglyceridemia, obesity, diabetes, hypercholesterolemia, xanthomatosis, and hyperlipidemia. Most preferable, the disorder is atherosclerosis.

In the cardiovascular applications, the agent is administered alone or in combination with a cholesterol lowering agent. Examples of cholesterol lowering agents include bile acid sequestering resins (e.g. colestipol hydrochloride or cholestyramine), fibric acid derivatives (e.g. clofibrate, fenofibrate, or gemfibrozil), thiazolidenediones (e.g. troglitazone), or hydroxymethylglutaryl coenzyme A reductase (HMG-CoA reductase) inhibitors (e.g. statins, such as fluvastatin sodium, lovastatin, pravastatin sodium, or simvastatin), an ApoAII-lowering agent, a VLDL lowering agent, an ApoAI-stimulating agent, as well as inhibitors of, nicotinic acid, niacin, or probucol. Preferred cholesterol lowering agents include inhibitors of HMG-CoA reductase (e.g., statins), nicotinic acid, and niacin.

The cholesterol lowering agent can be administered prior to, at the same time, or after administration of the agent, in single or multiple administration schedules. For example, the cholesterol lowering agent and the agents of the invention can be administered continually over a preselected period of time, or administered in a series of spaced doses, i.e., intermittently, for a period of time.

In a preferred embodiments, the agent, alone or in combination with the cholesterol lowering agent, inhibit (block or reduce) atherosclerotic lesion formation or development, e.g., so as to inhibit lipid accumulation, increase plaque stability or promote lesion regression.

In still another aspect, the invention features a method of modulating (e.g., enhancing or inhibiting) fatty acid metabolism, in a subject. The method includes administering to the subject an agent that modulates the activity or expression of a 25934 polypeptide or nucleic acid, in an amount effective to modulate the conversion of saturated fatty acids to unsaturated fatty acids, e.g., monounsaturated fatty acids.

In a preferred embodiment, the 25934 polypeptide has an amino acid sequence identical to, or substantially identical to, SEQ ID NO:2. In other embodiments, the 25934 polypeptide is a fragment of at least 15, 20, 50, 100, 150, 200, 250, 300 or more contiguous amino acids of SEQ ID NO:2.

In a preferred embodiment, the 25934 nucleic acid has a nucleotide sequence identical to, or substantially identical to, SEQ ID NO:1 or 3. In other embodiments, the 25934 nucleic acid is a fragment of at least 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900 or more contiguous nucleotides of SEQ ID NO:1 or 3.

In a preferred embodiment, the agent modulates, e.g., decreases or blocks, desaturase activity or expression. For example, the agent (e.g., a polyunsaturated fatty acid, or nicotinic acid or niacin) may negatively regulate 25934 protein expression.

5 In a preferred embodiment, the agent modulates (e.g., decreases or increases) the activity or expression of a 25934 polypeptide or nucleic acid such that modulation of one or more of: lipoprotein composition, lipid (e.g., triglyceride) levels, apolipoprotein B, total cholesterol, or lipoprotein (a), occurs. For example, the agent can decrease low density lipoprotein (LDL)- cholesterol levels, and/or lipid (e.g., triglyceride) levels. Preferably, the agent can also increase high-density lipoprotein (HDL)-cholesterol levels.

10 In a preferred embodiment, the agent modulates (e.g., increases or decreases) expression of the 25934 nucleic acid by, e.g., modulating transcription, mRNA stability, etc.

In preferred embodiments, the agent is a peptide, a phosphopeptide, a small molecule, e.g., a member of a combinatorial or natural product library, or an antibody, or
15 any combination thereof.

In additional preferred embodiments, the agent is an antisense, a ribozyme, or a triple helix molecule, or a 25934 nucleic acid or a fragment thereof, or any combination thereof.

In a preferred embodiment, the subject is a patient undergoing a therapeutic or prophylactic protocol. Preferably, the subject is a human suffering from, or at risk of a
20 cardiovascular disease, e.g., atherosclerosis, thrombosis, heart failure, ischemic heart disease, angina pectoris, myocardial infarction, sudden cardiac death, hypertensive heart disease; non-coronary vessel disease, such as arteriolosclerosis, small vessel disease, nephropathy, hypertriglyceridemia, obesity, diabetes, hypercholesterolemia,
25 hyperlipidemia, xanthomatosis, asthma, hypertension, emphysema and chronic pulmonary disease; or a cardiovascular condition associated with interventional procedures ("procedural vascular trauma"), such as restenosis following angioplasty, placement of a shunt, stet, stent, synthetic or natural excision grafts, indwelling catheter, valve or other implantable devices.

30 In a preferred embodiment, the subject is a human suffering from, or at risk of a disorder involving aberrant fatty acid metabolism. Examples of such disorders include, but are not limited to, atherosclerosis, arteriolosclerosis, hypertriglyceridemia, obesity,

diabetes, hypercholesterolemia, xanthomatosis and hyperlipidemia. Most preferable, the disorder is atherosclerosis.

In other embodiments, the subject is a non-human animal, e.g., an experimental animal.

5 In a preferred embodiment, the agent is administered alone or in combination with a cholesterol lowering agent. Examples of cholesterol lowering agents include bile acid sequestering resins (e.g. colestipol hydrochloride or cholestyramine), fibric acid derivatives (e.g. clofibrate, fenofibrate, or gemfibrozil), thiazolidenediones (e.g. troglitazone), or hydroxymethylglutaryl coenzyme A reductase (HMG-CoA reductase) inhibitors (e.g. statins, such as fluvastatin sodium, lovastatin, pravastatin sodium, or simvastatin), an ApoAII-lowering agent, a VLDL lowering agent, an ApoAI-stimulating agent, as well as inhibitors of, nicotinic acid, niacin, or probucol. Preferred cholesterol lowering agents include inhibitors of HMG-CoA reductase (e.g., statins), nicotinic acid, and niacin.

15 The cholesterol lowering agent can be administered prior to, at the same time, or after administration of the agent, in single or multiple administration schedules. For example, the cholesterol lowering agent and the agents of the invention can be administered continually over a preselected period of time, or administered in a series of spaced doses, i.e., intermittently, for a period of time.

20 In a preferred embodiment, the agent, alone or in combination with the cholesterol lowering agent, inhibits (blocks or reduces) atherosclerotic lesion formation or development, e.g., so as to inhibit lipid accumulation, increase plaque stability or promote lesion regression.

In a preferred embodiment, the agent, administered alone or in combination with the cholesterol lowering agent, results in a favorable plasma lipid profile (e.g., increased HDL and/or reduced LDL).

In yet another aspect, the invention features a method of treating or preventing a cardiovascular disorder (e.g., atherosclerosis), in a subject. The method includes administering to the subject an agent that modulates the activity or expression of a 25934 polypeptide or nucleic acid, in an amount effective to treat or prevent the cardiovascular disorder.

30 In a preferred embodiment, the 25934 polypeptide has an amino acid sequence identical to, or substantially identical to, SEQ ID NO:2. In other embodiments, the 25934

polypeptide is a fragment of at least 15, 20, 50, 100, 150, 200, 250, 300 or more contiguous amino acids of SEQ ID NO:2.

In a preferred embodiment, the 25934 nucleic acid has a nucleotide sequence identical to, or substantially identical to, SEQ ID NO:1 or 3. In other embodiments, the
5 25934 nucleic acid is a fragment of at least 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900 or more contiguous nucleotides of SEQ ID NO:1 or 3.

In a preferred embodiment, the agent modulates, e.g., decreases or blocks, desaturase activity or expression. For example, the agent (e.g., a polyunsaturated fatty acid, or nicotinic acid or niacin) may negatively regulate 25934 protein expression.

10 In a preferred embodiment, the agent modulates (e.g., decreases or increases) the activity or expression of a 25934 polypeptide or nucleic acid such that modulation of one or more of: lipoprotein composition, lipid (e.g., triglyceride) levels, apolipoprotein B, total cholesterol, or lipoprotein (a), occurs. For example, the agent can decrease low density lipoprotein (LDL)- cholesterol levels, and/or lipid (e.g., triglyceride) levels.

15 Preferably, the agent can also increase high-density lipoprotein (HDL)-cholesterol levels.

In a preferred embodiment, the agent modulates (e.g., increases or decreases) expression of the 25934 nucleic acid by, e.g., modulating transcription, mRNA stability, etc.

20 In preferred embodiments, the agent is a peptide, a phosphopeptide, a small molecule, e.g., a member of a combinatorial or natural product library, or an antibody, or any combination thereof.

In additional preferred embodiments, the agent is an antisense, a ribozyme, or a triple helix molecule, or a 25934 nucleic acid or a fragment thereof, or any combination thereof.

25 In a preferred embodiment, the subject is a patient undergoing a therapeutic or prophylactic protocol. Preferably, the subject is a human suffering from, or at risk of a cardiovascular disease, e.g., atherosclerosis, thrombosis, heart failure, ischemic heart disease, angina pectoris, myocardial infarction, sudden cardiac death, hypertensive heart disease; non-coronary vessel disease, such as arteriosclerosis, small vessel disease,
30 nephropathy, hypertriglyceridemia, hypercholesterolemia, hyperlipidemia, xanthomatosis, asthma, hypertension, emphysema and chronic pulmonary disease; or a cardiovascular condition associated with interventional procedures ("procedural vascular trauma"), such as restenosis following angioplasty, placement of a shunt, stet, stent,

synthetic or natural excision grafts, indwelling catheter, valve or other implantable devices.

In a preferred embodiment, the subject is a human suffering from, or at risk of a disorder involving aberrant fatty acid metabolism. Examples of such disorders include, but are not limited to, atherosclerosis, arteriosclerosis, hypertriglyceridemia, obesity, diabetes, hypercholesterolemia, xanthomatosis and hyperlipidemia. Most preferable, the disorder is atherosclerosis.

In other embodiments, the subject is a non-human animal, e.g., an experimental animal.

In a preferred embodiment, the agent is administered alone or in combination with a cholesterol lowering agent. Examples of cholesterol lowering agents include bile acid sequestering resins (e.g. colestipol hydrochloride or cholestyramine), fibric acid derivatives (e.g. clofibrate, fenofibrate, or gemfibrozil), thiazolidenediones (e.g. troglitazone), or hydroxymethylglutaryl coenzyme A reductase (HMG-CoA reductase) inhibitors (e.g. statins, such as fluvastatin sodium, lovastatin, pravastatin sodium, or simvastatin), an ApoAII-lowering agent, a VLDL lowering agent, an ApoAI-stimulating agent, as well as inhibitors of, nicotinic acid, niacin, or probucol. Preferred cholesterol lowering agents include inhibitors of HMG-CoA reductase (e.g., statins), nicotinic acid, and niacin.

The cholesterol lowering agent can be administered prior to, at the same time, or after administration of the agent in single or multiple administration schedules. For example, the cholesterol lowering agent and the agents of the invention can be administered continually over a preselected period of time, or administered in a series of spaced doses, i.e., intermittently, for a period of time as a therapeutic or preventative measure.

In a preferred embodiment, the agent, alone or in combination with the cholesterol lowering agent, inhibits (blocks or reduces) atherosclerotic lesion formation or development, e.g., so as to inhibit lipid accumulation, increase plaque stability or promote lesion regression.

In a preferred embodiment, the agent, administered alone or in combination with the cholesterol lowering agent, results in a favorable plasma lipid profile (e.g., increased HDL and/or reduced LDL).

The invention also features a method of diagnosing a disorder, e.g., a cardiovascular disorder (e.g., atherosclerosis), in a subject. The method includes evaluating the expression or activity of a 25934 nucleic acid or a 25934 polypeptide, such that, a difference in the level of 25934 nucleic acid or 25934 polypeptide relative to a
5 normal subject or a cohort of normal subjects is indicative of the disorder. Because 25934 is regulated by Niacin (a clinically used therapeutic), 25934 levels and/or activity may be considered a marker for Niacin activity and or efficacy.

In a preferred embodiment, the subject is a human.

In a preferred embodiment, the evaluating step occurs *in vitro* or *ex vivo*. For
10 example, a sample, e.g., a blood sample, is obtained from the subject.

In a preferred embodiment, the evaluating step occurs *in vivo*. For example, by administering to the subject a detectably labeled agent that interacts with the 25934 nucleic acid or polypeptide, such that a signal is generated relative to the level of activity or expression of the 25934 nucleic acid or polypeptide.

15 In a preferred embodiment, the disorder is a cardiovascular disorder, e.g., a cardiovascular disorder as described herein.

In a preferred embodiment, the disorder is atherosclerosis.

The invention also provides assays for determining the activity of or the presence or absence of 25934 polypeptides or nucleic acid molecules in a biological sample,
20 including for disease diagnosis.

In a further aspect, the invention provides assays for determining the presence or absence of a genetic alteration in a 25934 polypeptide or nucleic acid molecule, including for disease diagnosis, predicting triglyceride levels, predicting response to Niacin, and predicting a response to triglyceride therapy.

25 In yet another aspect, the invention features a method for identifying an agent, e.g., a compound, which modulates the activity of a 25934 polypeptide, e.g., a 25934 polypeptide as described herein, or the expression of a 25934 nucleic acid, e.g., a 25934 nucleic acid as described herein, including contacting the 25934 polypeptide or nucleic acid with a test agent (e.g., a test compound); and determining the effect of the test
30 compound on the activity of the polypeptide or nucleic acid to thereby identify a compound which modulates the activity of the polypeptide or nucleic acid. Such agents are useful for treating or preventing a 25934-mediated disorders, e.g., cardiovascular disorders (e.g., atherosclerosis) or metabolic disorders (e.g., obesity or diabetes).

In a preferred embodiment, the contacting step occurs *in vitro* or *ex vivo*. For example, a sample, e.g., a blood sample, is obtained from the subject.

In a preferred embodiment, the contacting step occurs *in vivo*. For example, by administering to the subject a detectably labeled agent that interacts with the 25934
5 nucleic acid or polypeptide, such that a signal is generated relative to the level of activity or expression of the 25934 nucleic acid or polypeptide.

In a preferred embodiment, the activity of the 25934 polypeptide is protein desaturase activity, e.g., catalyzing the conversion of saturated fatty acids to unsaturated fatty acids. In such embodiment, the 25934 polypeptide is contacted with a saturated
10 fatty acid, e.g., oleic acid, palmitate and stearate.

In a preferred embodiment, the agent is an inhibitor (partial or complete inhibitor) of 25934 polypeptide activity or expression.

In a preferred embodiment, the agent modulates one or more of: lipoprotein composition, lipid (e.g., triglyceride) levels, LDL, HDL, apolipoprotein B, total
15 cholesterol, or lipoprotein (a). For example, the agent can decrease low density lipoprotein (LDL)- cholesterol levels, and/or lipid (e.g., triglyceride) levels. Preferably, the agent can also increase high-density lipoprotein (HDL)-cholesterol levels.

In preferred embodiments, the agent is a peptide, a phosphopeptide, a small molecule, e.g., a member of a combinatorial library, or an antibody, or any combination
20 thereof.

In additional preferred embodiments, the agent is an antisense, a ribozyme, a triple helix molecule, or a 25934 nucleic acid, or any combination thereof.

In another aspect, the invention features a two dimensional array having a plurality of addresses, each address of the plurality being positionally distinguishable from each
25 other address of the plurality, and each address of the plurality having a unique capture probe, e.g., a nucleic acid or peptide sequence. At least one address of the plurality has a capture probe that recognizes a 25934 molecule. In one embodiment, the capture probe is a nucleic acid, e.g., a probe complementary to a 25934 nucleic acid sequence. In another embodiment, the capture probe is a polypeptide, e.g., an antibody specific for 25934
30 polypeptides. Also featured is a method of analyzing a sample by contacting the sample to the aforementioned array and detecting binding of the sample to the array.

Other features and advantages of the invention will be apparent from the following detailed description, and from the claims.

Brief Description of the Drawings

Figure 1 depicts a cDNA sequence (SEQ ID NO:1) and predicted amino acid
5 sequence (SEQ ID NO:2) of human 25934. The methionine-initiated open reading frame
of human 25934 (without the 5' and 3' untranslated regions) which occurs at nucleotide
403 through 1392 of SEQ ID NO:1 (shown also as coding sequence (SEQ ID NO:3).

Figure 2 depicts a hydropathy plot of human 25934. Relative hydrophobic
residues are shown above the dashed horizontal line, and relative hydrophilic residues are
10 below the dashed horizontal line. The cysteine residues (cys) and an N-glycosylation site
are indicated by short vertical lines just below the hydropathy trace. The transmembrane
regions are indicated by horizontal lines above the hydropathy trace. The numbers
corresponding to the amino acid sequence of human 25934 are indicated. Polypeptides of
the invention include 25934 fragments which include: all or part of a hydrophobic
15 sequence (a sequence above the dashed line, e.g., all or part of the sequence from about
residue 71 to about residue 91 of SEQ ID NO:2; all or part of a hydrophilic fragment
(e.g., a fragment below the dashed line). Other fragments include a cysteine or a
glycosylation site.

Figure 3 depicts an alignment of the desaturase domain of human 25934 with a
20 consensus amino acid sequence derived from a hidden Markov model using PFAM. The
upper sequence is the consensus amino acid sequence (SEQ ID NO:4), while the lower
amino acid sequence corresponds to amino acids 51 to 295 of SEQ ID NO:2.

Figure 4 is a bar graph depicting relative 25934 mRNA expression as determined
by TaqMan assays on mRNA derived from the human fetal heart, spinal cord, brain
25 (cortex, hypothalamus, glial cells), ovary, kidney, liver, endothelial cells and smooth
muscle cells (SMC). The highest 25934 mRNA expression, i.e., greater than 200 relative
units, was observed in spinal cord, brain and ovary. High level mRNA expression, i.e.,
greater than 100 relative units was observed in the kidney, endothelial cells and human
umbilical vein endothelial cells (HUVEC). Expression in liver was positive albeit low.

30 *Figure 5* is a bar graph depicting relative 25934 mRNA expression as determined
by TaqMan assays on mRNA derived from an array of human liver tissues from
individual donors.

Figure 6 depicts a comparison of the expression of 25934 mRNA and stearoyl CoA desaturase (SCD) mRNA in a human liver samples from individual donors. Expression of 25934 mRNA in human liver is equivalent to the relative expression of the SCD gene.

5 *Figure 7* is a bar graph depicting the inhibition of 25934 mRNA (via TaqMan) expression in the marmoset animal model. Niacin treatment in the marmoset model results in significant repression of 25934 in the liver.

10 *Figure 8* is a multiple sequence alignment of the 25934 amino acid sequence with the human (SEQ ID NO:7), rat (SEQ ID NO:8), and chicken (SEQ ID NO:9) delta-9 desaturase proteins. A comparison of the full length amino acid sequence revealed 63.6%, 58.4%, and 58.4% identity between the 25934 amino acid sequence and the chicken, human and rat amino acid sequences, respectively.

15

Detailed Description of the Invention

The human 25934 sequence (*Figure 1*; SEQ ID NO:1), which is approximately 1512 nucleotides long including untranslated regions, contains a predicted methionine-initiated coding sequence of about 990 nucleotides (nucleotides 403-1392 of SEQ ID NO:1; SEQ ID NO:3). The coding sequence encodes a 330 amino acid protein (SEQ ID NO:2).

20 Human 25934 contains the following regions or other structural features: a desaturase domain located at about amino acid residues 51 to 295 of SEQ ID NO:2; two transmembrane regions at about amino acids 50-93 and 194-235 of SEQ ID NO:2; three cytoplasmic domains at about amino acids 1-49, 94-193, and 236-330 of SEQ ID NO:2; one predicted N-glycosylation site (PS00001) at about amino acids 233 to 236 of SEQ ID NO:2; one predicted cAmp and cGMP dependent protein kinase phosphorylation site (PS00004) at about amino acids 311 to 314 of SEQ ID NO:2; four predicted Protein Kinase C phosphorylation sites (PS00005) at about amino acids 98 to 100, 101 to 103, 255 to 257 and 308 to 310 of SEQ ID NO:2; two predicted Casein Kinase II phosphorylation sites (PS00006) located at about amino acids 138 to 141 and 283-286 of SEQ ID NO:2; four predicted N-myristoylation sites (PS00008) from about amino acids 23 to 28, 40 to 45, 59 to 64, and 88 to 93 of SEQ ID NO:2; one predicted amidation site

(PS00009) from about amino acid 170 to 173 of SEQ ID NO:2; and one predicted fatty acid desaturase family 1 signature (PS00476) from about amino acid 268 to 282 of SEQ ID NO:2.

For general information regarding PFAM identifiers, PS prefix and PF prefix domain identification numbers, refer to Sonnhammer et al. (1997) *Protein* 28:405-420 and <http://www.psc.edu/general/software/packages/pfam/pfam.html>.

A plasmid containing the nucleotide sequence encoding human 25934 was deposited with American Type Culture Collection (ATCC), 10801 University Boulevard, Manassas, VA 20110-2209, on _____ and assigned Accession Number _____. This deposit will be maintained under the terms of the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure. This deposit was made merely as a convenience for those of skill in the art and is not an admission that a deposit is required under 35 U.S.C. §112.

The 25934 protein contains a significant number of structural characteristics in common with members of the desaturase family. The term "family" when referring to the protein and nucleic acid molecules of the invention means two or more proteins or nucleic acid molecules having a common structural domain or motif and having sufficient amino acid or nucleotide sequence homology as defined herein. Such family members can be naturally or non-naturally occurring and can be from either the same or different species. For example, a family can contain a first protein of human origin as well as other distinct proteins of human origin, or alternatively, can contain homologues of non-human origin, e.g., rat or mouse proteins. Members of a family can also have common functional characteristics.

Based on sequence homology, 25934 polypeptide is predicted to be a member of the desaturase family of enzymes, specifically the stearoyl-Co desaturase family (SCD family, EC 1.14.99.5) (see Figures 3 and 8). These enzymes are structurally and functionally homologous to one another, and can convert a single bond to a double bond in a fatty acyl chain. SCD enzymes utilize oxygen and electrons from cytochrome b₅ for catalysis. Similar to other enzymes such as ribonucleotide reductases and methane monooxygenases, stearoyl-CoA desaturases can have a conserved iron binding motif which includes eight histidines (Shanklin *et al.* (1997) *Proc. Natl. Acad. Sci. USA* 94:2981-2986), "H-X(3-4)-H-X(7-41)-H-X(2-3)-H-H-X(61-189)-H-X(2-3)-H-H (SEQ ID NO:5)." The eight histidine residues common to desaturase family members are typically

divided among three regions of the protein: region Ia (H-X(3-4)-H); region Ib (the first H-X(2-3)-H-H sequence); and region II (the second H-X(2-3)-H-H sequence) (Shanklin *et al.* (1994) *Biochemistry* 33:12787-94).

SCDs typically contain two or three long hydrophobic domains termed
5 “transmembrane regions,” each of which is capable of spanning the membrane two times (Shanklin *et al.* (1994) *Biochemistry* 33:12787-94). Because a transmembrane region is capable of traversing the membrane twice, amino acid residues flanking a transmembrane region reside on the same side of the membrane (Stukey *et al.* (1990) *J. Biol. Chem.* 265:20144-49). Thus, when region I (regions Ia and Ib) and region II are divided by a
10 transmembrane region in a desaturase family member, the regions will typically reside on the same side of the membrane, e.g., the cytoplasmic face of the endoplasmic reticulum membrane.

A 25934 polypeptides include a “desaturase domain” or regions homologous with a “desaturase domain”. As used herein, the term “desaturase domain” includes an amino
15 acid sequence of about 25 to 600 amino acid residues in length and having a bit score for the alignment of the sequence to the fatty acid desaturase domain (HMM) of at least 50. Preferably, a desaturase domain includes at least about 50-500 amino acids, more preferably about 100-400 amino acid residues, or about 200-250 amino acids and has a bit score for the alignment of the sequence to the desaturase domain (HMM) of at least 60,
20 80, 100, 150, 200, 250, 300, 450, 500 or greater. An alignment of the desaturase domain (amino acids 51 to 295 of SEQ ID NO:2) of human 25934 with a consensus amino acid sequence derived from a hidden Markov model is depicted in Figure 3.

In a preferred embodiment, 25934 polypeptide or protein has a “desaturase domain” or a region which includes at least about 50-500 amino acids, more preferably
25 about 100-400 amino acid residues, or about 200-250 amino acid residues and has at least about 70% 80% 90% 95%, 99%, or 100% homology with a “desaturase domain,” e.g., the desaturase domain of human 25934 (e.g., residues 51-295 of SEQ ID NO:2). Preferably, the desaturase domain of a 25934 polypeptide includes at least one, two, three, four, five, six, seven and preferably eight conserved histidines. Preferably, the histidines form an
30 eight-histidine motif, which binds two iron atoms in the catalytic center. For example, a 25934 polypeptide contains histidine residues at about amino acids 94, 99, 131, 134, 135, 272, 275, and 276 of SEQ ID NO:2.

To identify the presence of a “desaturase” domain in a 25934 protein sequence, and make the determination that a polypeptide or protein of interest has a particular profile, the amino acid sequence of the protein can be searched against a database of HMMs (e.g., the Pfam database, release 2.1) using the default parameters

5 (http://www.sanger.ac.uk/Software/Pfam/HMM_search). For example, the hmmsf program, which is available as part of the HMMER package of search programs, is a family specific default program for MILPAT0063 and a score of 15 is the default threshold score for determining a hit. Alternatively, the threshold score for determining a hit can be lowered (e.g., to 8 bits). A description of the Pfam database can be found in

10 Sonhammer *et al.* (1997) *Proteins* 28(3):405-420 and a detailed description of HMMs can be found, for example, in Gribskov *et al.* (1990) *Meth. Enzymol.* 183:146-159; Gribskov *et al.* (1987) *Proc. Natl. Acad. Sci. USA* 84:4355-4358; Krogh *et al.* (1994) *J. Mol. Biol.* 235:1501-1531; and Stultz *et al.* (1993) *Protein Sci.* 2:305-314, the contents of which are incorporated herein by reference. A search was performed against the HMM database

15 resulting in the identification of a “desaturase domain” domain in the amino acid sequence of human 25934 at about residues 51-295 of SEQ ID NO:2 (see Figure 1).

A 25934 family member includes a desaturase domain and optionally also a fatty acid desaturase family 1 signature, i.e., a motif that matches the ProSite motif PS00476, “G-E-X-[FY]-H-N-[FY]-H-H-X-F-P-X-D-Y (SEQ ID NO:6),” e.g., the peptide sequence

20 “GEGFHNYHTFPFDY” located at about residues 268 to 282 of SEQ ID NO:2.

In one embodiment, a 25934 protein includes at least one, preferably two, transmembrane regions. As used herein, the term “transmembrane region” includes an amino acid sequence of about 20 amino acid residues in length that spans a phospholipid membrane, e.g., an endoplasmic reticulum membrane, twice. More preferably, a

25 transmembrane region includes about at least 22, 24, 25, 30, 35, 40, 45, 50, 55, 60, 65, or 70 amino acid residues and spans a phospholipid membrane twice. Transmembrane regions are rich in hydrophobic residues, and typically have an α -helical structure. In a preferred embodiment, at least 50%, 60%, 70%, 80%, 90%, 95% or more of the amino acids of a transmembrane domain are hydrophobic, e.g., leucines, isoleucines, tyrosines,

30 or tryptophans. Transmembrane regions are described in, for example, <http://pfam.wustl.edu/cgi-bin/getdesc?name=7tm-1>, and Zagotta W.N. et al, (1996) *Annual Rev. Neurosci.* 19: 235-63, the contents of which are incorporated herein by reference.

In a preferred embodiment, a 25934 polypeptide or protein has at least one transmembrane region or a region which includes at least 20, 22, 24, 25, 30, 35, 40, 45, 50, 55, 60, 65, or 70 amino acid residues and has at least about 60%, 70% 80% 90% 95%, 99%, or 100% homology with a "transmembrane region," e.g., at least one
5 transmembrane region of human 25934 (e.g., amino acid residues 50-93 or 194-235 of SEQ ID NO:2).

In one embodiment, a 25934 protein includes at least one cytoplasmic domain. When located at the N-terminal domain the cytoplasmic domain is referred to herein as an "N-terminal cytoplasmic domain". As used herein, an "N-terminal cytoplasmic domain"
10 includes an amino acid sequence having about 1-200, preferably about 10-100, preferably about 20-90, more preferably about 30-80, more preferably about 35-70, more preferably about 40-60, or even more preferably about 45-55 amino acid residues in length and is located in the cytoplasm of a cell. The C-terminal amino acid residue of a "N-terminal cytoplasmic domain" is adjacent to an N-terminal amino acid residue of a transmembrane
15 region in a 25934 protein. For example, an N-terminal cytoplasmic domain is located at about amino acid residues 1-49 of SEQ ID NO:2.

In a preferred embodiment, a 25934 polypeptide or protein has at least one N-terminal cytoplasmic domain or a region which includes at least about 5, preferably about 40-60, or even more preferably about 45-55 amino acid residues and has at least
20 about 60%, 70% 80% 90% 95%, 99%, or 100% homology with an " N-terminal cytoplasmic domain," e.g., at least one N-terminal cytoplasmic domain of human 25934 (e.g., residues 1-49 of SEQ ID NO:2).

In another embodiment, a 25934 protein includes a "cytoplasmic loop" in the sequence of the protein. As used herein, a "cytoplasmic loop" includes an amino acid
25 sequence having a length of at least about 10, preferably about 20-250, preferably about 30-150, more preferably about 80-120 amino acid residues and is located within the cytoplasm of a cell. Accordingly, the N-terminal amino acid residue of a "cytoplasmic loop" is adjacent to a C-terminal amino acid residue of a transmembrane region and the C-terminal residue of a "cytoplasmic loop" is adjacent to a N-terminal amino acid residue
30 of a transmembrane region in a 25934 protein. For example, a cytoplasmic loop is found at about amino acid residues 94-193 of SEQ ID NO:2.

In a preferred embodiment, a 25934 polypeptide or protein has a cytoplasmic loop or a region which includes at least about 10, preferably about 20-250, preferably about

30-150, more preferably about 80-120 amino acid residues and has at least about 60%, 70% 80% 90% 95%, 99%, or 100% homology with an "cytoplasmic loop," e.g., the cytoplasmic loop of human 25934 (e.g., residues 94-193 of SEQ ID NO:2).

In another embodiment, a 25934 protein includes a "C-terminal cytoplasmic domain", also referred to herein as a C-terminal cytoplasmic tail, in the sequence of the protein. As used herein, a "C-terminal cytoplasmic domain" includes an amino acid sequence having a length of at least about 30, preferably about 50-150, preferably about 60-200, more preferably about 80-110 amino acid residues and is located within the cytoplasm of a cell. Accordingly, the N-terminal amino acid residue of a "C-terminal cytoplasmic domain" is adjacent to a C-terminal amino acid residue of a transmembrane region in a 25934 protein. For example, a C-terminal cytoplasmic domain is found at about amino acid residues 236-330 of SEQ ID NO:2.

In a preferred embodiment, a 25934 polypeptide or protein has a C-terminal cytoplasmic domain or a region which includes at least about 30, preferably about 50-150, preferably about 60-200, more preferably about 80-110 amino acid residues and has at least about 60%, 70% 80% 90% 95%, 99%, or 100% homology with an "C-terminal cytoplasmic domain," e.g., the C-terminal cytoplasmic domain of human 25934 (e.g., residues 236-330 of SEQ ID NO:2).

As the 25934 polypeptides of the invention may modulate 25934-mediated activities, they may be useful as of for developing novel diagnostic and therapeutic agents for 25934-mediated or related disorders, as described below.

As used herein, a "25934 activity", "biological activity of 25934" or "functional activity of 25934", refers to an activity exerted by a 25934 protein, polypeptide or nucleic acid molecule on e.g., a 25934-responsive cell or on a 25934 substrate, e.g., a protein substrate, as determined *in vivo* or *in vitro*. In one embodiment, a 25934 activity is a direct activity, such as an association with a 25934 target molecule. A "target molecule" or "binding partner" is a molecule with which a 25934 protein binds or interacts in nature. In an exemplary embodiment, the binding partner is a fatty acid, e.g., myristic, palmitic or stearic acid. The 25934 proteins of the present invention can have one or more of the following activities: (1) catalyzing the formation of a double bond, preferably, at positions up to 9 carbons from the carboxyl end of a molecule, e.g., a fatty acid, such as a polyunsaturated fatty acid; (2) modulating the synthesis of monounsaturated fatty acids, e.g., modulating the synthesis of a fatty acid synthesized in an animal, e.g., oleic acid,

palmitoyl- and stearoyl-CoA; (3) modulating the desaturation of a fatty acid, e.g., a polyunsaturated fatty acids; (4) modulating cellular lipid composition, e.g., modulating the ratio of saturated and unsaturated fatty acids; (5) modulating the energy state of adipocytes; (6) modulating membrane fluidity; (7) modulating lipid storage; (8) modulating proliferation and/or differentiation; (9) modulating lipoprotein (e.g., LDL) composition and/or concentration; (10) regulating triglyceride synthesis; (11) altering the HDL/LDL ration; or (12) modulating fatty acid metabolism.

Based on the above-described sequence similarities, the 25934 molecules of the present invention are predicted to have similar biological activities as other desaturase family members, and in particular, stearoyl CoA desaturases (SCD). For example, the 25934 polypeptide or a domain therein, e.g., desaturase domain, may function to catalyze the conversion of a single bond between two carbon atoms (C-C) to a double bond (C=C) in a fatty acid chain. This modification is expected to occur at the n9 position of the fatty acid. Desaturases are predicted to contribute to an unfavorable LDL content state, e.g., by increasing LDL-oleate, which is atherogenic (Rudel, LL. et al. (1997) *J. Clin Invest.* 1:100(1):74-83) as well as by playing a role in triglyceride metabolism and/or biosynthesis. As shown in Figure 7, Niacin treatment in the marmoset model results in significant repression of 25934 in the liver. Niacin has been shown to alter the composition of LDL and HDL to a favorable state, to cause a significant reduction in triglycerides, and to increase HDL concentration (Goldberg, A. (2000) *Am. J. Cardiol.* 85(9):1100-5. Moreover, a mouse deficient for SCD exhibits significant reduction in triglycerides (Miyazaki, M. et al. (2000) *J. Biol. Chem.* 275(39):30132-8). Accordingly, the 25934 molecules can act as novel diagnostic targets and therapeutic agents for controlling disorders associated with abnormal or aberrant desaturase activity and/or triglyceride levels. In particular, it is predicted that targeting the inhibition of 25934 nucleic acids and polypeptides will results in the favorable modification, and possible reduction, of LDL content and/or reduction of triglycerides. Thus, the 25934 molecules can act as novel targets for treating and/or diagnosing fatty acid metabolic disorders (e.g., desaturation of fatty acids) such as obesity and/or diabetes and more generally, cardiovascular disorders.

