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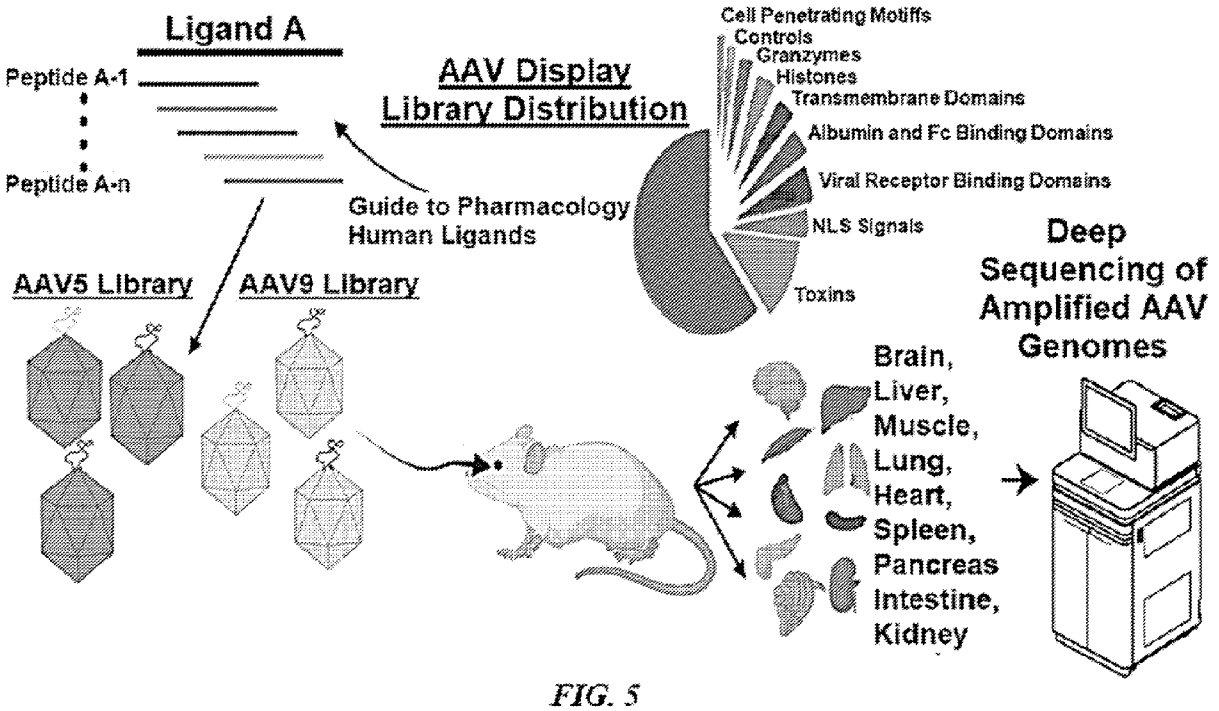

FIG. 5

(57) **Abstract:** The disclosure provides methods for coating viruses and viral particles with membrane fragments to circumvent immune responses, the coated viruses and viral particles resulting therefrom, and the use of the coated viruses and viral particles in various applications, including gene therapy and genome engineering applications. The disclosure further provides methods for making ligand-modified viruses and viral particles, the ligand- modified modified viruses and viral particles resulting therefrom, and the use of the ligand-modified modified viruses and viral particles in various applications, including gene therapy and genome engineering applications.

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MODIFIED VIRUSES AND VIRAL PARTICLES, METHODS OF MAKING, AND USES THEREOF

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority under 35 U.S.C. §119 from Provisional Application Serial No. 63/170,100 filed April 2, 2021, the disclosure of which is incorporated herein by reference.

STATEMENT OF GOVERNMENT SUPPORT

[0002] This invention was made with Government support under Grant Nos. CA222826, GM123313, and HG009285, awarded by the National Institutes of Health. The Government has certain rights in the invention.

TECHNICAL FIELD

[0003] The disclosure provides methods for coating viruses and viral particles with membrane fragments to circumvent immune responses, the coated viruses and viral particles resulting therefrom, and the use of the coated viruses and viral particles in various applications, including gene therapy and genome engineering applications. The disclosure further provides methods for making ligand-modified viruses and viral particles, the ligand-modified modified viruses and viral particles resulting therefrom, and the use of the ligand-modified modified viruses and viral particles in various applications, including gene therapy and genome engineering applications.

SEQUENCE LISTING

[0004] The instant application contains a Sequence Listing which has been submitted electronically in ASCII format and is hereby incorporated by reference in its entirety. Said ASCII copy, generated on April 1, 2022, is named Sequence_ST25.txt and is 3,604,142 bytes in size.

BACKGROUND

[0005] Viral gene therapy is a method to directly target mutations at a molecular level. Viruses are effective at delivering genes into the nucleus of the cell, but are easily recognized by the immune system, which can lead to increased side effects and rapid clearance. Adeno-associated virus (AAV) has been used increasingly as a promising vector for viral gene therapy. AAV is a small, non-enveloped virus that can transduce both dividing and quiescent cells, making it useful for many applications in viral gene therapy. The host's immune response to AAV is not a systemic response, and is limited to neutralizing antibodies, which leads to clearance, but no side effects. AAV is also nonpathogenic and

therefore generally regarded as safe. Therefore, AAV has great potential in viral gene therapy if shielded from the immune system during transport.

[0006] There are currently multiple strategies being developed in an attempt to improve gene delivery by AAVs. A common method is shielding the AAV in a polymer such as polyethylene glycol (PEG). The difficulty with this strategy is that above an important ratio of polymer added to the virus, the transduction efficiency is significantly affected. Therefore, there is an upper limit to the amount of polymer that can be used to coat the viral vector; however, this upper limit is not sufficient to fully protect from the immune response. For example, one paper found that the upper limit of PEG that did not interfere with viral transduction was only protective against antibodies up to 6% of their normal concentration in human serum. Therefore, this method is not feasible in human trials, where the levels of antibodies in serum would completely neutralize the shielding effect. Also there have been recent studies indicating some patients receiving PEG coated nanoparticles develop antibodies against the polymer. Extracellular vesicles or exosomes naturally produced by cells have also been used to encapsulate AAVs, similarly synthetic lipid nanoparticles or liposomes have been used as a shield. These methods are able to protect against antibodies at higher concentrations than the polymer coating method however the transduction efficiencies often decreased. In general, it appears the larger size of these vesicle or exosomes bound AAVs hinders their ability to disseminate throughout the body and infect a wide range of cell types. For each of these methods, the addition of certain proteins or other molecules have been investigated as a way to improve efficiency, and while cell targeting and transduction efficiencies can be improved, the neutralizing effects of antibodies still present a challenge.

SUMMARY

[0007] The disclosure provides a viral vector having a capsid protein comprising a heterologous targeting peptide in a range of 10-30 amino acids in length. In one embodiment, the heterologous targeting peptide is about 15-25 amino acids in length. In another or further embodiment, the heterologous targeting peptide is about 20 amino acids in length. In another or further embodiment, the viral vector is an adeno-associated virus (AAV). In another or further embodiment, the viral vector is a lentiviral vector. In another or further embodiment, the capsid protein is a VP1 capsid protein. In another or further embodiment, the capsid protein is a VP2 capsid protein. In another or further embodiment, the capsid protein is a VP3 capsid protein. In another or further embodiment, the heterologous targeting peptide is

inserted into an AAV capsid protein at loop 1 and/or loop 2. In another or further embodiment, the viral vector is an AAV5. In another or further embodiment, the viral vector is an AAV9. In another or further embodiment, the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide. In another or further embodiment, the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide. In another or further embodiment, the heterologous targeting peptide targets the viral vector to hepatocytes or liver tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to neuronal cells or brain tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to pancreatic cells or pancreas tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to cardiac cells or heart tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to lung tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to intestinal tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to spleen tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to renal cells or kidney tissue. In another or further embodiment, the heterologous targeting peptide targets the viral vector to muscle cells or tissue.

[0008] The disclosure also provides an adeno-associated virus (AAV) capsid protein comprising a heterologous targeting peptide cloned into loop 1 and/or loop 2 of the capsid protein, wherein the heterologous targeting peptide is about 10-30 amino acids in length. In one embodiment, the capsid protein is a VP1 capsid protein. In another embodiment, the capsid protein is a VP2 capsid protein. In still another embodiment, the capsid protein is a VP3 capsid protein. In another or further embodiment, the heterologous targeting peptide is about 15-25 amino acids in length. In another or further embodiment, the heterologous targeting peptide is about 20 amino acids in length. In another or further embodiment, the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide. In another or further embodiment, the heterologous targeting peptide targets hepatocytes or liver tissue. In another or further embodiment, the heterologous targeting peptide targets neuronal cells or brain tissue. In another or further embodiment, the heterologous targeting peptide targets pancreatic cells or pancreas tissue. In another or further embodiment, the heterologous targeting peptide targets cardiac cells or heart tissue. In another or further embodiment, the heterologous targeting

peptide targets lung tissue. In another or further embodiment, the heterologous targeting peptide targets intestinal tissue. In another or further embodiment, the heterologous targeting peptide targets spleen tissue. In another or further embodiment, the heterologous targeting peptide targets renal cells or kidney tissue. In another or further embodiment, the heterologous targeting peptide targets muscle cells or tissue.