Preferred examples of cardiovascular disorders or diseases include e.g., atherosclerosis, thrombosis, heart failure, ischemic heart disease, angina pectoris, myocardial infarction, sudden cardiac death, hypertensive heart disease; non-coronary

vessel disease, such as arteriosclerosis, small vessel disease, nephropathy, hypertriglyceridemia, hypercholesterolemia, hyperlipidemia, asthma, hypertension, emphysema and chronic pulmonary disease; or a cardiovascular condition associated with interventional procedures ("procedural vascular trauma"), such as restenosis following
5 angioplasty, placement of a shunt, stent, synthetic or natural excision grafts, indwelling catheter, valve or other implantable devices.

The term "cardiovascular disorders" or "disease" includes heart disorders, as well as disorders of the blood vessels of the circulation system caused by, e.g., abnormally high concentrations of lipids in the blood vessels.

10 Disorders involving the heart, include but are not limited to, heart failure, including but not limited to, cardiac hypertrophy, left-sided heart failure, and right-sided heart failure; ischemic heart disease, including but not limited to angina pectoris, myocardial infarction, chronic ischemic heart disease, and sudden cardiac death; hypertensive heart disease, including but not limited to, systemic (left-sided) hypertensive
15 heart disease and pulmonary (right-sided) hypertensive heart disease; valvular heart disease, including but not limited to, valvular degeneration caused by calcification, such as calcific aortic stenosis, calcification of a congenitally bicuspid aortic valve, and mitral annular calcification, and myxomatous degeneration of the mitral valve (mitral valve prolapse), rheumatic fever and rheumatic heart disease, infective endocarditis, and
20 noninfected vegetations, such as nonbacterial thrombotic endocarditis and endocarditis of systemic lupus erythematosus (Libman-Sacks disease), carcinoid heart disease, and complications of artificial valves; myocardial disease, including but not limited to dilated cardiomyopathy, hypertrophic cardiomyopathy, restrictive cardiomyopathy, and myocarditis; pericardial disease, including but not limited to, pericardial effusion and
25 hemopericardium and pericarditis, including acute pericarditis and healed pericarditis, and rheumatoid heart disease; neoplastic heart disease, including but not limited to, primary cardiac tumors, such as myxoma, lipoma, papillary fibroelastoma, rhabdomyoma, and sarcoma, and cardiac effects of noncardiac neoplasms; congenital heart disease, including but not limited to, left-to-right shunts--late cyanosis, such as atrial septal defect,
30 ventricular septal defect, patent ductus arteriosus, and atrioventricular septal defect, right-to-left shunts--early cyanosis, such as tetralogy of fallot, transposition of great arteries, truncus arteriosus, tricuspid atresia, and total anomalous pulmonary venous connection,

obstructive congenital anomalies, such as coarctation of aorta, pulmonary stenosis and atresia, and aortic stenosis and atresia, and disorders involving cardiac transplantation.

Disorders involving blood vessels include, but are not limited to, responses of vascular cell walls to injury, such as endothelial dysfunction and endothelial activation and intimal thickening; vascular diseases including, but not limited to, congenital anomalies, such as arteriovenous fistula, atherosclerosis, and hypertensive vascular disease, such as hypertension; inflammatory disease--the vasculitides, such as giant cell (temporal) arteritis, Takayasu arteritis, polyarteritis nodosa (classic), Kawasaki syndrome (mucocutaneous lymph node syndrome), microscopic polyanglitis (microscopic polyarteritis, hypersensitivity or leukocytoclastic angitis), Wegener granulomatosis, thromboanglitis obliterans (Buerger disease), vasculitis associated with other disorders, and infectious arteritis; Raynaud disease; aneurysms and dissection, such as abdominal aortic aneurysms, syphilitic (luetetic) aneurysms, and aortic dissection (dissecting hematoma); disorders of veins and lymphatics, such as varicose veins, thrombophlebitis and phlebothrombosis, obstruction of superior vena cava (superior vena cava syndrome), obstruction of inferior vena cava (inferior vena cava syndrome), and lymphangitis and lymphedema; tumors, including benign tumors and tumor-like conditions, such as hemangioma, lymphangioma, glomus tumor (glomangioma), vascular ectasias, and bacillary angiomatosis, and intermediate-grade (borderline low-grade malignant) tumors, such as Kaposi sarcoma and hemangioendothelioma, and malignant tumors, such as angiosarcoma and hemangiopericytoma; and pathology of therapeutic interventions in vascular disease, such as balloon angioplasty and related techniques and vascular replacement, such as coronary artery bypass graft surgery.

As used herein, the term "atherosclerosis" is intended to have its clinical meaning. This term refers to a cardiovascular condition occurring as a result of narrowing down of the arterial walls. The narrowing is due to the formation of plaques (raised patches) or streaks in the inner lining of the arteries. These plaques consist of foam cells of low-density lipoproteins, oxidized-LDL, decaying muscle cells, fibrous tissue, clumps of blood platelets, cholesterol, and sometimes calcium. They tend to form in regions of turbulent blood flow and are found most often in people with high concentrations of cholesterol in the bloodstream. The number and thickness of plaques increase with age, causing loss of the smooth lining of the blood vessels and encouraging the formation of thrombi (blood clots). Sometimes fragments of thrombi break off and form emboli,

which travel through the bloodstream and block smaller vessels. The blood supply is restricted to the heart, eventually forming a blood clot leading to death. The major causes of atherosclerosis are hypercholesterolemia (and low HDL), hypoalphoproteinemia, and hyperlipidemia marked by high circulating cholesterol and high lipids like LDL-
5 cholesterol and triglycerides in the blood. These lipids are deposited in the arterial walls, obstructing the blood flow and forming atherosclerotic plaques leading to death.

As used herein the term "hypercholesterolemia" is a condition with elevated levels of circulating total cholesterol, LDL-cholesterol and VLDL-cholesterol as per the guidelines of the Expert Panel Report of the National Cholesterol Educational Program
10 (NCEP) of Detection, Evaluation of Treatment of high cholesterol in adults (see, Arch. Int. Med. (1988) 148, 36-39).

As used herein the term "hyperlipidemia" or "hyperlipemia" is a condition where the blood lipid parameters are elevated in the blood. This condition manifests an abnormally high concentration of fats. The lipid fractions in the circulating blood are,
15 total cholesterol, low density lipoproteins, very low density lipoproteins and triglycerides.

As used herein the term "lipoprotein" such as VLDL, LDL and HDL, refers to a group of proteins found in the serum, plasma and lymph and are important for lipid transport. The chemical composition of each lipoprotein differs in that the HDL has a higher proportion of protein versus lipid, whereas the VLDL has a lower proportion of
20 protein versus lipid.

As used herein, the term "triglyceride" means a lipid or neutral fat consisting of glycerol combined with three fatty acid molecules.

As used herein the term "xanthomatosis" is a disease evidenced by a yellowish swelling or plaques in the skin resulting from deposits of fat. The presence of xanthomas
25 are usually accompanied by raised blood cholesterol levels.

As used herein the term "apolipoprotein B" or "apoprotein B" or "Apo B" refers to the protein component of the LDL cholesterol transport proteins. Cholesterol synthesized de novo is transported from the liver and intestine to peripheral tissues in the form of lipoproteins. Most of the apolipoprotein B is secreted into the circulatory system as
30 VLDL.

As used herein the term "apolipoprotein A" or "apoprotein A" or "Apo A" refers to the protein component of the HDL cholesterol transport proteins.

"Procedural vascular trauma" includes the effects of surgical/medical-mechanical interventions into mammalian vasculature, but does not include vascular trauma due to the organic vascular pathologies listed hereinabove, or to unintended traumas, such as due to an accident. Thus, procedural vascular traumas within the scope of the present treatment method include (1) organ grafting or transplantation, such as transplantation and grafting of heart, kidney, liver and the like, e.g., involving vessel anastomosis; (2) vascular surgery, such as coronary bypass surgery, biopsy, heart valve replacement, atheroectomy, thrombectomy, and the like; (3) transcatheter vascular therapies (TVT) including angioplasty, e.g., laser angioplasty and PTCA procedures discussed hereinbelow, employing balloon catheters, or indwelling catheters; (4) vascular grafting using natural or synthetic materials, such as in saphenous vein coronary bypass grafts, dacron and venous grafts used for peripheral arterial reconstruction, etc.; (5) placement of a mechanical shunt, such as a PTFE hemodialysis shunt used for arteriovenous communications; and (6) placement of an intravascular stent, which may be metallic, plastic or a biodegradable polymer. See U.S. patent application Ser. No. 08/389,712, filed Feb. 15, 1995, which is incorporated by reference herein. For a general discussion of implantable devices and biomaterials from which they can be formed, see H. Kambic et al., "Biomaterials in Artificial Organs", Chem. Eng. News, 30 (Apr. 14, 1986), the disclosure of which is incorporated by reference herein.

Small vessel disease includes, but is not limited to, vascular insufficiency in the limbs, peripheral neuropathy and retinopathy, e.g., diabetic retinopathy.

In some embodiments, the therapeutic and prophylactic uses of the compositions of the invention, further include the administration of cholesterol lowering agents as a combination drug therapies. The term "combination therapy" as used herein refers to the administration to a subject (concurrently or sequentially) of two or more cholesterol lowering agents. Current combination therapy therapies using combinations of niacin and statins are being used with positive results to treat hyperlipidemia (Guyton, JR. (1999) *Curr Cardiol Rep.* 1(3):244-250; Otto, C. et al. (1999) *Internist (Berl)* 40(12):1338-45). Other useful drug combinations include those derived by addition of fish oil, bile acid binding resins, or stanol esters, as well as nonstatin combinations such as niacin-resin or fibrate-niacin (Guyton, JR. (1999) *supra*). For examples of dosages and administration schedules of the cholesterol lowering agents, the teachings of Guyton, JR. (1999) *supra*, Otto, C. et al. (1999) *supra*, Guyton, JR et al. (1998) *Am J Cardiol* 82(12A):82U-86U;

Guyton, JR et al. (1998) *Am J Cardiol.* 82(6):737-43; Vega, GL et al. (1998) *Am J Cardiol.* 81(4A):36B-42B; Schectman, G. (1996) *Ann Intern Med.* 125(12):990-1000; Nakamura, H. et al. (1993) *Nippon Rinsho* 51(8):2101-7; Goldberg, A. et al. (2000) *Am J Cardiol* 85(9):1100-5; Morgan, JM et al. (1996) *J Cardiovasc. Pharmac. Ther.* 1(3):195-202; Stein, EA et al. (1996) *J Cardiovasc Pharmacol Ther* 1(2):107-116; and Goldberg, AC (1998) *Am J Cardiol* 82(12A):35U-41U, are expressly incorporated by reference.

As used herein, "cholesterol lowering agents" include agents which are useful for lowering serum cholesterol such as for example bile acid sequestering resins (e.g. colestipol hydrochloride or cholestyramine), fish oil, stanol esters, an ApoAII-lowering agent, a VLDL lowering agent, an ApoAI-stimulating agent, fibric acid derivatives (e.g. clofibrate, fenofibrate, or gemfibrozil), thiazolidenediones (e.g. troglitazone), or HMG-CoA reductase inhibitors (e.g. statins, such as fluvastatin sodium, lovastatin, pravastatin sodium, or simvastatin), as well as nicotinic acid, niacin, or probucol.

"VLDL-lowering agent" includes an agent which decreases the hepatic synthesis of triglyceride-rich lipoproteins or increases the catabolism of triglyceride-rich lipoproteins, e.g., fibrates such as gemfibrozil, or the statins, increases the expression of the apoE-mediated clearance pathway, or improves insulin sensitivity in diabetics, e.g., the thiazolidene diones.

The 25934 molecules can also be used to treat, diagnose or prevent lipid disorders. Examples of lipid disorders include those disorders which affect fatty acid metabolism. Fatty acids are synthesized from acetyl-CoA, which is derived from carbohydrate, protein and other non-lipid sources, and the pathway produces saturated fatty acids, predominantly palmitic acid (10:0). In mammals, the fatty acids may be elongated and desaturated. Desaturation is catalyzed by desaturases which function by inserting one or more double bonds at positions up to 9 carbons from the carboxyl end of a fatty acid molecule.

The degree of fatty acid desaturation in cell membrane lipids determines membrane fluidity. The activity of the desaturase enzyme is critical for maintaining the ratio of saturated and unsaturated fatty acids in cell membranes. Alterations in this ratio can, e.g., alter the physical properties of membranes. Moreover, alterations in the ratio of fatty acids have been implicated in a range of diseases including diabetes, obesity, hypertension, cancer, developmental disorders, immune disorders and neurological and

the above-described heart diseases. For example, tumor tissue and virus-transformed cells have a higher content of unsaturated fatty acids, especially oleic acid. Such shifts increase the metabolic rates of many lipid-dependent enzymes and are associated with a higher capacity for cell division.

5 As the 25934 mRNA is found in the brain, ovary, kidney and liver, the molecules of the invention can be used to develop novel agents or compounds to treat, prevent and/or diagnose disorders involving aberrant activities of those cells (Figures 4-6). For example, the molecules of the invention can be used to treat, present and/or diagnose neurological, reproductive (ovarian), renal and hepatic disorders, as described below.

10 The 25934 protein, fragments thereof, and derivatives and other variants of the sequence in SEQ ID NO:2 thereof are collectively referred to as "polypeptides or proteins of the invention" or "25934 polypeptides or proteins". Nucleic acid molecules encoding such polypeptides or proteins are collectively referred to as "nucleic acids of the invention" or "25934 nucleic acids." 25934 molecules refer to 25934 nucleic acids, polypeptides, and antibodies.

15 As used herein, the term "nucleic acid molecule" includes DNA molecules (e.g., a cDNA or genomic DNA) and RNA molecules (e.g., an mRNA) and analogs of the DNA or RNA generated, e.g., by the use of nucleotide analogs. The nucleic acid molecule can be single-stranded or double-stranded, but preferably is double-stranded DNA.

20 The term "isolated or purified nucleic acid molecule" includes nucleic acid molecules which are separated from other nucleic acid molecules which are present in the natural source of the nucleic acid. For example, with regards to genomic DNA, the term "isolated" includes nucleic acid molecules which are separated from the chromosome with which the genomic DNA is naturally associated. Preferably, an "isolated" nucleic acid is free of sequences which naturally flank the nucleic acid (i.e., sequences located at the 5' and/or 3' ends of the nucleic acid) in the genomic DNA of the organism from which the nucleic acid is derived. For example, in various embodiments, the isolated nucleic acid molecule can contain less than about 5 kb, 4kb, 3kb, 2kb, 1 kb, 0.5 kb or 0.1 kb of 5' and/or 3' nucleotide sequences which naturally flank the nucleic acid molecule in genomic DNA of the cell from which the nucleic acid is derived. Moreover, an "isolated" nucleic acid molecule, such as a cDNA molecule, can be substantially free of other cellular material, or culture medium when produced by recombinant techniques, or substantially free of chemical precursors or other chemicals when chemically synthesized.

As used herein, the term "hybridizes under low stringency, medium stringency, high stringency, or very high stringency conditions" describes conditions for hybridization and washing. Guidance for performing hybridization reactions can be found in *Current Protocols in Molecular Biology*, John Wiley & Sons, N. Y. (1989), 6.3.1-6.3.6, which is incorporated by reference. Aqueous and nonaqueous methods are described in that reference and either can be used. Specific hybridization conditions referred to herein are as follows: 1) low stringency hybridization conditions in 6X sodium chloride/sodium citrate (SSC) at about 45°C, followed by two washes in 0.2X SSC, 0.1% SDS at least at 50°C (the temperature of the washes can be increased to 55°C for low stringency conditions); 2) medium stringency hybridization conditions in 6X SSC at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 60°C; 3) high stringency hybridization conditions in 6X SSC at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 65°C; and preferably 4) very high stringency hybridization conditions are 0.5M sodium phosphate, 7% SDS at 65°C, followed by one or more washes at 0.2X SSC, 1% SDS at 65°C. Very high stringency conditions (4) are the preferred conditions and the ones that should be used unless otherwise specified.

As used herein, a "naturally-occurring" nucleic acid molecule refers to an RNA or DNA molecule having a nucleotide sequence that occurs in nature (e.g., encodes a natural protein).

As used herein, the terms "gene" and "recombinant gene" refer to nucleic acid molecules which include an open reading frame encoding a 25934 protein, preferably a mammalian 25934 protein, and can further include non-coding regulatory sequences, and introns.

An "isolated" or "purified" polypeptide or protein is substantially free of cellular material or other contaminating proteins from the cell or tissue source from which the protein is derived, or substantially free from chemical precursors or other chemicals when chemically synthesized. In one embodiment, the language "substantially free" means preparation of 25934 protein having less than about 30%, 20%, 10% and more preferably 5% (by dry weight), of non-25934 protein (also referred to herein as a "contaminating protein"), or of chemical precursors or non-25934 chemicals. When the 25934 protein or biologically active portion thereof is recombinantly produced, it is also preferably substantially free of culture medium, i.e., culture medium represents less than about 20%, more preferably less than about 10%, and most preferably less than about 5% of the

volume of the protein preparation. The invention includes isolated or purified preparations of at least 0.01, 0.1, 1.0, and 10 milligrams in dry weight.

A "non-essential" amino acid residue is a residue that can be altered from the wild-type sequence of 25934 (e.g., the sequence of SEQ ID NO:1 or 3, or the nucleotide
5 sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____) without abolishing or more preferably, without substantially altering a biological activity, whereas an "essential" amino acid residue results in such a change. For example, amino acid residues that are conserved among the polypeptides of the present invention, e.g., those present in the desaturase domain, are predicted to be particularly unamenable
10 to alteration.

A "conservative amino acid substitution" is one in which the amino acid residue is replaced with an amino acid residue having a similar side chain. Families of amino acid residues having similar side chains have been defined in the art. These families include amino acids with basic side chains (e.g., lysine, arginine, histidine), acidic side chains
15 (e.g., aspartic acid, glutamic acid), uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (e.g., threonine, valine, isoleucine) and aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine). Thus, a predicted nonessential amino acid
20 residue in a 25934 protein is preferably replaced with another amino acid residue from the same side chain family. Alternatively, in another embodiment, mutations can be introduced randomly along all or part of a 25934 coding sequence, such as by saturation mutagenesis, and the resultant mutants can be screened for 25934 biological activity to identify mutants that retain activity. Following mutagenesis of SEQ ID NO:1 or 3, or the
25 nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, the encoded protein can be expressed recombinantly and the activity of the protein can be determined.

As used herein, a "biologically active portion" of a 25934 protein includes a fragment of a 25934 protein which participates in an interaction between a 25934
30 molecule and a non-25934 molecule. Biologically active portions of a 25934 protein include peptides comprising amino acid sequences sufficiently homologous to or derived from the amino acid sequence of the 25934 protein, e.g., the amino acid sequence shown in SEQ ID NO:2, which include less amino acids than the full length 25934 proteins, and

exhibit at least one activity of a 25934 protein. Typically, biologically active portions comprise a domain or motif with at least one activity of the 25934 protein, e.g., 1) catalyzing the formation of a double bond at positions up to 9 carbons from the carboxyl end of a molecule; (2) modulating the synthesis of monounsaturated fatty acids; (3) 5 modulating the desaturation of a fatty acid, e.g., a polyunsaturated fatty acids; (4) modulating cellular lipid composition; (5) modulating the energy state of adipocytes; (6) modulating membrane fluidity; (7) modulating lipid storage; (8) modulating cell proliferation and/or differentiation; (9) modulating lipoprotein (e.g., LDL) composition and/or concentration; (10) regulating triglyceride synthesis; (11) altering the HDL/LDL 10 ration; or (12) modulating fatty acid metabolism.. A biologically active portion of a 25934 protein can be a polypeptide which is, for example, 50, 100, 200 or more amino acids in length. Biologically active portions of a 25934 protein can be used as targets for developing agents which modulate a 25934 mediated activity, e.g., a 25934 mediated activity as described above.

15 Particularly preferred 25934 polypeptides of the present invention have an amino acid sequence substantially identical to the amino acid sequence of SEQ ID NO:2. In the context of an amino acid sequence, the term "substantially identical" is used herein to refer to a first amino acid that contains a sufficient or minimum number of amino acid residues that are i) identical to, or ii) conservative substitutions of aligned amino acid 20 residues in a second amino acid sequence such that the first and second amino acid sequences can have a common structural domain and/or common functional activity. For example, amino acid sequences that contain a common structural domain having at least about 60%, or 65% identity, likely 75% identity, more likely 85%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identity to SEQ ID NO:2 are termed substantially 25 identical.

In the context of nucleotide sequence, the term "substantially identical" is used herein to refer to a first nucleic acid sequence that contains a sufficient or minimum number of nucleotides that are identical to aligned nucleotides in a second nucleic acid sequence such that the first and second nucleotide sequences encode a polypeptide having 30 common functional activity, or encode a common structural polypeptide domain or a common functional polypeptide activity. For example, nucleotide sequences having at least about 60%, or 65% identity, likely 75% identity, more likely 85%, 90%, 91%, 92%,

93%, 94%, 95%, 96%, 97%, 98% or 99% identity to SEQ ID NO:1 or 3 are termed substantially identical.

Calculations of homology or sequence identity between sequences (the terms are used interchangeably herein) are performed as follows.

5 To determine the percent identity of two amino acid sequences, or of two nucleic acid sequences, the sequences are aligned for optimal comparison purposes (e.g., gaps can be introduced in one or both of a first and a second amino acid or nucleic acid sequence for optimal alignment and non-homologous sequences can be disregarded for comparison purposes). In a preferred embodiment, the length of a reference sequence aligned for
10 comparison purposes is at least 30%, preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, and even more preferably at least 70%, 80%, 90%, 100% of the length of the reference sequence (e.g., when aligning a second sequence to the 25934 amino acid sequence of SEQ ID NO:2 having 20 amino acid residues, at least 50, preferably at least 100, more preferably at least 200, even more
15 preferably at least 300, and even more preferably at least 320, or 330 amino acid residues are aligned). The amino acid residues or nucleotides at corresponding amino acid positions or nucleotide positions are then compared. When a position in the first sequence is occupied by the same amino acid residue or nucleotide as the corresponding position in the second sequence, then the molecules are identical at that position (as used
20 herein amino acid or nucleic acid "identity" is equivalent to amino acid or nucleic acid "homology"). The percent identity between the two sequences is a function of the number of identical positions shared by the sequences, taking into account the number of gaps, and the length of each gap, which need to be introduced for optimal alignment of the two sequences.

25 The comparison of sequences and determination of percent identity between two sequences can be accomplished using a mathematical algorithm. In a preferred embodiment, the percent identity between two amino acid sequences is determined using the Needleman and Wunsch (*J. Mol. Biol.* (48):444-453 (1970)) algorithm which has been incorporated into the GAP program in the GCG software package (available at
30 <http://www.gcg.com>), using either a Blossum 62 matrix or a PAM250 matrix, and a gap weight of 16, 14, 12, 10, 8, 6, or 4 and a length weight of 1, 2, 3, 4, 5, or 6. In yet another preferred embodiment, the percent identity between two nucleotide sequences is determined using the GAP program in the GCG software package (available at

http://www.gcg.com), using a NWSgapdna.CMP matrix and a gap weight of 40, 50, 60, 70, or 80 and a length weight of 1, 2, 3, 4, 5, or 6. A particularly preferred set of parameters (and the one that should be used if the practitioner is uncertain about what parameters should be applied to determine if the molecule is within the sequence identity
5 limits of a claim) is using Blossum 62 scoring matrix with a gap open penalty of 12, a gap extend penalty of 4, and a frameshift gap penalty of 5.

The percent identity between two amino acid or nucleotide sequences can be determined using the algorithm of E. Meyers and W. Miller (CABIOS, 4:11-17 (1989)) which has been incorporated into the ALIGN program (version 2.0), using a PAM120
10 weight residue table, a gap length penalty of 12 and a gap penalty of 4.

The nucleic acid and protein sequences described herein can be used as a "query sequence" to perform a search against public databases to, for example, identify other family members or related sequences. Such searches can be performed using the NBLAST and XBLAST programs (version 2.0) of Altschul, et al. (1990) *J. Mol. Biol.*
15 215:403-10. BLAST nucleotide searches can be performed with the NBLAST program, score = 100, wordlength = 12 to obtain nucleotide sequences homologous to 25934 nucleic acid molecules of the invention. BLAST protein searches can be performed with the XBLAST program, score = 50, wordlength = 3 to obtain amino acid sequences homologous to 25934 protein molecules of the invention. To obtain gapped alignments
20 for comparison purposes, Gapped BLAST can be utilized as described in Altschul et al., (1997) *Nucleic Acids Res.* 25(17):3389-3402. When utilizing BLAST and Gapped BLAST programs, the default parameters of the respective programs (e.g., XBLAST and NBLAST) can be used. See <http://www.ncbi.nlm.nih.gov>.

"Misexpression or aberrant expression", as used herein, refers to a non-wild type
25 pattern of gene expression, at the RNA or protein level. It includes: expression at non-wild type levels, i.e., over or under expression; a pattern of expression that differs from wild type in terms of the time or stage at which the gene is expressed, e.g., increased or decreased expression (as compared with wild type) at a predetermined developmental period or stage; a pattern of expression that differs from wild type in terms of decreased
30 expression (as compared with wild type) in a predetermined cell type or tissue type; a pattern of expression that differs from wild type in terms of the splicing size, amino acid sequence, post-translational modification, or biological activity of the expressed polypeptide; a pattern of expression that differs from wild type in terms of the effect of an

environmental stimulus or extracellular stimulus on expression of the gene, e.g., a pattern of increased or decreased expression (as compared with wild type) in the presence of an increase or decrease in the strength of the stimulus.

"Subject", as used herein, can refer to a mammal, e.g., a human, or to an experimental or animal or disease model. The subject can also be a non-human animal, e.g., a horse, cow, goat, or other domestic animal.

A "purified preparation of cells", as used herein, refers to, in the case of plant or animal cells, an in vitro preparation of cells and not an entire intact plant or animal. In the case of cultured cells or microbial cells, it consists of a preparation of at least 10% and more preferably 50% of the subject cells.

Various aspects of the invention are described in further detail below.

Isolated Nucleic Acid Molecules

In one aspect, the invention provides, an isolated or purified, nucleic acid molecule that encodes a 25934 polypeptide described herein, e.g., a full length 25934 protein or a fragment thereof, e.g., a biologically active portion of 25934 protein. Also included is a nucleic acid fragment suitable for use as a hybridization probe, which can be used, e.g., to identify nucleic acid molecule encoding a polypeptide of the invention, 25934 mRNA, and fragments suitable for use as primers, e.g., PCR primers for the amplification or mutation of nucleic acid molecules.

In one embodiment, an isolated nucleic acid molecule of the invention includes the nucleotide sequence shown in SEQ ID NO:1, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, or a portion of any of these nucleotide sequences. In one embodiment, the nucleic acid molecule includes sequences encoding the human 25934 protein (i.e., "the coding region", from nucleotides 403-1392 of SEQ ID NO:1), as well as 5' untranslated sequence (nucleotides 1-402 of SEQ ID NO:1) and a 3' untranslated sequence (nucleotides 1393-1512). Alternatively, the nucleic acid molecule can include only the coding region of SEQ ID NO:1 (e.g., nucleotides 1-990, corresponding to SEQ ID NO:3) and, e.g., no flanking sequences which normally accompany the subject sequence.

In another embodiment, an isolated nucleic acid molecule of the invention includes a nucleic acid molecule which is a complement of the nucleotide sequence shown in SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid

deposited with ATCC as Accession Number _____, or a portion of any of these nucleotide sequences. In other embodiments, the nucleic acid molecule of the invention is sufficiently complementary to the nucleotide sequence shown in SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as
5 Accession Number _____ such that it can hybridize to the nucleotide sequence shown in SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, thereby forming a stable duplex.

In one embodiment, an isolated nucleic acid molecule of the present invention includes a nucleotide sequence which is at least about: 60%, 65%, 66-69%, 70%, 75%,
10 80%, 85%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or more homologous to the entire length of the nucleotide sequence shown in SEQ ID NO:1 or 3, or the entire length of the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, or a portion, preferably of the same length, of any of these nucleotide sequences.

15

25934 Nucleic Acid Fragments

A nucleic acid molecule of the invention can include only a portion of the nucleic acid sequence of SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____. For example, such a nucleic
20 acid molecule can include a fragment which can be used as a probe or primer or a fragment encoding a portion of a 25934 protein, e.g., an immunogenic or biologically active portion of a 25934 protein. A fragment can comprise nucleotides 555 to 1287 of SEQ ID NO:1, which encodes a desaturase domain of human 25934. The nucleotide sequence determined from the cloning of the 25934 gene allows for the generation of
25 probes and primers designed for use in identifying and/or cloning other 25934 family members, or fragments thereof, as well as 25934 homologues, or fragments thereof, from other species.

In another embodiment, a nucleic acid includes a nucleotide sequence that includes part, or all, of the coding region and extends into either (or both) the 5' or 3' noncoding
30 region. Other embodiments include a fragment which includes a nucleotide sequence encoding an amino acid fragment described herein. Nucleic acid fragments can encode a specific domain or site described herein or fragments thereof, particularly fragments thereof which are at least 50, 90, 120, 150, 200, or 244 amino acids in length. Fragments also

include nucleic acid sequences corresponding to specific amino acid sequences described above or fragments thereof. Nucleic acid fragments should not be construed as encompassing those fragments that may have been disclosed prior to the invention.

5 A nucleic acid fragment can include a sequence corresponding to a domain, region, or functional site described herein. A nucleic acid fragment can also include one or more domain, region, or functional site described herein. Thus, for example, the fragment can include a desaturase domain and a protein kinase C phosphorylation site.

10 25934 probes and primers are provided. Typically a probe/primer is an isolated or purified oligonucleotide. The oligonucleotide typically includes a region of nucleotide sequence that hybridizes under stringent conditions to at least about 7, 12 or 15, preferably about 20 or 25, more preferably about 30, 35, 40, 45, 50, 55, 60, 65, or 75 consecutive nucleotides of a sense or antisense sequence of SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, or of a naturally occurring allelic variant or mutant of SEQ ID NO:1 or 3,
15 or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____.

In a preferred embodiment the nucleic acid is a probe which is at least 5 or 10, and less than 200, more preferably less than 100, or less than 50, base pairs in length. It should be identical, or differ by 1, or less than in 5 or 10 bases, from a sequence disclosed
20 herein. If alignment is needed for this comparison the sequences should be aligned for maximum homology. "Looped" out sequences from deletions or insertions, or mismatches, are considered differences.

A probe or primer can be derived from the sense or anti-sense strand of a nucleic acid which encodes a desaturase domain: amino acids 51 to 295 of SEQ ID NO:2.

25 In another embodiment a set of primers is provided, e.g., primers suitable for use in a PCR, which can be used to amplify a selected region of a 25934 sequence. The primers should be at least 5, 10, or 50 base pairs in length and less than 100, or less than 200, base pairs in length. The primers should be identical, or differs by one base from a sequence disclosed herein or from a naturally occurring variant. E.g., primers suitable for
30 amplifying a domain or region described herein, e.g., a desaturase domain which occurs at amino acids 51 to 295 of SEQ ID NO:2, are provided.

A nucleic acid fragment can encode an epitope bearing region of a polypeptide described herein.

A nucleic acid fragment encoding a "biologically active portion of a 25934 polypeptide" can be prepared by isolating a portion of the nucleotide sequence of SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____, which encodes a polypeptide having a 25934 biological activity (e.g., the biological activities of the 25934 proteins are described herein), expressing the encoded portion of the 25934 protein (e.g., by recombinant expression *in vitro*) and assessing the activity of the encoded portion of the 25934 protein. For example, a nucleic acid fragment encoding a biologically active portion of 25934 includes a desaturase domain, e.g., amino acid residues 51 to 295 of SEQ ID NO:2. A nucleic acid fragment encoding a biologically active portion of a 25934 polypeptide, may comprise a nucleotide sequence which is greater 350 or more nucleotides in length (e.g., greater than about 400 nucleotides in length).

In a preferred embodiment, the fragment is at least 604, 650, 700, 750, 800, 850, 900, 950, 1000, 1100, 1200, 1300, 1400, 1500 nucleotides in length, or more nucleotides in length and hybridizes under stringent hybridization conditions to a nucleic acid molecule of SEQ ID NO:1, or SEQ ID NO:3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____.

In a preferred embodiment, a nucleic acid fragment includes a nucleotide sequence comprising nucleotides SEQ ID NO:1 or SEQ ID NO:3, or a portion thereof, wherein each portion is about 604 or longer nucleotides and hybridizes under stringent hybridization conditions to a nucleic acid molecule of SEQ ID NO:1, or SEQ ID NO:3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____. In other embodiments, a nucleic acid fragment includes a nucleotide sequence of about 466 or more nucleotides in length which comprises nucleotides 1-709 of SEQ ID NO:1; or about 604 or more nucleotides in length which comprises nucleotides 710-1669 of SEQ ID NO:1.

In a preferred embodiment, a nucleic acid fragment has a nucleotide sequence other than (e.g., differs by at least one, two, three, five, ten or more nucleotides from) the nucleotide sequence of sequence of AI 401562, AI 942480, AW 131469, BE 515130, W 28157, BE 244746, AI 815730, or AI 816228.

25934 Nucleic Acid Variants

The invention further encompasses nucleic acid molecules that differ from the nucleotide sequence shown in SEQ ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____. Such
5 differences can be due to degeneracy of the genetic code (and result in a nucleic acid which encodes the same 25934 proteins as those encoded by the nucleotide sequence disclosed herein. In another embodiment, an isolated nucleic acid molecule of the invention has a nucleotide sequence encoding a protein having an amino acid sequence which differs, by at least 1, but less than 5, 10, 20, 50, or 100 amino acid residues that
10 shown in SEQ ID NO:2. If alignment is needed for this comparison the sequences should be aligned for maximum homology. "Looped" out sequences from deletions or insertions, or mismatches, are considered differences.

Nucleic acids of the inventor can be chosen for having codons, which are preferred, or non preferred, for a particular expression system. E.g., the nucleic acid can
15 be one in which at least one codon, at preferably at least 10%, or 20% of the codons has been altered such that the sequence is optimized for expression in e. coli, yeast, human, insect, or CHO cells.

Nucleic acid variants can be naturally occurring, such as allelic variants (same locus), homologs (different locus), and orthologs (different organism) or can be non
20 naturally occurring. Non-naturally occurring variants can be made by mutagenesis techniques, including those applied to polynucleotides, cells, or organisms. The variants can contain nucleotide substitutions, deletions, inversions and insertions. Variation can occur in either or both the coding and non-coding regions. The variations can produce both conservative and non-conservative amino acid substitutions (as compared in the encoded
25 product).

In a preferred embodiment, the nucleic acid differs from that of SEQ ID NO: 1 or 3, or the sequence in ATCC Accession Number ____, e.g., as follows: by at least one but less than 10, 20, 30, or 40 nucleotides; at least one but less than 1%, 5%, 10% or 20% of the in
30 the subject nucleic acid. If necessary for this analysis the sequences should be aligned for maximum homology. "Looped" out sequences from deletions or insertions, or mismatches, are considered differences.