[0009] The disclosure also provides recombinant AAV (rAAV) comprising a capsid protein of the disclosure comprising a targeting peptide.

[0010] The disclosure also provides a recombinant AAV (rAAV) comprising a capsid protein having a targeting peptide in loop 1 and/or loop 2 wherein the targeting peptide is independently selected from SEQ ID Nos:5865 to 11445. In another or further embodiment, the recombinant AAV further comprises a heterologous polynucleotide for gene delivery In another or further embodiment, the heterologous polynucleotide is a therapeutic gene.

[0011] The disclosure also provides a composition comprising the recombinant rAAV of the disclosure. In one embodiment, the composition further comprises a pharmaceutically acceptable carrier.

[0012] The disclosure also provides a method for delivering a transgene to a subject comprising: administering a recombinant AAV (rAAV) to a subject, wherein the rAAV comprises: (i) a capsid protein of the disclosure comprising a targeting peptide, and (ii) at least one transgene, and wherein the rAAV infects cells of a target tissue of the subject. In another or further embodiment, the at least one transgene encodes a protein. In another or further embodiment, the protein is an immunoglobulin heavy chain or light chain or fragment thereof. In another or further embodiment, the at least one transgene encodes a small interfering nucleic acid. In another or further embodiment, the small interfering nucleic acid is a miRNA. In another or further embodiment, the small interfering nucleic acid is a miRNA sponge or TuD RNA that inhibits the activity of at least one miRNA in the subject or animal. In another or further embodiment, the miRNA is expressed in a cell of the target tissue. In another or further embodiment, the target tissue is skeletal muscle, heart, liver, pancreas, brain or lung. In another or further embodiment, the transgene expresses a transcript that comprises at least one binding site for a miRNA, wherein the miRNA inhibits activity of the transgene, in a tissue other than the target tissue, by hybridizing to the binding site. In another or further embodiment, the at least one transgene encodes a gene product that mediates genome editing. In another or further embodiment, the transgene comprises a tissue specific promoter or inducible promoter. In another or further embodiment, the tissue specific

promoter is a liver-specific thyroxin binding globulin (TBG) promoter, an insulin promoter, a glucagon promoter, a somatostatin promoter, a pancreatic polypeptide (PPY) promoter, a synapsin-1 (Syn) promoter, a creatine kinase (MCK) promoter, a mammalian desmin (DES) promoter, a a-myosin heavy chain (a-MHC) promoter, or a cardiac Troponin T (cTnT) promoter. In another or further embodiment, the rAAV is administered intravenously, intravascularly, transdermally, intraocularly, intrathecally, orally, intramuscularly, subcutaneously, intranasally, or by inhalation. In another or further embodiment, the subject is selected from a mouse, a rat, a rabbit, a dog, a cat, a sheep, a pig, and a non-human primate. In another or further embodiment, the subject is a human.

[0013] The disclosure provides an isolated nucleic acid encoding an AAV capsid protein containing an amino acid sequence selected from the group consisting of SEQ ID No:5865 to 11444 and 11445. The disclosure also provides a composition comprising the isolated AAV capsid protein.

[0014] The disclosure also provides a kit for producing a rAAV, the kit comprising: a container housing an isolated nucleic acid encoding a capsid protein comprising a targeting peptide of the disclosure. In one embodiment, the kit further comprises instructions for producing the rAAV. In another or further embodiment, the kit further comprises at least one container housing a recombinant AAV vector, wherein the recombinant AAV vector comprises a transgene.

[0015] The disclosure also provides a method for coating a virus or viral particle with membrane fragments comprising: lysing donor cells in a hypotonic solution, which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane; removing cells and cell debris by one or more rounds of centrifugation, leaving a membrane enriched fraction; extruding the membrane enriched faction through polycarbonate membrane(s) to generate purified membrane fragments; and coating virus or viral particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s). In another or further embodiment, the viruses or viral particles are non-enveloped viruses or viral particles. In another or further embodiment, the viruses or viral particles are enveloped viruses or viral particles which have had their viral envelope removed. In another or further embodiment, the viruses or viral particles are selected from retroviruses, adenovirus, adeno-associated virus, hybrid adenoviruses, alphavirus, herpes simplex virus, poxvirus, Epstein-Barr virus and lentivirus. In another or further embodiment, the viruses or viral particles are adeno-associated viruses (AAV). In another or further

embodiment, the viruses or viral particles have been modified by directed evolution to have increased neutralizing antibody-evasion properties, as well as enhanced gene delivery, gene targeting, and/or enhanced capacity to infect. In another or further embodiment, the viruses or viral particles have been modified by one or more amino acid substitutions in one or more regions of a viral capsid protein so as to reduce the affinity of the viral capsid protein for the major histocompatibility complex. In another or further embodiment, the donor cells are mammalian cells. In another or further embodiment, the donor cells are human cells. In another or further embodiment, the donor cells are human stem cells, human progenitor cells, human primary cells, human somatic cells, human germline cells, or human tumor cells. In another or further embodiment, the membranes of the donor cells have been modified to express or present a targeting ligand. In another or further embodiment, the targeting ligand is used to improve entry of the coated viruses or viral particles into target cells, inhibit components of the immune response to the coated viruses or viral particles, or to target the coated viruses or viral particles to certain cell types or organs In another or further embodiment, the targeting ligand is a peptide, antibody or antibody fragment. In another or further embodiment, the targeting ligand comprises a peptide of any one of SEQ ID Nos:5865 to 11445.

[0016] The disclosure also provides coated viruses or viral particles made by the method described above. In another or further embodiment, the coated viruses or viral particles have been modified to comprise a targeting ligand. In another or further embodiment, the coated viruses or viral particles are used to deliver transgene(s) into target cells. In another or further embodiment, the coated viruses or viral particles are used to genome engineer target cells.

[0017] The disclosure also provides a pharmaceutical composition comprising the coated viruses or viral particles and a pharmaceutically acceptable carrier, diluent, binder and/or filler.

[0018] The disclosure also provides a method of treating a subject suffering from a disease or disorder in need of treatment thereof, comprising administering the coated viruses or viral particles or the pharmaceutical composition of the disclosure.

[0019] The disclosure also provides an engineered viral particle comprising an artificially prepared lipid envelope.

[0020] The disclosure provides a method of preparing an engineered retroviral particle, the method comprising treating a retroviral particle with a detergent to remove a

lipid envelop to obtain naked retroviral particles, isolating the naked retroviral particles and co-extruding a lipid envelop with the naked retroviral particles to obtain an engineered retroviral particle.

DESCRIPTION OF DRAWINGS

[0021] **Figure 1A-B** provides embodiment of methodologies that can be used to **(A)** prepare cell membrane fragments for **(B)** coating adeno-associated viruses (AAV).

[0022] **Figure 2** illustrates how the coated AAVs of the disclosure can provide for higher transgene expression *in vivo* by minimizing immune detection and clearance.

[0023] **Figure 3** presents the standard recognized model of the relationship between 'uncoated' AAV capsid dose and outcome of gene transfer following systemic vector delivery. Low 'uncoated' capsid doses are more likely to be neutralized by anti-AAV antibodies, even low-titer NAb. This results in lack of efficacy. Higher 'uncoated' capsid doses overcome this limitation, leading to therapeutic efficacy. Capsid-specific T-cell activation is detected as the total uncoated capsid dose administered increases. This does not affect efficacy until an important threshold is reached, above which immune-mediated clearance of transduced target cells results in loss of efficacy. The 'coated' AAVs of the disclosure, unlike the 'uncoated' AAVs described above and presented in **FIG. 3**, can achieve efficacy at much lower doses, as the 'coated' AAVs made by the methods presented herein are far less likely to be neutralized by anti-AAV antibodies.

[0024] **Figure 4** illustrates how the coated AAVs of the disclosure can be engineered to have tissue specificity using targeting ligands, thereby providing for programmable tropism.

[0025] **Figure 5** shows an overall workflow for rationally engineering AAV variants and screening them *in vivo*. The pie chart depicts the distribution of categories from which protein sources of peptides were selected. These proteins were tiled into 20-mer peptides and synthesized on an oligonucleotide pool. DNA coding for the peptides were then inserted into distinct locations on the AAV capsid enabling production of AAV5 and AAV9 variants for a total of ~1.1 million capsid variants. AAVs were then injected retro-orbitally into replicate mice. Two weeks later, organs, including the liver, spleen, brain, large intestine, lung, kidney, heart, skeletal muscle, and pancreas were harvested. DNA was isolated from these tissues, the peptide insertion region was selectively PCR-amplified and prepared for sequencing, and then paired-end 100 deep sequencing was performed using the Illumina NovaSeq platform to analyze transducing variants.

[0026] **Figure 6A-B** shows engineering peptide-displaying AAV variants. **(a)** Icosahedral structural rendering of the AAV5 capsid. Surface residues are colored according to their distance from the capsid center with specific amino acid residues highlighted to illustrate the location of the Loop1 (red) and Loop2 (salmon) inserts. **(b)** Cloning strategy shown for inserting the peptide library into the wild-type AAV backbone with flanking G-S residues, AAV5-Loop1 shown as an example. The AAV backbone was modified at the desired location to insert two DNA sequences encoding Glycine and Serine, along with two PaqCI type IIS restriction sites flanking an approximately 60-base pair filler region to be cut out. The peptide insert library is flanked by two PaqCI recognition sites for ligation upon restriction digest.

[0027] **Figure 7A-D** shows plasmid and capsid level analysis. Polar plots illustrating the proportion of peptide library recovered after cloning the library into the cap gene and then packing the plasmid pool into functional AAV capsids for **(a)** AAV5-Loop1, **(b)** AAV5-Loop2, **(c)** AAV9-Loop1, and **(d)** AAV9-Loop2. Numbers on the perimeter represent total peptides quantified.

[0028] **Figure 8A-E** shows a method of Identifying top transducing AAV variants. **(a)** On the left, a heatmap illustrating the AAV variants across all capsids and loops which have a log2fc > 1 in both replicates, and FDR adjusted $p < .05$ (one sample T test comparing capsid counts to organ counts). Shown to the right is a heatmap showing the levenshtein distance between the peptides in the left heatmap. The data has been filtered to remove peptides with no detected homology within the dataset. **(c-e)** Heatmaps showing final hits which have a Z-score (Z-normalized log2FC) greater than 2.5 in any organ, a log2(capsid count) > 3, and at least one homologous peptide detected in the same organ. Heatmaps are separated by AAV serotype/insertion site.

[0029] **Figure 9A-B** shows identifying pan-organ and organ specific AAV variants. **(a)** Pan-organ transducing AAV variants. Pan-organ specific AAVs were identified by taking the average log2FC across all organs for each capsid/loop. Shown in the heatmap are all variants which have an average (across all organs) log2FC greater than 1. **(b)** Organ specific AAV variants. Organ specific AAVs were identified via an ANOVA test, comparing the log2FC values in one organ versus all the others. AAV variants were then ranked to identify the variants with the lowest p-values. The log2FC values for the AAV variants with the 5 lowest p values for each organ are plotted in the heatmap.

[0030] **Figure 10A-C** shows an overview of lentiviral display strategy. **(a)** Plasmid map showing key genetic material packaged into lentiviral particles. Each lentiviral particle contains the RNA coding for a displayed peptide, as well as a puromycin resistance gene under the control of the same promoter. **(b)** Cartoon diagram of engineered lentivirus, showing displayed peptides and mutant VSVG protein. **(c)** Cartoon diagram showing cell lines of interest screened via lentiviral display strategy. Cell lines cover a variety of lineages and tissue types to enable development of tissue specific lentiviral particles.

[0031] **Figure 11** provides a table of AAV targeting hits in the indicated tissues.

[0032] **Figure 12** provides a table of Lentivirus targeting hits in the indicated cells.

[0033] **Figure 13** presents a wild type DNA and peptide sequences for AAV5. Further indicated is the Loop 1 and Loop 2 insertion sites in the wildtype sequences for AAV5, as highlighted in lighter gray and medium gray, respectively.

[0034] **Figure 14** presents a wild type DNA and peptide sequences for AAV9. Further indicated is the Loop 1 and Loop 2 insertion sites in the wildtype sequences for AAV9, as highlighted in lighter gray and medium gray, respectively.

DETAILED DESCRIPTION

[0035] As used herein and in the appended claims, the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a virus" includes a plurality of such viruses and reference to "the viral particle" includes reference to one or more viral particles and equivalents thereof known to those skilled in the art, and so forth.

[0036] Also, the use of “or” means “and/or” unless stated otherwise. Similarly, “comprise,” “comprises,” “comprising” “include,” “includes,” and “including” are interchangeable and not intended to be limiting.

[0037] It is to be further understood that where descriptions of various embodiments use the term “comprising,” those skilled in the art would understand that in some specific instances, an embodiment can be alternatively described using language “consisting essentially of” or “consisting of.”

[0038] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this disclosure belongs. Although many methods and reagents are similar or equivalent to those described herein, the exemplary methods and materials are disclosed herein.

[0039] All publications mentioned herein are incorporated herein by reference in full for the purpose of describing and disclosing the methodologies, which might be used in connection with the description herein. Moreover, with respect to any term that is presented in one or more publications that is similar to, or identical with, a term that has been expressly defined in this disclosure, the definition of the term as expressly provided in this disclosure will control in all respects.

[0040] It should be understood that this disclosure is not limited to the particular methodology, protocols, and reagents, etc., described herein and as such may vary. The terminology used herein is for the purpose of describing particular embodiments or aspects only and is not intended to limit the scope of the present disclosure.

[0041] Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients or reaction conditions used herein should be understood as modified in all instances by the term "about." The term "about" when used to described the present invention, in connection with percentages means ±1%.

[0042] The term "purified" when used in reference to viruses or viral particles disclosed herein refers to the fact that the virus is removed from the majority of other cellular components from which it was generated or in which it is typically present in nature, or from the coating agents disclosed herein. The coated viruses or viral particles disclosed herein are typically prepared to the state where they are purified or semi-purified.

[0043] An "effective amount" as the term is used herein, is used to refer to an amount that is sufficient to produce at least a reproducibly detectable amount of the desired results. An effective amount will vary with the specific conditions and circumstances. Such an amount can be determined by the skilled practitioner for a given situation.

[0044] The term "therapeutically effective amount" refers to an amount that is sufficient to affect a therapeutically significant reduction in one or more symptoms of the condition when administered to a typical subject who has the condition. A therapeutically significant reduction in a symptom is, e.g. about 10%, about 20%, about 30%>, about 40%>, about 50%, about 60%, about 70%, about 80%, about 90%, about 100%, or more as compared to a control or non-treated subject.

[0045] The term "treat" or "treatment" refers to therapeutic treatment wherein the object is to eliminate or lessen symptoms. Beneficial or desired clinical results include, but are not limited to, elimination of symptoms, alleviation of symptoms, diminishment of extent

of condition, stabilized (i.e., not worsening) state of condition, delay or slowing of progression of the condition.

[0046] The terms "patient", "subject" and "individual" are used interchangeably herein, and refer to an animal, particularly a human, to whom treatment including prophylactic treatment is provided. This includes human and non-human animals. The term "non-human animals" and "non-human mammals" are used interchangeably herein includes all vertebrates, e.g., mammals, such as non-human primates, (particularly higher primates), sheep, dog, rodent (e.g. mouse or rat), guinea pig, goat, pig, cat, rabbits, cows, and non-mammals such as chickens, amphibians, reptiles etc. In one embodiment, the subject is human. In another embodiment, the subject is an experimental animal or animal substitute as a disease model. "Mammal" refers to any animal classified as a mammal, including humans, non-human primates, domestic and farm animals, and zoo, sports, or pet animals, such as dogs, cats, cattle, horses, sheep, pigs, goats, rabbits, etc. Patient or subject includes any subset of the foregoing, e.g., all of the above, but excluding one or more groups or species such as humans, primates or rodents. A subject can be male or female. A subject can be a fully developed subject (*e.g.*, an adult) or a subject undergoing the developmental process (*e.g.*, a child, infant or fetus).

[0047] Gene therapy is the process of introducing foreign genomic materials into host cells to elicit a therapeutic benefit. Although initially the main focus of gene therapy was on special genetic disorders, now diverse diseases with different patterns of inheritance and acquired diseases are targets of gene therapy. Basically, gene therapy is an intracellular delivery of genomic materials (transgene) into specific cells to generate a therapeutic effect by correcting an existing abnormality or providing the cells with a new function. Different types of gene delivery systems may be applied in gene therapy to restore a specific gene function or turning off a special gene(s). The ultimate goal of gene therapy is single administration of an appropriate material to replace a defective or missing gene. One of the successful gene therapy systems available today are viral vectors, such as retrovirus, adenovirus (types 2 and 5), adeno-associated virus, herpes virus, pox virus, human foamy virus (HFV), and lentivirus. All viral vector genomes have been modified by deleting some areas of their genomes so that their replication becomes deranged and it makes them safer, but the system has some problems, such as their marked immunogenicity that causes induction of inflammatory system leading to degeneration of transduced tissue; and toxin production, including mortality, the insertional mutagenesis; and their limitation in transgenic

capacity size. During the past few years some viral vectors with specific receptors have been designed that could transfer the transgenes to some other specific cells, which are not their natural target cells (retargeting).