Orthologs, homologs, and allelic variants can be identified using methods known in the art. These variants comprise a nucleotide sequence encoding a polypeptide that is 50%,

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at least about 55%, typically at least about 70-75%, more typically at least about 80-85%, and most typically at least about 90-95% or more identical to the nucleotide sequence shown in SEQ ID NO:2 or a fragment of this sequence. Nucleic acid molecules corresponding to orthologs, homologs, and allelic variants of the 25934 cDNAs of the invention can further
5 be isolated by mapping to the same chromosome or locus as the 25934 gene.

Preferred variants include those that are correlated with (1) catalyzing the formation of a double bond, preferably, at positions up to 9 carbons from the carboxyl end of a molecule, e.g., a fatty acid, such as a polyunsaturated fatty acid; (2) modulating the synthesis of monounsaturated fatty acids, e.g., modulating the synthesis of a fatty acid
10 synthesized in an animal, e.g., oleic acid, palmitoyl- and stearoyl-CoA; (3) modulating the desaturation of a fatty acid, e.g., a polyunsaturated fatty acids; (4) modulating cellular lipid composition, e.g., modulating the ratio of saturated and unsaturated fatty acids; (5) modulating the energy state of adipocytes; (6) modulating membrane fluidity; (7) modulating lipid storage; (8) modulating proliferation and/or differentiation; (9)
15 modulating lipoprotein (e.g., LDL) composition and/or concentration; (10) regulating triglyceride synthesis; (11) altering the HDL/LDL ration; (12) modulating fatty acid metabolism; or (13) modulating the development of atherosclerotic lesions in disease models.

Allelic variants of 25934, e.g., human 25934, include both functional and non-
20 functional proteins. Functional allelic variants are naturally occurring amino acid sequence variants of the 25934 protein within a population that maintain the ability to (1) catalyzing the formation of a double bond, preferably, at positions up to 9 carbons from the carboxyl end of a molecule, e.g., a fatty acid, such as a polyunsaturated fatty acid; (2) modulating the synthesis of monounsaturated fatty acids, e.g., modulating the synthesis of
25 a fatty acid synthesized in an animal, e.g., oleic acid, palmitoyl- and stearoyl-CoA; (3) modulating the desaturation of a fatty acid, e.g., a polyunsaturated fatty acids; (4) modulating cellular lipid composition, e.g., modulating the ratio of saturated and unsaturated fatty acids; (5) modulating the energy state of adipocytes; (6) modulating membrane fluidity; (7) modulating lipid storage; (8) modulating proliferation and/or
30 differentiation; (9) modulating lipoprotein (e.g., LDL) composition and/or concentration; (10) regulating triglyceride synthesis; (11) altering the HDL/LDL ration; or (12) modulating fatty acid metabolism. Functional allelic variants will typically contain only conservative substitution of one or more amino acids of SEQ ID NO:2, or substitution,

deletion or insertion of non-critical residues in non-critical regions of the protein. Non-functional allelic variants are naturally-occurring amino acid sequence variants of the 25934, e.g., human 25934, protein within a population that do not have the ability to modulate a 25934-mediated activity as described herein. Non-functional allelic variants
5 will typically contain a non-conservative substitution, a deletion, or insertion, or premature truncation of the amino acid sequence of SEQ ID NO:2, or a substitution, insertion, or deletion in critical residues or critical regions of the protein.

Moreover, nucleic acid molecules encoding other 25934 family members and, thus, which have a nucleotide sequence which differs from the 25934 sequences of SEQ
10 ID NO:1 or 3, or the nucleotide sequence of the DNA insert of the plasmid deposited with ATCC as Accession Number _____ are intended to be within the scope of the invention.

Antisense Nucleic Acid Molecules, Ribozymes and Modified 25934 Nucleic Acid Molecules

15 In another aspect, the invention features, an isolated nucleic acid molecule which is antisense to 25934. An "antisense" nucleic acid can include a nucleotide sequence which is complementary to a "sense" nucleic acid encoding a protein, e.g., complementary to the coding strand of a double-stranded cDNA molecule or complementary to an mRNA sequence. The antisense nucleic acid can be complementary
20 to an entire 25934 coding strand, or to only a portion thereof (e.g., the coding region of human 25934 corresponding to SEQ ID NO:3). In another embodiment, the antisense nucleic acid molecule is antisense to a "noncoding region" of the coding strand of a nucleotide sequence encoding 25934 (e.g., the 5' and 3' untranslated regions).

An antisense nucleic acid can be designed such that it is complementary to the
25 entire coding region of 25934 mRNA, but more preferably is an oligonucleotide which is antisense to only a portion of the coding or noncoding region of 25934 mRNA. For example, the antisense oligonucleotide can be complementary to the region surrounding the translation start site of 25934 mRNA, e.g., between the -10 and +10 regions of the target gene nucleotide sequence of interest. An antisense oligonucleotide can be, for
30 example, about 7, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, or more nucleotides in length.

An antisense nucleic acid of the invention can be constructed using chemical synthesis and enzymatic ligation reactions using procedures known in the art. For

example, an antisense nucleic acid (e.g., an antisense oligonucleotide) can be chemically synthesized using naturally occurring nucleotides or variously modified nucleotides designed to increase the biological stability of the molecules or to increase the physical stability of the duplex formed between the antisense and sense nucleic acids, e.g.,
5 phosphorothioate derivatives and acridine substituted nucleotides can be used. The antisense nucleic acid also can be produced biologically using an expression vector into which a nucleic acid has been subcloned in an antisense orientation (i.e., RNA transcribed from the inserted nucleic acid will be of an antisense orientation to a target nucleic acid of interest, described further in the following subsection).

10 The antisense nucleic acid molecules of the invention are typically administered to a subject (e.g., by direct injection at a tissue site), or generated *in situ* such that they hybridize with or bind to cellular mRNA and/or genomic DNA encoding a 25934 protein to thereby inhibit expression of the protein, e.g., by inhibiting transcription and/or translation. Alternatively, antisense nucleic acid molecules can be modified to target
15 selected cells and then administered systemically. For systemic administration, antisense molecules can be modified such that they specifically bind to receptors or antigens expressed on a selected cell surface, e.g., by linking the antisense nucleic acid molecules to peptides or antibodies which bind to cell surface receptors or antigens. The antisense nucleic acid molecules can also be delivered to cells using the vectors described herein.
20 To achieve sufficient intracellular concentrations of the antisense molecules, vector constructs in which the antisense nucleic acid molecule is placed under the control of a strong pol II or pol III promoter are preferred.

In yet another embodiment, the antisense nucleic acid molecule of the invention is an α -anomeric nucleic acid molecule. An α -anomeric nucleic acid molecule forms
25 specific double-stranded hybrids with complementary RNA in which, contrary to the usual β -units, the strands run parallel to each other (Gaultier et al. (1987) *Nucleic Acids Res.* 15:6625-6641). The antisense nucleic acid molecule can also comprise a 2'-o-methylribonucleotide (Inoue et al. (1987) *Nucleic Acids Res.* 15:6131-6148) or a chimeric RNA-DNA analogue (Inoue et al. (1987) *FEBS Lett.* 215:327-330).

30 In still another embodiment, an antisense nucleic acid of the invention is a ribozyme. A ribozyme having specificity for a 25934-encoding nucleic acid can include one or more sequences complementary to the the nucleotide sequence of a 25934 cDNA disclosed herein (i.e., SEQ ID NO:1 or 3), and a sequence having known catalytic

sequence responsible for mRNA cleavage (see U.S. Pat. No. 5,093,246 or Haselhoff and Gerlach (1988) *Nature* 334:585-591). For example, a derivative of a *Tetrahymena* L-19 IVS RNA can be constructed in which the nucleotide sequence of the active site is complementary to the nucleotide sequence to be cleaved in a 25934-encoding mRNA.

5 See, e.g., Cech et al. U.S. Patent No. 4,987,071; and Cech et al. U.S. Patent No. 5,116,742. Alternatively, 25934 mRNA can be used to select a catalytic RNA having a specific ribonuclease activity from a pool of RNA molecules. See, e.g., Bartel, D. and Szostak, J.W. (1993) *Science* 261:1411-1418.

25934 gene expression can be inhibited by targeting nucleotide sequences
10 complementary to the regulatory region of the 25934 (e.g., the 25934 promoter and/or enhancers) to form triple helical structures that prevent transcription of the 25934 gene in target cells. See generally, Helene, C. (1991) *Anticancer Drug Des.* 6(6):569-84; Helene, C. et al. (1992) *Ann. N.Y. Acad. Sci.* 660:27-36; and Maher, L.J. (1992) *Bioassays* 14(12):807-15. The potential sequences that can be targeted for triple helix formation can
15 be increased by creating a so called "switchback" nucleic acid molecule. Switchback molecules are synthesized in an alternating 5'-3', 3'-5' manner, such that they base pair with first one strand of a duplex and then the other, eliminating the necessity for a sizeable stretch of either purines or pyrimidines to be present on one strand of a duplex.

The invention also provides detectably labeled oligonucleotide primer and probe
20 molecules. Typically, such labels are chemiluminescent, fluorescent, radioactive, or colorimetric.

A 25934 nucleic acid molecule can be modified at the base moiety, sugar moiety or phosphate backbone to improve, e.g., the stability, hybridization, or solubility of the molecule. For example, the deoxyribose phosphate backbone of the nucleic acid
25 molecules can be modified to generate peptide nucleic acids (see Hyrup B. et al. (1996) *Bioorganic & Medicinal Chemistry* 4 (1): 5-23). As used herein, the terms "peptide nucleic acid" or "PNA" refers to a nucleic acid mimic, e.g., a DNA mimic, in which the deoxyribose phosphate backbone is replaced by a pseudopeptide backbone and only the four natural nucleobases are retained. The neutral backbone of a PNA can allow for
30 specific hybridization to DNA and RNA under conditions of low ionic strength. The synthesis of PNA oligomers can be performed using standard solid phase peptide synthesis protocols as described in Hyrup B. et al. (1996) *supra*; Perry-O'Keefe et al. *Proc. Natl. Acad. Sci.* 93: 14670-675.

PNAs of 25934 nucleic acid molecules can be used in therapeutic and diagnostic applications. For example, PNAs can be used as antisense or antigene agents for sequence-specific modulation of gene expression by, for example, inducing transcription or translation arrest or inhibiting replication. PNAs of 25934 nucleic acid molecules can also be used in the analysis of single base pair mutations in a gene, (e.g., by PNA-directed PCR clamping); as 'artificial restriction enzymes' when used in combination with other enzymes, (e.g., S1 nucleases (Hyrup B. (1996) *supra*)); or as probes or primers for DNA sequencing or hybridization (Hyrup B. et al. (1996) *supra*; Perry-O'Keefe *supra*).

In other embodiments, the oligonucleotide may include other appended groups such as peptides (e.g., for targeting host cell receptors *in vivo*), or agents facilitating transport across the cell membrane (see, e.g., Letsinger et al. (1989) *Proc. Natl. Acad. Sci. USA* 86:6553-6556; Lemaitre et al. (1987) *Proc. Natl. Acad. Sci. USA* 84:648-652; PCT Publication No. W088/09810) or the blood-brain barrier (see, e.g., PCT Publication No. W089/10134). In addition, oligonucleotides can be modified with hybridization-triggered cleavage agents (See, e.g., Krol et al. (1988) *Bio-Techniques* 6:958-976) or intercalating agents (See, e.g., Zon (1988) *Pharm. Res.* 5:539-549). To this end, the oligonucleotide may be conjugated to another molecule, (e.g., a peptide, hybridization triggered cross-linking agent, transport agent, or hybridization-triggered cleavage agent).

The invention also includes molecular beacon oligonucleotide primer and probe molecules having at least one region which is complementary to a 25934 nucleic acid of the invention, two complementary regions one having a fluorophore and one a quencher such that the molecular beacon is useful for quantitating the presence of the 25934 nucleic acid of the invention in a sample. Molecular beacon nucleic acids are described, for example, in Lizardi et al., U.S. Patent No. 5,854,033; Nazarenko et al., U.S. Patent No. 5,866,336, and Livak et al., U.S. Patent 5,876,930.

Isolated 25934 Polypeptides

In another aspect, the invention features, an isolated 25934 protein, or fragment, e.g., a biologically active portion, for use as immunogens or antigens to raise or test (or more generally to bind) anti-25934 antibodies. 25934 protein can be isolated from cells or tissue sources using standard protein purification techniques. 25934 protein or fragments thereof can be produced by recombinant DNA techniques or synthesized chemically.

Polypeptides of the invention include those which arise as a result of the existence of multiple genes, alternative transcription events, alternative RNA splicing events, and alternative translational and postranslational events. The polypeptide can be expressed in systems, e.g., cultured cells, which result in substantially the same postranslational modifications present when expressed the polypeptide is expressed in a native cell, or in systems which result in the alteration or omission of postranslational modifications, e.g., glycosylation or cleavage, present when expressed in a native cell.

In a preferred embodiment, a 25934 polypeptide has one or more of the following characteristics:

- 10 (i) it has the ability to promote the formation of a double bond at positions up to 9 carbons from the carboxyl end of a molecule;
- (ii) it has a molecular weight (e.g., a deduced molecular weight), amino acid composition or other physical characteristic of the protein of SEQ ID NO:2;
- (iii) it has an overall sequence similarity of at least 65-69%, preferably at least 70, 15 80, 90, or 95%, with a polypeptide of SEQ ID NO:2;
- (iv) it has a desaturase domain which is preferably about 70%, 80%, 90% or 95% with amino acid residues 51-295 of SEQ ID NO:2;
- (v) it has the fatty acid desaturase signature (ProSite PS00476) at about residues 268 to 282 of SEQ ID NO:2;
- 20 (vi) it has eight conserved histidines which can coordinate the iron active site at about residues 94, 99, 131, 134, 135, 272, 275, and 276 of SEQ ID NO:2; or
- (vii) it has at least 70%, preferably 80%, and most preferably 90% of the cysteines found amino acid sequence of the native protein.

In a preferred embodiment the 25934 protein, or fragment thereof, differs from the corresponding sequence in SEQ ID NO:2. In one embodiment it differs by at least one but by less than 15, 10 or 5 amino acid residues. In another it differs from the corresponding sequence in SEQ ID NO:2 by at least one residue but less than 20%, 15%, 10% or 5% of the residues in it differ from the corresponding sequence in SEQ ID NO:2. The differences are, preferably, differences or changes at a non-essential residue or a conservative substitution. In a preferred embodiment the differences are not in the desaturase domain. In another preferred embodiment, one or more differences are in the desaturase domain.

Other embodiments include a protein that contain one or more changes in amino acid sequence, e.g., a change in an amino acid residue which is not essential for activity. Such 25934 proteins differ in amino acid sequence from SEQ ID NO:2, yet retain biological activity.

5 In one embodiment, the protein includes an amino acid sequence at least about 60%, 65%, 66-69%, 70%, 75%, 80%, 85%, 90%, 95%, 98% or more homologous to SEQ ID NO:2.

10 A 25934 protein or fragment is provided which varies from the sequence of SEQ ID NO:2 in non-active site residues by at least one but by less than 15, 10 or 5 amino acid residues in the protein or fragment, but which does not differ from SEQ ID NO:2 in regions having desaturase activity. In some embodiments, the difference is at a non-essential residue or is a conservative substitution, while in others the difference is at an essential residue or is a non conservative substitution.

15 In one embodiment, a biologically active portion of a 25934 protein includes desaturase domain. Moreover, other biologically active portions, in which other regions of the protein are deleted, can be prepared by recombinant techniques and evaluated for one or more of the functional activities of a native 25934 protein.

20 In a preferred embodiment, the 25934 protein has an amino acid sequence shown in SEQ ID NO:2. In other embodiments, the 25934 protein is substantially identical to SEQ ID NO:2. In yet another embodiment, the 25934 protein is substantially identical to SEQ ID NO:2 and retains the functional activity of the protein of SEQ ID NO:2, as described in detail in the subsections above.

25934 Chimeric or Fusion Proteins

25 In another aspect, the invention provides 25934 chimeric or fusion proteins. As used herein, a 25934 "chimeric protein" or "fusion protein" includes a 25934 polypeptide linked to a non-25934 polypeptide. A "non-25934 polypeptide" refers to a polypeptide having an amino acid sequence corresponding to a protein which is not substantially
30 homologous to the 25934 protein, e.g., a protein which is different from the 25934 protein and which is derived from the same or a different organism. The 25934 polypeptide of the fusion protein can correspond to all or a portion e.g., a fragment described herein of a 25934 amino acid sequence. In a preferred embodiment, a 25934 fusion protein includes

at least one (or two) biologically active portion of a 25934 protein. The non-25934 polypeptide can be fused to the N-terminus or C-terminus of the 25934 polypeptide.

The fusion protein can include a moiety which has a high affinity for a ligand. For example, the fusion protein can be a GST-25934 fusion protein in which the 25934 sequences are fused to the C-terminus of the GST sequences. Such fusion proteins can facilitate the purification of recombinant 25934. Alternatively, the fusion protein can be a 25934 protein containing a heterologous signal sequence at its N-terminus. In certain host cells (e.g., mammalian host cells), expression and/or secretion of 25934 can be increased through use of a heterologous signal sequence.

Fusion proteins can include all or a part of a serum protein, e.g., an IgG constant region, or human serum albumin.

The 25934 fusion proteins of the invention can be incorporated into pharmaceutical compositions and administered to a subject *in vivo*. The 25934 fusion proteins can be used to affect the bioavailability of a 25934 substrate. 25934 fusion proteins may be useful therapeutically for the treatment of disorders caused by, for example, (i) aberrant modification or mutation of a gene encoding a 25934 protein; (ii) mis-regulation of the 25934 gene; and (iii) aberrant post-translational modification of a 25934 protein.

Moreover, the 25934-fusion proteins of the invention can be used as immunogens to produce anti-25934 antibodies in a subject, to purify 25934 ligands and in screening assays to identify molecules which inhibit the interaction of 25934 with a 25934 substrate.

Expression vectors are commercially available that already encode a fusion moiety (e.g., a GST polypeptide). A 25934-encoding nucleic acid can be cloned into such an expression vector such that the fusion moiety is linked in-frame to the 25934 protein.

Variants of 25934 Proteins

In another aspect, the invention also features a variant of a 25934 polypeptide, e.g., which functions as an agonist (mimetics) or as an antagonist. Variants of the 25934 proteins can be generated by mutagenesis, e.g., discrete point mutation, the insertion or deletion of sequences or the truncation of a 25934 protein. An agonist of the 25934 proteins can retain substantially the same, or a subset, of the biological activities of the naturally occurring form of a 25934 protein. An antagonist of a 25934 protein can inhibit

one or more of the activities of the naturally occurring form of the 25934 protein by, for example, competitively modulating a 25934-mediated activity of a 25934 protein. Thus, specific biological effects can be elicited by treatment with a variant of limited function. Preferably, treatment of a subject with a variant having a subset of the biological activities of the naturally occurring form of the protein has fewer side effects in a subject relative to treatment with the naturally occurring form of the 25934 protein.

Variants of a 25934 protein can be identified by screening combinatorial libraries of mutants, e.g., truncation mutants, of a 25934 protein for agonist or antagonist activity.

Libraries of fragments e.g., N terminal, C terminal, or internal fragments, of a 25934 protein coding sequence can be used to generate a variegated population of fragments for screening and subsequent selection of variants of a 25934 protein.

Variants in which a cysteine residues is added or deleted or in which a residue which is glycosylated is added or deleted are particularly preferred.

Methods for screening gene products of combinatorial libraries made by point mutations or truncation, and for screening cDNA libraries for gene products having a selected property. Recursive ensemble mutagenesis (REM), a new technique which enhances the frequency of functional mutants in the libraries, can be used in combination with the screening assays to identify 25934 variants (Arkin and Yourvan (1992) *Proc. Natl. Acad. Sci. USA* 89:7811-7815; Delgrave et al. (1993) *Protein Engineering* 6(3):327-331).

Cell based assays can be exploited to analyze a variegated 25934 library. For example, a library of expression vectors can be transfected into a cell line, e.g., a cell line, which ordinarily responds to 25934 in a substrate-dependent manner. The transfected cells are then contacted with 25934 and the effect of the expression of the mutant on signaling by the 25934 substrate can be detected, e.g., by measuring the formation of double bonds in the hydrocarbon areas of fatty acids. Plasmid DNA can then be recovered from the cells which score for inhibition, or alternatively, potentiation of signaling by the 25934 substrate, and the individual clones further characterized.

In another aspect, the invention features a method of making a 25934 polypeptide, e.g., a peptide having a non-wild type activity, e.g., an antagonist, agonist, or super agonist of a naturally occurring 25934 polypeptide, e.g., a naturally occurring 25934 polypeptide. The method includes: altering the sequence of a 25934 polypeptide, e.g., altering the sequence, e.g., by substitution or deletion of one or more residues of a non-

conserved region, a domain or residue disclosed herein, and testing the altered polypeptide for the desired activity.

In another aspect, the invention features a method of making a fragment or analog of a 25934 polypeptide a biological activity of a naturally occurring 25934 polypeptide.

- 5 The method includes: altering the sequence, e.g., by substitution or deletion of one or more residues, of a 25934 polypeptide, e.g., altering the sequence of a non-conserved region, or a domain or residue described herein, and testing the altered polypeptide for the desired activity.

10 Anti-25934 Antibodies

In another aspect, the invention provides an anti-25934 antibody, or a fragment thereof (e.g., an antigen-binding fragment thereof). The term "antibody" as used herein refers to an immunoglobulin molecule or immunologically active portion thereof, i.e., an antigen-binding portion. As used herein, the term "antibody" refers to a protein

- 15 comprising at least one, and preferably two, heavy (H) chain variable regions (abbreviated herein as VH), and at least one and preferably two light (L) chain variable regions (abbreviated herein as VL). The VH and VL regions can be further subdivided into regions of hypervariability, termed "complementarity determining regions" ("CDR"), interspersed with regions that are more conserved, termed "framework regions" (FR).

- 20 The extent of the framework region and CDR's has been precisely defined (see, Kabat, E.A., *et al.* (1991) *Sequences of Proteins of Immunological Interest, Fifth Edition*, U.S. Department of Health and Human Services, NIH Publication No. 91-3242, and Chothia, C. *et al.* (1987) *J. Mol. Biol.* 196:901-917, which are incorporated herein by reference). Each VH and VL is composed of three CDR's and four FRs, arranged from amino-
- 25 terminus to carboxy-terminus in the following order: FR1, CDR1, FR2, CDR2, FR3, CDR3, FR4.

- The anti-25934 antibody can further include a heavy and light chain constant region, to thereby form a heavy and light immunoglobulin chain, respectively. In one embodiment, the antibody is a tetramer of two heavy immunoglobulin chains and two
- 30 light immunoglobulin chains, wherein the heavy and light immunoglobulin chains are inter-connected by, e.g., disulfide bonds. The heavy chain constant region is comprised of three domains, CH1, CH2 and CH3. The light chain constant region is comprised of one domain, CL. The variable region of the heavy and light chains contains a binding

domain that interacts with an antigen. The constant regions of the antibodies typically mediate the binding of the antibody to host tissues or factors, including various cells of the immune system (e.g., effector cells) and the first component (C1q) of the classical complement system.

5 As used herein, the term "immunoglobulin" refers to a protein consisting of one or more polypeptides substantially encoded by immunoglobulin genes. The recognized human immunoglobulin genes include the kappa, lambda, alpha (IgA1 and IgA2), gamma (IgG1, IgG2, IgG3, IgG4), delta, epsilon and mu constant region genes, as well as the myriad immunoglobulin variable region genes. Full-length immunoglobulin "light
10 chains" (about 25 Kd or 214 amino acids) are encoded by a variable region gene at the NH₂-terminus (about 110 amino acids) and a kappa or lambda constant region gene at the COOH--terminus. Full-length immunoglobulin "heavy chains" (about 50 Kd or 446 amino acids), are similarly encoded by a variable region gene (about 116 amino acids) and one of the other aforementioned constant region genes, e.g., gamma (encoding about
15 330 amino acids).

The term "antigen-binding fragment" of an antibody (or simply "antibody portion," or "fragment"), as used herein, refers to one or more fragments of a full-length antibody that retain the ability to specifically bind to the antigen, e.g., 25934 polypeptide or fragment thereof. Examples of antigen-binding fragments of the anti-25934 antibody
20 include, but are not limited to: (i) a Fab fragment, a monovalent fragment consisting of the VL, VH, CL and CH1 domains; (ii) a F(ab')₂ fragment, a bivalent fragment comprising two Fab fragments linked by a disulfide bridge at the hinge region; (iii) a Fd fragment consisting of the VH and CH1 domains; (iv) a Fv fragment consisting of the VL and VH domains of a single arm of an antibody, (v) a dAb fragment (Ward *et al.*, (1989)
25 *Nature* 341:544-546), which consists of a VH domain; and (vi) an isolated complementarity determining region (CDR). Furthermore, although the two domains of the Fv fragment, VL and VH, are coded for by separate genes, they can be joined, using recombinant methods, by a synthetic linker that enables them to be made as a single protein chain in which the VL and VH regions pair to form monovalent molecules
30 (known as single chain Fv (scFv); see e.g., Bird *et al.* (1988) *Science* 242:423-426; and Huston *et al.* (1988) *Proc. Natl. Acad. Sci. USA* 85:5879-5883). Such single chain antibodies are also encompassed within the term "antigen-binding fragment" of an antibody. These antibody fragments are obtained using conventional techniques known

to those with skill in the art, and the fragments are screened for utility in the same manner as are intact antibodies.

The anti-25934 antibody can be a polyclonal or a monoclonal antibody. In other embodiments, the antibody can be recombinantly produced, e.g., produced by phage display or by combinatorial methods.

Phage display and combinatorial methods for generating anti-25934 antibodies are known in the art (see e.g., Ladner et al. U.S. Patent No. 5,223,409; Kang et al. International Publication No. WO 92/18619; Dower et al. International Publication No. WO 91/17271; Winter et al. International Publication WO 92/20791; Markland et al. International Publication No. WO 92/15679; Breitling et al. International Publication WO 93/01288; McCafferty et al. International Publication No. WO 92/01047; Garrard et al. International Publication No. WO 92/09690; Ladner et al. International Publication No. WO 90/02809; Fuchs et al. (1991) *Bio/Technology* 9:1370-1372; Hay et al. (1992) *Hum Antibod Hybridomas* 3:81-85; Huse et al. (1989) *Science* 246:1275-1281; Griffiths et al. (1993) *EMBO J* 12:725-734; Hawkins et al. (1992) *J Mol Biol* 226:889-896; Clackson et al. (1991) *Nature* 352:624-628; Gram et al. (1992) *PNAS* 89:3576-3580; Garrad et al. (1991) *Bio/Technology* 9:1373-1377; Hoogenboom et al. (1991) *Nuc Acid Res* 19:4133-4137; and Barbas et al. (1991) *PNAS* 88:7978-7982, the contents of all of which are incorporated by reference herein).

In one embodiment, the anti-25934 antibody is a fully human antibody (e.g., an antibody made in a mouse which has been genetically engineered to produce an antibody from a human immunoglobulin sequence), or a non-human antibody, e.g., a rodent (mouse or rat), goat, primate (e.g., monkey), camel antibody. Preferably, the non-human antibody is a rodent (mouse or rat antibody). Method of producing rodent antibodies are known in the art.

Human monoclonal antibodies can be generated using transgenic mice carrying the human immunoglobulin genes rather than the mouse system. Splenocytes from these transgenic mice immunized with the antigen of interest are used to produce hybridomas that secrete human mAbs with specific affinities for epitopes from a human protein (see, e.g., Wood et al. International Application WO 91/00906, Kucherlapati et al. PCT publication WO 91/10741; Lonberg et al. International Application WO 92/03918; Kay et al. International Application 92/03917; Lonberg, N. et al. 1994 *Nature* 368:856-859; Green, L.L. et al. 1994 *Nature Genet.* 7:13-21; Morrison, S.L. et al. 1994 *Proc. Natl.*

Acad. Sci. USA 81:6851-6855; Bruggeman et al. 1993 *Year Immunol* 7:33-40; Tuailon et al. 1993 *PNAS* 90:3720-3724; Bruggeman et al. 1991 *Eur J Immunol* 21:1323-1326).

An anti-25934 antibody can be one in which the variable region, or a portion thereof, e.g., the CDR's, are generated in a non-human organism, e.g., a rat or mouse.

5 Chimeric, CDR-grafted, and humanized antibodies are within the invention. Antibodies generated in a non-human organism, e.g., a rat or mouse, and then modified, e.g., in the variable framework or constant region, to decrease antigenicity in a human are within the invention.

Chimeric antibodies can be produced by recombinant DNA techniques known in
10 the art. For example, a gene encoding the Fc constant region of a murine (or other species) monoclonal antibody molecule is digested with restriction enzymes to remove the region encoding the murine Fc, and the equivalent portion of a gene encoding a human Fc constant region is substituted (see Robinson et al., International Patent Publication PCT/US86/02269; Akira, et al., European Patent Application 184,187;
15 Taniguchi, M., European Patent Application 171,496; Morrison et al., European Patent Application 173,494; Neuberger et al., International Application WO 86/01533; Cabilly et al. U.S. Patent No. 4,816,567; Cabilly et al., European Patent Application 125,023; Better et al. (1988 *Science* 240:1041-1043); Liu et al. (1987) *PNAS* 84:3439-3443; Liu et al., 1987, *J. Immunol.* 139:3521-3526; Sun et al. (1987) *PNAS* 84:214-218; Nishimura et al., 1987, *Canc. Res.* 47:999-1005; Wood et al. (1985) *Nature* 314:446-449; and Shaw et al., 1988, *J. Natl Cancer Inst.* 80:1553-1559).

A humanized or CDR-grafted antibody will have at least one or two but generally all three recipient CDR's (of heavy and or light immunoglobulin chains) replaced with a donor CDR. An antibody may be replaced with at least a portion of a non-human CDR or
25 or only some of the CDR's may be replaced with non-human CDR's. It is only necessary to replace the number of CDR's required for binding of the humanized antibody to a 25934 or a fragment thereof. Preferably, the donor will be a rodent antibody, e.g., a rat or mouse antibody, and the recipient will be a human framework or a human consensus framework. Typically, the immunoglobulin providing the CDR's is called the "donor" and the
30 immunoglobulin providing the framework is called the "acceptor." In one embodiment, the donor immunoglobulin is a non-human (e.g., rodent). The acceptor framework is a naturally-occurring (e.g., a human) framework or a consensus framework, or a sequence about 85% or higher, preferably 90%, 95%, 99% or higher identical thereto.

As used herein, the term "consensus sequence" refers to the sequence formed from the most frequently occurring amino acids (or nucleotides) in a family of related sequences (See e.g., Winnaker, *From Genes to Clones* (Verlagsgesellschaft, Weinheim, Germany 1987). In a family of proteins, each position in the consensus sequence is occupied by the amino acid occurring most frequently at that position in the family. If two amino acids occur equally frequently, either can be included in the consensus sequence. A "consensus framework" refers to the framework region in the consensus immunoglobulin sequence.

An antibody can be humanized by methods known in the art. Humanized antibodies can be generated by replacing sequences of the Fv variable region which are not directly involved in antigen binding with equivalent sequences from human Fv variable regions. General methods for generating humanized antibodies are provided by Morrison, S. L., 1985, *Science* 229:1202-1207, by Oi et al., 1986, *BioTechniques* 4:214, and by Queen et al. US 5,585,089, US 5,693,761 and US 5,693,762, the contents of all of which are hereby incorporated by reference. Those methods include isolating, manipulating, and expressing the nucleic acid sequences that encode all or part of immunoglobulin Fv variable regions from at least one of a heavy or light chain. Sources of such nucleic acid are well known to those skilled in the art and, for example, may be obtained from a hybridoma producing an antibody against a 25934 polypeptide or fragment thereof. The recombinant DNA encoding the humanized antibody, or fragment thereof, can then be cloned into an appropriate expression vector.

Humanized or CDR-grafted antibodies can be produced by CDR-grafting or CDR substitution, wherein one, two, or all CDR's of an immunoglobulin chain can be replaced. See e.g., U.S. Patent 5,225,539; Jones et al. 1986 *Nature* 321:552-525; Verhoeyan et al. 1988 *Science* 239:1534; Beidler et al. 1988 *J. Immunol.* 141:4053-4060; Winter US 5,225,539, the contents of all of which are hereby expressly incorporated by reference. Winter describes a CDR-grafting method which may be used to prepare the humanized antibodies of the present invention (UK Patent Application GB 2188638A, filed on March 26, 1987; Winter US 5,225,539), the contents of which is expressly incorporated by reference.

Also within the scope of the invention are humanized antibodies in which specific amino acids have been substituted, deleted or added. Preferred humanized antibodies have amino acid substitutions in the framework region, such as to improve binding to the antigen. For example, a humanized antibody will have framework residues identical to

the donor framework residue or to another amino acid other than the recipient framework residue. To generate such antibodies, a selected, small number of acceptor framework residues of the humanized immunoglobulin chain can be replaced by the corresponding donor amino acids. Preferred locations of the substitutions include amino acid residues adjacent to the CDR, or which are capable of interacting with a CDR (see 5 e.g., US 5,585,089). Criteria for selecting amino acids from the donor are described in US 5,585,089, e.g., columns 12-16 of US 5,585,089, the e.g., columns 12-16 of US 5,585,089, the contents of which are hereby incorporated by reference. Other techniques for humanizing antibodies are described in Padlan et al. EP 519596 A1, published on 10 December 23, 1992.

A full-length 25934 protein or, antigenic peptide fragment of 25934 can be used as an immunogen or can be used to identify anti-25934 antibodies made with other immunogens, e.g., cells, membrane preparations, and the like. In preferred embodiments an antibody can be made by immunizing with purified 25934 antigen, or a fragment 15 thereof, e.g., a fragment described herein. The antigenic peptide of 25934 should include at least 8 amino acid residues of the amino acid sequence shown in SEQ ID NO:2 and encompasses an epitope of 25934. Preferably, the antigenic peptide includes at least 10 amino acid residues, more preferably at least 15 amino acid residues, even more preferably at least 20 amino acid residues, and most preferably at least 30 amino acid 20 residues.

Fragments of 25934 which include residues 30-45, 121-151, or 241-261 can be used to make, e.g., used as immunogens, or used to characterize the specificity of an antibody, antibodies against hydrophilic regions of the 25934 protein. Similarly, a fragment of 25934 which include residues 291-307 can be used to make an antibody 25 against a hydrophobic region of the 25934 protein; a fragment of 25934 which include all or a portion of residues 51-95 can be used to make an antibody against the desaturase domain of the 25934 protein.

Antibodies reactive with, or specific for, any of these regions, or other regions or domains described herein are provided.

30 Antibodies which bind only native 25934 protein, only denatured or otherwise non-native 25934 protein, or which bind both, are within the invention. Antibodies with linear or conformational epitopes are within the invention. Conformational epitopes can

sometimes be identified by identifying antibodies which bind to native, but not the denatured 25934 protein.