[0048] Adenoviral vectors have been isolated from a large number of different species, and more than 100 different serotypes have been reported. Most adults have been exposed to the adenovirus serotypes most commonly used in gene therapy (types 2 and 5). Adenoviruses type 2 and 5 can be utilized for transferring both dividing and nondividing cells and have low host specificity so can be used for gene delivery into large range of tissues.

[0049] Adeno-associated vectors (AAV) are like adenoviral vectors in their features but because of having some deficiency in their replication and pathogenicity, are safer than adenoviral vectors. In human, AAVs are not associated with any disease. Another special character of AAV is their ability to integrate into a specific site on chromosome 19 with no noticeable effects cause long-term expression *in vivo*. The major disadvantages of these vectors are complicated process of vector production and the limited transgene capacity of the particles (up to 4.8 kb). AAVs have been used in the treatment of some diseases, such as CF, hemophilia B, Leber congenital amaurosis, and AAT (Alpha-1 antitrypsin) deficiency.

[0050] Current AAV gene delivery system does not allow for repeated treatments, due to the immune response generated in the patient if a second dose is attempted. Currently there are methods of shielding AAVs to avoid this scenario but experimental data shows that there is an improvement only for avoiding small amounts of neutralizing antibodies. As stated above, methods like coating with polymers face a challenge of the proper ratio of AAV to polymer. If the polymer concentration is too high then the ability of the AAV to enter the cell is compromised, but if the polymer concentration is low enough to preserve the transduction efficiency, then there is little protection against antibodies. Vesicle and exosome encapsulation can also be a way to shield the AAV from the immune system but the increase in size generally reduces the ability of the AAV to infect a broad range of cell types, which traditionally was one of the advantages to using AAVs. Therefore, these methods are not effective in normal physiological conditions. One of the main advantages of AAVs is their small size (25 nm) which allows them to transduce most tissues of the body. The strategies employing native vesicles may help get around the response of the immune system but the increased size negatively impacts transduction efficiencies.

[0051] The disclosure provides methods that can be used to coat AAV and other viruses by using fragments of purified cell membranes to coat the viruses. As such, the

methods of the disclosure are especially suited to coating naturally occurring non-enveloped viruses, like adenoviruses or AAVs. For example, one can coat a non-enveloped AAV using the methods disclosed herein, thereby providing for a coated AAV of a specific size that has the surface properties of a native cell with the advantages of small size. Additionally, the methods of the disclosures can be used with enveloped viruses, like retroviruses. In such a case, the envelope of the virus may be first removed using standard methods, like detergent treatment, and then be coated with membrane fragment using the methods disclosed herein. In doing so, new, non-standard applications for the 'coated' virus can be possibly realized, such as an increased host range, and programmable tropism. Accordingly, the methods of the disclosure allow for, *e.g.*, the production of coated viruses or viral particles that are recognized as self by the immune system, thereby preventing an immunogenic response, while also retaining the ability to transduce many different cell types.

[0052] The disclosure further provides methods for rationally engineering novel viral variants (e.g., AAV variants) and identifying transducing capsids which exhibit strong activity and organ specificity *in vivo* (see **FIG. 5).** In a particular embodiment, the disclosure provides a viral vector having a capsid protein comprising a heterologous targeting peptide of 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 amino acids in length, or a range that includes or is between any two of the foregoing amino acid lengths (*e.g.*, 10-30 amino acids in length, 15-25 amino acids in length, etc.). In a particular embodiment, the heterologous targeting peptide is about 20 amino acids in length. In regards to the transducing capsid, the capsid can be of any type of capsid proteins, including but not limited to, VP1, VP2, VP3, N protein, and HHV capsid portal protein. In a particular embodiment, the capsid protein is a VP1 capsid protein. In another embodiment, the capsid protein is a VP2 capsid protein. In yet another embodiment, the capsid protein is a VP3 capsid protein. Examples of viruses and viral particles, or vectors encoding thereof, which can be used in the methods of the disclosure include, but are not limited to, retroviruses, adenovirus, adeno-associated virus, hybrid adenoviruses, alphavirus, herpes simplex virus, poxvirus, Epstein-Barr virus and lentivirus.

[0053] Adenoviruses are able to deliver large DNA particles (up to 38 kb), but in contrast to retroviruses, as they would not integrate into the host genome, their gene expression is too short term. Natural and acute immunologic responses against adenoviruses have made their clinical application limited to a few tissues, such as liver, lung (especially for CF (Cystic Fibrosis) treatment), or localized cancer gene therapy. Another viral gene

delivery system useful in the present methods utilizes adenovirus-derived vectors. The genome of an adenovirus can be manipulated, such that it encodes and expresses a gene product of interest but is inactivated in terms of its ability to replicate in a normal lytic viral life cycle. See, for example, Berkner *et al.*, *BioTechniques* 6:616 (1988); Rosenfeld *et al.*, Science 252:431-434 (1991); and Rosenfeld *et al.*, *Cell* 68: 143-155 (1992). Suitable adenoviral vectors derived from the adenovirus strain Ad type 5 dl324 or other strains of adenovirus (*e.g.*, Ad2, Ad3, or Ad7 etc.) are known to those skilled in the art. Recombinant adenoviruses can be advantageous in certain circumstances, in that they are not capable of infecting non- dividing cells and can be used to infect a wide variety of cell types, including epithelial cells (Rosenfeld et al., (1992) supra). Furthermore, the virus particle is relatively stable and amenable to purification and concentration, and as above, can be modified so as to affect the spectrum of infectivity. Additionally, introduced adenoviral DNA (and foreign DNA contained therein) is not integrated into the genome of a host cell but remains episomal, thereby avoiding potential problems that can occur as a result of insertional mutagenesis in situ, where introduced DNA becomes integrated into the host genome (*e.g.*, retroviral DNA). Moreover, the carrying capacity of the adenoviral genome for foreign DNA is large (up to 8 kilobases) relative to other gene delivery vectors (Berkner *et al.*, supra; Haj-Ahmand and Graham, J. Virol. 57:267 (1986)).

[0054] Retroviruses are one of the most frequently employed forms of gene delivery in somatic and germline gene therapies. Retroviruses in contrast to adenoviral and lentiviral viruses, can transfect dividing cells because they can pass through the nuclear pores of mitotic cells; this character of retroviruses make them proper candidates for *in situ* treatment. In addition, all of the viral genes have been removed, creating approximately 8 kb of space for transgenic incorporation. Retroviruses are useful for *ex vivo* delivery of somatic cells because of their ability to linearly integrate into host cell genome; for example, they have been used for human gene therapy of X-SCID successfully but incidence of leukemia in some patients occurred because of integration of retroviruses to the LMO2 gene and inappropriate activation of it. Retroviruses also have been applied for familial hyperlipidemia gene therapy and tumor vaccination. However, the main limitations of retroviruses are their low efficiency *in vivo*, immunogenic problems, the inability to transduce the nondividing cells and the risk of insertion, which could possibly cause oncogene activation or tumor-suppressor gene inactivation. A replication defective retrovirus can be packaged into virions, which can be used to infect a target cell through the use of a helper virus by standard techniques. Protocols

for producing recombinant retroviruses and for infecting cells in vitro or in vivo with such viruses can be found in Ausubel, *et al*, eds., Current Protocols in Molecular Biology, Greene Publishing Associates, (1989), Sections 9.10-9.14, and other standard laboratory manuals. Examples of suitable retroviruses include pLJ, pZIP, pWE and pEM which are known to those skilled in the art. Examples of suitable packaging virus lines for preparing both ecotropic and amphotropic retroviral systems include Ψ&íρ, Ψ&ε, Ψ2 and ΨAπι. Retroviruses have been used to introduce a variety of genes into many different cell types, including epithelial cells, in vitro and/or in vivo (see for example Eglitis, *et al.* (1985) *Science* 230: 1395-1398; Danos and Mulligan (1988) *Proc. Natl. Acad. Sci. USA* 85:6460-6464; Wilson *et al.* (1988) *Proc. Natl. Acad. Sci. USA* 85:3014-3018; Armentano *et al.* (1990) *Proc. Natl. Acad. Sci. USA* 87:6141-6145; Huber *et al.* (1991) *Proc. Natl. Acad. Sci. USA* 88:8039-8043; Ferry *et al.* (1991) *Proc. Natl. Acad. Sci. USA* 88:8377-8381; Chowdhury *et al.* (1991) Science 254: 1802-1805; van Beusechem *et al.* (1992) Proc. Natl. Acad. Sci. USA 89:7640-7644; Kay et al. (1992) Human Gene Therapy 3:641- 647; Dai *et al.* (1992) *Proc. Natl. Acad. Sci. USA* 89: 10892-10895; Hwu *et al.* (1993) *J. Immunol.* 150:4104-4115; U.S. Patent No. 4,868, 116; U.S. Patent No. 4,980,286; PCT Application WO 89/07136; PCT Application WO 89/02468; PCT Application WO 89/05345; and PCT Application WO 92/07573).

[0055] Hybrid adenoviruses are made of the high transduction efficiency of a gene-deleted adenoviral vector and the long-term genome-integrating potential of adeno-associated and retroviruses viruses. Such hybrid systems show stable transduction and limited integration sites. Among integrating vectors, those derived from retroviruses are most common. One of the family of Retroviridae are called spuma retroviruses or foamy viruses (FVs). FVs are a group of apparently nonpathogenic nonhuman retroviruses, which have been developed only recently. The potential advantages of FV vectors include a broad range of hosts, the largest packaging capacity of any retrovirus, and the ability to persist in quiescent cells. Because of these features, FVs have the unique potential to safely and efficiently deliver several genes into a number of different types of cells.

[0056] Alphaviruses can also be used. Alphaviruses are enveloped single stranded RNA viruses that have a broad host range, and when used in viral gene therapy protocols alphaviruses can provide high-level transient gene expression. Exemplary alphaviruses include the Semliki Forest virus (SFV), Sindbis virus (SIN) and Venezuelan Equine Encephalitis (VEE) virus, all of which have been genetically engineered to provide efficient replication-deficient and -competent expression vectors. Alphaviruses exhibit significant

neurotropism, and so are useful for CNS- related diseases. See, *e.g.*, Lundstrom, Viruses. 2009 Jun; 1(1): 13-25; Lundstrom, Viruses. 2014 Jun; 6(6): 2392-2415; Lundstrom, *Curr Gene Ther.* 2001 May; l(l): 19- 29; Rayner *et al.*, *Rev Med Virol.* 2002 Sep-Oct; 12(5):279-96.

[0057] Herpes simplex virus (HSV) is one of the recent viruses candidate in gene delivery. HSV systems include the development of the so-called disabled infectious single copy (DISC) viruses, which comprise a glycoprotein H defective mutant HSV genome. When the defective HSV propagated in complementing cells' viral particles are generated, they can infect in subsequent cells permanently replicating their own genome but not producing more infectious particles. Herpes vectors can deliver up to 150 kb transgenic DNA and because of its neuronotropic features, it has the greatest potential for gene delivery to nervous system, tumors, and cancer cells

[0058] Epstein–Barr virus as a herpes virus can be used for the expression of large DNA fragments in target cells. Because *Epstein–Barr virus* (EBV) establishes itself in the host nucleus in a latent state as extrachromosomal circular plasmid, this virus is suitable for long-term retention in the target cell. Because of the natural B-cell tropism of the virus, EBV-derived vectors, such as B-cell lymphoma, have been tested for immune therapy of cancer.

[0059] Poxvirus vectors are members of the Poxviridae family that are widely used for high-level cytoplasmatic expression of transgenes. The high stable insertion capacity (more than 25 KB) of this virus is the most advantageous feature of it for gene delivery. The insertion of the transgene sequences is somewhat different from the other vector systems and utilizes homologous recombination or *in vitro* ligation for construction of recombinant vaccinia virus vectors. Poxviruses have been used for cancer therapy in various studies, such as prostate cancer, colorectal cancer, breast cancer, and lung cancer. Recombinant vaccinia virus vectors were also used for expression of *E6* and *E7* genes of human papilloma virus types 16 and 18 in cervical cancer patients to induce tumor regression.

[0060] Lentiviruses are a subclass of retroviruses. They have recently been used as gene delivery vectors due to their ability to naturally integrate with nondividing cells, which is the unique feature of lentiviruses as compared with other retroviruses, which can infect only the dividing cells. Lentiviral vectors can deliver 8 kb of sequence. Because lentiviruses have strong tropism for neural stem cells, extensively used for *ex vivo* gene transfer in central nervous system with no significant immune responses and no unwanted side effects.

Lentiviral vectors have the advantages of high-efficiency infection of dividing and nondividing cells, long-term stable expression of a transgene, low immunogenicity, and the ability to accommodate larger transgenes. There are numerous examples of effective long-term treatment of animal models of neurologic disorders, such as motor neuron diseases, Parkinson, Alzheimer, Huntington's disease, lysosomal storage diseases, and spinal injury.

[0061] Adeno-associated viruses, from the parvovirus family, are small viruses with a genome of single stranded DNA. AAV was discovered in 1960s as a contaminant in adenovirus (a cold causing virus) preparations. Its growth in cells is dependent on the presence of adenovirus and, therefore, it was named as adeno-associated virus. AAV can infect both dividing and non-dividing cells and may incorporate its genome into that of the host cell. These features make AAV a very attractive candidate for creating viral vectors for gene therapy. The AAV viruses can insert genetic material at a specific site on chromosome 19 with near 100% certainty. There are a few disadvantages to using AAV, including the small amount of DNA it can carry (low capacity) and the difficulty in producing it. This type of virus is being used for gene therapy, however, because it is non-pathogenic (most people carry this harmless virus). AAV is a tiny non- enveloped virus having a 25 nm capsid. No disease is known or has been shown to be associated with the wild type virus. AAV has a single-stranded DNA (ssDNA) genome. AAV has been shown to exhibit long-term episomal transgene expression, and AAV has demonstrated excellent transgene expression in the brain, particularly in neurons. Vectors containing as little as 300 base pairs of AAV can be packaged and can integrate. Space for exogenous DNA is limited to about 4.7 kb. An AAV vector such as that described in Tratschin *et al.*, *Mol. Cell. Biol.* 5:3251-3260 (1985) can be used to introduce DNA into cells. A variety of nucleic acids have been introduced into different cell types using AAV vectors (see for example Hermonat *et al.*, *Proc. Natl. Acad. Sci. USA* 81 :6466-6470 (1984); Tratschin *et al.*, *Mol. Cell. Biol.* 4:2072- 2081 (1985); Wondisford *et al.*, *Mol. Endocrinol.* 2:32-39 (1988); Tratschin *et al.*, *J. Virol.* 51 :611-619 (1984); and Flotte *et al.*, *J. Biol. Chem.* 268:3781-.3790 (1993). There are numerous alternative AAV variants (over 100 have been cloned), and AAV variants have been identified based on desirable characteristics. For example, AAV9 has been shown to efficiently cross the blood-brain barrier. Moreover, the AAV capsid can be genetically engineered to increase transduction efficiency and selectivity, *e.g.*, biotinylated AAV vectors, directed molecular evolution, self-complementary AAV genomes and so on. Modified AAV have also been described, including AAV based on ancestral sequences; see, *e.g.*,

US7906111; WO/2005/033321; WO2008027084, WO2014124282; WO2015054653; and WO2007127264.

[0062] In certain embodiment, the disclosure provides for the generation of modified AAVs engineered to contain heterologous targeting peptides that target the AAVs to certain cells and/or tissues. Modified AAVs disclosed herein are useful because they can effectively deliver nucleic acids of interest to a particular cell and/or tissue, *e.g.*, for purposes of manipulating levels of a particular gene product in the cell and/or tissue. For example, in some embodiments, the disclosure provides modified AAVs comprising a capsid protein having a heterologous targeting peptide that confers unique tissue targeting and cell transduction properties. In some embodiments, such heterologous targeting peptides are useful for targeting AAVs to tissues of the central nervous system (CNS) (*e.g.*, the brain), liver, muscle, lung, heart, spleen pancreas, intestine and/or kidney. In a further embodiment, the AAV used in the compositions, methods, and kits disclosed herein has a serotype selected from AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV9.47, AAVrh10, AAVPHP.B, AAVPHP.eB, and AAVPHP.S. In a certain embodiment, the AAV used in the compositions, methods, and kits herein is AAV5. In another embodiment, the AAV used in the compositions, methods, and kits disclosed herein is AAV9.

[0063] The design and implementation of displaying a large, tiled peptide library in the capsid of multiple viral (*e.g.*, AAV) serotypes is shown in the studies presented herein. The disclosure further provides methodology for performing an *in vivo* screen to identify transducing viral variants across multiple organs, the analytical pipeline to characterize the top-performing hits, and finally, the identity and potential application of top performing viral variants is also discussed herein. Hits from a targeting peptide screen with AAV and Lentivirus and their coding sequences are provided in the sequence listing and their targeted tissue or cells are presented in **FIG. 11** and **FIG. 12**.