Preferred epitopes encompassed by the antigenic peptide are regions of 25934 are located on the surface of the protein, e.g., hydrophilic regions, as well as regions with high antigenicity. For example, an Emini surface probability analysis of the human 25934 protein sequence can be used to indicate the regions that have a particularly high probability of being localized to the surface of the 25934 protein and are thus likely to constitute surface residues useful for targeting antibody production.

The anti-25934 antibody can be a single chain antibody. A single-chain antibody (scFV) may be engineered (see, for example, Colcher, D. *et al.* (1999) *Ann NY Acad Sci* 880:263-80; and Reiter, Y. (1996) *Clin Cancer Res* 2:245-52). The single chain antibody can be dimerized or multimerized to generate multivalent antibodies having specificities for different epitopes of the same target 25934 protein.

In a preferred embodiment the antibody has: effector function; and can fix complement. In other embodiments the antibody does not; recruit effector cells; or fix complement.

In a preferred embodiment, the antibody has reduced or no ability to bind an Fc receptor. For example., it is a isotype or subtype, fragment or other mutant, which does not support binding to an Fc receptor, e.g., it has a mutagenized or deleted Fc receptor binding region.

The antibody can be coupled to a toxin, e.g., a polypeptide toxin, e.g, ricin or diphtheria toxin or active fragment hereof, or a radionuclide, or imaging agent, e.g. a radioactive, enzymatic, or other, e.g., imaging agent, e.g., a NMR contrast agent. Labels which produce detectable radioactive emissions or fluorescence are preferred.

An anti-25934 antibody (e.g., monoclonal antibody) can be used to isolate 25934 by standard techniques, such as affinity chromatography or immunoprecipitation. Moreover, an anti-25934 antibody can be used to detect 25934 protein (e.g., in a cellular lysate or cell supernatant) in order to evaluate the abundance and pattern of expression of the protein. Anti-25934 antibodies can be used diagnostically to monitor protein levels in tissue as part of a clinical testing procedure, e.g., to determine the efficacy of a given treatment regimen. Detection can be facilitated by coupling (i.e., physically linking) the antibody to a detectable substance (i.e., antibody labelling). Examples of detectable substances include various enzymes, prosthetic groups, fluorescent materials, luminescent

materials, bioluminescent materials, and radioactive materials. Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, β -galactosidase, or acetylcholinesterase; examples of suitable prosthetic group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include
5 umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine
fluorescein, dansyl chloride or phycoerythrin; an example of a luminescent material
includes luminol; examples of bioluminescent materials include luciferase, luciferin, and
aequorin, and examples of suitable radioactive material include ^{125}I , ^{131}I , ^{35}S or ^3H .

The invention also includes a nucleic acid which encodes an anti-25934 antibody,
10 e.g., an anti-25934 antibody described herein. Also included are vectors which include
the nucleic acid and cells transformed with the nucleic acid, particularly cells which are
useful for producing an antibody, e.g., mammalian cells, e.g. CHO or lymphatic cells.

The invention also includes cell lines, e.g., hybridomas, which make an anti-25934
antibody, e.g., and antibody described herein, and method of using said cells to make a
15 25934 antibody.

Recombinant Expression Vectors, Host Cells and Genetically Engineered Cells

In another aspect, the invention includes, vectors, preferably expression vectors,
containing a nucleic acid encoding a polypeptide described herein. As used herein, the
20 term "vector" refers to a nucleic acid molecule capable of transporting another nucleic
acid to which it has been linked and can include a plasmid, cosmid or viral vector. The
vector can be capable of autonomous replication or it can integrate into a host DNA.
Viral vectors include, e.g., replication defective retroviruses, adenoviruses and adeno-
associated viruses.

25 A vector can include a 25934 nucleic acid in a form suitable for expression of the
nucleic acid in a host cell. Preferably the recombinant expression vector includes one or
more regulatory sequences operatively linked to the nucleic acid sequence to be
expressed. The term "regulatory sequence" includes promoters, enhancers and other
expression control elements (e.g., polyadenylation signals). Regulatory sequences
30 include those which direct constitutive expression of a nucleotide sequence, as well as
tissue-specific regulatory and/or inducible sequences. The design of the expression
vector can depend on such factors as the choice of the host cell to be transformed, the
level of expression of protein desired, and the like. The expression vectors of the

invention can be introduced into host cells to thereby produce proteins or polypeptides, including fusion proteins or polypeptides, encoded by nucleic acids as described herein (e.g., 25934 proteins, mutant forms of 25934 proteins, fusion proteins, and the like).

The recombinant expression vectors of the invention can be designed for
5 expression of 25934 proteins in prokaryotic or eukaryotic cells. For example, polypeptides of the invention can be expressed in *E. coli*, insect cells (e.g., using baculovirus expression vectors), yeast cells or mammalian cells. Suitable host cells are discussed further in Goeddel, *Gene Expression Technology: Methods in Enzymology*
185, Academic Press, San Diego, CA (1990). Alternatively, the recombinant expression
10 vector can be transcribed and translated *in vitro*, for example using T7 promoter regulatory sequences and T7 polymerase.

Expression of proteins in prokaryotes is most often carried out in *E. coli* with vectors containing constitutive or inducible promoters directing the expression of either fusion or non-fusion proteins. Fusion vectors add a number of amino acids to a protein
15 encoded therein, usually to the amino terminus of the recombinant protein. Such fusion vectors typically serve three purposes: 1) to increase expression of recombinant protein; 2) to increase the solubility of the recombinant protein; and 3) to aid in the purification of the recombinant protein by acting as a ligand in affinity purification. Often, a proteolytic cleavage site is introduced at the junction of the fusion moiety and the recombinant
20 protein to enable separation of the recombinant protein from the fusion moiety subsequent to purification of the fusion protein. Such enzymes, and their cognate recognition sequences, include Factor Xa, thrombin and enterokinase. Typical fusion expression vectors include pGEX (Pharmacia Biotech Inc; Smith, D.B. and Johnson, K.S. (1988) *Gene* 67:31-40), pMAL (New England Biolabs, Beverly, MA) and pRIT5 (Pharmacia,
25 Piscataway, NJ) which fuse glutathione S-transferase (GST), maltose E binding protein, or protein A, respectively, to the target recombinant protein.

Purified fusion proteins can be used in 25934 activity assays, (e.g., direct assays or competitive assays described in detail below), or to generate antibodies specific for 25934 proteins. In a preferred embodiment, a fusion protein expressed in a retroviral expression
30 vector of the present invention can be used to infect bone marrow cells which are subsequently transplanted into irradiated recipients. The pathology of the subject recipient is then examined after sufficient time has passed (e.g., six (6) weeks).

To maximize recombinant protein expression in *E. coli* is to express the protein in a host bacteria with an impaired capacity to proteolytically cleave the recombinant protein (Gottesman, S., *Gene Expression Technology: Methods in Enzymology* 185, Academic Press, San Diego, California (1990) 119-128). Another strategy is to alter the nucleic acid sequence of the nucleic acid to be inserted into an expression vector so that the individual codons for each amino acid are those preferentially utilized in *E. coli* (Wada et al., (1992) *Nucleic Acids Res.* 20:2111-2118). Such alteration of nucleic acid sequences of the invention can be carried out by standard DNA synthesis techniques.

The 25934 expression vector can be a yeast expression vector, a vector for expression in insect cells, e.g., a baculovirus expression vector or a vector suitable for expression in mammalian cells.

When used in mammalian cells, the expression vector's control functions are often provided by viral regulatory elements. For example, commonly used promoters are derived from polyoma, Adenovirus 2, cytomegalovirus and Simian Virus 40.

In another embodiment, the recombinant mammalian expression vector is capable of directing expression of the nucleic acid preferentially in a particular cell type (e.g., tissue-specific regulatory elements are used to express the nucleic acid). Non-limiting examples of suitable tissue-specific promoters include the albumin promoter (liver-specific; Pinkert et al. (1987) *Genes Dev.* 1:268-277), lymphoid-specific promoters (Calame and Eaton (1988) *Adv. Immunol.* 43:235-275), in particular promoters of T cell receptors (Winoto and Baltimore (1989) *EMBO J.* 8:729-733) and immunoglobulins (Banerji et al. (1983) *Cell* 33:729-740; Queen and Baltimore (1983) *Cell* 33:741-748), neuron-specific promoters (e.g., the neurofilament promoter; Byrne and Ruddle (1989) *Proc. Natl. Acad. Sci. USA* 86:5473-5477), pancreas-specific promoters (Edlund et al. (1985) *Science* 230:912-916), and mammary gland-specific promoters (e.g., milk whey promoter; U.S. Patent No. 4,873,316 and European Application Publication No. 264,166). Developmentally-regulated promoters are also encompassed, for example, the murine hox promoters (Kessel and Gruss (1990) *Science* 249:374-379) and the α -fetoprotein promoter (Campes and Tilghman (1989) *Genes Dev.* 3:537-546).

The invention further provides a recombinant expression vector comprising a DNA molecule of the invention cloned into the expression vector in an antisense orientation. Regulatory sequences (e.g., viral promoters and/or enhancers) operatively linked to a nucleic acid cloned in the antisense orientation can be chosen which direct the

constitutive, tissue specific or cell type specific expression of antisense RNA in a variety of cell types. The antisense expression vector can be in the form of a recombinant plasmid, phagemid or attenuated virus. For a discussion of the regulation of gene expression using antisense genes see Weintraub, H. et al., Antisense RNA as a molecular tool for genetic analysis, *Reviews - Trends in Genetics*, Vol. 1(1) 1986.

Another aspect the invention provides a host cell which includes a nucleic acid molecule described herein, e.g., a 25934 nucleic acid molecule within a recombinant expression vector or a 25934 nucleic acid molecule containing sequences which allow it to homologously recombine into a specific site of the host cell's genome. The terms "host cell" and "recombinant host cell" are used interchangeably herein. Such terms refer not only to the particular subject cell but to the progeny or potential progeny of such a cell. Because certain modifications may occur in succeeding generations due to either mutation or environmental influences, such progeny may not, in fact, be identical to the parent cell, but are still included within the scope of the term as used herein.

A host cell can be any prokaryotic or eukaryotic cell. For example, a 25934 protein can be expressed in bacterial cells such as *E. coli*, insect cells, yeast or mammalian cells (such as Chinese hamster ovary cells (CHO) or COS cells). Other suitable host cells are known to those skilled in the art.

Vector DNA can be introduced into host cells via conventional transformation or transfection techniques. As used herein, the terms "transformation" and "transfection" are intended to refer to a variety of art-recognized techniques for introducing foreign nucleic acid (e.g., DNA) into a host cell, including calcium phosphate or calcium chloride co-precipitation, DEAE-dextran-mediated transfection, lipofection, or electroporation

A host cell of the invention can be used to produce (i.e., express) a 25934 protein. Accordingly, the invention further provides methods for producing a 25934 protein using the host cells of the invention. In one embodiment, the method includes culturing the host cell of the invention (into which a recombinant expression vector encoding a 25934 protein has been introduced) in a suitable medium such that a 25934 protein is produced. In another embodiment, the method further includes isolating a 25934 protein from the medium or the host cell.

In another aspect, the invention features, a cell or purified preparation of cells which include a 25934 transgene, or which otherwise misexpress 25934. The cell preparation can consist of human or non human cells, e.g., rodent cells, e.g., mouse or rat

cells, rabbit cells, or pig cells. In preferred embodiments, the cell or cells include a 25934 transgene, e.g., a heterologous form of a 25934, e.g., a gene derived from humans (in the case of a non-human cell). The 25934 transgene can be misexpressed, e.g., overexpressed or underexpressed. In other preferred embodiments, the cell or cells
5 include a gene which misexpress an endogenous 25934, e.g., a gene the expression of which is disrupted, e.g., a knockout. Such cells can serve as a model for studying disorders which are related to mutated or mis-expressed 25934 alleles or for use in drug screening.

In another aspect, the invention features, a human cell, e.g., a hematopoietic stem
10 cell, transformed with nucleic acid which encodes a subject 25934 polypeptide.

Also provided are cells, e.g., human cells, e.g., human hematopoietic or fibroblast cells, in which an endogenous 25934 is under the control of a regulatory sequence that does not normally control the expression of the endogenous 25934 gene. The expression characteristics of an endogenous gene within a cell, e.g., a cell line or microorganism, can
15 be modified by inserting a heterologous DNA regulatory element into the genome of the cell such that the inserted regulatory element is operably linked to the endogenous 25934 gene. For example, an endogenous 25934 gene, e.g., a gene that is "transcriptionally silent", e.g., not normally expressed, or expressed only at very low levels, may be activated by inserting a regulatory element which is capable of promoting the expression
20 of a normally expressed gene product in that cell. Techniques, such as targeted homologous recombination, can be used to insert the heterologous DNA as described in, e.g., Chappel, US 5,272,071; WO 91/06667, published in May 16, 1991.

Transgenic Animals

25 The invention provides non-human transgenic animals. Such animals are useful for studying the function and/or activity of a 25934 protein and for identifying and/or evaluating modulators of 25934 activity. As used herein, a "transgenic animal" is a non-human animal, preferably a mammal, more preferably a rodent such as a rat or mouse, in which one or more of the cells of the animal includes a transgene. Other examples of
30 transgenic animals include non-human primates, sheep, dogs, cows, goats, chickens, amphibians, and the like. A transgene is exogenous DNA or a rearrangement, e.g., a deletion of endogenous chromosomal DNA, which preferably is integrated into or occurs in the genome of the cells of a transgenic animal. A transgene can direct the expression

of an encoded gene product in one or more cell types or tissues of the transgenic animal, other transgenes, e.g., a knockout, reduce expression. Thus, a transgenic animal can be one in which an endogenous 25934 gene has been altered by, e.g., by homologous recombination between the endogenous gene and an exogenous DNA molecule
5 introduced into a cell of the animal, e.g., an embryonic cell of the animal, prior to development of the animal.

Intronic sequences and polyadenylation signals can also be included in the transgene to increase the efficiency of expression of the transgene. A tissue-specific regulatory sequence(s) can be operably linked to a transgene of the invention to direct
10 expression of a 25934 protein to particular cells. A transgenic founder animal can be identified based upon the presence of a 25934 transgene in its genome and/or expression of 25934 mRNA in tissues or cells of the animals. A transgenic founder animal can then be used to breed additional animals carrying the transgene. Moreover, transgenic animals carrying a transgene encoding a 25934 protein can further be bred to other transgenic
15 animals carrying other transgenes.

25934 proteins or polypeptides can be expressed in transgenic animals or plants, e.g., a nucleic acid encoding the protein or polypeptide can be introduced into the genome of an animal. In preferred embodiments the nucleic acid is placed under the control of a tissue specific promoter, e.g., a milk or egg specific promoter, and recovered from the
20 milk or eggs produced by the animal. Suitable animals are mice, pigs, cows, goats, and sheep.

The invention also includes a population of cells from a transgenic animal, as discussed, e.g., below.

25 Uses

The nucleic acid molecules, proteins, protein homologues, and antibodies described herein can be used in one or more of the following methods: a) screening assays; b) predictive medicine (e.g., diagnostic assays, prognostic assays, monitoring clinical trials, and pharmacogenetics); and c) methods of treatment (e.g., therapeutic and
30 prophylactic).

The isolated nucleic acid molecules of the invention can be used, for example, to express a 25934 protein (e.g., via a recombinant expression vector in a host cell in gene therapy applications), to detect a 25934 mRNA (e.g., in a biological sample) or a genetic

alteration in a 25934 gene, and to modulate 25934 activity, as described further below. The 25934 proteins can be used to treat disorders characterized by insufficient or excessive production of a 25934 substrate or production of 25934 inhibitors. In addition, the 25934 proteins can be used to screen for naturally occurring 25934 substrates, to
5 screen for drugs or compounds which modulate 25934 activity, as well as to treat disorders characterized by insufficient or excessive production of 25934 protein or production of 25934 protein forms which have decreased, aberrant or unwanted activity compared to 25934 wild type protein, e.g., diabetes, obesity, hypertension, cancer, developmental disorders, immune disorders and neurological and heart diseases.

10 Moreover, the anti-25934 antibodies of the invention can be used to detect and isolate 25934 proteins, regulate the bioavailability of 25934 proteins, and modulate 25934 activity.

A method of evaluating a compound for the ability to interact with, e.g., bind, a subject 25934 polypeptide is provided. The method includes: contacting the compound,
15 e.g., a substrate, with the subject 25934 polypeptide; and evaluating ability of the compound to interact with, e.g., to bind or form a complex with the subject 25934 polypeptide. This method can be performed in vitro, e.g., in a cell free system, or in vivo, e.g., in a two-hybrid interaction trap assay. This method can be used to identify naturally occurring molecules, which interact with subject 25934 polypeptide. It can also be used
20 to find natural or synthetic inhibitors of subject 25934 polypeptide. Screening methods are discussed in more detail below.

Screening Assays:

The invention provides methods (also referred to herein as "screening assays") for
25 identifying modulators, i.e., candidate or test compounds or agents (e.g., proteins, peptides, peptidomimetics, peptoids, small molecules or other drugs) which bind to 25934 proteins, have a stimulatory or inhibitory effect on, for example, 25934 expression or 25934 activity, or have a stimulatory or inhibitory effect on, for example, the expression or activity of a 25934 substrate. Compounds thus identified can be used to modulate the
30 activity of target gene products (e.g., 25934 genes) in a therapeutic protocol, to elaborate the biological function of the target gene product, or to identify compounds that disrupt normal target gene interactions.

In one embodiment, the invention provides assays for screening candidate or test compounds which are substrates of a 25934 protein or polypeptide or a biologically active portion thereof. In another embodiment, the invention provides assays for screening candidate or test compounds which bind to or modulate the activity of a 25934 protein or polypeptide or a biologically active portion thereof.

The test compounds of the present invention can be obtained using any of the numerous approaches in combinatorial library methods known in the art, including: biological libraries; peptoid libraries [libraries of molecules having the functionalities of peptides, but with a novel, non-peptide backbone which are resistant to enzymatic degradation but which nevertheless remain bioactive] (see, e.g., Zuckermann, R.N. et al. *J. Med. Chem.* 1994, 37: 2678-85); spatially addressable parallel solid phase or solution phase libraries; synthetic library methods requiring deconvolution; the 'one-bead one-compound' library method; and synthetic library methods using affinity chromatography selection. The biological library and peptoid library approaches are limited to peptide libraries, while the other four approaches are applicable to peptide, non-peptide oligomer or small molecule libraries of compounds (Lam, K.S. (1997) *Anticancer Drug Des.* 12:145).

Examples of methods for the synthesis of molecular libraries can be found in the art, for example in: DeWitt *et al.* (1993) *Proc. Natl. Acad. Sci. U.S.A.* 90:6909; Erb *et al.* (1994) *Proc. Natl. Acad. Sci. USA* 91:11422; Zuckermann *et al.* (1994). *J. Med. Chem.* 37:2678; Cho *et al.* (1993) *Science* 261:1303; Carrell *et al.* (1994) *Angew. Chem. Int. Ed. Engl.* 33:2059; Carell *et al.* (1994) *Angew. Chem. Int. Ed. Engl.* 33:2061; and in Gallop *et al.* (1994) *J. Med. Chem.* 37:1233.

Libraries of compounds may be presented in solution (e.g., Houghten (1992) *Biotechniques* 13:412-421), or on beads (Lam (1991) *Nature* 354:82-84), chips (Fodor (1993) *Nature* 364:555-556), bacteria (Ladner USP 5,223,409), spores (Ladner USP '409), plasmids (Cull *et al.* (1992) *Proc Natl Acad Sci USA* 89:1865-1869) or on phage (Scott and Smith (1990) *Science* 249:386-390); (Devlin (1990) *Science* 249:404-406); (Cwirla *et al.* (1990) *Proc. Natl. Acad. Sci.* 87:6378-6382); (Felici (1991) *J. Mol. Biol.* 222:301-310); (Ladner *supra.*).

In one embodiment, an assay is a cell-based assay in which a cell which expresses a 25934 protein or biologically active portion thereof is contacted with a test compound, and the ability of the test compound to modulate 25934 activity is determined.

Determining the ability of the test compound to modulate 25934 activity can be accomplished by monitoring, for example, determining desaturase activity. The cell, for example, can be of mammalian origin, e.g., a brain, ovarian, kidney, and/or liver cell.

The ability of the test compound to modulate 25934 binding to, or interaction
5 with, a compound, e.g., a 25934 substrate, or to bind to 25934 can also be evaluated. This can be accomplished, for example, by coupling the compound, e.g., the substrate, with a radioisotope or enzymatic label such that binding of the compound, e.g., the substrate, to 25934 can be determined by detecting the labeled compound, e.g., substrate, in a complex. Alternatively, 25934 could be coupled with a radioisotope or enzymatic label
10 to monitor the ability of a test compound to modulate 25934 binding to a 25934 substrate in a complex. For example, compounds (e.g., 25934 substrates) can be labeled with ^{125}I , ^{35}S , ^{14}C , or ^3H , either directly or indirectly, and the radioisotope detected by direct counting of radioemission or by scintillation counting. Alternatively, compounds can be enzymatically labeled with, for example, horseradish peroxidase, alkaline phosphatase,
15 or luciferase, and the enzymatic label detected by determination of conversion of an appropriate substrate to product.

The ability of a compound (e.g., a 25934 substrate) to interact with 25934 with or without the labeling of any of the interactants can be evaluated. For example, a microphysiometer can be used to detect the interaction of a compound with 25934
20 without the labeling of either the compound or the 25934. McConnell, H. M. et al. (1992) *Science* 257:1906-1912. As used herein, a "microphysiometer" (e.g., Cytosensor) is an analytical instrument that measures the rate at which a cell acidifies its environment using a light-addressable potentiometric sensor (LAPS). Changes in this acidification rate can be used as an indicator of the interaction between a compound and 25934.

In yet another embodiment, a cell-free assay is provided in which a 25934 protein
25 or biologically active portion thereof is contacted with a test compound and the ability of the test compound to bind to the 25934 protein or biologically active portion thereof is evaluated. Preferred biologically active portions of the 25934 proteins to be used in assays of the present invention include fragments, which participate in interactions with
30 non-25934 molecules, e.g., fragments with high surface probability scores.

Soluble and/or membrane-bound forms of isolated proteins (e.g., 25934 proteins or biologically active portions thereof) can be used in the cell-free assays of the invention. When membrane-bound forms of the protein are used, it may be desirable to utilize a

solubilizing agent. Examples of such solubilizing agents include non-ionic detergents such as n-octylglucoside, n-dodecylglucoside, n-dodecylmaltoside, octanoyl-N-methylglucamide, decanoyl-N-methylglucamide, Triton[®] X-100, Triton[®] X-114, Thesit[®], Isotridecylpoly(ethylene glycol ether)_n, 3-[(3-
5 cholamidopropyl)dimethylamminio]-1-propane sulfonate (CHAPS), 3-[(3-
cholamidopropyl)dimethylamminio]-2-hydroxy-1-propane sulfonate (CHAPSO), or N-
dodecyl=N,N-dimethyl-3-ammonio-1-propane sulfonate.

Cell-free assays involve preparing a reaction mixture of the target gene protein and the test compound under conditions and for a time sufficient to allow the two
10 components to interact and bind, thus forming a complex that can be removed and/or
detected.

The interaction between two molecules can also be detected, e.g., using fluorescence energy transfer (FET) (see, for example, Lakowicz *et al.*, U.S. Patent No. 5,631,169; Stavrianopoulos, *et al.*, U.S. Patent No. 4,868,103). A fluorophore label on
15 the first, 'donor' molecule is selected such that its emitted fluorescent energy will be
absorbed by a fluorescent label on a second, 'acceptor' molecule, which in turn is able to
fluoresce due to the absorbed energy. Alternately, the 'donor' protein molecule may
simply utilize the natural fluorescent energy of tryptophan residues. Labels are chosen
20 that emit different wavelengths of light, such that the 'acceptor' molecule label may be
differentiated from that of the 'donor'. Since the efficiency of energy transfer between
the labels is related to the distance separating the molecules, the spatial relationship
between the molecules can be assessed. In a situation in which binding occurs between
the molecules, the fluorescent emission of the 'acceptor' molecule label in the assay
should be maximal. An FET binding event can be conveniently measured through
25 standard fluorometric detection means well known in the art (e.g., using a fluorimeter).

In another embodiment, determining the ability of the 25934 protein to bind to a target molecule can be accomplished using real-time Biomolecular Interaction Analysis (BIA) (see, e.g., Sjolander, S. and Urbaniczky, C. (1991) *Anal. Chem.* 63:2338-2345 and Szabo *et al.* (1995) *Curr. Opin. Struct. Biol.* 5:699-705). "Surface plasmon resonance" or
30 "BIA" detects biospecific interactions in real time, without labeling any of the
interactants (e.g., BIAcore). Changes in the mass at the binding surface (indicative of a
binding event) result in alterations of the refractive index of light near the surface (the

optical phenomenon of surface plasmon resonance (SPR)), resulting in a detectable signal which can be used as an indication of real-time reactions between biological molecules.

5 In one embodiment, the target gene product or the test substance is anchored onto a solid phase. The target gene product/test compound complexes anchored on the solid phase can be detected at the end of the reaction. Preferably, the target gene product can be anchored onto a solid surface, and the test compound, (which is not anchored), can be labeled, either directly or indirectly, with detectable labels discussed herein.

10 It may be desirable to immobilize either 25934, an anti-25934 antibody or its target molecule to facilitate separation of complexed from uncomplexed forms of one or both of the proteins, as well as to accommodate automation of the assay. Binding of a test compound to a 25934 protein, or interaction of a 25934 protein with a target molecule in the presence and absence of a candidate compound, can be accomplished in any vessel suitable for containing the reactants. Examples of such vessels include microtiter plates, 15 test tubes, and micro-centrifuge tubes. In one embodiment, a fusion protein can be provided which adds a domain that allows one or both of the proteins to be bound to a matrix. For example, glutathione-S-transferase/25934 fusion proteins or glutathione-S-transferase/target fusion proteins can be adsorbed onto glutathione sepharose beads (Sigma Chemical, St. Louis, MO) or glutathione derivatized microtiter plates, which are 20 then combined with the test compound or the test compound and either the non-adsorbed target protein or 25934 protein, and the mixture incubated under conditions conducive to complex formation (e.g., at physiological conditions for salt and pH). Following incubation, the beads or microtiter plate wells are washed to remove any unbound components, the matrix immobilized in the case of beads, complex determined either 25 directly or indirectly, for example, as described above. Alternatively, the complexes can be dissociated from the matrix, and the level of 25934 binding or activity determined using standard techniques.

Other techniques for immobilizing either a 25934 protein or a target molecule on matrices include using conjugation of biotin and streptavidin. Biotinylated 25934 protein 30 or target molecules can be prepared from biotin-NHS (N-hydroxy-succinimide) using techniques known in the art (e.g., biotinylation kit, Pierce Chemicals, Rockford, IL), and immobilized in the wells of streptavidin-coated 96 well plates (Pierce Chemical).

In order to conduct the assay, the non-immobilized component is added to the coated surface containing the anchored component. After the reaction is complete, unreacted components are removed (e.g., by washing) under conditions such that any complexes formed will remain immobilized on the solid surface. The detection of
5 complexes anchored on the solid surface can be accomplished in a number of ways. Where the previously non-immobilized component is pre-labeled, the detection of label immobilized on the surface indicates that complexes were formed. Where the previously non-immobilized component is not pre-labeled, an indirect label can be used to detect
10 complexes anchored on the surface; e.g., using a labeled antibody specific for the immobilized component (the antibody, in turn, can be directly labeled or indirectly labeled with, e.g., a labeled anti-Ig antibody).

In one embodiment, this assay is performed utilizing antibodies reactive with 25934 protein or target molecules but which do not interfere with binding of the 25934 protein to its target molecule. Such antibodies can be derivatized to the wells of the plate,
15 and unbound target or 25934 protein trapped in the wells by antibody conjugation. Methods for detecting such complexes, in addition to those described above for the GST-immobilized complexes, include immunodetection of complexes using antibodies reactive with the 25934 protein or target molecule, as well as enzyme-linked assays which rely on detecting an enzymatic activity associated with the 25934 protein or target molecule.

20 Alternatively, cell free assays can be conducted in a liquid phase. In such an assay, the reaction products are separated from unreacted components, by any of a number of standard techniques, including but not limited to: differential centrifugation (see, for example, Rivas, G., and Minton, A.P., *Trends Biochem Sci* 1993 Aug;18(8):284-7); chromatography (gel filtration chromatography, ion-exchange chromatography);
25 electrophoresis (see, e.g., Ausubel, F. et al., eds. *Current Protocols in Molecular Biology* 1999, J. Wiley: New York.); and immunoprecipitation (see, for example, Ausubel, F. et al., eds. *Current Protocols in Molecular Biology* 1999, J. Wiley: New York). Such resins and chromatographic techniques are known to one skilled in the art (see, e.g., Heegaard, N.H., *J Mol Recognit* 1998 Winter;11(1-6):141-8; Hage, D.S., and Tweed, S.A. *J Chromatogr B Biomed Sci Appl* 1997 Oct 10;699(1-2):499-525). Further, fluorescence
30 energy transfer may also be conveniently utilized, as described herein, to detect binding without further purification of the complex from solution.

In a preferred embodiment, the assay includes contacting the 25934 protein or biologically active portion thereof with a known compound which binds 25934 to form an assay mixture, contacting the assay mixture with a test compound, and determining the ability of the test compound to interact with a 25934 protein, wherein determining the ability of the test compound to interact with a 25934 protein includes determining the ability of the test compound to preferentially bind to 25934 or biologically active portion thereof, or to modulate the activity of a target molecule, as compared to the known compound.

The target gene products of the invention can, *in vivo*, interact with one or more cellular or extracellular macromolecules, such as proteins. For the purposes of this discussion, such cellular and extracellular macromolecules are referred to herein as "binding partners." Compounds that disrupt such interactions can be useful in regulating the activity of the target gene product. Such compounds can include, but are not limited to molecules such as antibodies, peptides, and small molecules. The preferred target genes/products for use in this embodiment are the 25934 genes herein identified. In an alternative embodiment, the invention provides methods for determining the ability of the test compound to modulate the activity of a 25934 protein through modulation of the activity of a downstream effector of a 25934 target molecule. For example, the activity of the effector molecule on an appropriate target can be determined, or the binding of the effector to an appropriate target can be determined, as previously described.

To identify compounds that interfere with the interaction between the target gene product and its cellular or extracellular binding partner(s), a reaction mixture containing the target gene product and the binding partner is prepared, under conditions and for a time sufficient, to allow the two products to form complex. In order to test an inhibitory agent, the reaction mixture is provided in the presence and absence of the test compound. The test compound can be initially included in the reaction mixture, or can be added at a time subsequent to the addition of the target gene and its cellular or extracellular binding partner. Control reaction mixtures are incubated without the test compound or with a placebo. The formation of any complexes between the target gene product and the cellular or extracellular binding partner is then detected. The formation of a complex in the control reaction, but not in the reaction mixture containing the test compound, indicates that the compound interferes with the interaction of the target gene product and the interactive binding partner. Additionally, complex formation within reaction mixtures

containing the test compound and normal target gene product can also be compared to complex formation within reaction mixtures containing the test compound and mutant target gene product. This comparison can be important in those cases wherein it is desirable to identify compounds that disrupt interactions of mutant but not normal target gene products.

5 These assays can be conducted in a heterogeneous or homogeneous format. Heterogeneous assays involve anchoring either the target gene product or the binding partner onto a solid phase, and detecting complexes anchored on the solid phase at the end of the reaction. In homogeneous assays, the entire reaction is carried out in a liquid phase. In either approach, the order of addition of reactants can be varied to obtain different information about the compounds being tested. For example, test compounds that interfere with the interaction between the target gene products and the binding partners, e.g., by competition, can be identified by conducting the reaction in the presence of the test substance. Alternatively, test compounds that disrupt preformed complexes, e.g., compounds with higher binding constants that displace one of the components from the complex, can be tested by adding the test compound to the reaction mixture after complexes have been formed. The various formats are briefly described below.

10 In a heterogeneous assay system, either the target gene product or the interactive cellular or extracellular binding partner, is anchored onto a solid surface (e.g., a microtiter plate), while the non-anchored species is labeled, either directly or indirectly. The anchored species can be immobilized by non-covalent or covalent attachments. Alternatively, an immobilized antibody specific for the species to be anchored can be used to anchor the species to the solid surface.

15 In order to conduct the assay, the partner of the immobilized species is exposed to the coated surface with or without the test compound. After the reaction is complete, unreacted components are removed (e.g., by washing) and any complexes formed will remain immobilized on the solid surface. Where the non-immobilized species is pre-labeled, the detection of label immobilized on the surface indicates that complexes were formed. Where the non-immobilized species is not pre-labeled, an indirect label can be used to detect complexes anchored on the surface; e.g., using a labeled antibody specific for the initially non-immobilized species (the antibody, in turn, can be directly labeled or indirectly labeled with, e.g., a labeled anti-Ig antibody). Depending upon the order of

addition of reaction components, test compounds that inhibit complex formation or that disrupt preformed complexes can be detected.

Alternatively, the reaction can be conducted in a liquid phase in the presence or absence of the test compound, the reaction products separated from unreacted
5 components, and complexes detected; e.g., using an immobilized antibody specific for one of the binding components to anchor any complexes formed in solution, and a labeled antibody specific for the other partner to detect anchored complexes. Again, depending upon the order of addition of reactants to the liquid phase, test compounds that inhibit complex or that disrupt preformed complexes can be identified.

10 In an alternate embodiment of the invention, a homogeneous assay can be used. For example, a preformed complex of the target gene product and the interactive cellular or extracellular binding partner product is prepared in that either the target gene products or their binding partners are labeled, but the signal generated by the label is quenched due to complex formation (see, e.g., U.S. Patent No. 4,109,496 that utilizes this approach for
15 immunoassays). The addition of a test substance that competes with and displaces one of the species from the preformed complex will result in the generation of a signal above background. In this way, test substances that disrupt target gene product-binding partner interaction can be identified.

In yet another aspect, the 25934 proteins can be used as "bait proteins" in a two-
20 hybrid assay or three-hybrid assay (see, e.g., U.S. Patent No. 5,283,317; Zervos et al. (1993) *Cell* 72:223-232; Madura et al. (1993) *J. Biol. Chem.* 268:12046-12054; Bartel et al. (1993) *Biotechniques* 14:920-924; Iwabuchi et al. (1993) *Oncogene* 8:1693-1696; and Brent WO94/10300), to identify other proteins, which bind to or interact with 25934 ("25934-binding proteins" or "25934-bp") and are involved in 25934 activity. Such
25 25934-bps can be activators or inhibitors of signals by the 25934 proteins or 25934 targets as, for example, downstream elements of a 25934-mediated signaling pathway.

The two-hybrid system is based on the modular nature of most transcription factors, which consist of separable DNA-binding and activation domains. Briefly, the assay utilizes two different DNA constructs. In one construct, the gene that codes for a
30 25934 protein is fused to a gene encoding the DNA binding domain of a known transcription factor (e.g., GAL-4). In the other construct, a DNA sequence, from a library of DNA sequences, that encodes an unidentified protein ("prey" or "sample") is fused to a gene that codes for the activation domain of the known transcription factor.

(Alternatively the: 25934 protein can be the fused to the activator domain.) If the "bait" and the "prey" proteins are able to interact, *in vivo*, forming a 25934-dependent complex, the DNA-binding and activation domains of the transcription factor are brought into close proximity. This proximity allows transcription of a reporter gene (e.g., LacZ) which is operably linked to a transcriptional regulatory site responsive to the transcription factor. Expression of the reporter gene can be detected and cell colonies containing the functional transcription factor can be isolated and used to obtain the cloned gene which encodes the protein which interacts with the 25934 protein.

In another embodiment, modulators of 25934 expression are identified. For example, a cell or cell free mixture is contacted with a candidate compound and the expression of 25934 mRNA or protein evaluated relative to the level of expression of 25934 mRNA or protein in the absence of the candidate compound. When expression of 25934 mRNA or protein is greater in the presence of the candidate compound than in its absence, the candidate compound is identified as a stimulator of 25934 mRNA or protein expression. Alternatively, when expression of 25934 mRNA or protein is less (statistically significantly less) in the presence of the candidate compound than in its absence, the candidate compound is identified as an inhibitor of 25934 mRNA or protein expression. The level of 25934 mRNA or protein expression can be determined by methods described herein for detecting 25934 mRNA or protein.

In another aspect, the invention pertains to a combination of two or more of the assays described herein. For example, a modulating agent can be identified using a cell-based or a cell free assay, and the ability of the agent to modulate the activity of a 25934 protein can be confirmed *in vivo*, e.g., using an animal model.

This invention further pertains to novel agents identified by the above-described screening assays. Accordingly, it is within the scope of this invention to further use an agent identified as described herein (e.g., a 25934 modulating agent, an antisense 25934 nucleic acid molecule, a 25934-specific antibody, or a 25934-binding partner) in an appropriate animal model to determine the efficacy, toxicity, side effects, or mechanism of action, of treatment with such an agent. Furthermore, novel agents identified by the above-described screening assays can be used for treatments as described herein.

Detection Assays

Portions or fragments of the nucleic acid sequences identified herein can be used as polynucleotide reagents. For example, these sequences can be used to: (i) map their respective genes on a chromosome e.g., to locate gene regions associated with genetic disease or to associate 25934 with a disease; (ii) identify an individual from a minute biological sample (tissue typing); and (iii) aid in forensic identification of a biological sample. These applications are described in the subsections below.

Chromosome Mapping

The 25934 nucleotide sequences or portions thereof can be used to map the location of the 25934 genes on a chromosome. This process is called chromosome mapping. Chromosome mapping is useful in correlating the 25934 sequences with genes associated with disease.

Briefly, 25934 genes can be mapped to chromosomes by preparing PCR primers (preferably 15-25 bp in length) from the 25934 nucleotide sequences. These primers can then be used for PCR screening of somatic cell hybrids containing individual human chromosomes. Only those hybrids containing the human gene corresponding to the 25934 sequences will yield an amplified fragment.

A panel of somatic cell hybrids in which each cell line contains either a single human chromosome or a small number of human chromosomes, and a full set of mouse chromosomes, can allow easy mapping of individual genes to specific human chromosomes. (D'Eustachio P. et al. (1983) *Science* 220:919-924).

Other mapping strategies e.g., in situ hybridization (described in Fan, Y. et al. (1990) *Proc. Natl. Acad. Sci. USA*, 87:6223-27), pre-screening with labeled flow-sorted chromosomes, and pre-selection by hybridization to chromosome specific cDNA libraries can be used to map 25934 to a chromosomal location.

Fluorescence *in situ* hybridization (FISH) of a DNA sequence to a metaphase chromosomal spread can further be used to provide a precise chromosomal location in one step. The FISH technique can be used with a DNA sequence as short as 500 or 600 bases. However, clones larger than 1,000 bases have a higher likelihood of binding to a unique chromosomal location with sufficient signal intensity for simple detection. Preferably 1,000 bases, and more preferably 2,000 bases will suffice to get good results at a reasonable amount of time. For a review of this technique, see Verma et al., *Human Chromosomes: A Manual of Basic Techniques* (Pergamon Press, New York 1988).

Reagents for chromosome mapping can be used individually to mark a single chromosome or a single site on that chromosome, or panels of reagents can be used for marking multiple sites and/or multiple chromosomes. Reagents corresponding to noncoding regions of the genes actually are preferred for mapping purposes. Coding sequences are more likely to be conserved within gene families, thus increasing the chance of cross hybridizations during chromosomal mapping.

Once a sequence has been mapped to a precise chromosomal location, the physical position of the sequence on the chromosome can be correlated with genetic map data. (Such data are found, for example, in V. McKusick, Mendelian Inheritance in Man, available on-line through Johns Hopkins University Welch Medical Library). The relationship between a gene and a disease, mapped to the same chromosomal region, can then be identified through linkage analysis (co-inheritance of physically adjacent genes), described in, for example, Egeland, J. et al. (1987) *Nature*, 325:783-787.

Moreover, differences in the DNA sequences between individuals affected and unaffected with a disease associated with the 25934 gene, can be determined. If a mutation is observed in some or all of the affected individuals but not in any unaffected individuals, then the mutation is likely to be the causative agent of the particular disease. Comparison of affected and unaffected individuals generally involves first looking for structural alterations in the chromosomes, such as deletions or translocations that are visible from chromosome spreads or detectable using PCR based on that DNA sequence. Ultimately, complete sequencing of genes from several individuals can be performed to confirm the presence of a mutation and to distinguish mutations from polymorphisms.

Tissue Typing

25934 sequences can be used to identify individuals from biological samples using, e.g., restriction fragment length polymorphism (RFLP). In this technique, an individual's genomic DNA is digested with one or more restriction enzymes, the fragments separated, e.g., in a Southern blot, and probed to yield bands for identification. The sequences of the present invention are useful as additional DNA markers for RFLP (described in U.S. Patent 5,272,057).

Furthermore, the sequences of the present invention can also be used to determine the actual base-by-base DNA sequence of selected portions of an individual's genome. Thus, the 25934 nucleotide sequences described herein can be used to prepare two PCR

primers from the 5' and 3' ends of the sequences. These primers can then be used to amplify an individual's DNA and subsequently sequence it. Panels of corresponding DNA sequences from individuals, prepared in this manner, can provide unique individual identifications, as each individual will have a unique set of such DNA sequences due to allelic differences.

Allelic variation occurs to some degree in the coding regions of these sequences, and to a greater degree in the noncoding regions. Each of the sequences described herein can, to some degree, be used as a standard against which DNA from an individual can be compared for identification purposes. Because greater numbers of polymorphisms occur in the noncoding regions, fewer sequences are necessary to differentiate individuals. The noncoding sequences of SEQ ID NO:1 can provide positive individual identification with a panel of perhaps 10 to 1,000 primers which each yield a noncoding amplified sequence of 100 bases. If predicted coding sequences, such as those in SEQ ID NO:3 are used, a more appropriate number of primers for positive individual identification would be 500-2,000.

If a panel of reagents from 25934 nucleotide sequences described herein is used to generate a unique identification database for an individual, those same reagents can later be used to identify tissue from that individual. Using the unique identification database, positive identification of the individual, living or dead, can be made from extremely small tissue samples.

Use of Partial 25934 Sequences in Forensic Biology

DNA-based identification techniques can also be used in forensic biology. To make such an identification, PCR technology can be used to amplify DNA sequences taken from very small biological samples such as tissues, e.g., hair or skin, or body fluids, e.g., blood, saliva, or semen found at a crime scene. The amplified sequence can then be compared to a standard, thereby allowing identification of the origin of the biological sample.

The sequences of the present invention can be used to provide polynucleotide reagents, e.g., PCR primers, targeted to specific loci in the human genome, which can enhance the reliability of DNA-based forensic identifications by, for example, providing another "identification marker" (i.e. another DNA sequence that is unique to a particular individual). As mentioned above, actual base sequence information can be used for

identification as an accurate alternative to patterns formed by restriction enzyme generated fragments. Sequences targeted to noncoding regions of SEQ ID NO:1 (e.g., fragments derived from the noncoding regions of SEQ ID NO:1 having a length of at least 20 bases, preferably at least 30 bases) are particularly appropriate for this use.

5 The 25934 nucleotide sequences described herein can further be used to provide polynucleotide reagents, e.g., labeled or labelable probes which can be used in, for example, an *in situ* hybridization technique, to identify a specific tissue, e.g., a tissue containing 25934. This can be very useful in cases where a forensic pathologist is presented with a tissue of unknown origin. Panels of such 25934 probes can be used to
10 identify tissue by species and/or by organ type.

In a similar fashion, these reagents, e.g., 25934 primers or probes can be used to screen tissue culture for contamination (i.e. screen for the presence of a mixture of different types of cells in a culture).

15 Predictive Medicine

The present invention also pertains to the field of predictive medicine in which diagnostic assays, prognostic assays, and monitoring clinical trials are used for prognostic (predictive) purposes to thereby treat an individual.

20 Generally, the invention provides, a method of determining if a subject is at risk for a disorder related to a lesion in or the misexpression of a gene which encodes 25934..

Such disorders include, e.g., a disorder associated with the misexpression 25934; a disorder associated with unsaturation of fatty acids, e.g., cardiovascular, diabetes, obesity, hypertension, cancer, and neurological diseases.

The method includes one or more of the following:

25 detecting, in a tissue of the subject, the presence or absence of a mutation which affects the expression of the 25934 gene, or detecting the presence or absence of a mutation in a region which controls the expression of the gene, e.g., a mutation in the 5' control region;

30 detecting, in a tissue of the subject, the presence or absence of a mutation which alters the structure of the 25934 gene;

detecting, in a tissue of the subject, the misexpression of the 25934 gene, at the mRNA level, e.g., detecting a non-wild type level of a mRNA ;

detecting, in a tissue of the subject, the misexpression of the gene, at the protein level, e.g., detecting a non-wild type level of a 25934 polypeptide.

In preferred embodiments the method includes: ascertaining the existence of at least one of: a deletion of one or more nucleotides from the 25934 gene; an insertion of
5 one or more nucleotides into the gene, a point mutation, e.g., a substitution of one or more nucleotides of the gene, a gross chromosomal rearrangement of the gene, e.g., a translocation, inversion, or deletion.

For example, detecting the genetic lesion can include: (i) providing a
10 probe/primer including an oligonucleotide containing a region of nucleotide sequence which hybridizes to a sense or antisense sequence from SEQ ID NO:1, or naturally occurring mutants thereof or 5' or 3' flanking sequences naturally associated with the 25934 gene; (ii) exposing the probe/primer to nucleic acid of the tissue; and detecting, by hybridization, e.g., *in situ* hybridization, of the probe/primer to the nucleic acid, the presence or absence of the genetic lesion.

15 In preferred embodiments detecting the misexpression includes ascertaining the existence of at least one of: an alteration in the level of a messenger RNA transcript of the 2593 gene; the presence of a non-wild type splicing pattern of a messenger RNA transcript of the gene; or a non-wild type level of 25934.

20 Methods of the invention can be used prenatally or to determine if a subject's offspring will be at risk for a disorder.

In preferred embodiments the method includes determining the structure of a 25934 gene, an abnormal structure being indicative of risk for the disorder.

In preferred embodiments the method includes contacting a sample from the subject with an antibody to the 25934 protein or a nucleic acid, which hybridizes
25 specifically with the gene. There and other embodiments are discussed below.

Diagnostic and Prognostic Assays

Diagnostic and prognostic assays of the invention include method for assessing the expression level of 25934 molecules and for identifying variations and mutations in the
30 sequence of 25934 molecules.

Expression Monitoring and Profiling.

The presence, level, or absence of 25934 protein or nucleic acid in a biological sample can be evaluated by obtaining a biological sample from a test subject and contacting the biological sample with a compound or an agent capable of detecting 25934 protein or nucleic acid (e.g., mRNA, genomic DNA) that encodes 25934 protein such that the presence of 25934 protein or nucleic acid is detected in the biological sample. The term "biological sample" includes tissues, cells and biological fluids isolated from a subject, as well as tissues, cells and fluids present within a subject. A preferred biological sample is serum. The level of expression of the 25934 gene can be measured in a number of ways, including, but not limited to: measuring the mRNA encoded by the 25934 genes; measuring the amount of protein encoded by the 25934 genes; or measuring the activity of the protein encoded by the 25934 genes.

The level of mRNA corresponding to the 25934 gene in a cell can be determined both by *in situ* and by *in vitro* formats.

The isolated mRNA can be used in hybridization or amplification assays that include, but are not limited to, Southern or Northern analyses, polymerase chain reaction analyses and probe arrays. One preferred diagnostic method for the detection of mRNA levels involves contacting the isolated mRNA with a nucleic acid molecule (probe) that can hybridize to the mRNA encoded by the gene being detected. The nucleic acid probe can be, for example, a full-length 25934 nucleic acid, such as the nucleic acid of SEQ ID NO:1, or a portion thereof, such as an oligonucleotide of at least 7, 15, 30, 50, 100, 250 or 500 nucleotides in length and sufficient to specifically hybridize under stringent conditions to 25934 mRNA or genomic DNA. The probe can be disposed on an address of an array, e.g., an array described below. Other suitable probes for use in the diagnostic assays are described herein.

In one format, mRNA (or cDNA) is immobilized on a surface and contacted with the probes, for example by running the isolated mRNA on an agarose gel and transferring the mRNA from the gel to a membrane, such as nitrocellulose. In an alternative format, the probes are immobilized on a surface and the mRNA (or cDNA) is contacted with the probes, for example, in a two-dimensional gene chip array described below. A skilled artisan can adapt known mRNA detection methods for use in detecting the level of mRNA encoded by the 25934 genes.

The level of mRNA in a sample that is encoded by one of 25934 can be evaluated with nucleic acid amplification, e.g., by rtPCR (Mullis (1987) U.S. Patent No. 4,683,202),

ligase chain reaction (Barany (1991) *Proc. Natl. Acad. Sci. USA* 88:189-193), self sustained sequence replication (Guatelli *et al.*, (1990) *Proc. Natl. Acad. Sci. USA* 87:1874-1878), transcriptional amplification system (Kwoh *et al.*, (1989), *Proc. Natl. Acad. Sci. USA* 86:1173-1177), Q-Beta Replicase (Lizardi *et al.*, (1988) *Bio/Technology* 5 6:1197), rolling circle replication (Lizardi *et al.*, U.S. Patent No. 5,854,033) or any other nucleic acid amplification method, followed by the detection of the amplified molecules using techniques known in the art. As used herein, amplification primers are defined as being a pair of nucleic acid molecules that can anneal to 5' or 3' regions of a gene (plus and minus strands, respectively, or vice-versa) and contain a short region in between. In 10 general, amplification primers are from about 10 to 30 nucleotides in length and flank a region from about 50 to 200 nucleotides in length. Under appropriate conditions and with appropriate reagents, such primers permit the amplification of a nucleic acid molecule comprising the nucleotide sequence flanked by the primers.

For *in situ* methods, a cell or tissue sample can be prepared/processed and 15 immobilized on a support, typically a glass slide, and then contacted with a probe that can hybridize to mRNA that encodes the 25934 gene being analyzed.

In another embodiment, the methods further contacting a control sample with a compound or agent capable of detecting 25934 mRNA, or genomic DNA, and comparing the presence of 25934 mRNA or genomic DNA in the control sample with the presence 20 of 25934 mRNA or genomic DNA in the test sample. In still another embodiment, serial analysis of gene expression, as described in U.S. Patent No. 5,695,937, is used to detect 25934 transcript levels.

A variety of methods can be used to determine the level of protein encoded by 25934. In general, these methods include contacting an agent that selectively binds to the 25 protein, such as an antibody with a sample, to evaluate the level of protein in the sample. In a preferred embodiment, the antibody bears a detectable label. Antibodies can be polyclonal, or more preferably, monoclonal. An intact antibody, or a fragment thereof (e.g., Fab or F(ab')₂) can be used. The term "labeled", with regard to the probe or 30 antibody, is intended to encompass direct labeling of the probe or antibody by coupling (i.e., physically linking) a detectable substance to the probe or antibody, as well as indirect labeling of the probe or antibody by reactivity with a detectable substance. Examples of detectable substances are provided herein.

The detection methods can be used to detect 25934 protein in a biological sample *in vitro* as well as *in vivo*. *In vitro* techniques for detection of 25934 protein include enzyme linked immunosorbent assays (ELISAs), immunoprecipitations, immunofluorescence, enzyme immunoassay (EIA), radioimmunoassay (RIA), and Western blot analysis. *In vivo* techniques for detection of 25934 protein include introducing into a subject a labeled anti-25934 antibody. For example, the antibody can be labeled with a radioactive marker whose presence and location in a subject can be detected by standard imaging techniques. In another embodiment, the sample is labeled, e.g., biotinylated and then contacted to the antibody, e.g., an anti-25934 antibody positioned on an antibody array (as described below). The sample can be detected, e.g., with avidin coupled to a fluorescent label.

In another embodiment, the methods further include contacting the control sample with a compound or agent capable of detecting 25934 protein, and comparing the presence of 25934 protein in the control sample with the presence of 25934 protein in the test sample.

The invention also includes kits for detecting the presence of 25934 in a biological sample. For example, the kit can include a compound or agent capable of detecting 25934 protein or mRNA in a biological sample; and a standard. The compound or agent can be packaged in a suitable container. The kit can further comprise instructions for using the kit to detect 25934 protein or nucleic acid.

For antibody-based kits, the kit can include: (1) a first antibody (e.g., attached to a solid support) which binds to a polypeptide corresponding to a marker of the invention; and, optionally, (2) a second, different antibody which binds to either the polypeptide or the first antibody and is conjugated to a detectable agent.

For oligonucleotide-based kits, the kit can include: (1) an oligonucleotide, e.g., a detectably labeled oligonucleotide, which hybridizes to a nucleic acid sequence encoding a polypeptide corresponding to a marker of the invention or (2) a pair of primers useful for amplifying a nucleic acid molecule corresponding to a marker of the invention. The kit can also include a buffering agent, a preservative, or a protein stabilizing agent. The kit can also include components necessary for detecting the detectable agent (e.g., an enzyme or a substrate). The kit can also contain a control sample or a series of control samples which can be assayed and compared to the test sample contained. Each component of the kit can be enclosed within an individual container and all of the various

containers can be within a single package, along with instructions for interpreting the results of the assays performed using the kit.

The diagnostic methods described herein can identify subjects having, or at risk of developing, a disease or disorder associated with misexpressed or aberrant or unwanted
5 25934 expression or activity. As used herein, the term "unwanted" includes an unwanted phenomenon involved in a biological response such as pain or deregulated cell proliferation.

In one embodiment, a disease or disorder associated with aberrant or unwanted
10 25934 expression or activity is identified. A test sample is obtained from a subject and 25934 protein or nucleic acid (e.g., mRNA or genomic DNA) is evaluated, wherein the level, e.g., the presence or absence, of 25934 protein or nucleic acid is diagnostic for a subject having or at risk of developing a disease or disorder associated with aberrant or unwanted 25934 expression or activity. As used herein, a "test sample" refers to a biological sample obtained from a subject of interest, including a biological fluid (e.g.,
15 serum), cell sample, or tissue.

The prognostic assays described herein can be used to determine whether a subject can be administered an agent (e.g., an agonist, antagonist, peptidomimetic, protein, peptide, nucleic acid, small molecule, or other drug candidate) to treat a disease or disorder associated with aberrant or unwanted 25934 expression or activity. For example,
20 such methods can be used to determine whether a subject can be effectively treated with an agent for a cardiovascular disorder.

In another aspect, the invention features a computer medium having a plurality of digitally encoded data records. Each data record includes a value representing the level of expression of 25934 in a sample, and a descriptor of the sample. The descriptor of the
25 sample can be an identifier of the sample, a subject from which the sample was derived (e.g., a patient), a diagnosis, or a treatment (e.g., a preferred treatment). In a preferred embodiment, the data record further includes values representing the level of expression of genes other than 25934 (e.g., other genes associated with a 25934-disorder, or other genes on an array). The data record can be structured as a table, e.g., a table that is part of
30 a database such as a relational database (e.g., a SQL database of the Oracle or Sybase database environments).

Also featured is a method of evaluating a sample. The method includes providing a sample, e.g., from the subject, and determining a gene expression profile of the sample,

wherein the profile includes a value representing the level of 25934 expression. The method can further include comparing the value or the profile (i.e., multiple values) to a reference value or reference profile. The gene expression profile of the sample can be obtained by any of the methods described herein (e.g., by providing a nucleic acid from the sample and contacting the nucleic acid to an array). The method can be used to
5 diagnose a cardiovascular disorder in a subject wherein an increase in 25934 expression is an indication that the subject has or is disposed to having a cardiovascular disorder. The method can be used to monitor a treatment for a cardiovascular disorder in a subject. For example, the gene expression profile can be determined for a sample from a subject
10 undergoing treatment. The profile can be compared to a reference profile or to a profile obtained from the subject prior to treatment or prior to onset of the disorder (see, e.g., Golub *et al.* (1999) *Science* 286:531).

In yet another aspect, the invention features a method of evaluating a test compound (see also, "Screening Assays", above). The method includes providing a cell
15 and a test compound; contacting the test compound to the cell; obtaining a subject expression profile for the contacted cell; and comparing the subject expression profile to one or more reference profiles. The profiles include a value representing the level of 25934 expression. In a preferred embodiment, the subject expression profile is compared to a target profile, e.g., a profile for a normal cell or for desired condition of a cell. The
20 test compound is evaluated favorably if the subject expression profile is more similar to the target profile than an expression profile obtained from an uncontacted cell.

In another aspect, the invention features, a method of evaluating a subject. The method includes: a) obtaining a sample from a subject, e.g., from a caregiver, e.g., a caregiver who obtains the sample from the subject; b) determining a subject expression
25 profile for the sample. Optionally, the method further includes either or both of steps: c) comparing the subject expression profile to one or more reference expression profiles; and d) selecting the reference profile most similar to the subject reference profile. The subject expression profile and the reference profiles include a value representing the level of 25934 expression. A variety of routine statistical measures can be used to compare
30 two reference profiles. One possible metric is the length of the distance vector that is the difference between the two profiles. Each of the subject and reference profile is represented as a multi-dimensional vector, wherein each dimension is a value in the profile.

The method can further include transmitting a result to a caregiver. The result can be the subject expression profile, a result of a comparison of the subject expression profile with another profile, a most similar reference profile, or a descriptor of any of the aforementioned. The result can be transmitted across a computer network, e.g., the result
5 can be in the form of a computer transmission, e.g., a computer data signal embedded in a carrier wave.

Also featured is a computer medium having executable code for effecting the following steps: receive a subject expression profile; access a database of reference expression profiles; and either i) select a matching reference profile most similar to the
10 subject expression profile or ii) determine at least one comparison score for the similarity of the subject expression profile to at least one reference profile. The subject expression profile, and the reference expression profiles each include a value representing the level of 25934 expression.

15 Arrays and Uses Thereof

In another aspect, the invention features an array that includes a substrate having a plurality of addresses. At least one address of the plurality includes a capture probe that binds specifically to a 25934 molecule (e.g., a 25934 nucleic acid or a 25934 polypeptide). The array can have a density of at least than 10, 50, 100, 200, 500, 1,000,
20 2,000, or 10,000 or more addresses/cm², and ranges between. In a preferred embodiment, the plurality of addresses includes at least 10, 100, 500, 1,000, 5,000, 10,000, 50,000 addresses. In a preferred embodiment, the plurality of addresses includes equal to or less than 10, 100, 500, 1,000, 5,000, 10,000, or 50,000 addresses. The substrate can be a two-dimensional substrate such as a glass slide, a wafer (e.g., silica or plastic), a mass
25 spectroscopy plate, or a three-dimensional substrate such as a gel pad. Addresses in addition to address of the plurality can be disposed on the array.

In a preferred embodiment, at least one address of the plurality includes a nucleic acid capture probe that hybridizes specifically to a 25934 nucleic acid, e.g., the sense or anti-sense strand. In one preferred embodiment, a subset of addresses of the plurality of
30 addresses has a nucleic acid capture probe for 25934. Each address of the subset can include a capture probe that hybridizes to a different region of a 25934 nucleic acid. In another preferred embodiment, addresses of the subset include a capture probe for a 25934 nucleic acid. Each address of the subset is unique, overlapping, and

complementary to a different variant of 25934 (e.g., an allelic variant, or all possible hypothetical variants). The array can be used to sequence 25934 by hybridization (see, e.g., U.S. Patent No. 5,695,940).

5 An array can be generated by various methods, e.g., by photolithographic methods (see, e.g., U.S. Patent Nos. 5,143,854; 5,510,270; and 5,527,681), mechanical methods (e.g., directed-flow methods as described in U.S. Patent No. 5,384,261), pin-based methods (e.g., as described in U.S. Pat. No. 5,288,514), and bead-based techniques (e.g., as described in PCT US/93/04145).

10 In another preferred embodiment, at least one address of the plurality includes a polypeptide capture probe that binds specifically to a 25934 polypeptide or fragment thereof. The polypeptide can be a naturally-occurring interaction partner of 25934 polypeptide. Preferably, the polypeptide is an antibody, e.g., an antibody described herein (see "Anti-25934 Antibodies," above), such as a monoclonal antibody or a single-chain antibody.

15 In another aspect, the invention features a method of analyzing the expression of 25934. The method includes providing an array as described above; contacting the array with a sample and detecting binding of a 25934-molecule (e.g., nucleic acid or polypeptide) to the array. In a preferred embodiment, the array is a nucleic acid array. Optionally the method further includes amplifying nucleic acid from the sample prior or
20 during contact with the array.

In another embodiment, the array can be used to assay gene expression in a tissue to ascertain tissue specificity of genes in the array, particularly the expression of 25934. If a sufficient number of diverse samples is analyzed, clustering (e.g., hierarchical clustering, k-means clustering, Bayesian clustering and the like) can be used to identify
25 other genes which are co-regulated with 25934. For example, the array can be used for the quantitation of the expression of multiple genes. Thus, not only tissue specificity, but also the level of expression of a battery of genes in the tissue is ascertained. Quantitative data can be used to group (e.g., cluster) genes on the basis of their tissue expression *per se* and level of expression in that tissue.

30 For example, array analysis of gene expression can be used to assess the effect of cell-cell interactions on 25934 expression. A first tissue can be perturbed and nucleic acid from a second tissue that interacts with the first tissue can be analyzed. In this context, the effect of one cell type on another cell type in response to a biological

stimulus can be determined, e.g., to monitor the effect of cell-cell interaction at the level of gene expression.

In another embodiment, cells are contacted with a therapeutic agent. The expression profile of the cells is determined using the array, and the expression profile is compared to the profile of like cells not contacted with the agent. For example, the assay can be used to determine or analyze the molecular basis of an undesirable effect of the therapeutic agent. If an agent is administered therapeutically to treat one cell type but has an undesirable effect on another cell type, the invention provides an assay to determine the molecular basis of the undesirable effect and thus provides the opportunity to co-administer a counteracting agent or otherwise treat the undesired effect. Similarly, even within a single cell type, undesirable biological effects can be determined at the molecular level. Thus, the effects of an agent on expression of other than the target gene can be ascertained and counteracted.

In another embodiment, the array can be used to monitor expression of one or more genes in the array with respect to time. For example, samples obtained from different time points can be probed with the array. Such analysis can identify and/or characterize the development of a 25934-associated disease or disorder; and processes, such as a cellular transformation associated with a 25934-associated disease or disorder. The method can also evaluate the treatment and/or progression of a 25934-associated disease or disorder

The array is also useful for ascertaining differential expression patterns of one or more genes in normal and abnormal cells. This provides a battery of genes (e.g., including 25934) that could serve as a molecular target for diagnosis or therapeutic intervention.

In another aspect, the invention features an array having a plurality of addresses. Each address of the plurality includes a unique polypeptide. At least one address of the plurality has disposed thereon a 25934 polypeptide or fragment thereof. Methods of producing polypeptide arrays are described in the art, e.g., in De Wildt *et al.* (2000). *Nature Biotech.* 18, 989-994; Lueking *et al.* (1999). *Anal. Biochem.* 270, 103-111; Ge, H. (2000). *Nucleic Acids Res.* 28, e3, I-VII; MacBeath, G., and Schreiber, S.L. (2000). *Science* 289, 1760-1763; and WO 99/51773A1. In a preferred embodiment, each addresses of the plurality has disposed thereon a polypeptide at least 60, 70, 80, 85, 90, 95 or 99 % identical to a 25934 polypeptide or fragment thereof. For example, multiple

variants of a 25934 polypeptide (e.g., encoded by allelic variants, site-directed mutants, random mutants, or combinatorial mutants) can be disposed at individual addresses of the plurality. Addresses in addition to the address of the plurality can be disposed on the array.

- 5 The polypeptide array can be used to detect a 25934 binding compound, e.g., an antibody in a sample from a subject with specificity for a 25934 polypeptide or the presence of a 25934-binding protein or ligand.

 The array is also useful for ascertaining the effect of the expression of a gene on the expression of other genes in the same cell or in different cells (e.g., ascertaining the effect of 25934 expression on the expression of other genes). This provides, for example, for a selection of alternate molecular targets for therapeutic intervention if the ultimate or downstream target cannot be regulated.

 In another aspect, the invention features a method of analyzing a plurality of probes. The method is useful, e.g., for analyzing gene expression. The method includes: providing a two dimensional array having a plurality of addresses, each address of the plurality being positionally distinguishable from each other address of the plurality having a unique capture probe, e.g., wherein the capture probes are from a cell or subject which express 25934 or from a cell or subject in which a 25934 mediated response has been elicited, e.g., by contact of the cell with 25934 nucleic acid or protein, or administration to the cell or subject 25934 nucleic acid or protein; providing a two dimensional array having a plurality of addresses, each address of the plurality being positionally distinguishable from each other address of the plurality, and each address of the plurality having a unique capture probe, e.g., wherein the capture probes are from a cell or subject which does not express 25934 (or does not express as highly as in the case of the 25934 positive plurality of capture probes) or from a cell or subject which in which a 25934 mediated response has not been elicited (or has been elicited to a lesser extent than in the first sample); contacting the array with one or more inquiry probes (which is preferably other than a 25934 nucleic acid, polypeptide, or antibody), and thereby evaluating the plurality of capture probes. Binding, e.g., in the case of a nucleic acid, hybridization with a capture probe at an address of the plurality, is detected, e.g., by signal generated from a label attached to the nucleic acid, polypeptide, or antibody.

 In another aspect, the invention features a method of analyzing a plurality of probes or a sample. The method is useful, e.g., for analyzing gene expression. The

method includes: providing a two dimensional array having a plurality of addresses, each address of the plurality being positionally distinguishable from each other address of the plurality having a unique capture probe, contacting the array with a first sample from a cell or subject which express or mis-express 25934 or from a cell or subject in which a 25934-mediated response has been elicited, e.g., by contact of the cell with 25934 nucleic acid or protein, or administration to the cell or subject 25934 nucleic acid or protein; providing a two dimensional array having a plurality of addresses, each address of the plurality being positionally distinguishable from each other address of the plurality, and each address of the plurality having a unique capture probe, and contacting the array with a second sample from a cell or subject which does not express 25934 (or does not express as highly as in the case of the 25934 positive plurality of capture probes) or from a cell or subject which in which a 25934 mediated response has not been elicited (or has been elicited to a lesser extent than in the first sample); and comparing the binding of the first sample with the binding of the second sample. Binding, e.g., in the case of a nucleic acid, hybridization with a capture probe at an address of the plurality, is detected, e.g., by signal generated from a label attached to the nucleic acid, polypeptide, or antibody. The same array can be used for both samples or different arrays can be used. If different arrays are used the plurality of addresses with capture probes should be present on both arrays.

In another aspect, the invention features a method of analyzing 25934, e.g., analyzing structure, function, or relatedness to other nucleic acid or amino acid sequences. The method includes: providing a 25934 nucleic acid or amino acid sequence; comparing the 25934 sequence with one or more preferably a plurality of sequences from a collection of sequences, e.g., a nucleic acid or protein sequence database; to thereby analyze 25934.

Detection of Variations or Mutations

The methods of the invention can also be used to detect genetic alterations in a 25934 gene, thereby determining if a subject with the altered gene is at risk for a disorder characterized by misregulation in 25934 protein activity or nucleic acid expression, such as a cardiovascular disorder. In preferred embodiments, the methods include detecting, in a sample from the subject, the presence or absence of a genetic alteration characterized by at least one of an alteration affecting the integrity of a gene encoding a 25934-protein, or

the mis-expression of the 25934 gene. For example, such genetic alterations can be detected by ascertaining the existence of at least one of 1) a deletion of one or more nucleotides from a 25934 gene; 2) an addition of one or more nucleotides to a 25934 gene; 3) a substitution of one or more nucleotides of a 25934 gene, 4) a chromosomal rearrangement of a 25934 gene; 5) an alteration in the level of a messenger RNA transcript of a 25934 gene, 6) aberrant modification of a 25934 gene, such as of the methylation pattern of the genomic DNA, 7) the presence of a non-wild type splicing pattern of a messenger RNA transcript of a 25934 gene, 8) a non-wild type level of a 25934-protein, 9) allelic loss of a 25934 gene, and 10) inappropriate post-translational modification of a 25934-protein.

An alteration can be detected without a probe/primer in a polymerase chain reaction, such as anchor PCR or RACE PCR, or, alternatively, in a ligation chain reaction (LCR), the latter of which can be particularly useful for detecting point mutations in the 25934-gene. This method can include the steps of collecting a sample of cells from a subject, isolating nucleic acid (e.g., genomic, mRNA or both) from the sample, contacting the nucleic acid sample with one or more primers which specifically hybridize to a 25934 gene under conditions such that hybridization and amplification of the 25934-gene (if present) occurs, and detecting the presence or absence of an amplification product, or detecting the size of the amplification product and comparing the length to a control sample. It is anticipated that PCR and/or LCR may be desirable to use as a preliminary amplification step in conjunction with any of the techniques used for detecting mutations described herein. Alternatively, other amplification methods described herein or known in the art can be used.

In another embodiment, mutations in a 25934 gene from a sample cell can be identified by detecting alterations in restriction enzyme cleavage patterns. For example, sample and control DNA is isolated, amplified (optionally), digested with one or more restriction endonucleases, and fragment length sizes are determined, e.g., by gel electrophoresis and compared. Differences in fragment length sizes between sample and control DNA indicates mutations in the sample DNA. Moreover, the use of sequence specific ribozymes (see, for example, U.S. Patent No. 5,498,531) can be used to score for the presence of specific mutations by development or loss of a ribozyme cleavage site.