[0064] The heterologous targeting peptide-modified AAV variants identified here could be of broad use both clinically and experimentally. Based upon preliminary *in vivo* screening data, an expansive list of AAV variants with broad organ tropism were identified, these variants exhibited high log_2foldchange values in multiple organs in comparison to overall counts in the AAV capsid pool (see FIG. 9A). The ability of these AAV variants to transduce multiple organs at relatively low administered AAV doses allows for a lower overall titer of AAV that needs to be produced and delivered to achieve the same therapeutic benefit as current wild-type AAVs. This is especially important for reducing the overall costs

of viral production, as well as limiting physiological exposure to the AAV vector in an effort to address the inherent immunogenicity of these gene delivery vehicles which has hindered prior efficacy of gene therapies in humans.

[0065] In addition to the broadly infective AAV variants discovered herein, the methods of the disclosure also identified several variants which enable organ-specific AAV transduction. These include AAV variants which specifically transduce the brain, lung, heart, skeletal muscle, pancreas, kidney, spleen, intestine, and liver (see FIG. 9B). Specific examples of the clinical utility of these organ-specific gene delivery vehicles are described in the following sections, however, any disease or condition in which a gene or genetic engineering protein should be expressed in a specific tissue or cell type could utilize the heterologous targeting peptide-modified AAV variants disclosed herein and achieve specific expression without the need for specialized promoters.

[0066] In the brain, a difficult organ to transduce due to the selectivity of the blood brain barrier, there are numerous diseases which would benefit from AAV that only target cell types in the central nervous system. Previous efforts to transduce the CNS have relied on difficult routes of administration such as intrathecal, intraparenchymal, and intracerebroventricular. The heterologous targeting peptide-modified AAV variants provided herein were shown to effectively transduce CNS cell types via systemic administration. For monogenic neurological disorders caused by specific gene mutations, these could be addressed with organ-specific AAV variants to address loss-of-function mutations (e.g. replacing survival motor neuron protein (*SMN*) for spinal muscular atrophy) or silencing harmful gain-of-function mutations (e.g. superoxide dismutase 1 (*SOD1)* for amyotrophic lateral sclerosis or huntingtin (*HTT*) for Huntington's disease. Other CNS diseases which currently have gene therapy based clinical trials ongoing, which would benefit from brain-specific AAV variants include Parkinson's disease, mucopolysaccaridosis type I, II and III, Batten disease, giant axonal neuropathy, and metachromatic leukodystrophy. Similarly, while it was not directly assessed in the initial screen, the AAV-engineering approach could greatly improve transgene delivery to the retina where mutations in >270 genes are implicated in hereditary retinal degeneration and could be addressed with an AAV-based gene therapy.

[0067] A similar paradigm exists in the lung where several diseases resulting from specific gene mutations have been addressed with AAVs administered through difficult means (*i.e.*, intratracheal). Lung-specific AAV variants were identified with the methods presented herein, and therefore, the methods and compositions of the disclosure can be used

to generate lung-specific AAV variants to treat various lung disease. Diseases which could be addressed include, but are not limited to, surfactant protein B deficiency, pulmonary vascular leakage, cystic fibrosis, and other lung obstructive diseases.

[0068] In other tissues, there is a vast array of clinical scenarios in which organ-specific AAV variants would be useful. Some examples include AAT deficiency and hepatitis in the liver, Duchenne and limb-girdle muscular dystrophy, sporadic inclusion body myositis, and dysferlin deficiency in the muscle, diabetes mellitus in the pancreas, and recovery from myocardial infarction and heart failure in the heart. Examples also include tissue specific cancer in which gene therapies could be packaged into the AAV variants to deliver anti-angiogenic factors, toxic genes, cytokines, tumor suppressor gene, antigenic vaccines, or antibodies specifically to cancer cells.

[0069] Additionally, the heterologous targeting peptide-modified AAV variants have been characterized on a tissue level in the studies presented herein, their tropism could be further investigated at the cellular level to enable cell-type specific targeting of transgene delivery. This could be of significant importance in an immune setting, for instance, where delivery of key transcription factors to regulatory T cells could provide a new treatment paradigm for autoimmune disorders or delivery of targeting receptors to cytotoxic T cells could transform the field of immuno-oncology. In the brain, using the platform to specifically target microglia could enable novel treatment approaches for diseases such as Alzheimer's and Parkinson's. Furthermore, while the modified AAV vectors presented thus far make use of a single peptide insertion site on the AAV capsid. It is postulated that dual-insertion of an identified peptide at both the "Loop1" and "Loop2" sites could further improve the specificity of transduction.

[0070] Due to the rational design approach of the methodology disclosed herein, the heterologous targeting peptide-modified AAV variants disclosed herein could be broadly utilized for basic research purposes. AAVs do not traditionally transduce cells in culture very effectively, which is especially true for primary cultures. The heterologous targeting peptide-modified AAV variants identified using the methods disclosed herein could enhance transduction and delivery of transgenes, greatly enabling basic research studies which were not previously feasible.

[0071] The heterologous targeting peptide- modified lentivirus variants identified here could be of broad use both clinically and experimentally. Tissue or cell type specific lentiviral particles have many potential applications. Lentiviral particles which can more

efficiently transduce immune cells could have great utility for engineering chimeric antigen receptor (CAR) T cells for clinical applications. Additionally, tissue or cell type specific lentiviral particles could have great utility as basic science reagents. For example, being able to transduce a single cell type in a mixed population opens up unique screening avenues for perturbing cells of interest while sparing bystanders. More specifically, modern 3-dimensional tissue culture often makes use of multiple cell types to more accurately model tissue level physiology and architecture. A cell-type specific lentivirus could thus be applied to 3-dimensional tissue models to genetically modify only a subset of the cells which make up the tissue. Beyond the direct applications of engineered lentiviruses, the peptides discovered by this screening methods disclosed herein could also be applied to alternative gene and drug delivery modalities. For example, peptides identified using the methods disclosed herein could be used as targeting ligands for lipid nanoparticles, fused to therapeutic proteins to enable targeted delivery, or even integrated into other viral particles with different wild-type tropism. Targeting of lipid nano-particles is of special interest, due to the similarities between a lipid nanoparticle and the lipid wrapped structure of a lentivirus. Re-targeted lipid nano-particles have immense therapeutic potential, in fields such as vaccine delivery, gene therapy, or targeted imaging.

[0072] As indicated above, any number of virus and viral particles may be coated using the methods disclosed herein, including enveloped viruses, such as retroviruses. In regards to enveloped viruses, the viruses may be first treated to remove the viral envelope, and then coated with membrane fragments using the methods disclosed herein. Examples of method to remove viral envelopes include use of detergents, like triton-X 100, and 3-[(3-cholamidopropyl)dimethylammonio]-1-propanesulfonate (CHAPS); use of alcohols, like ethanol and 2-propanol; heat treatment; and drying.

[0073] The disclosure provides a method for coating a virus or viral particle with membrane fragments comprising one or more of the following steps: lysing cells in a hypotonic solution, which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane; removing cells and cell debris by differential centrifugation, leaving a membrane enriched fraction; pelleting and extruding the membrane fragments through polycarbonate membrane(s) to generate purified membrane fragments; coating virus or viral particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s).

[0074] The cells that are used to generate the membrane fragments disclosed herein, are referred to herein as donor cells. The donor cells are generally eukaryotic in origin and are typically mammalian cells. The donor cells can originate from any number of different types of organisms, including from humans, mice, rats, rabbits, sheep, goats, non-human primates, dogs, etc. Moreover, the methods disclosed herein are not limited to a particular donor cell type, and the membrane fragments can be generated from a variety of different cells types, including, but not limited to, stem cells, progenitor cells, primary cells, somatic cells, germline cells, tumor cells, cell lines, etc. Thus, the methods of the disclosure have general applicability and can be used with different types of cells, from different organisms. Further, the donor cells can be selected so as to generate a coated viruses or viral particle for a specific purpose, for example delivering to a specific cell or tissue type, or improving the efficiency of the therapy.