In other embodiments, genetic mutations in 25934 can be identified by hybridizing a sample and control nucleic acids, e.g., DNA or RNA, two-dimensional arrays, e.g., chip

based arrays. Such arrays include a plurality of addresses, each of which is positionally distinguishable from the other. A different probe is located at each address of the plurality. A probe can be complementary to a region of a 25934 nucleic acid or a putative variant (e.g., allelic variant) thereof. A probe can have one or more mismatches to a region of a 25934 nucleic acid (e.g., a destabilizing mismatch). The arrays can have a high density of addresses, e.g., can contain hundreds or thousands of oligonucleotides probes (Cronin, M.T. *et al.* (1996) *Human Mutation* 7: 244-255; Kozal, M.J. *et al.* (1996) *Nature Medicine* 2: 753-759). For example, genetic mutations in 25934 can be identified in two-dimensional arrays containing light-generated DNA probes as described in Cronin, M.T. *et al. supra*. Briefly, a first hybridization array of probes can be used to scan through long stretches of DNA in a sample and control to identify base changes between the sequences by making linear arrays of sequential overlapping probes. This step allows the identification of point mutations. This step is followed by a second hybridization array that allows the characterization of specific mutations by using smaller, specialized probe arrays complementary to all variants or mutations detected. Each mutation array is composed of parallel probe sets, one complementary to the wild-type gene and the other complementary to the mutant gene.

In yet another embodiment, any of a variety of sequencing reactions known in the art can be used to directly sequence the 25934 gene and detect mutations by comparing the sequence of the sample 25934 with the corresponding wild-type (control) sequence. Automated sequencing procedures can be utilized when performing the diagnostic assays ((1995) *Biotechniques* 19:448), including sequencing by mass spectrometry.

Other methods for detecting mutations in the 25934 gene include methods in which protection from cleavage agents is used to detect mismatched bases in RNA/RNA or RNA/DNA heteroduplexes (Myers *et al.* (1985) *Science* 230:1242; Cotton *et al.* (1988) *Proc. Natl Acad Sci USA* 85:4397; Saleeba *et al.* (1992) *Methods Enzymol.* 217:286-295).

In still another embodiment, the mismatch cleavage reaction employs one or more proteins that recognize mismatched base pairs in double-stranded DNA (so called "DNA mismatch repair" enzymes) in defined systems for detecting and mapping point mutations in 25934 cDNAs obtained from samples of cells. For example, the mutY enzyme of *E. coli* cleaves A at G/A mismatches and the thymidine DNA glycosylase from HeLa cells cleaves T at G/T mismatches (Hsu *et al.* (1994) *Carcinogenesis* 15:1657-1662; U.S. Patent No. 5,459,039).

In other embodiments, alterations in electrophoretic mobility will be used to identify mutations in 25934 genes. For example, single strand conformation polymorphism (SSCP) may be used to detect differences in electrophoretic mobility between mutant and wild type nucleic acids (Orita *et al.* (1989) *Proc Natl. Acad. Sci USA*: 5 86:2766, see also Cotton (1993) *Mutat. Res.* 285:125-144; and Hayashi (1992) *Genet. Anal. Tech. Appl.* 9:73-79). Single-stranded DNA fragments of sample and control 25934 nucleic acids will be denatured and allowed to renature. The secondary structure of single-stranded nucleic acids varies according to sequence, the resulting alteration in electrophoretic mobility enables the detection of even a single base change. The DNA 10 fragments may be labeled or detected with labeled probes. The sensitivity of the assay may be enhanced by using RNA (rather than DNA), in which the secondary structure is more sensitive to a change in sequence. In a preferred embodiment, the subject method utilizes heteroduplex analysis to separate double stranded heteroduplex molecules on the basis of changes in electrophoretic mobility (Keen *et al.* (1991) *Trends Genet* 7:5).

15 In yet another embodiment, the movement of mutant or wild-type fragments in polyacrylamide gels containing a gradient of denaturant is assayed using denaturing gradient gel electrophoresis (DGGE) (Myers *et al.* (1985) *Nature* 313:495). When DGGE is used as the method of analysis, DNA will be modified to insure that it does not completely denature, for example by adding a GC clamp of approximately 40 bp of high-melting GC-rich DNA by PCR. In a further embodiment, a temperature gradient is used 20 in place of a denaturing gradient to identify differences in the mobility of control and sample DNA (Rosenbaum and Reissner (1987) *Biophys Chem* 265:12753).

Examples of other techniques for detecting point mutations include, but are not limited to, selective oligonucleotide hybridization, selective amplification, or selective 25 primer extension (Saiki *et al.* (1986) *Nature* 324:163); Saiki *et al.* (1989) *Proc. Natl Acad. Sci USA* 86:6230). A further method of detecting point mutations is the chemical ligation of oligonucleotides as described in Xu *et al.* ((2001) *Nature Biotechnol.* 19:148). Adjacent oligonucleotides, one of which selectively anneals to the query site, are ligated together if the nucleotide at the query site of the sample nucleic acid is complementary to 30 the query oligonucleotide; ligation can be monitored, e.g., by fluorescent dyes coupled to the oligonucleotides.

Alternatively, allele specific amplification technology that depends on selective PCR amplification may be used in conjunction with the instant invention.

Oligonucleotides used as primers for specific amplification may carry the mutation of interest in the center of the molecule (so that amplification depends on differential hybridization) (Gibbs *et al.* (1989) *Nucleic Acids Res.* 17:2437-2448) or at the extreme 3' end of one primer where, under appropriate conditions, mismatch can prevent, or reduce polymerase extension (Prossner (1993) *Tibtech* 11:238). In addition it may be desirable to introduce a novel restriction site in the region of the mutation to create cleavage-based detection (Gasparini *et al.* (1992) *Mol. Cell Probes* 6:1). It is anticipated that in certain embodiments amplification may also be performed using Taq ligase for amplification (Barany (1991) *Proc. Natl. Acad. Sci USA* 88:189). In such cases, ligation will occur only if there is a perfect match at the 3' end of the 5' sequence making it possible to detect the presence of a known mutation at a specific site by looking for the presence or absence of amplification.

In another aspect, the invention features a set of oligonucleotides. The set includes a plurality of oligonucleotides, each of which is at least partially complementary (e.g., at least 50%, 60%, 70%, 80%, 90%, 92%, 95%, 97%, 98%, or 99% complementary) to a 25934 nucleic acid.

In a preferred embodiment the set includes a first and a second oligonucleotide. The first and second oligonucleotide can hybridize to the same or to different locations of SEQ ID NO:1 or 3, or the complement of SEQ ID NO:1 or 3. Different locations can be different but overlapping or nonoverlapping on the same strand. The first and second oligonucleotide can hybridize to sites on the same or on different strands.

The set can be useful, e.g., for identifying SNP's, or identifying specific alleles of 25934. In a preferred embodiment, each oligonucleotide of the set has a different nucleotide at an interrogation position. In one embodiment, the set includes two oligonucleotides, each complementary to a different allele at a locus, e.g., a biallelic or polymorphic locus.

In another embodiment, the set includes four oligonucleotides, each having a different nucleotide (e.g., adenine, guanine, cytosine, or thymidine) at the interrogation position. The interrogation position can be a SNP or the site of a mutation. In another preferred embodiment, the oligonucleotides of the plurality are identical in sequence to one another (except for differences in length). The oligonucleotides can be provided with differential labels, such that an oligonucleotide that hybridizes to one allele provides a signal that is distinguishable from an oligonucleotide that hybridizes to a second allele.

In still another embodiment, at least one of the oligonucleotides of the set has a nucleotide change at a position in addition to a query position, e.g., a destabilizing mutation to decrease the T_m of the oligonucleotide. In another embodiment, at least one oligonucleotide of the set has a non-natural nucleotide, e.g., inosine. In a preferred
5 embodiment, the oligonucleotides are attached to a solid support, e.g., to different addresses of an array or to different beads or nanoparticles.

In a preferred embodiment the set of oligo nucleotides can be used to specifically amplify, e.g., by PCR, or detect, a 25934 nucleic acid.

The methods described herein may be performed, for example, by utilizing pre-
10 packaged diagnostic kits comprising at least one probe nucleic acid or antibody reagent described herein, which may be conveniently used, e.g., in clinical settings to diagnose patients exhibiting symptoms or family history of a disease or illness involving a 25934 gene.

15 Use of 25934 Molecules as Surrogate Markers

The 25934 molecules of the invention are also useful as markers of disorders or disease states, as markers for precursors of disease states, as markers for predisposition of disease states, as markers of drug activity, or as markers of the pharmacogenomic profile of a subject. Using the methods described herein, the presence, absence and/or quantity
20 of the 25934 molecules of the invention may be detected, and may be correlated with one or more biological states *in vivo*. For example, the 25934 molecules of the invention may serve as surrogate markers for one or more disorders or disease states or for conditions leading up to disease states. As used herein, a “surrogate marker” is an objective biochemical marker which correlates with the absence or presence of a disease or
25 disorder, or with the progression of a disease or disorder (e.g., with the presence or absence of a tumor). The presence or quantity of such markers is independent of the disease. Therefore, these markers may serve to indicate whether a particular course of treatment is effective in lessening a disease state or disorder. Surrogate markers are of particular use when the presence or extent of a disease state or disorder is difficult to
30 assess through standard methodologies (e.g., early stage tumors), or when an assessment of disease progression is desired before a potentially dangerous clinical endpoint is reached (e.g., an assessment of cardiovascular disease may be made using cholesterol levels as a surrogate marker, and an analysis of HIV infection may be made using HIV

RNA levels as a surrogate marker, well in advance of the undesirable clinical outcomes of myocardial infarction or fully-developed AIDS). Examples of the use of surrogate markers in the art include: Koomen *et al.* (2000) *J. Mass. Spectrom.* 35: 258-264; and James (1994) *AIDS Treatment News Archive* 209.

5 The 25934 molecules of the invention are also useful as pharmacodynamic markers. As used herein, a “pharmacodynamic marker” is an objective biochemical marker which correlates specifically with drug effects. The presence or quantity of a pharmacodynamic marker is not related to the disease state or disorder for which the drug is being administered; therefore, the presence or quantity of the marker is indicative of
10 the presence or activity of the drug in a subject. For example, a pharmacodynamic marker may be indicative of the concentration of the drug in a biological tissue, in that the marker is either expressed or transcribed or not expressed or transcribed in that tissue in relationship to the level of the drug. In this fashion, the distribution or uptake of the drug may be monitored by the pharmacodynamic marker. Similarly, the presence or
15 quantity of the pharmacodynamic marker may be related to the presence or quantity of the metabolic product of a drug, such that the presence or quantity of the marker is indicative of the relative breakdown rate of the drug *in vivo*. Pharmacodynamic markers are of particular use in increasing the sensitivity of detection of drug effects, particularly when the drug is administered in low doses. Since even a small amount of a drug may be
20 sufficient to activate multiple rounds of marker (e.g., a 25934 marker) transcription or expression, the amplified marker may be in a quantity which is more readily detectable than the drug itself. Also, the marker may be more easily detected due to the nature of the marker itself; for example, using the methods described herein, anti-25934 antibodies may be employed in an immune-based detection system for a 25934 protein marker, or
25 25934-specific radiolabeled probes may be used to detect a 25934 mRNA marker. Furthermore, the use of a pharmacodynamic marker may offer mechanism-based prediction of risk due to drug treatment beyond the range of possible direct observations. Examples of the use of pharmacodynamic markers in the art include: Matsuda *et al.* US 6,033,862; Hattis *et al.* (1991) *Env. Health Perspect.* 90: 229-238; Schentag (1999) *Am. J. Health-Syst. Pharm.* 56 Suppl. 3: S21-S24; and Nicolau (1999) *Am. J. Health-Syst. Pharm.* 56 Suppl. 3: S16-S20.

 The 25934 molecules of the invention are also useful as pharmacogenomic markers. As used herein, a “pharmacogenomic marker” is an objective biochemical

marker which correlates with a specific clinical drug response or susceptibility in a subject (see, e.g., McLeod *et al.* (1999) *Eur. J. Cancer* 35(12): 1650-1652). The presence or quantity of the pharmacogenomic marker is related to the predicted response of the subject to a specific drug or class of drugs prior to administration of the drug. By
5 assessing the presence or quantity of one or more pharmacogenomic markers in a subject, a drug therapy which is most appropriate for the subject, or which is predicted to have a greater degree of success, may be selected. For example, based on the presence or quantity of RNA, or protein (e.g., 25934 protein or RNA) for specific tumor markers in a
10 subject, a drug or course of treatment may be selected that is optimized for the treatment of the specific tumor likely to be present in the subject. Similarly, the presence or absence of a specific sequence mutation in 25934 DNA may correlate 25934 drug response. The use of pharmacogenomic markers therefore permits the application of the most appropriate treatment for each subject without having to administer the therapy.

15 Pharmaceutical Compositions

The nucleic acid and polypeptides, fragments thereof, as well as anti-25934 antibodies (also referred to herein as "active compounds") of the invention can be incorporated into pharmaceutical compositions. Such compositions typically include the nucleic acid molecule, protein, or antibody and a pharmaceutically acceptable carrier. As
20 used herein the language "pharmaceutically acceptable carrier" includes solvents, dispersion media, coatings, antibacterial and antifungal agents, isotonic and absorption delaying agents, and the like, compatible with pharmaceutical administration. Supplementary active compounds can also be incorporated into the compositions.

A pharmaceutical composition is formulated to be compatible with its intended
25 route of administration. Examples of routes of administration include parenteral, e.g., intravenous, intradermal, subcutaneous, oral (e.g., inhalation), transdermal (topical), transmucosal, and rectal administration. Solutions or suspensions used for parenteral, intradermal, or subcutaneous application can include the following components: a sterile
30 diluent such as water for injection, saline solution, fixed oils, polyethylene glycols, glycerine, propylene glycol or other synthetic solvents; antibacterial agents such as benzyl alcohol or methyl parabens; antioxidants such as ascorbic acid or sodium bisulfite; chelating agents such as ethylenediaminetetraacetic acid; buffers such as acetates, citrates or phosphates and agents for the adjustment of tonicity such as sodium chloride or

dextrose. pH can be adjusted with acids or bases, such as hydrochloric acid or sodium hydroxide. The parenteral preparation can be enclosed in ampoules, disposable syringes or multiple dose vials made of glass or plastic.

Pharmaceutical compositions suitable for injectable use include sterile aqueous
5 solutions (where water soluble) or dispersions and sterile powders for the
extemporaneous preparation of sterile injectable solutions or dispersion. For intravenous
administration, suitable carriers include physiological saline, bacteriostatic water,
Cremophor EL™ (BASF, Parsippany, NJ) or phosphate buffered saline (PBS). In all
10 cases, the composition must be sterile and should be fluid to the extent that easy
syringability exists. It should be stable under the conditions of manufacture and storage
and must be preserved against the contaminating action of microorganisms such as
bacteria and fungi. The carrier can be a solvent or dispersion medium containing, for
example, water, ethanol, polyol (for example, glycerol, propylene glycol, and liquid
polyethylene glycol, and the like), and suitable mixtures thereof. The proper fluidity can
15 be maintained, for example, by the use of a coating such as lecithin, by the maintenance
of the required particle size in the case of dispersion and by the use of surfactants.
Prevention of the action of microorganisms can be achieved by various antibacterial and
antifungal agents, for example, parabens, chlorobutanol, phenol, ascorbic acid,
thimerosal, and the like. In many cases, it will be preferable to include isotonic agents,
20 for example, sugars, polyalcohols such as manitol, sorbitol, sodium chloride in the
composition. Prolonged absorption of the injectable compositions can be brought about
by including in the composition an agent which delays absorption, for example,
aluminum monostearate and gelatin.

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

Oral compositions generally include an inert diluent or an edible carrier. For the purpose of oral therapeutic administration, the active compound can be incorporated with excipients and used in the form of tablets, troches, or capsules, e.g., gelatin capsules.

Oral compositions can also be prepared using a fluid carrier for use as a mouthwash.

5 Pharmaceutically compatible binding agents, and/or adjuvant materials can be included as part of the composition. The tablets, pills, capsules, troches and the like can contain any of the following ingredients, or compounds of a similar nature: a binder such as microcrystalline cellulose, gum tragacanth or gelatin; an excipient such as starch or lactose, a disintegrating agent such as alginic acid, Primogel, or corn starch; a lubricant
10 such as magnesium stearate or Sterotes; a glidant such as colloidal silicon dioxide; a sweetening agent such as sucrose or saccharin; or a flavoring agent such as peppermint, methyl salicylate, or orange flavoring.

For administration by inhalation, the compounds are delivered in the form of an aerosol spray from pressured container or dispenser which contains a suitable propellant,
15 e.g., a gas such as carbon dioxide, or a nebulizer.

Systemic administration can also be by transmucosal or transdermal means. For transmucosal or transdermal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art, and include, for example, for transmucosal administration, detergents, bile salts, and
20 fusidic acid derivatives. Transmucosal administration can be accomplished through the use of nasal sprays or suppositories. For transdermal administration, the active compounds are formulated into ointments, salves, gels, or creams as generally known in the art.

The compounds can also be prepared in the form of suppositories (e.g., with
25 conventional suppository bases such as cocoa butter and other glycerides) or retention enemas for rectal delivery.

In one embodiment, the active compounds are prepared with carriers that will protect the compound against rapid elimination from the body, such as a controlled release formulation, including implants and microencapsulated delivery systems.
30 Biodegradable, biocompatible polymers can be used, such as ethylene vinyl acetate, polyanhydrides, polyglycolic acid, collagen, polyorthoesters, and polylactic acid. Methods for preparation of such formulations will be apparent to those skilled in the art. The materials can also be obtained commercially from Alza Corporation and Nova

Pharmaceuticals, Inc. Liposomal suspensions (including liposomes targeted to infected cells with monoclonal antibodies to viral antigens) can also be used as pharmaceutically acceptable carriers. These can be prepared according to methods known to those skilled in the art, for example, as described in U.S. Patent No. 4,522,811.

5 It is advantageous to formulate oral or parenteral compositions in dosage unit form for ease of administration and uniformity of dosage. Dosage unit form as used herein refers to physically discrete units suited as unitary dosages for the subject to be treated; each unit containing a predetermined quantity of active compound calculated to produce the desired therapeutic effect in association with the required pharmaceutical
10 carrier.

Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g.*, for determining the LD50 (the dose lethal to 50% of the population) and the ED50 (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and
15 therapeutic effects is the therapeutic index and it can be expressed as the ratio LD50/ED50. Compounds which exhibit high therapeutic indices are preferred. While compounds that exhibit toxic side effects may be used, care should be taken to design a delivery system that targets such compounds to the site of affected tissue in order to minimize potential damage to uninfected cells and, thereby, reduce side effects.

20 The data obtained from the cell culture assays and animal studies can be used in formulating a range of dosage for use in humans. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED50 with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilized. For any compound used in the method
25 of the invention, the therapeutically effective dose can be estimated initially from cell culture assays. A dose may be formulated in animal models to achieve a circulating plasma concentration range that includes the IC50 (*i.e.*, the concentration of the test compound which achieves a half-maximal inhibition of symptoms) as determined in cell culture. Such information can be used to more accurately determine useful doses in
30 humans. Levels in plasma may be measured, for example, by high performance liquid chromatography.

As defined herein, a therapeutically effective amount of protein or polypeptide (*i.e.*, an effective dosage) ranges from about 0.001 to 30 mg/kg body weight, preferably

about 0.01 to 25 mg/kg body weight, more preferably about 0.1 to 20 mg/kg body weight, and even more preferably about 1 to 10 mg/kg, 2 to 9 mg/kg, 3 to 8 mg/kg, 4 to 7 mg/kg, or 5 to 6 mg/kg body weight. The protein or polypeptide can be administered one time per week for between about 1 to 10 weeks, preferably between 2 to 8 weeks, more preferably between about 3 to 7 weeks, and even more preferably for about 4, 5, or 6 weeks. The skilled artisan will appreciate that certain factors may influence the dosage and timing required to effectively treat a subject, including but not limited to the severity of the disease or disorder, previous treatments, the general health and/or age of the subject, and other diseases present. Moreover, treatment of a subject with a therapeutically effective amount of a protein, polypeptide, or antibody can include a single treatment or, preferably, can include a series of treatments.

For antibodies, the preferred dosage is 0.1 mg/kg of body weight (generally 10 mg/kg to 20 mg/kg). If the antibody is to act in the brain, a dosage of 50 mg/kg to 100 mg/kg is usually appropriate. Generally, partially human antibodies and fully human antibodies have a longer half-life within the human body than other antibodies. Accordingly, lower dosages and less frequent administration is often possible. Modifications such as lipidation can be used to stabilize antibodies and to enhance uptake and tissue penetration (e.g., into the brain). A method for lipidation of antibodies is described by Cruikshank et al. ((1997) *J. Acquired Immune Deficiency Syndromes and Human Retrovirology* 14:193).

The present invention encompasses agents which modulate expression or activity. An agent may, for example, be a small molecule. For example, such small molecules include, but are not limited to, peptides, peptidomimetics (e.g., peptoids), amino acids, amino acid analogs, polynucleotides, polynucleotide analogs, nucleotides, nucleotide analogs, organic or inorganic compounds (i.e., including heteroorganic and organometallic compounds) having a molecular weight less than about 10,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 5,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 1,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 500 grams per mole, and salts, esters, and other pharmaceutically acceptable forms of such compounds.

Exemplary doses include milligram or microgram amounts of the small molecule per kilogram of subject or sample weight (e.g., about 1 microgram per kilogram to about

500 milligrams per kilogram, about 100 micrograms per kilogram to about 5 milligrams per kilogram, or about 1 microgram per kilogram to about 50 micrograms per kilogram. It is furthermore understood that appropriate doses of a small molecule depend upon the potency of the small molecule with respect to the expression or activity to be modulated.

5 When one or more of these small molecules is to be administered to an animal (e.g., a human) in order to modulate expression or activity of a polypeptide or nucleic acid of the invention, a physician, veterinarian, or researcher may, for example, prescribe a relatively low dose at first, subsequently increasing the dose until an appropriate response is obtained. In addition, it is understood that the specific dose level for any particular
10 animal subject will depend upon a variety of factors including the activity of the specific compound employed, the age, body weight, general health, gender, and diet of the subject, the time of administration, the route of administration, the rate of excretion, any drug combination, and the degree of expression or activity to be modulated.

An antibody (or fragment thereof) may be conjugated to a therapeutic moiety such
15 as a cytotoxin, a therapeutic agent or a radioactive metal ion. A cytotoxin or cytotoxic agent includes any agent that is detrimental to cells. Examples include taxol, cytochalasin B, gramicidin D, ethidium bromide, emetine, mitomycin, etoposide, tenoposide, vincristine, vinblastine, colchicin, doxorubicin, daunorubicin, dihydroxy anthracin dione, mitoxantrone, mithramycin, actinomycin D, 1-dehydrotestosterone,
20 glucocorticoids, procaine, tetracaine, lidocaine, propranolol, and puromycin and analogs or homologs thereof. Therapeutic agents include, but are not limited to, antimetabolites (e.g., methotrexate, 6-mercaptopurine, 6-thioguanine, cytarabine, 5-fluorouracil decarbazine), alkylating agents (e.g., mechlorethamine, thioepa chlorambucil, melphalan, carmustine (BSNU) and lomustine (CCNU), cyclophosphamide, busulfan,
25 dibromomannitol, streptozotocin, mitomycin C, and cis-dichlorodiamine platinum (II) (DDP) cisplatin), anthracyclines (e.g., daunorubicin (formerly daunomycin) and doxorubicin), antibiotics (e.g., dactinomycin (formerly actinomycin), bleomycin, mithramycin, and anthramycin (AMC)), and anti-mitotic agents (e.g., vincristine and vinblastine).

30 The conjugates of the invention can be used for modifying a given biological response, the drug moiety is not to be construed as limited to classical chemical therapeutic agents. For example, the drug moiety may be a protein or polypeptide possessing a desired biological activity. Such proteins may include, for example, a toxin

such as abrin, ricin A, pseudomonas exotoxin, or diphtheria toxin; a protein such as tumor necrosis factor, .alpha.-interferon, .beta.-interferon, nerve growth factor, platelet derived growth factor, tissue plasminogen activator; or, biological response modifiers such as, for example, lymphokines, interleukin-1 ("IL-1"), interleukin-2 ("IL-2"),
5 interleukin-6 ("IL-6"), granulocyte macrophase colony stimulating factor ("GM-CSF"), granulocyte colony stimulating factor ("G-CSF"), or other growth factors.

Alternatively, an antibody can be conjugated to a second antibody to form an antibody heteroconjugate as described by Segal in U.S. Patent No. 4,676,980.

The nucleic acid molecules of the invention can be inserted into vectors and used
10 as gene therapy vectors. Gene therapy vectors can be delivered to a subject by, for example, intravenous injection, local administration (see U.S. Patent 5,328,470) or by stereotactic injection (see e.g., Chen et al. (1994) *Proc. Natl. Acad. Sci. USA* 91:3054-3057). The pharmaceutical preparation of the gene therapy vector can include the gene therapy vector in an acceptable diluent, or can comprise a slow release matrix in which
15 the gene delivery vehicle is imbedded. Alternatively, where the complete gene delivery vector can be produced intact from recombinant cells, e.g., retroviral vectors, the pharmaceutical preparation can include one or more cells which produce the gene delivery system.

The pharmaceutical compositions can be included in a container, pack, or
20 dispenser together with instructions for administration.

Methods of Treatment:

The present invention provides for both prophylactic and therapeutic methods of treating a subject at risk of (or susceptible to) a disorder or having a disorder associated
25 with aberrant or unwanted 25934 expression or activity. As used herein, the term "treatment" is defined as the application or administration of a therapeutic agent to a patient, or application or administration of a therapeutic agent to an isolated tissue or cell line from a patient, who has a disease, a symptom of disease or a predisposition toward a disease, with the purpose to cure, heal, alleviate, relieve, alter, remedy, ameliorate,
30 improve or affect the disease, the symptoms of disease or the predisposition toward disease. A therapeutic agent includes, but is not limited to, small molecules, peptides, antibodies, ribozymes and antisense oligonucleotides.

With regards to both prophylactic and therapeutic methods of treatment, such treatments may be specifically tailored or modified, based on knowledge obtained from the field of pharmacogenomics. "Pharmacogenomics", as used herein, refers to the application of genomics technologies such as gene sequencing, statistical genetics, and gene expression analysis to drugs in clinical development and on the market. More specifically, the term refers the study of how a patient's genes determine his or her response to a drug (e.g., a patient's "drug response phenotype", or "drug response genotype".) Thus, another aspect of the invention provides methods for tailoring an individual's prophylactic or therapeutic treatment with either the 25934 molecules of the present invention or 25934 modulators according to that individual's drug response genotype. Pharmacogenomics allows a clinician or physician to target prophylactic or therapeutic treatments to patients who will most benefit from the treatment and to avoid treatment of patients who will experience toxic drug-related side effects.

In one aspect, the invention provides a method for preventing in a subject, a disease or condition associated with an aberrant or unwanted 25934 expression or activity, by administering to the subject a 25934 or an agent which modulates 25934 expression or at least one 25934 activity. Subjects at risk for a disease which is caused or contributed to by aberrant or unwanted 25934 expression or activity can be identified by, for example, any or a combination of diagnostic or prognostic assays as described herein. Administration of a prophylactic agent can occur prior to the manifestation of symptoms characteristic of the 25934 aberrance, such that a disease or disorder is prevented or, alternatively, delayed in its progression. Depending on the type of 25934 aberrance, for example, a 25934, 25934 agonist or 25934 antagonist agent can be used for treating the subject. The appropriate agent can be determined based on screening assays described herein.

It is possible that some 25934 disorders can be caused, at least in part, by an abnormal level of gene product, or by the presence of a gene product exhibiting abnormal activity. As such, the reduction in the level and/or activity of such gene products would bring about the amelioration of disorder symptoms.

In addition to the cardiovascular indications described above, the 25934 molecules of the invention can be used to treat, prevent and/or diagnose disorders involving the cells in which the 25934 mRNA is expressed (Figures 4-6). Accordingly, the molecules of the

invention can be used to treat, present and/or diagnose neurological, reproductive (ovarian), renal, metabolic and hepatic disorders.

Disorders involving the brain include, but are not limited to, disorders involving neurons, and disorders involving glia, such as astrocytes, oligodendrocytes, ependymal cells, and microglia; cerebral edema, raised intracranial pressure and herniation, and hydrocephalus; malformations and developmental diseases, such as neural tube defects, forebrain anomalies, posterior fossa anomalies, and syringomyelia and hydromyelia; perinatal brain injury; cerebrovascular diseases, such as those related to hypoxia, ischemia, and infarction, including hypotension, hypoperfusion, and low-flow states-- global cerebral ischemia and focal cerebral ischemia--infarction from obstruction of local blood supply, intracranial hemorrhage, including intracerebral (intraparenchymal) hemorrhage, subarachnoid hemorrhage and ruptured berry aneurysms, and vascular malformations, hypertensive cerebrovascular disease, including lacunar infarcts, slit hemorrhages, and hypertensive encephalopathy; infections, such as acute meningitis, including acute pyogenic (bacterial) meningitis and acute aseptic (viral) meningitis, acute focal suppurative infections, including brain abscess, subdural empyema, and extradural abscess, chronic bacterial meningoencephalitis, including tuberculosis and mycobacterioses, neurosyphilis, and neuroborreliosis (Lyme disease), viral meningoencephalitis, including arthropod-borne (Arbo) viral encephalitis, *Herpes simplex* virus Type 1, *Herpes simplex* virus Type 2, *Varicella-zoster* virus (*Herpes zoster*), cytomegalovirus, poliomyelitis, rabies, and human immunodeficiency virus 1, including HIV-1 meningoencephalitis (subacute encephalitis), vacuolar myelopathy, AIDS-associated myopathy, peripheral neuropathy, and AIDS in children, progressive multifocal leukoencephalopathy, subacute sclerosing panencephalitis, fungal meningoencephalitis, other infectious diseases of the nervous system; transmissible spongiform encephalopathies (prion diseases); demyelinating diseases, including multiple sclerosis, multiple sclerosis variants, acute disseminated encephalomyelitis and acute necrotizing hemorrhagic encephalomyelitis, and other diseases with demyelination; degenerative diseases, such as degenerative diseases affecting the cerebral cortex, including Alzheimer disease and Pick disease, degenerative diseases of basal ganglia and brain stem, including Parkinsonism, idiopathic Parkinson disease (paralysis agitans), progressive supranuclear palsy, corticobasal degeneration, multiple system atrophy, including striatonigral degeneration, Shy-Drager syndrome, and olivopontocerebellar

atrophy, and Huntington disease; spinocerebellar degenerations, including spinocerebellar ataxias, including Friedreich ataxia, and ataxia-telangiectasia, degenerative diseases affecting motor neurons, including amyotrophic lateral sclerosis (motor neuron disease), bulbospinal atrophy (Kennedy syndrome), and spinal muscular atrophy; inborn errors of metabolism, such as leukodystrophies, including Krabbe disease, metachromatic leukodystrophy, adrenoleukodystrophy, Pelizaeus-Merzbacher disease, and Canavan disease, mitochondrial encephalomyopathies, including Leigh disease and other mitochondrial encephalomyopathies; toxic and acquired metabolic diseases, including vitamin deficiencies such as thiamine (vitamin B₁) deficiency and vitamin B₁₂ deficiency, neurologic sequelae of metabolic disturbances, including hypoglycemia, hyperglycemia, and hepatic encephatopathy, toxic disorders, including carbon monoxide, methanol, ethanol, and radiation, including combined methotrexate and radiation-induced injury; tumors, such as gliomas, including astrocytoma, including fibrillary (diffuse) astrocytoma and glioblastoma multiforme, pilocytic astrocytoma, pleomorphic xanthoastrocytoma, and brain stem glioma, oligodendroglioma, and ependymoma and related paraventricular mass lesions, neuronal tumors, poorly differentiated neoplasms, including medulloblastoma, other parenchymal tumors, including primary brain lymphoma, germ cell tumors, and pineal parenchymal tumors, meningiomas, metastatic tumors, paraneoplastic syndromes, peripheral nerve sheath tumors, including schwannoma, neurofibroma, and malignant peripheral nerve sheath tumor (malignant schwannoma), and neurocutaneous syndromes (phakomatoses), including neurofibromatosis, including Type 1 neurofibromatosis (NF1) and TYPE 2 neurofibromatosis (NF2), tuberous sclerosis, and Von Hippel-Lindau disease.

Disorders involving the ovary include, for example, polycystic ovarian disease, Stein-leventhal syndrome, Pseudomyxoma peritonei and stromal hyperthecosis; ovarian tumors such as, tumors of coelomic epithelium, serous tumors, mucinous tumors, endometrioid tumors, clear cell adenocarcinoma, cystadenofibroma, brenner tumor, surface epithelial tumors; germ cell tumors such as mature (benign) teratomas, monodermal teratomas, immature malignant teratomas, dysgerminoma, endodermal sinus tumor, choriocarcinoma; sex cord-stomal tumors such as, granulosa-theca cell tumors, thecoma-fibromas, androblastomas, hill cell tumors, and gonadoblastoma; and metastatic tumors such as Krukenberg tumors.

Disorders involving the kidney include, but are not limited to, congenital anomalies including, but not limited to, cystic diseases of the kidney, that include but are not limited to, cystic renal dysplasia, autosomal dominant (adult) polycystic kidney disease, autosomal recessive (childhood) polycystic kidney disease, and cystic diseases of renal medulla, which
5 include, but are not limited to, medullary sponge kidney, and nephronophthisis-uremic medullary cystic disease complex, acquired (dialysis-associated) cystic disease, such as simple cysts; glomerular diseases including pathologies of glomerular injury that include, but are not limited to, in situ immune complex deposition, that includes, but is not limited to, anti-GBM nephritis, Heymann nephritis, and antibodies against planted antigens, circulating
10 immune complex nephritis, antibodies to glomerular cells, cell-mediated immunity in glomerulonephritis, activation of alternative complement pathway, epithelial cell injury, and pathologies involving mediators of glomerular injury including cellular and soluble mediators, acute glomerulonephritis, such as acute proliferative (poststreptococcal, postinfectious) glomerulonephritis, including but not limited to, poststreptococcal
15 glomerulonephritis and nonstreptococcal acute glomerulonephritis, rapidly progressive (crescentic) glomerulonephritis, nephrotic syndrome, membranous glomerulonephritis (membranous nephropathy), minimal change disease (lipoid nephrosis), focal segmental glomerulosclerosis, membranoproliferative glomerulonephritis, IgA nephropathy (Berger disease), focal proliferative and necrotizing glomerulonephritis (focal glomerulonephritis),
20 hereditary nephritis, including but not limited to, Alport syndrome and thin membrane disease (benign familial hematuria), chronic glomerulonephritis, glomerular lesions associated with systemic disease, including but not limited to, systemic lupus erythematosus, Henoch-Schönlein purpura, bacterial endocarditis, diabetic glomerulosclerosis, amyloidosis, fibrillary and immunotactoid glomerulonephritis, and other
25 systemic disorders; diseases affecting tubules and interstitium, including acute tubular necrosis and tubulointerstitial nephritis, including but not limited to, pyelonephritis and urinary tract infection, acute pyelonephritis, chronic pyelonephritis and reflux nephropathy, and tubulointerstitial nephritis induced by drugs and toxins, including but not limited to, acute drug-induced interstitial nephritis, analgesic abuse nephropathy, nephropathy
30 associated with nonsteroidal anti-inflammatory drugs, and other tubulointerstitial diseases including, but not limited to, urate nephropathy, hypercalcemia and nephrocalcinosis, and multiple myeloma; diseases of blood vessels including benign nephrosclerosis, malignant hypertension and accelerated nephrosclerosis, renal artery stenosis, and thrombotic

microangiopathies including, but not limited to, classic (childhood) hemolytic-uremic syndrome, adult hemolytic-uremic syndrome/thrombotic thrombocytopenic purpura, idiopathic HUS/TTP, and other vascular disorders including, but not limited to, atherosclerotic ischemic renal disease, atheroembolic renal disease, sickle cell disease nephropathy, diffuse cortical necrosis, and renal infarcts; urinary tract obstruction (obstructive uropathy); urolithiasis (renal calculi, stones); and tumors of the kidney including, but not limited to, benign tumors, such as renal papillary adenoma, renal fibroma or hamartoma (renomedullary interstitial cell tumor), angiomyolipoma, and oncocytoma, and malignant tumors, including renal cell carcinoma (hypernephroma, adenocarcinoma of kidney), which includes urothelial carcinomas of renal pelvis.

Disorders of the liver include, but are not limited to, disorders associated with an accumulation in the liver of fibrous tissue, such as that resulting from an imbalance between production and degradation of the extracellular matrix accompanied by the collapse and condensation of preexisting fibers. The methods described herein can be used to diagnose or treat hepatocellular necrosis or injury induced by a wide variety of agents including processes which disturb homeostasis, such as an inflammatory process, tissue damage resulting from toxic injury or altered hepatic blood flow, and infections (e.g., bacterial, viral and parasitic). For example, the methods can be used for the early detection of hepatic injury, such as portal hypertension or hepatic fibrosis. In addition, the methods can be employed to detect liver fibrosis attributed to inborn errors of metabolism, for example, fibrosis resulting from a storage disorder such as Gaucher's disease (lipid abnormalities) or a glycogen storage disease, A1-antitrypsin deficiency; a disorder mediating the accumulation (e.g., storage) of an exogenous substance, for example, hemochromatosis (iron-overload syndrome) and copper storage diseases (Wilson's disease), disorders resulting in the accumulation of a toxic metabolite (e.g., tyrosinemia, fructosemia and galactosemia) and peroxisomal disorders (e.g., Zellweger syndrome). Additionally, the methods described herein may be useful for the early detection and treatment of liver injury associated with the administration of various chemicals or drugs, such as for example, methotrexate, isoniazid, oxyphenisatin, methyl dopa, chlorpromazine, tolbutamide or alcohol, or which represents a hepatic manifestation of a vascular disorder such as obstruction of either the intrahepatic or extrahepatic bile flow or an alteration in hepatic circulation resulting, for example, from

chronic heart failure, veno-occlusive disease, portal vein thrombosis or Budd-Chiari syndrome.

5 Additionally, 25934 molecules may play an important role in the etiology of certain viral diseases, including but not limited to Hepatitis B, Hepatitis C and Herpes Simplex Virus (HSV). Modulators of 25934 activity could be used to control viral diseases. The modulators can be used in the treatment and/or diagnosis of viral infected tissue or virus-associated tissue fibrosis, especially liver and liver fibrosis. Also, 25934 modulators can be used in the treatment and/or diagnosis of virus-associated carcinoma, especially hepatocellular cancer.

10 Additionally, 25934 may play an important role in the regulation of metabolism. Diseases of metabolic imbalance include, but are not limited to, obesity, anorexia nervosa, cachexia, lipid disorders diabetes.

As discussed, successful treatment of 25934 disorders can be brought about by techniques that serve to inhibit the expression or activity of target gene products. For example, compounds, e.g., an agent identified using an assays described above, that proves to exhibit negative modulatory activity, can be used in accordance with the invention to prevent and/or ameliorate symptoms of 25934 disorders. Such molecules can include, but are not limited to peptides, phosphopeptides, small organic or inorganic molecules, or antibodies (including, for example, polyclonal, monoclonal, humanized, anti-idiotypic, chimeric or single chain antibodies, and Fab, F(ab')₂ and FAb expression library fragments, scFV molecules, and epitope-binding fragments thereof).

20 Further, antisense and ribozyme molecules that inhibit expression of the target gene can also be used in accordance with the invention to reduce the level of target gene expression, thus effectively reducing the level of target gene activity. Still further, triple helix molecules can be utilized in reducing the level of target gene activity. Antisense, ribozyme and triple helix molecules are discussed above.

It is possible that the use of antisense, ribozyme, and/or triple helix molecules to reduce or inhibit mutant gene expression can also reduce or inhibit the transcription (triple helix) and/or translation (antisense, ribozyme) of mRNA produced by normal target gene alleles, such that the concentration of normal target gene product present can be lower than is necessary for a normal phenotype. In such cases, nucleic acid molecules that encode and express target gene polypeptides exhibiting normal target gene activity can be introduced into cells via gene therapy method. Alternatively, in instances in that

the target gene encodes an extracellular protein, it can be preferable to co-administer normal target gene protein into the cell or tissue in order to maintain the requisite level of cellular or tissue target gene activity.

Another method by which nucleic acid molecules may be utilized in treating or preventing a disease characterized by 25934 expression is through the use of aptamer molecules specific for 25934 protein. Aptamers are nucleic acid molecules having a tertiary structure which permits them to specifically bind to protein ligands (see, e.g., Osborne, et al. *Curr. Opin. Chem Biol.* 1997, 1(1): 5-9; and Patel, D.J. *Curr Opin Chem Biol* 1997 Jun;1(1):32-46). Since nucleic acid molecules may in many cases be more conveniently introduced into target cells than therapeutic protein molecules may be, aptamers offer a method by which 25934 protein activity may be specifically decreased without the introduction of drugs or other molecules which may have pluripotent effects.

Antibodies can be generated that are both specific for target gene product and that reduce target gene product activity. Such antibodies may, therefore, be administered in instances whereby negative modulatory techniques are appropriate for the treatment of 25934 disorders. For a description of antibodies, see the Antibody section above.

In circumstances wherein injection of an animal or a human subject with a 25934 protein or epitope for stimulating antibody production is harmful to the subject, it is possible to generate an immune response against 25934 through the use of anti-idiotypic antibodies (see, for example, Herlyn, D. *Ann Med* 1999;31(1):66-78; and Bhattacharya-Chatterjee, M., and Foon, K.A. *Cancer Treat Res* 1998;94:51-68). If an anti-idiotypic antibody is introduced into a mammal or human subject, it should stimulate the production of anti-anti-idiotypic antibodies, which should be specific to the 25934 protein. Vaccines directed to a disease characterized by 25934 expression may also be generated in this fashion.

In instances where the target antigen is intracellular and whole antibodies are used, internalizing antibodies may be preferred. Lipofectin or liposomes can be used to deliver the antibody or a fragment of the Fab region that binds to the target antigen into cells. Where fragments of the antibody are used, the smallest inhibitory fragment that binds to the target antigen is preferred. For example, peptides having an amino acid sequence corresponding to the Fv region of the antibody can be used. Alternatively, single chain neutralizing antibodies that bind to intracellular target antigens can also be administered. Such single chain antibodies can be administered, for example, by

expressing nucleotide sequences encoding single-chain antibodies within the target cell population (see e.g., Marasco et al. (1993, Proc. Natl. Acad. Sci. USA 90:7889-7893).

The identified compounds that inhibit target gene expression, synthesis and/or activity can be administered to a patient at therapeutically effective doses to prevent, treat
5 or ameliorate 25934 disorders. A therapeutically effective dose refers to that amount of the compound sufficient to result in amelioration of symptoms of the disorders.

Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, e.g., for determining the LD₅₀ (the dose lethal to 50% of the population) and the ED₅₀ (the dose
10 therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio LD₅₀/ED₅₀. Compounds that exhibit large therapeutic indices are preferred. While compounds that exhibit toxic side effects can be used, care should be taken to design a delivery system that targets such compounds to the site of affected tissue in order to minimize potential
15 damage to uninfected cells and, thereby, reduce side effects.

The data obtained from the cell culture assays and animal studies can be used in formulating a range of dosage for use in humans. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED₅₀ with little or no toxicity. The dosage can vary within this range depending upon the dosage form
20 employed and the route of administration utilized. For any compound used in the method of the invention, the therapeutically effective dose can be estimated initially from cell culture assays. A dose can be formulated in animal models to achieve a circulating plasma concentration range that includes the IC₅₀ (i.e., the concentration of the test compound that achieves a half-maximal inhibition of symptoms) as determined in cell
25 culture. Such information can be used to more accurately determine useful doses in humans. Levels in plasma can be measured, for example, by high performance liquid chromatography.

Another example of determination of effective dose for an individual is the ability to directly assay levels of "free" and "bound" compound in the serum of the test subject.
30 Such assays may utilize antibody mimics and/or "biosensors" that have been created through molecular imprinting techniques. The compound which is able to modulate 25934 activity is used as a template, or "imprinting molecule", to spatially organize polymerizable monomers prior to their polymerization with catalytic reagents. The

subsequent removal of the imprinted molecule leaves a polymer matrix which contains a repeated “negative image” of the compound and is able to selectively rebind the molecule under biological assay conditions. A detailed review of this technique can be seen in Ansell, R. J. *et al* (1996) *Current Opinion in Biotechnology* 7:89-94 and in Shea, K.J. (1994) *Trends in Polymer Science* 2:166-173. Such “imprinted” affinity matrixes are amenable to ligand-binding assays, whereby the immobilized monoclonal antibody component is replaced by an appropriately imprinted matrix. An example of the use of such matrixes in this way can be seen in Vlatakis, G. *et al* (1993) *Nature* 361:645-647. Through the use of isotope-labeling, the “free” concentration of compound which modulates the expression or activity of 25934 can be readily monitored and used in calculations of IC_{50} .

Such “imprinted” affinity matrixes can also be designed to include fluorescent groups whose photon-emitting properties measurably change upon local and selective binding of target compound. These changes can be readily assayed in real time using appropriate fiberoptic devices, in turn allowing the dose in a test subject to be quickly optimized based on its individual IC_{50} . An rudimentary example of such a “biosensor” is discussed in Kriz, D. *et al* (1995) *Analytical Chemistry* 67:2142-2144.

Another aspect of the invention pertains to methods of modulating 25934 expression or activity for therapeutic purposes. Accordingly, in an exemplary embodiment, the modulatory method of the invention involves contacting a cell with a 25934 or agent that modulates one or more of the activities of 25934 protein activity associated with the cell. An agent that modulates 25934 protein activity can be an agent as described herein, such as a nucleic acid or a protein, a naturally-occurring target molecule of a 25934 protein (e.g., a 25934 substrate or receptor), a 25934 antibody, a 25934 agonist or antagonist, a peptidomimetic of a 25934 agonist or antagonist, or other small molecule.

In one embodiment, the agent stimulates one or 25934 activities. Examples of such stimulatory agents include active 25934 protein and a nucleic acid molecule encoding 25934. In another embodiment, the agent inhibits one or more 25934 activities. Examples of such inhibitory agents include antisense 25934 nucleic acid molecules, anti25934 antibodies, and 25934 inhibitors. These modulatory methods can be performed *in vitro* (e.g., by culturing the cell with the agent) or, alternatively, *in vivo* (e.g., by administering the agent to a subject). As such, the present invention provides methods of

treating an individual afflicted with a disease or disorder characterized by aberrant or unwanted expression or activity of a 25934 protein or nucleic acid molecule. In one embodiment, the method involves administering an agent (e.g., an agent identified by a screening assay described herein), or combination of agents that modulates (e.g.,
5 upregulates or downregulates) 25934 expression or activity. In another embodiment, the method involves administering a 25934 protein or nucleic acid molecule as therapy to compensate for reduced, aberrant, or unwanted 25934 expression or activity.

Stimulation of 25934 activity is desirable in situations in which 25934 is abnormally downregulated and/or in which increased 25934 activity is likely to have a
10 beneficial effect. For example, stimulation of 25934 activity is desirable in situations in which a 25934 is downregulated and/or in which increased 25934 activity is likely to have a beneficial effect. Likewise, inhibition of 25934 activity is desirable in situations in which 25934 is abnormally upregulated and/or in which decreased 25934 activity is likely to have a beneficial effect.

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Pharmacogenomics

The 25934 molecules of the present invention, as well as agents, or modulators which have a stimulatory or inhibitory effect on 25934 activity (e.g., 25934 gene expression) as identified by a screening assay described herein can be administered to
20 individuals to treat (prophylactically or therapeutically) 25934 associated disorders (e.g., diabetes, obesity, hypertension, cancer, developmental disorders, immune disorders and neurological and heart diseases) associated with aberrant or unwanted 25934 activity. In conjunction with such treatment, pharmacogenomics (i.e., the study of the relationship between an individual's genotype and that individual's response to a foreign compound or
25 drug) may be considered. Differences in metabolism of therapeutics can lead to severe toxicity or therapeutic failure by altering the relation between dose and blood concentration of the pharmacologically active drug. Thus, a physician or clinician may consider applying knowledge obtained in relevant pharmacogenomics studies in
30 tailoring the dosage and/or therapeutic regimen of treatment with a 25934 molecule or 25934 modulator.

Pharmacogenomics deals with clinically significant hereditary variations in the response to drugs due to altered drug disposition and abnormal action in affected persons.

See, for example, Eichelbaum, M. et al. (1996) *Clin. Exp. Pharmacol. Physiol.* 23(10-11) :983-985 and Linder, M.W. et al. (1997) *Clin. Chem.* 43(2):254-266. In general, two types of pharmacogenetic conditions can be differentiated. Genetic conditions transmitted as a single factor altering the way drugs act on the body (altered drug action) or genetic conditions transmitted as single factors altering the way the body acts on drugs (altered drug metabolism). These pharmacogenetic conditions can occur either as rare genetic defects or as naturally-occurring polymorphisms. For example, glucose-6-phosphate dehydrogenase deficiency (G6PD) is a common inherited enzymopathy in which the main clinical complication is haemolysis after ingestion of oxidant drugs (anti-malarials, sulfonamides, analgesics, nitrofurans) and consumption of fava beans.

One pharmacogenomics approach to identifying genes that predict drug response, known as "a genome-wide association", relies primarily on a high-resolution map of the human genome consisting of already known gene-related markers (e.g., a "bi-allelic" gene marker map which consists of 60,000-100,000 polymorphic or variable sites on the human genome, each of which has two variants.) Such a high-resolution genetic map can be compared to a map of the genome of each of a statistically significant number of patients taking part in a Phase II/III drug trial to identify markers associated with a particular observed drug response or side effect. Alternatively, such a high resolution map can be generated from a combination of some ten-million known single nucleotide polymorphisms (SNPs) in the human genome. As used herein, a "SNP" is a common alteration that occurs in a single nucleotide base in a stretch of DNA. For example, a SNP may occur once per every 1000 bases of DNA. A SNP may be involved in a disease process, however, the vast majority may not be disease-associated. Given a genetic map based on the occurrence of such SNPs, individuals can be grouped into genetic categories depending on a particular pattern of SNPs in their individual genome. In such a manner, treatment regimens can be tailored to groups of genetically similar individuals, taking into account traits that may be common among such genetically similar individuals.

Alternatively, a method termed the "candidate gene approach", can be utilized to identify genes that predict drug response. According to this method, if a gene that encodes a drug's target is known (e.g., a 25934 protein of the present invention), all common variants of that gene can be fairly easily identified in the population and it can be determined if having one version of the gene versus another is associated with a particular drug response.

Alternatively, a method termed the "gene expression profiling", can be utilized to identify genes that predict drug response. For example, the gene expression of an animal dosed with a drug (e.g., a 25934 molecule or 25934 modulator of the present invention) can give an indication whether gene pathways related to toxicity have been turned on.

5 Information generated from more than one of the above pharmacogenomics approaches can be used to determine appropriate dosage and treatment regimens for prophylactic or therapeutic treatment of an individual. This knowledge, when applied to dosing or drug selection, can avoid adverse reactions or therapeutic failure and thus enhance therapeutic or prophylactic efficiency when treating a subject with a 25934
10 molecule or 25934 modulator, such as a modulator identified by one of the exemplary screening assays described herein.

The present invention further provides methods for identifying new agents, or combinations, that are based on identifying agents that modulate the activity of one or more of the gene products encoded by one or more of the 25934 genes of the present
15 invention, wherein these products may be associated with resistance of the cells to a therapeutic agent. Specifically, the activity of the proteins encoded by the 25934 genes of the present invention can be used as a basis for identifying agents for overcoming agent resistance. By blocking the activity of one or more of the resistance proteins, target cells, e.g., adipocyte cells, will become sensitive to treatment with an agent that the unmodified
20 target cells were resistant to.

Monitoring the influence of agents (e.g., drugs) on the expression or activity of a 25934 protein can be applied in clinical trials. For example, the effectiveness of an agent determined by a screening assay as described herein to increase 25934 gene expression, protein levels, or upregulate 25934 activity, can be monitored in clinical trials of subjects
25 exhibiting decreased 25934 gene expression, protein levels, or downregulated 25934 activity. Alternatively, the effectiveness of an agent determined by a screening assay to decrease 25934 gene expression, protein levels, or downregulate 25934 activity, can be monitored in clinical trials of subjects exhibiting increased 25934 gene expression, protein levels, or upregulated 25934 activity. In such clinical trials, the expression or
30 activity of a 25934 gene, and preferably, other genes that have been implicated in, for example, a 25934-associated disorder can be used as a "read out" or markers of the phenotype of a particular cell.

25934 Informatics

The sequence of a 25934 molecule is provided in a variety of media to facilitate use thereof. A sequence can be provided as a manufacture, other than an isolated nucleic acid or amino acid molecule, which contains a 25934. Such a manufacture can provide a nucleotide or amino acid sequence, e.g., an open reading frame, in a form which allows examination of the manufacture using means not directly applicable to examining the nucleotide or amino acid sequences, or a subset thereof, as they exists in nature or in purified form. The sequence information can include, but is not limited to, 25934 full-length nucleotide and/or amino acid sequences, partial nucleotide and/or amino acid sequences, polymorphic sequences including single nucleotide polymorphisms (SNPs), epitope sequence, and the like. In a preferred embodiment, the manufacture is a machine-readable medium, e.g., a magnetic, optical, chemical or mechanical information storage device.

As used herein, "machine-readable media" refers to any medium that can be read and accessed directly by a machine, e.g., a digital computer or analogue computer. Non-limiting examples of a computer include a desktop PC, laptop, mainframe, server (e.g., a web server, network server, or server farm), handheld digital assistant, pager, mobile telephone, and the like. The computer can be stand-alone or connected to a communications network, e.g., a local area network (such as a VPN or intranet), a wide area network (e.g., an Extranet or the Internet), or a telephone network (e.g., a wireless, DSL, or ISDN network). Machine-readable media include, but are not limited to: magnetic storage media, such as floppy discs, hard disc storage medium, and magnetic tape; optical storage media such as CD-ROM; electrical storage media such as RAM, ROM, EPROM, EEPROM, flash memory, and the like; and hybrids of these categories such as magnetic/optical storage media.

A variety of data storage structures are available to a skilled artisan for creating a machine-readable medium having recorded thereon a nucleotide or amino acid sequence of the present invention. The choice of the data storage structure will generally be based on the means chosen to access the stored information. In addition, a variety of data processor programs and formats can be used to store the nucleotide sequence information of the present invention on computer readable medium. The sequence information can be represented in a word processing text file, formatted in commercially-available software such as WordPerfect and Microsoft Word, or represented in the form of an ASCII file,

stored in a database application, such as DB2, Sybase, Oracle, or the like. The skilled artisan can readily adapt any number of data processor structuring formats (e.g., text file or database) in order to obtain computer readable medium having recorded thereon the nucleotide sequence information of the present invention.

- 5 In a preferred embodiment, the sequence information is stored in a relational database (such as Sybase or Oracle). The database can have a first table for storing sequence (nucleic acid and/or amino acid sequence) information. The sequence information can be stored in one field (e.g., a first column) of a table row and an identifier for the sequence can be store in another field (e.g., a second column) of the table row.
- 10 The database can have a second table, e.g., storing annotations. The second table can have a field for the sequence identifier, a field for a descriptor or annotation text (e.g., the descriptor can refer to a functionality of the sequence, a field for the initial position in the sequence to which the annotation refers, and a field for the ultimate position in the sequence to which the annotation refers. Non-limiting examples for annotation to
- 15 nucleic acid sequences include polymorphisms (e.g., SNP's) translational regulatory sites and splice junctions. Non-limiting examples for annotations to amino acid sequence include polypeptide domains, e.g., a domain described herein; active sites and other functional amino acids; and modification sites.

By providing the nucleotide or amino acid sequences of the invention in computer readable form, the skilled artisan can routinely access the sequence information for a variety of purposes. For example, one skilled in the art can use the nucleotide or amino acid sequences of the invention in computer readable form to compare a target sequence or target structural motif with the sequence information stored within the data storage means. A search is used to identify fragments or regions of the sequences of the

20 invention which match a particular target sequence or target motif. The search can be a BLAST search or other routine sequence comparison, e.g., a search described herein.

Thus, in one aspect, the invention features a method of analyzing 25934, e.g., analyzing structure, function, or relatedness to one or more other nucleic acid or amino acid sequences. The method includes: providing a 25934 nucleic acid or amino acid sequence; comparing the 25934 sequence with a second sequence, e.g., one or more preferably a plurality of sequences from a collection of sequences, e.g., a nucleic acid or protein sequence database to thereby analyze 25934. The method can be performed in a

30 machine, e.g., a computer, or manually by a skilled artisan.

The method can include evaluating the sequence identity between a 25934 sequence and a database sequence. The method can be performed by accessing the database at a second site, e.g., over the Internet.

As used herein, a "target sequence" can be any DNA or amino acid sequence of
5 six or more nucleotides or two or more amino acids. A skilled artisan can readily recognize that the longer a target sequence is, the less likely a target sequence will be present as a random occurrence in the database. Typical sequence lengths of a target sequence are from about 10 to 100 amino acids or from about 30 to 300 nucleotide
10 residues. However, it is well recognized that commercially important fragments, such as sequence fragments involved in gene expression and protein processing, may be of shorter length.

Computer software is publicly available which allows a skilled artisan to access sequence information provided in a computer readable medium for analysis and comparison to other sequences. A variety of known algorithms are disclosed publicly and
15 a variety of commercially available software for conducting search means are and can be used in the computer-based systems of the present invention. Examples of such software include, but are not limited to, MacPattern (EMBL), BLASTN and BLASTX (NCBI).

Thus, the invention features a method of making a computer readable record of a sequence of a 25934 sequence which includes recording the sequence on a computer
20 readable matrix. In a preferred embodiment the record includes one or more of the following: identification of an ORF; identification of a domain, region, or site; identification of the start of transcription; identification of the transcription terminator; the full length amino acid sequence of the protein, or a mature form thereof; the 5' end of the translated region.

25 In another aspect, the invention features, a method of analyzing a sequence. The method includes: providing a 25934 sequence, or record, in machine-readable form; comparing a second sequence to the 25934 sequence; thereby analyzing a sequence. Comparison can include comparing to sequences for sequence identity or determining if one sequence is included within the other, e.g., determining if the 25934 sequence
30 includes a sequence being compared. In a preferred embodiment the 25934 or second sequence is stored on a first computer, e.g., at a first site and the comparison is performed, read, or recorded on a second computer, e.g., at a second site. E.g., the 25934 or second sequence can be stored in a public or proprietary database in one computer, and

the results of the comparison performed, read, or recorded on a second computer. In a preferred embodiment the record includes one or more of the following: identification of an ORF; identification of a domain, region, or site; identification of the start of transcription; identification of the transcription terminator; the full length amino acid sequence of the protein, or a mature form thereof; the 5' end of the translated region.

In another aspect, the invention provides a machine-readable medium for holding instructions for performing a method for determining whether a subject has a 25934-associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder, wherein the method comprises the steps of determining 25934 sequence information associated with the subject and based on the 25934 sequence information, determining whether the subject has a 25934-associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder and/or recommending a particular treatment for the disease, disorder or pre-disease condition.

The invention further provides in an electronic system and/or in a network, a method for determining whether a subject has a 25934-associated disease or disorder or a pre-disposition to a disease associated with a 25934 wherein the method comprises the steps of determining 25934 sequence information associated with the subject, and based on the 25934 sequence information, determining whether the subject has a 25934-associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder, and/or recommending a particular treatment for the disease, disorder or pre-disease condition. In a preferred embodiment, the method further includes the step of receiving information, e.g., phenotypic or genotypic information, associated with the subject and/or acquiring from a network phenotypic information associated with the subject. The information can be stored in a database, e.g., a relational database. In another embodiment, the method further includes accessing the database, e.g., for records relating to other subjects, comparing the 25934 sequence of the subject to the 25934 sequences in the database to thereby determine whether the subject as a 25934-associated disease or disorder, or a pre-disposition for such.

The present invention also provides in a network, a method for determining whether a subject has a 25934 associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder associated with 25934, said method comprising the steps of receiving 25934 sequence information from the subject and/or information related thereto, receiving phenotypic information associated with the subject, acquiring

information from the network corresponding to 25934 and/or corresponding to a 25934-associated disease or disorder (e.g., a cardiovascular disorder), and based on one or more of the phenotypic information, the 25934 information (e.g., sequence information and/or information related thereto), and the acquired information, determining whether the
5 subject has a 25934-associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder. The method may further comprise the step of recommending a particular treatment for the disease, disorder or pre-disease condition.

The present invention also provides a method for determining whether a subject
10 has a 25934 -associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder, said method comprising the steps of receiving information related to 25934 (e.g., sequence information and/or information related thereto), receiving phenotypic information associated with the subject, acquiring information from the network related to 25934 and/or related to a 25934-associated disease or disorder, and
15 based on one or more of the phenotypic information, the 25934 information, and the acquired information, determining whether the subject has a 25934-associated disease or disorder or a pre-disposition to a 25934-associated disease or disorder. The method may further comprise the step of recommending a particular treatment for the disease, disorder or pre-disease condition.

20 This invention is further illustrated by the following examples which should not be construed as limiting. The contents of all references, patents and published patent applications cited throughout this application are incorporated herein by reference.

EXAMPLES

25

Example 1: Identification and Characterization of Human 25934 cDNA

The human 25934 sequence (Figure 1; SEQ ID NO:1), which is approximately
1512 nucleotides long including untranslated regions, contains a predicted methionine-initiated coding sequence of about 990 nucleotides (nucleotides 403 to 1392 of SEQ ID
30 NO:1; SEQ ID NO:3). The coding sequence encodes a 330 amino acid protein (SEQ ID NO:2).

Example 2: Tissue Distribution of 25934 mRNA

Endogenous human 25934 gene expression was determined using the Perkin-Elmer/ABI 7700 Sequence Detection System which employs TaqMan technology.

5 Briefly, TaqMan technology relies on standard RT-PCR with the addition of a third gene-specific oligonucleotide (referred to as a probe) which has a fluorescent dye coupled to its 5' end (typically 6-FAM) and a quenching dye at the 3' end (typically TAMRA). When the fluorescently tagged oligonucleotide is intact, the fluorescent signal from the 5' dye is quenched. As PCR proceeds, the 5' to 3' nucleolytic activity of Taq polymerase digests
10 the labeled primer, producing a free nucleotide labeled with 6-FAM, which is now detected as a fluorescent signal. The PCR cycle where fluorescence is first released and detected is directly proportional to the starting amount of the gene of interest in the test sample, thus providing a way of quantitating the initial template concentration. Samples can be internally controlled by the addition of a second set of primers/probe specific for a
15 housekeeping gene such as GAPDH which has been labeled with a different fluorophore on the 5' end (typically VIC).

To determine the level of 25934 in various human tissues a primer/probe set was designed using Primer Express (Perkin-Elmer) software and primary cDNA sequence information. Total RNA was prepared from a series of human tissues using an RNeasy
20 kit from Qiagen. First strand cDNA was prepared from 1 µg total RNA using an oligo-dT primer and Superscript II reverse transcriptase (Gibco/BRL). cDNA obtained from approximately 50 ng total RNA was used per TaqMan reaction.

25934 mRNA levels were analyzed in a variety of samples of isolated from the human fetal heart, spinal cord, brain (cortex, hypothalamus, glial cells), ovary, kidney,
25 liver, endothelial cells and smooth muscle cells (SMC). The highest relative 25934 mRNA expression, i.e., greater than 200 relative units, was observed in spinal cord, brain and ovary (Figure 4). High level mRNA expression, i.e., greater than 100 relative units was observed in the kidney, endothelial cells and human umbilical vein endothelial cells (HUVEC) (Figure 4). Expression in liver (a target organ for 25934) was positive but
30 lower relative to other tissues

The relative 25934 mRNA expression as determined by TaqMan assays on mRNA derived a panel of human liver tissues is shown in Figure 5. Figure 6 shows a comparison of the expression of 25934 mRNA and stearoyl CoA desaturase (SCD) mRNA in a panel

of human liver. Expression of 25934 mRNA in human liver is equivalent to the relative expression of the known SCD gene.

Figure 7 shows the inhibition of 25934 mRNA expression in the marmoset animal model. Niacin treatment in the marmoset model results in significant repression of 25934
5 in the liver.

Northern blot hybridizations with various RNA samples can be performed under standard conditions and washed under stringent conditions, i.e., 0.2xSSC at 65°C. A DNA probe corresponding to all or a portion of the 25934 cDNA (SEQ ID NO:1) is used. The DNA is radioactively labeled with ³²P-dCTP using the Prime-It Kit (Stratagene, La
10 Jolla, CA) according to the instructions of the supplier. Filters containing mRNA from mouse hematopoietic and endocrine tissues, and cancer cell lines (Clontech, Palo Alto, CA) is probed in ExpressHyb hybridization solution (Clontech) and washed at high stringency according to manufacturer's recommendations.

15 Example 3: Recombinant Expression of 25934 in Bacterial Cells

In this example, 25934 is expressed as a recombinant glutathione-S-transferase (GST) fusion polypeptide in *E. coli* and the fusion polypeptide is isolated and characterized. Specifically, 25934 is fused to GST and this fusion polypeptide is expressed in *E. coli*, e.g., strain PEB199. Expression of the GST-25934 fusion protein in
20 PEB199 is induced with IPTG. The recombinant fusion polypeptide is purified from crude bacterial lysates of the induced PEB199 strain by affinity chromatography on glutathione beads. Using polyacrylamide gel electrophoretic analysis of the polypeptide purified from the bacterial lysates, the molecular weight of the resultant fusion polypeptide is determined.

25

Example 4: Expression of Recombinant 25934 Protein in COS Cells

To express the 25934 gene in COS cells, the pcDNA/Amp vector by Invitrogen Corporation (San Diego, CA) is used. This vector contains an SV40 origin of replication, an ampicillin resistance gene, an *E. coli* replication origin, a CMV promoter followed by
30 a polylinker region, and an SV40 intron and polyadenylation site. A DNA fragment encoding the entire 25934 protein and an HA tag (Wilson et al. (1984) *Cell* 37:767) or a FLAG tag fused in-frame to its 3' end of the fragment is cloned into the polylinker region

of the vector, thereby placing the expression of the recombinant protein under the control of the CMV promoter.

To construct the plasmid, the 25934 DNA sequence is amplified by PCR using two primers. The 5' primer contains the restriction site of interest followed by approximately twenty nucleotides of the 25934 coding sequence starting from the initiation codon; the 3' end sequence contains complementary sequences to the other restriction site of interest, a translation stop codon, the HA tag or FLAG tag and the last 20 nucleotides of the 25934 coding sequence. The PCR amplified fragment and the pCDNA/Amp vector are digested with the appropriate restriction enzymes and the vector is dephosphorylated using the CIAP enzyme (New England Biolabs, Beverly, MA). Preferably the two restriction sites chosen are different so that the 25934 gene is inserted in the correct orientation. The ligation mixture is transformed into *E. coli* cells (strains HB101, DH5 α , SURE, available from Stratagene Cloning Systems, La Jolla, CA, can be used), the transformed culture is plated on ampicillin media plates, and resistant colonies are selected. Plasmid DNA is isolated from transformants and examined by restriction analysis for the presence of the correct fragment.

COS cells are subsequently transfected with the 25934-pcDNA/Amp plasmid DNA using the calcium phosphate or calcium chloride co-precipitation methods, DEAE-dextran-mediated transfection, lipofection, or electroporation. Other suitable methods for transfecting host cells can be found in Sambrook, J., Fritsh, E. F., and Maniatis, T. *Molecular Cloning: A Laboratory Manual*. 2nd, ed., Cold Spring Harbor Laboratory, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1989. The expression of the 25934 polypeptide is detected by radiolabelling (^{35}S -methionine or ^{35}S -cysteine available from NEN, Boston, MA, can be used) and immunoprecipitation (Harlow, E. and Lane, D. *Antibodies: A Laboratory Manual*, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1988) using an HA specific monoclonal antibody. Briefly, the cells are labeled for 8 hours with ^{35}S -methionine (or ^{35}S -cysteine). The culture media are then collected and the cells are lysed using detergents (RIPA buffer, 150 mM NaCl, 1% NP-40, 0.1% SDS, 0.5% DOC, 50 mM Tris, pH 7.5). Both the cell lysate and the culture media are precipitated with an HA specific monoclonal antibody. Precipitated polypeptides are then analyzed by SDS-PAGE.

Alternatively, DNA containing the 25934 coding sequence is cloned directly into the polylinker of the pCDNA/Amp vector using the appropriate restriction sites. The

resulting plasmid is transfected into COS cells in the manner described above, and the expression of the 25934 polypeptide is detected by radiolabelling and immunoprecipitation using a 25934 specific monoclonal antibody.

- 5 Equivalents Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. Such equivalents are intended to be encompassed by the following claims.