[0075] The donor cells may be modified such that the membrane fragments generated therefrom further comprise a targeting ligand. Such a targeting ligand may be used to direct the coated viruses or viral particles of the disclosure to specific cells with which they will ultimately fuse. Such a targeting ligand can be produced, for example, by engineering the donor cells to express a cell surface anchoring motif comprising a targeting ligand (*e.g.*, a neuron-specific RVG peptide), or by affixing peptides to membrane proteins via maleimide based linkers. Examples of cell surface anchoring/display motifs include, but are not limited to, outer membrane proteins, lipoproteins, glycosylphosphatidylinositol (GPI) anchoring motifs, and autotranspoters. The targeting ligand can be a member of a specific binding pair, the other of which is found on the target cells (Alvarez-Erviti *et al.*, *Nature Biotechnology* 29: 341-345 (2011)). In one embodiment, the targeting ligand is an antibody or antigen binding fragment thereof (*e.g.*, a single chain antibody (scFV)) that specifically binds a marker present on a cellular target. In another embodiment, the targeting ligand is a short homing peptide. Examples of sequences for short homing peptides include, but are not limited to, ATWLPPR, NGR, CRTLTVRKC, CRKRLDRNC, SPSYVYHQF, SVYDFFVWL, aKXVAAWTLKAAaZC, SFERFEIFPKEC, CRGDKCPDC, KLWVLPKGGGCAm, CSKSSDYQC, hTrail (114-281), TFFYGGSRGKRNNFKTEEY, CGNKRTR, CHVLWSTRC, CDLRSAAVC, cRGFfK, cdG-HoCit-GPQc-Ebes-K-alkyne, HLNILSTLWKYR, cyclic RGD, c(RGDyK), cRGD, c(RGDyK), and GRGDS.

[0076] One of the primary advantages of the coated viruses or viral particles disclosed herein is avoiding immunodetection in a subject. More specifically, the coated virus or viral

particles disclosed herein will not be recognized by the human immune system as a pathogen because the outer cell membrane has a human source, containing proteins that prevent neutralization by immune cells.

[0077] Immunity can be broadly defined as all the processes that enable an organism to defend itself against antigens perceived as causing a rupture of homeostatic welfare. Since recombinant AAV vectors do not contain any viral gene, the only sources of foreign antigens brought in during gene transfer are derived from the viral capsid and the transgene product. The nucleic acid contained in the virion may also concur to activate immunity via engagement of Toll-like receptors. The prevalence of total anti-AAV antibodies is close to 70% of the population for AAV1 and AAV2, 45% for AAV6 and AAV9, and 38% for AAV8. Importantly, titers of anti-AAV immunoglobulin G (IgG) antibodies correlate significantly, though not completely, with titers of anti-AAV neutralizing antibodies. Anti-capsid cellular responses are less preponderant than humoral responses. Correlation studies between anti-AAV humoral and cellular responses suggest that there is no link between both parameters, at least for the AAV1 and AAV2 serotypes.

[0078] While rAAV vectors do not encode viral proteins, the viral particles have an identical composition to WT AAV. Therefore, high doses of rAAV vectors can potentially activate recall responses generated against WT AAV capsid following cross-presentation of capsid antigens on target cells. The easiest way to bypass the impact of pre-existing immune responses to AAV would be simply to exclude from clinical trials the subjects exhibiting high amounts of anti-AAV antibodies/neutralizing factors or capsid-reactive T cells. Considering that AAV-seropositive individuals represent up to 70% of the population, exclusion is difficult. Similarly, pre-screening patients to exclude those with pre-existing anti-AAV cellular immunity is not a sound approach, as the frequency of pre-existing circulating AAV-specific T cells in PBMCs is too low to permit their systematic detection through ELISpot or flow cytometry assays. Furthermore, positive anti-capsid cellular responses in clinical trials are not systematically translated into deleterious clinical consequences, and there is currently no means of predicting which parameters will trigger the onset of harmful responses. Importantly, though anti-AAV immune responses can result in loss of transgene expression, they do not inflict other harmful sequelae to the patient and seem to be so far more an "efficiency" than a "safety" issue. The best trade-off one can currently imagine is to engineer rAAV vectors with better transduction efficiency, carrying optimized therapeutic transgenes and with reduced immunogenic profiles. Such vectors would provide a higher therapeutic

index, as they would permit therapeutic efficiency at doses sufficient to bypass pre-existing humoral immunity, but not high enough to trigger deleterious cellular immunity.

[0079] Accordingly, the methods of the disclosure can greatly improve the efficacy and safety of current gene therapies, many of which use adeno-associated viruses due to their low pathogenicity and high degree of infectivity. Because AAVs (as well as the vast majority of gene therapy products) do not mediate lifelong transgene expression, there is considerable need for a method to bypass the immune system and enable repeat dosing. Encapsulating the AAV (or other gene therapy vector) in non-immunogenic human cell membranes allows for multiple doses of immunogenic gene therapies to be safely administered to patients. As such, the coated viruses or viral particles provide for a higher therapeutic index than non-coated viruses, and would permit therapeutic efficiency at doses sufficient to bypass pre-existing humoral immunity (*e.g.*, humoral immunity to AAV), but not high enough to trigger deleterious cellular immunity. Further, the coated viruses and viral particles made by the methods disclosed herein can be further modified to provide for targeted delivery by the selection of the specific types of donor cells and/or use of targeting ligands. Additionally, peptide sequences can be added to the viral capsid to improve transduction and inhibit the pathway that presents viral antigens to immune cells (*i.e.*, Major Histocompatibility complex). Such peptide sequences can be identified using the methods described in WO 2018/170015, the disclosure of which is incorporated herein in-full, which describes identifying one or more regions of an AAV capsid protein with affinity for a major histocompatibility complex (MHC), and modifying the one or more regions of the AAV capsid protein with affinity for the MHC through one or more amino acid substitutions, such that the modified region has no affinity for the MHC. Additionally, directed evolution can be used to rapidly engineer viruses or viral particles with desired gene delivery properties, including neutralizing antibody-evasion properties, as well as enhanced gene delivery, gene targeting, and enhanced capacity to infect. Such directed evolution strategies for creating virus variants with improved properties are described in the following references, which disclosure of which are incorporated herein in-full, Asuri *et al.*, *Molecular Therapy* 20(2):329-338 (2012)); Maheshri *et al.*, *Nat Biotechnol* 24:198-294 (2006); Koerber *et al.*, *Mol Ther* 16:1703-1709 (2008); Koerber *et al.*, *Mol Ther* 17:2088-2095 (2009); Klimczak *et al.*, PLoS One 4:e7467 (2009); Exoffon *et al.*, *Proc Natl Acad Sci USA* 106:3865-3870 (2009); Li *et al.*, *Mol. Ther* 17:2067-2077 (2009); and Grimm *et al.*, *J Virol* 82:5887-5911 (2008)). By preventing the presentation of antigens and/or by improving the evasion

properties of the viruses to antibody neutralization, the immune stealth qualities of the coated viruses or viral particles of the disclosure can be improved without having to administer immunosuppressants, which may have deleterious effects.

[0080] The coated viruses and viral particles made by the methods of the disclosure can be used to treat diseases which can be ameliorated by the delivery or the actions of viral gene therapy, or other therapies (*e.g.*, antisense oligonucleotide, small molecule therapeutics, genome engineering, etc.) on the target cells. In one embodiment, the disease involves or is caused by a genetic deficiency in the target cells. The molecule for which they are deficient (or encoding the molecule for which they are deficient) can be delivered to the appropriate cells via the coated viruses or viral particles disclosed herein.

[0081] The disclosure further provides methods of delivering viral gene therapy, or other therapy, to a subject comprising, administering an effective amount of a coated virus or viral particle preparation produced by a method disclosed herein to the subject. The administering can be local or systemic. For example, the coated virus or viral particle preparation disclosed herein may be locally administered to a subject by injection, such as by injection into an organ or a tumor.

[0082] The disclosure also provides methods of delivering a viral gene therapy, or other therapy to a cell, comprising: contacting the cell with an effective amount of a coated virus or viral particle preparation produced by a method disclosed herein that comprises a gene therapy. In one embodiment, the cell is contacted *in vivo*. In a further embodiment, the cell is contacted within an organ or tumor. In yet a further embodiment, the coated virus or viral particle preparation is produced *ex vivo* from donor cells of a subject. In an alternate embodiment, the cell is contacted *in vitro*.

[0083] The disclosure further provides methods of delivering a CRISPR-Cas genome engineering system, or other type of genome engineering system to a cell, comprising: contacting the cell with an effective amount of a coated virus or viral particle preparation produced by a method disclosed herein which comprises a CRISPR-Cas genome engineering system. In one embodiment, the cell is contacted *in vivo*. In a further embodiment, the cell is contacted within an organ or tumor. In yet a further embodiment, the coated virus or viral particle preparation is produced *ex vivo* from donor cells of a subject. In an alternate embodiment, the cell is contacted *in vitro*.