10 **WHAT IS CLAIMED IS:**

1 1. An isolated nucleic acid molecule selected from the group consisting of:
2 a) a nucleic acid molecule comprising a nucleotide sequence which is at least
3 80% identical to the nucleotide sequence of SEQ ID NO:1, 3, or the cDNA insert of the
4 plasmid deposited with the ATCC as Accession Number _____;
5 b) a nucleic acid molecule comprising a fragment of at least 604 nucleotides
6 of the nucleotide sequence of SEQ ID NO: 1, 3, or the cDNA insert of the plasmid
7 deposited with the ATCC as Accession Number _____;
8 c) a nucleic acid molecule which encodes a polypeptide comprising the
9 amino acid sequence of SEQ ID NO:2, or the amino acid sequence encoded by the cDNA
10 insert of the plasmid deposited with the ATCC as Accession Number _____;
11 d) a nucleic acid molecule which encodes a fragment of a polypeptide
12 comprising the amino acid sequence of SEQ ID NO:2, or the amino acid sequence
13 encoded by the cDNA insert of the plasmid deposited with the ATCC as Accession
14 Number _____, wherein the fragment comprises at least 15 contiguous amino acids of
15 SEQ ID NO: 2, or the amino acid sequence encoded by the cDNA insert of the plasmid
16 deposited with the ATCC as Accession Number _____; and
17 e) a nucleic acid molecule which encodes a naturally occurring allelic variant
18 of a polypeptide comprising the amino acid sequence of SEQ ID NO:2, or the amino acid
19 sequence encoded by the cDNA insert of the plasmid deposited with the ATCC as
20 Accession Number _____, wherein the nucleic acid molecule hybridizes to a nucleic
21 acid molecule comprising SEQ ID NO: 1, 3, or a complement thereof, under stringent
22 conditions.

1 2. The isolated nucleic acid molecule of claim 1, which is selected from the
2 group consisting of:
3 a) a nucleic acid comprising the nucleotide sequence of SEQ ID NO: 1, 3, or
4 the cDNA insert of the plasmid deposited with the ATCC as Accession Number _____;
5 and
6 b) a nucleic acid molecule which encodes a polypeptide comprising the
7 amino acid sequence of SEQ ID NO:2, or the amino acid sequence encoded by the cDNA
8 insert of the plasmid deposited with the ATCC as Accession Number _____.

1 3. The nucleic acid molecule of claim 1 further comprising vector nucleic
2 acid sequences.

- 1 4. The nucleic acid molecule of claim 1 further comprising nucleic acid
2 sequences encoding a heterologous polypeptide.
- 1 5. A host cell which contains the nucleic acid molecule of claim 1.
- 1 6. The host cell of claim 5 which is a mammalian host cell.
- 1 7. A non-human mammalian host cell containing the nucleic acid molecule of
2 claim 1.
- 1 8. An isolated polypeptide selected from the group consisting of:
2 a) a polypeptide which is encoded by a nucleic acid molecule comprising a
3 nucleotide sequence which is at least 80% identical to a nucleic acid comprising the
4 nucleotide sequence of SEQ ID NO: 1, 3, the amino acid sequence encoded by the cDNA
5 insert of the plasmid deposited with the ATCC as Accession Number _____, or a
6 complement thereof.
7 b) a naturally occurring allelic variant of a polypeptide comprising the amino
8 acid sequence of SEQ ID NO:2, or the amino acid sequence encoded by the cDNA insert
9 of the plasmid deposited with the ATCC as Accession Number _____, wherein the
10 polypeptide is encoded by a nucleic acid molecule which hybridizes to a nucleic acid
11 molecule comprising SEQ ID NO: 1, 3, or a complement thereof under stringent
12 conditions; and
13 c) a fragment of a polypeptide comprising the amino acid sequence of SEQ
14 ID NO:2, or the amino acid sequence encoded by the cDNA insert of the plasmid
15 deposited with the ATCC as Accession Number _____, wherein the fragment comprises
16 at least 15 contiguous amino acids of SEQ ID NO:2.
- 1 9. The isolated polypeptide of claim 8 comprising the amino acid sequence of
2 SEQ ID NO:2.
- 1 10. The polypeptide of claim 8 further comprising heterologous amino acid
2 sequences.
- 1 11. An antibody which selectively binds to a polypeptide of claim 8.

- 1 12. A method for producing a polypeptide selected from the group consisting
2 of:
- 3 a) a polypeptide comprising the amino acid sequence of SEQ ID NO:2, or the
4 amino acid sequence encoded by the cDNA insert of the plasmid deposited with the
5 ATCC as Accession Number _____;
- 6 b) a polypeptide comprising a fragment of the amino acid sequence of SEQ
7 ID NO:2, or the amino acid sequence encoded by the cDNA insert of the plasmid
8 deposited with the ATCC as Accession Number _____, wherein the fragment comprises
9 at least 15 contiguous amino acids of SEQ ID NO:2, or the amino acid sequence encoded
10 by the cDNA insert of the plasmid deposited with the ATCC as Accession Number
11 _____; and
- 12 c) a naturally occurring allelic variant of a polypeptide comprising the amino
13 acid sequence of SEQ ID NO:2, or the amino acid sequence encoded by the cDNA insert
14 of the plasmid deposited with the ATCC as Accession Number _____, wherein the
15 polypeptide is encoded by a nucleic acid molecule which hybridizes to a nucleic acid
16 molecule comprising SEQ ID NO:1, 3, or a complement thereof under stringent
17 conditions;
- 18 comprising culturing the host cell of claim 5 under conditions in which the nucleic
19 acid molecule is expressed.

- 1 13. A method for detecting the presence of a polypeptide of claim 8 in a
2 sample, comprising:
- 3 a) contacting the sample with a compound which selectively binds to a
4 polypeptide of claim 8; and
- 5 b) determining whether the compound binds to the polypeptide in the sample.

1

1 14. The method of claim 13, wherein the compound which binds to the
2 polypeptide is an antibody.

1 15. A kit comprising a compound which selectively binds to a polypeptide of
2 claim 8 and instructions for use.

1 16. A method for detecting the presence of a nucleic acid molecule of claim 1
2 in a sample, comprising the steps of:

3 a) contacting the sample with a nucleic acid probe or primer which
4 selectively hybridizes to the nucleic acid molecule; and

5 b) determining whether the nucleic acid probe or primer binds to a nucleic
6 acid molecule in the sample.

1 17. The method of claim 16, wherein the sample comprises mRNA molecules
2 and is contacted with a nucleic acid probe.

1 18. A kit comprising a compound which selectively hybridizes to a nucleic
2 acid molecule of claim 1 and instructions for use.

1 19. A method for identifying a compound which binds to a polypeptide of
2 claim 8 comprising the steps of:

3 a) contacting a polypeptide, or a cell expressing a polypeptide of claim 8 with
4 a test compound; and

5 b) determining whether the polypeptide binds to the test compound.

1 20. The method of claim 19, wherein the binding of the test compound to the
2 polypeptide is detected by a method selected from the group consisting of:

3 a) detection of binding by direct detecting of test compound/polypeptide
4 binding;

5 b) detection of binding using a competition binding assay;

6 c) detection of binding using an assay for 25934-mediated desaturase
7 activity.

1 21. A method for modulating the activity of a polypeptide of claim 8
2 comprising contacting a polypeptide or a cell expressing a polypeptide of claim 8 with a
3 compound which binds to the polypeptide in a sufficient concentration to modulate the
4 activity of the polypeptide.

1 22. A method for identifying a compound which modulates the activity of a
2 polypeptide of claim 8, comprising:

- 3 a) contacting a polypeptide of claim 8 with a test compound; and
4 b) determining the effect of the test compound on the activity of the
5 polypeptide to thereby identify a compound which modulates the activity of the
6 polypeptide.

1 23. A method of modulating fatty acid metabolism, in a subject, comprising
2 administering to the subject an agent that modulates the activity or expression of a 25934
3 nucleic acid of claim 1, thereby modulating the conversion of saturated fatty acids to
4 unsaturated fatty acids.

1 24. A method of treating or preventing a cardiovascular disorder, in a subject,
2 comprising administering to the subject an agent that modulates the activity or expression
3 of a 25934 polypeptide of claim 8, in an amount effective to treat or prevent the
4 cardiovascular disorder.

1 25. A method for evaluating the efficacy of a treatment of a cardiovascular
2 disorder, in a subject, comprising:
3 treating a subject with a protocol under evaluation;
4 assessing the expression level of a nucleic acid of claim 1, or a polypeptide
5 of claim 8,
6 wherein a change in the expression level of the nucleic acid or the
7 polypeptide after the treatment, relative to the level before the treatment, is indicative of
8 the efficacy of the treatment of the cardiovascular disorder.

1 26. A method of diagnosing a cardiovascular disorder, in a subject,
2 comprising:
3 evaluating the expression or activity of a nucleic acid of claim 1, or a
4 polypeptide of claim 8, such that, a difference in the level of the nucleic acid or the

- 5 polypeptide relative to a normal subject or a cohort of normal subjects is indicative of the
- 6 cardiovascular disorder.

(See ID No: 1)

CCACGGCTCCGGACTAGTTCACATTTCACAGCTCCTCTCCCGCGCCGGCGCCCTCCCGCCCCCGCGGGCCCTCCTC

TTTCTCGCGCCGAGTTCAGCCCGGGCAGCCATATGGGGGATACGCCAGCAACAGACCGCCGGCCCAAGATCTGCATC

CCTAGGCCACGCTAAGACCCTGGGGAAGAGCGCAGGAGCCCGGAGAAGGGCTGGAAGGAGGGGACTGGACGTCCGGAG

AATTCCCCCTAAAAGGCAGAAGCCCCCGCCCCACCCCTGGAGCTCCGCTCGGGCAGAGCGCCTGCCTGCCTGCCGCTG

(See ID No: 2)

M P G P A T D A G K I P F

CTGCGGGCGCCACCTCGCCAGCC ATG CCA GGC CCG GCC ACC GAC GCG GGG AAG ATC CCT TTC 13 39

(See ID No: 3)

C D A K E E I R A G L E S S E G G G G P 33
TGC GAC GCC AAG GAA GAA ATC CGT GCC GGG CTC GAA AGC TCT GAG GGC GGC GGC GGC CCG 99

E R P G A R G Q R Q N I V W R N V V L M 53
GAG AGG CCA GGC GCG CGC GGG CAG CGG CAG AAC ATC GTC TGG AGG AAT GTC GTC CTG ATG 159

S L L H L G A V Y S L V L I P K A K P L 73
AGC TTG CTC CAC TTG GGG GCC GTG TAC TCC CTG GTG CTC ATC CCC AAA GCC AAG CCA CTC 219

T L L W A Y F C F L L A A L G V T A G A 93
ACT CTG CTC TGG GCC TAC TTC TGC TTC CTC CTG GCC GCT CTG GGT GTG ACA GCT GGT GCC 279

H R L W S H R S Y R A K L P L R I F L A 113
CAT CGC TTG TGG AGC CAC AGG TCC TAC CGG GCC AAG CTG CCT CTG AGG ATA TTT CTG GCT 339

V A N S M A F Q N D I F E W S R D H R A 133
GTC GCC AAC TCC ATG GCT TTC CAG AAT GAC ATC TTC GAG TGG TCC AGG GAC CAC CGA GCC 399

H H K Y S E T D A D P H N A R R G F F F 153
CAC CAC AAG TAC TCA GAG ACG GAT GCT GAC CCC CAC AAT GCC CGC CGG GGC TTC TTC TTC 459

S H I G W L F V R K H R D V I E K G R K 173
TCC CAT ATT GGG TGG CTG TTT GTT CGC AAG CAT CGA GAT GTT ATT GAG AAG GGG AGA AAG 519

L D V T D L L A D P V V R I Q R K Y Y K 193
CTT GAC GTC ACT GAC CTG CTT GCT GAT CCT GTG GTC CGG ATC CAG AGA AAG TAC TAT AAG 579

I S V V L M C F V V P T L V P W Y I W G 213
ATC TCC GTG GTG CTC ATG TGC TTT GTG GTC CCC ACG CTG GTG CCC TGG TAC ATC TGG GGA 639

E S L W N S Y F L A S I L R Y T I S L N 233
GAG AGT CTG TGG AAT TCC TAC TTC TTG GCC TCT ATT CTC CGC TAT ACC ATC TCA CTC AAC 699

I S W L V N S A A H M Y G N R P Y D K H 253
ATC AGC TGG CTG GTC AAC AGC GCC GCC CAC ATG TAT GGA AAC CGG CCC TAT GAC AAG CAC 759

I S P R Q N P L V A L G A I G E G F H N 273
ATC AGC CCT CGG CAG AAC CCA CTC GTC GCT CTG GGT GCC ATT GGT GAA GGC TTC CAT AAT 819

Y H H T F P F D Y S A S E F G L N F N P 293
TAC CAT CAC ACC TTT CCC TTT GAC TAC TCT GCG AGT GAA TTT GGC TTA AAT TTT AAC CCA 879

T T W F I D F M C W L G L A T D R K R A 313
ACC ACC TGG TTC ATT GAT TTC ATG TGC TGG CTG GGG CTG GCC ACT GAC CGC AAA CGG GCA 939

T K P M I E A R K A R T G D S S A * 331
ACC AAG CCG ATG ATC GAG GCC CGG AAG GCC AGG ACT GGA GAC AGC AGT GCT TGA 993

(See ID No: 2)

(See ID No: 3)

Fig. 1 (1 of 2)

ACTTGGAACAGCCATCCCACATGTCTGCCGTTGCCAACCTCGGTTCATGGCTTTGGTACAAATAGCTCTCTGTACATTG
GATCGTGGGAGGGGGCAGAGGGTGGGAAGGAACGAGTCAATGTGGTTGGGAATGTTTTGTTTATCTCAAATAATG
TTGAAATACAATTATCAATG
(See ID NO: 1)

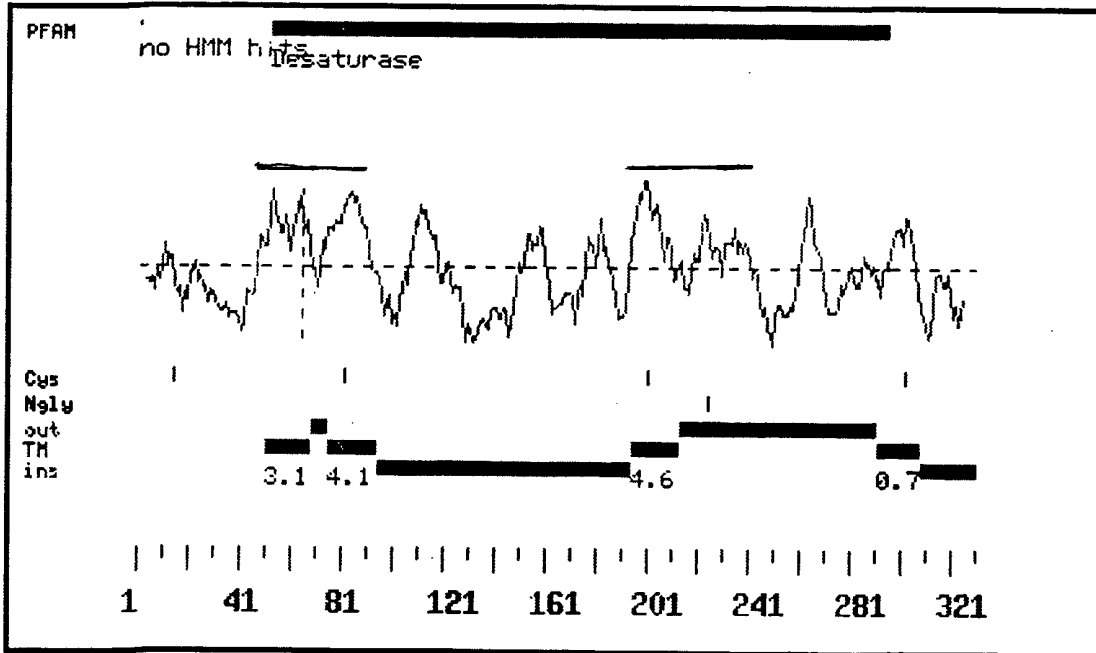


Fig. 2

De saturase: domain 1 of 1, from 51 to 295: score 505.3; E = 4.7e-148
 *->illgalHlgAlyllallptelkwtvivallyvitGGIGITaGyHR
 +l+++lHlgA y + l++ +k t +++e+++ + + lG+TaG+HR
 25934 51 VLMSLLHLGAVYS-LVLIPKAKPLTLLWAYPCFLAA-LGVTAGAHR 95
 LwsHRSYkaklpLrifaifgtlavQgsiyewardHRAHHkysDTdaDPH
 LwsHRSY+aklpLrifla +++A+Q++i+ew+rdHRAHHkys+TdaDPH
 25934 96 LWSHRSYRAKPLLRIFLAVANSHAPONDIFEWSRDHRAHHKYSSETDADPH 145
 danRGFffSHvGwllvkkhPavkskqkldlsDLkaDpVvrfqhryYipl
 +a+RGFffSH+Gw1 v+kh++v+ekg+kld++DL+aDpVvrfq++yY++
 25934 146 NARRGFPPSHIGWLFVRKHRDVIEKGRKLDVTDLLADFPVRIQRKYYKIS 195
 mvmgfiLPtLvpgylwGetfwggfwagflRlvfvlhaTWcVNSaAHkf
 +vln+f++PtLvpy wGe++w++++ a++lR+++ l+ W+VNSaAH++
 25934 196 VVLMCFVVPTLVFVYIWGESLWNSYFLASILRYTISLNI SWLVNSAAHMY 245
 GyrPyDaritPrnnwlvAlvtiGEGwHNfHHTFPyDYRnaekwkweyDIT
 G+rPyD++i+Pr+n lval+++GEG+HN+HHTFP+DY +++e+++ +++T
 25934 246 GNRFPYDKHISPRQNPLVALGAIGEGFHNYHHTFPFDYSASEFG-LNPNPT 294
 k<-
 +
 25934 295 T 295

Fig. 3

Phase 1.2.2 Expression of 25934 w/β2

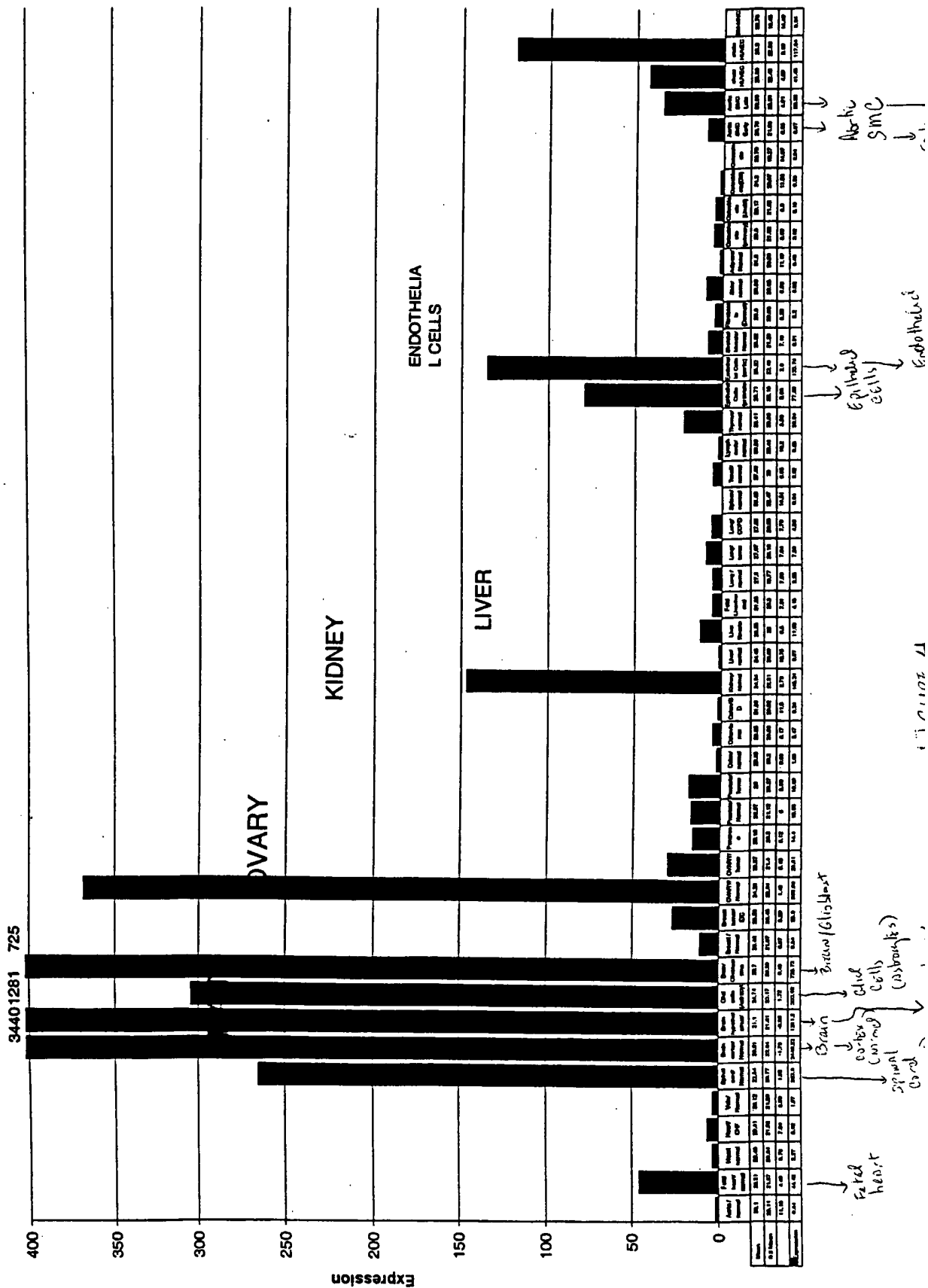
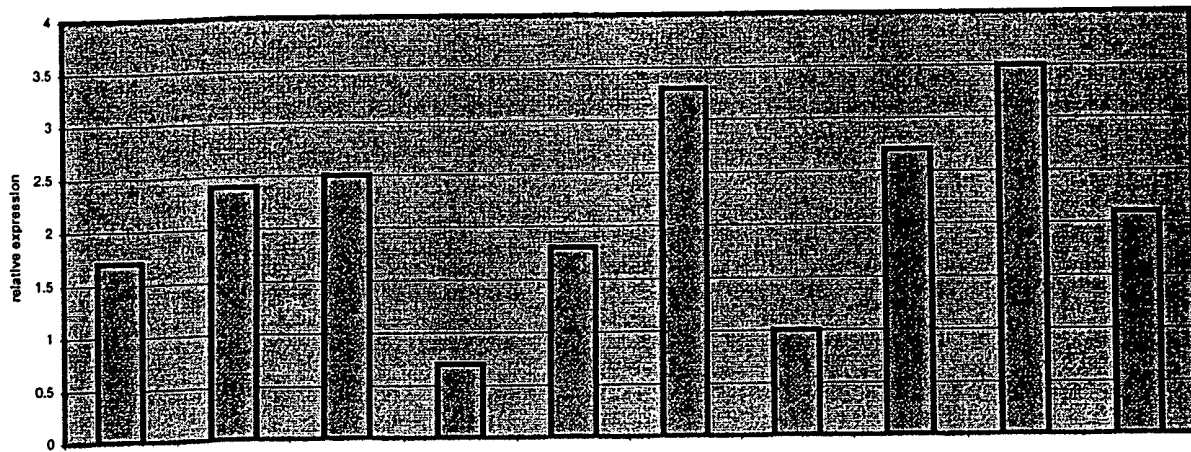


FIGURE 11

Expression of 25934 in Human Liver Tissue



Liver Samples from Individual Donors

FIGURE 5

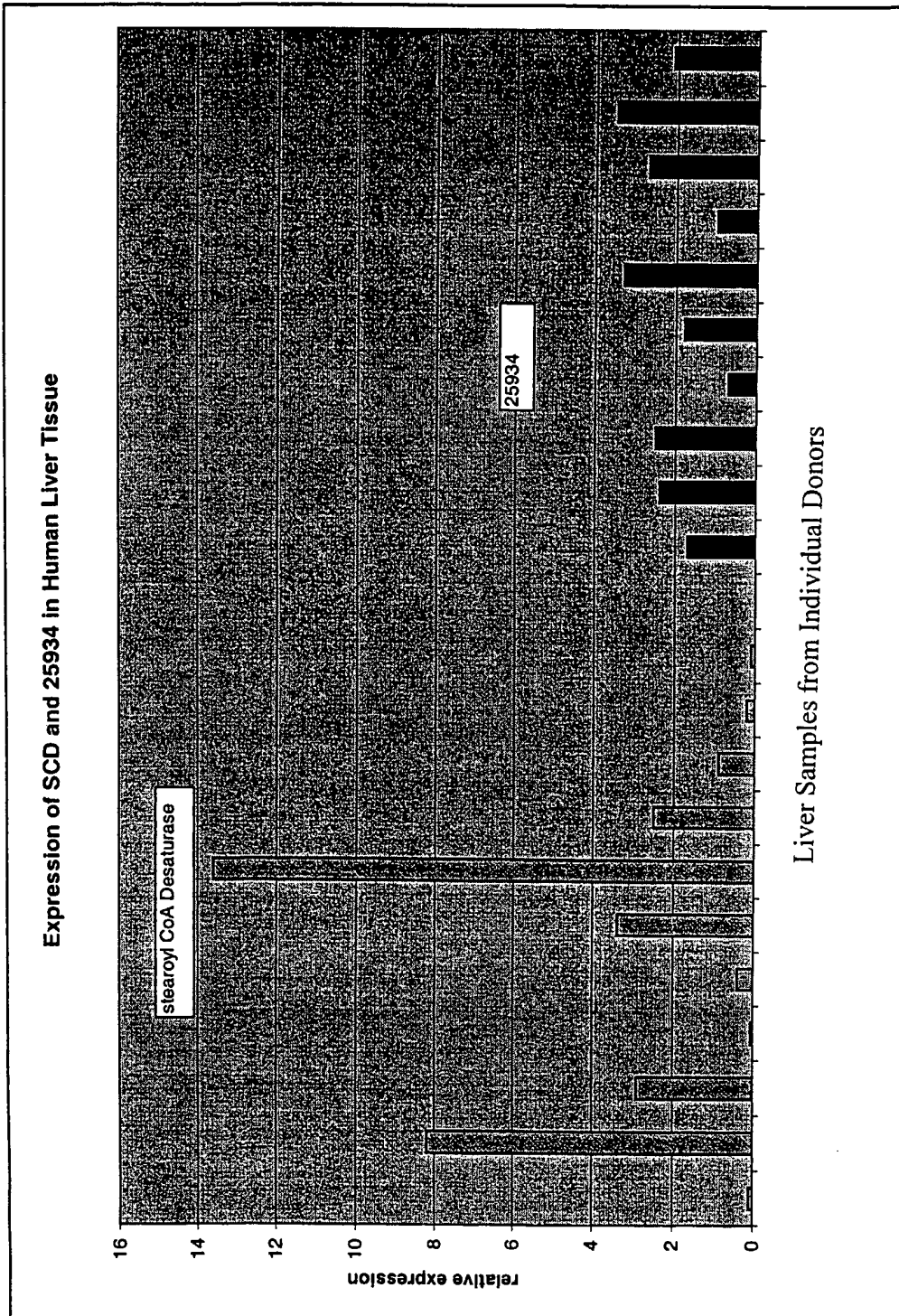


FIGURE 6

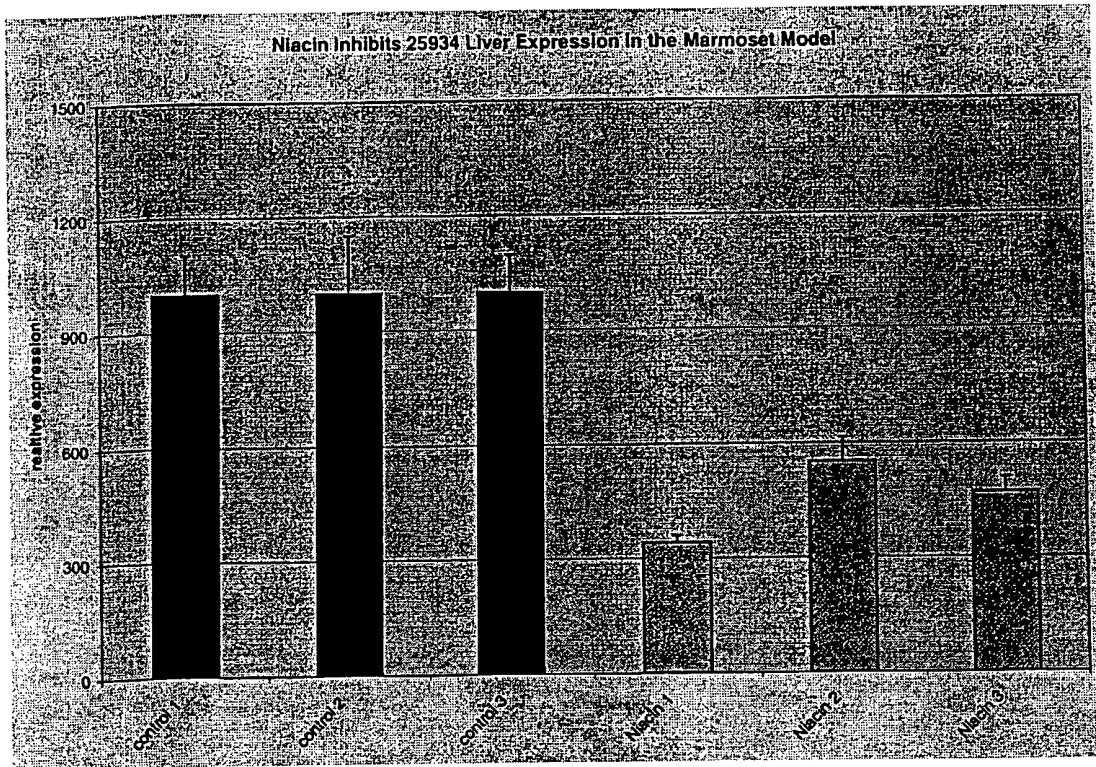


FIGURE 7

CLUSTAL W (1.74) multiple sequence alignment

Homo (Seq ID# 7) MPAHLLQDDISSYTTTTTITAPPSRVLQNGGDKLETMPLYLEDDIRPD--IKDDIYDPT
Rat (Seq ID# 8) MPAHMLQ-EISSSYTTTTITEPPSGNLQNGREKMKKVPLYLEEDIRPE--MREDIHDP
Gallus (Seq ID# 9) MPAHLLQEEEFSSASSTTTVT---SRVTKNGNVIMEKD-LLNHDDVAAERGMVDDLFD
25934 -----MPGPATDAGKIPFCDA---KEEIRAG--L-ESSEGGG
. . . * :

Homo YKDEKGPS-PKVEYVWRNIILMSLLHLGALYGITLIPTCKFYTWLWGVFYFVSALGITA
Rat YQDEEGPP-PKLEYVWRNIILMALLHVGALYGITLIPTSSKVYTLWGFYFYLISALGITA
Gallus YREKEGPK-PPLRYVWRNIILMSLLHLGAIIGLTLIPSAKIOTLAWAILCFVLSALGITA
25934 GPERPGARGQRQNIIVWRNVVLSLLHLGAVYSLVLI PKAKPLTLLWAYFCFLAALGVTA
. . * : * * . . . :

Homo GAHRLWSHRSYKARLPLRFLIIANTMAFQNDVYEWARHDRAHKKFSETHADPHNSRRGF
Rat GAHRLWSHRTYKARLPLRIFLIIANTMAFQNDVYEWARHDRAHKKFSETHADPHNSRRGF
Gallus GSHRLWSHRSYKATLPLRIFLIIANSMAFQNDIYEWARHDHVHKKFSETHADPHNAMRGY
25934 GAHRLWSHRSYRAKPLRIFLAVANSMAFQNDIFEWSRDHRAHKKYSETDADPHNARRGF
* : : * * : * : : * : : * :

Homo FFSHVWLLVRKHPAVKEKSTLDLSDLEAEKLVMFQRRYKPGLLMCFILPTLVPWYF
Rat FFSHVWLLVRKHPAVKEKGGKLDMSDLKAEKLVMFQRRYKPGLLMCFILPTLVPWYC
Gallus FFSHMAWLLVRKHPDVIIEKGQKLDLSDLKADKVMFQRRYKPSVLLCFTLPTLVPWYF
25934 FFSHIGWLFVRKHRDVIIEKGRKLDVTDLLADFPVRIQRKYKISVVLKCFVPTLVPWYI
* : * * : * : : * : : * :

Homo WGETFQNSV FVATFLRYAVVLNATWLVNSAAHLFGYR PYDKNISPRENIVSLGAVGEGF
Rat WGETFLHSLFVSTFLRYTLVNLATWLVNSAAHLYGYR PYDKNIQSRNIVSLGAVGEGF
Gallus WDESIIISFFIPAILRYTLGLNATWLVNSAAHMFQGNRPYDQININPRENPLVSGALGEGF
25934 WGESLWNSYFLASILRYTISLNI SWLVNSAAHMYGNRPYDKHISPRQNPVALGAI GEGF
* . : : * * : : : * : : * * : : * : : * : : * : : * : : * : : * : : * : : * : : *

Homo HNYHHSFPYDYSASEYRWHINFTTFFIDCMAALGLAYDRKKVSKAAILARIKRTGDGNYK
Rat HNYHHAFPYDYSASEYRWHINFTTFFIDCMAALGLAYDRKKVSKAAVLAIRIKRTGDGSHK
Gallus HNYHHTFPYDYSTSEFGWRFNLTAFIDLMLGLASDRKKVSKAVILARKMRTGDGSHK
25934 HNYHHTFPFDYSASEFGLNFNPTTWFIDFMCWLGLATDRKRATKPMIEARKARTGDSSA-
* : : * * * * * . * * * * * : : * * * * * .

Homo SG
Rat SS
Gallus SG
25934 --

Figure 3

**INDICATIONS RELATING TO DEPOSITED MICROORGANISM
OR OTHER BIOLOGICAL MATERIAL**

(PCT Rule 13bis)

<p>A. The indications made below relate to the deposited microorganism or other biological material referred to in the description on page <u>3,4,14,27,31-35,37, 117-119</u>, line: <u>see attached substitute sheets</u></p>	
<p>B. IDENTIFICATION OF DEPOSIT Further deposits are identified on an additional sheet <input type="checkbox"/></p>	
<p>Name of depositary institution American Type Culture Collection (ATCC)</p>	
<p>Address of depositary institution <i>(including postal code and country)</i> 10801 University Blvd. Manassas, Virginia 20110-2209 United States of America</p>	
<p>Date of deposit June 27, 2000</p>	<p>Accession Number PTA-2167</p>
<p>C. ADDITIONAL INDICATIONS <i>(leave blank if not applicable)</i> This information is continued on an additional sheet <input type="checkbox"/></p>	
Empty space for additional indications	
<p>D. DESIGNATED STATES FOR WHICH INDICATIONS ARE MADE <i>(if the indications are not for all designated States)</i></p>	
Empty space for designated states	
<p>E. SEPARATE FURNISHING OF INDICATIONS <i>(leave blank if not applicable)</i></p>	
<p>The indications listed below will be submitted to the International Bureau later <i>(specify the general nature of the indications e.g., "Accession Number of Deposit")</i></p>	
Empty space for separate furnishing of indications	

<p>For receiving Office use only</p>
<p><input type="checkbox"/> This sheet was received with the international application</p>
<p>Authorized officer</p>

<p>For International Bureau use only</p>
<p><input type="checkbox"/> This sheet was received by the International Bureau on: 16. July 01.</p>
<p>Authorized officer J. N. Adams.</p>