[0084] The disclosure further provides for pharmaceutical compositions, formulations and preparations comprising a coated virus or viral particle described herein for specified

modes of administration. In one embodiment, a coated virus or viral particle described herein is an active ingredient in a composition comprising a pharmaceutically acceptable carrier. Such a composition is referred to herein as a pharmaceutical composition. A "pharmaceutically acceptable carrier" means any pharmaceutically acceptable means to mix and/or deliver the targeted delivery composition to a subject. The term "pharmaceutically acceptable carrier" as used herein means a pharmaceutically acceptable material, composition or vehicle, such as a liquid or solid filler, diluent, excipient, solvent or encapsulating material, involved in carrying or transporting the subject agents from one organ, or portion of the body, to another organ, or portion of the body. Each carrier should be "acceptable" in the sense of being compatible with the other ingredients of the composition and is compatible with administration to a subject, for example a human. Such compositions can be specifically formulated for administration via one or more of a number of routes, such as the routes of administration described herein. Supplementary active ingredients also can be incorporated into the compositions. When an agent, formulation or pharmaceutical composition described herein, is administered to a subject, preferably, a therapeutically effective amount is administered. As used herein, the term "therapeutically effective amount" refers to an amount that results in an improvement or remediation of the condition.

[0085] Administration of the pharmaceutical composition to a subject is by means which the coated viruses or virial particle contained therein will contact the target cell. The specific route will depend upon certain variables such as the target cell and can be determined by the skilled practitioner. Suitable methods of administering a coated virus or viral particle described herein to a patient include any route of *in vivo* administration that is suitable for delivering a coated virus or viral particle to a patient. The preferred routes of administration will be apparent to those of skill in the art, depending on the preparation's type of viral gene therapy being used, the target cell population, and the disease or condition experienced by the subject. Preferred methods of *in vivo* administration include, but are not limited to, intravenous administration, intraperitoneal administration, intramuscular administration, intracoronary administration, intraarterial administration (*e.g.*, into a carotid artery), subcutaneous administration, transdermal delivery, intratracheal administration, subcutaneous administration, intraarticular administration, intraventricular administration, inhalation (e.g., aerosol), intracerebral, nasal, oral, pulmonary administration, impregnation of a catheter, and direct injection into a tissue. In an embodiment where the target cells are in or near a tumor, a preferred route of administration is by direct injection into the tumor or tissue surrounding the

tumor. For example, when the tumor is a breast tumor, the preferred methods of administration include impregnation of a catheter, and direct injection into the tumor.

[0086] Intravenous, intraperitoneal, and intramuscular administrations can be performed using methods standard in the art. Aerosol (inhalation) delivery can also be performed using methods standard in the art (see, for example, Stribling *et al.*, *Proc. Natl. Acad. Sci. USA* 189: 11277-11281, 1992, which is incorporated herein by reference in its entirety). Oral delivery can be performed by complexing an extracellular vesicle preparation of the present invention to a carrier capable of withstanding degradation by digestive enzymes in the gut of an animal. Examples of such carriers, include plastic capsules or tablets, such as those known in the art.

[0087] One method of local administration is by direct injection. Direct injection techniques are particularly useful for administering the coated virus or viral particle to a cell or tissue that is accessible by surgery, and particularly, on or near the surface of the body. Administration of a composition locally within the area of a target cell refers to injecting the composition centimeters and preferably, millimeters from the target cell or tissue.

[0088] The appropriate dosage and treatment regimen for the methods of treatment described herein will vary with respect to the particular disease being treated, the coated virus or viral particle being delivered, and the specific condition of the subject. The skilled practitioner is to determine the amounts and frequency of administration on a case-by-case basis. In one embodiment, the administration is over a period of time until the desired effect (*e.g.*, reduction in symptoms is achieved). In a certain embodiment, administration is 1, 2, 3, 4, 5, 6, or 7 times per week. In a particular embodiment, administration is over a period of 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 weeks. In another embodiment, administration is over a period of 2, 3, 4, 5, 6 or more months. In yet another embodiment, treatment is resumed following a period of remission.

[0089] For use in the applications described herein, kits and articles of manufacture are also described herein. Such kits can comprise a carrier, package, or container that is compartmentalized to receive one or more containers such as vials, tubes, and the like, each of the container(s) comprising one of the separate elements to be used in a method described herein. Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers can be formed from a variety of materials such as glass or plastic.

[0090] For example, the container(s) can comprise one or more agents for coating viruses or viral particles described herein, optionally in a composition or in combination with

another agent as disclosed herein. The container(s) optionally have a sterile access port (for example the container can be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). Such kits optionally comprise a compound disclosed herein with an identifying description or label or instructions relating to its use in the methods described herein.

[0091] A kit will typically comprise one or more additional containers, each with one or more of various materials (such as reagents, optionally in concentrated form, and/or devices) desirable from a commercial and user standpoint for use of a compound described herein. Non-limiting examples of such materials include, but are not limited to, buffers, diluents, filters, needles, syringes; carrier, package, container, vial and/or tube labels listing contents and/or instructions for use, and package inserts with instructions for use. A set of instructions will also typically be included.

[0092] A label can be on or associated with the container. A label can be on a container when letters, numbers or other characters forming the label are attached, molded or etched into the container itself; a label can be associated with a container when it is present within a receptacle or carrier that also holds the container, *e.g.*, as a package insert. A label can be used to indicate that the contents are to be used for a specific therapeutic application. The label can also indicate directions for use of the contents, such as in the methods described herein. These other therapeutic agents may be used, for example, in the amounts indicated in the Physicians' Desk Reference (PDR) or as otherwise determined by one of ordinary skill in the art.

[0093] The disclosure further provides that the methods and compositions described herein can be further defined by the following aspects (aspects 1 to 87):

1. A viral vector having a capsid protein comprising a heterologous targeting peptide in a range of 10-30 amino acids in length.

2. The viral vector of aspect 1, wherein the heterologous targeting peptide is about 15-25 amino acids in length.

3. The viral vector of aspect 1 or 2, wherein the heterologous targeting peptide is about 20 amino acids in length.

4. The viral vector of any one of aspects 1-3, wherein the viral vector is an adeno-associated virus (AAV).

5. The viral vector of any one of aspect 1-3, wherein the viral vector is a lentiviral vector.

6. The viral vector of any one of aspects 1 to 5, wherein the capsid protein is a VP1 capsid protein.

7. The viral vector of any one of aspects 1 to 5, wherein the capsid protein is a VP2 capsid protein.

8. The viral vector of any one of aspects 1 to 5, wherein the capsid protein is a VP3 capsid protein.

9. The viral vector of any one of any one of aspects 1-4 and 6-8, wherein the heterologous targeting peptide is inserted into an AAV capsid protein at loop 1 and/or loop 2.

10. The viral vector of any one of aspects 1-3 or 9, wherein the viral vector is an AAV5.

11. The viral vector of any one of aspects 1-4 and 6-9, wherein the viral vector is an AAV9.

12. The viral vector of any one of aspects 1-11, wherein the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

13. The viral vector of any one of aspects 1-11, wherein the heterologous targeting peptide is not flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

14. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to hepatocytes or liver tissue.

15. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to neuronal cells or brain tissue.

16. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to pancreatic cells or pancreas tissue.

17. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to cardiac cells or heart tissue.

18. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to lung tissue.

19. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to intestinal tissue.

20. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to spleen tissue.

21. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to renal cells or kidney tissue.

22. The viral vector of any one of aspects 1-13, wherein the heterologous targeting peptide targets the viral vector to muscle cells or tissue.

23. An adeno-associated virus (AAV) capsid protein comprising a heterologous targeting peptide cloned into loop 1 and/or loop 2 of the capsid protein, wherein the heterologous targeting peptide is about 10-30 amino acids in length.

24. The AAV capsid protein of aspect 23, wherein the capsid protein is a VP1 capsid protein.

25. The AAV capsid protein of aspect 23, wherein the capsid protein is a VP2 capsid protein.

26. The AAV capsid protein of aspect 23, wherein the capsid protein is a VP3 capsid protein.

27. The AAV capsid protein of aspect 23 to 26, wherein the heterologous targeting peptide is about 15-25 amino acids in length.

28. The AAV capsid protein of any one of aspects 23 to 27, wherein the heterologous targeting peptide is about 20 amino acids in length.

29. The AAV capsid protein of any one of aspects 23 to 28, wherein the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

30. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets hepatocytes or liver tissue.

31. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets neuronal cells or brain tissue.

32. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets pancreatic cells or pancreas tissue.

33. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets cardiac cells or heart tissue.

34. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets lung tissue.

35. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets intestinal tissue.

36. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets spleen tissue.

37. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets renal cells or kidney tissue.

38. The AAV capsid protein of any one of aspects 23 to 29, wherein the heterologous targeting peptide targets muscle cells or tissue.

39. A recombinant AAV (rAAV) comprising a capsid protein of any one of aspects 23-38.

40. A recombinant AAV (rAAV) comprising a capsid protein having a targeting peptide in loop 1 and/or loop 2 wherein the targeting peptide is independently selected from SEQ ID Nos:5865 to 11445.

41. The recombinant AAV of aspect 40, wherein the recombinant AAV further comprises a heterologous polynucleotide for gene delivery.

42. The recombinant AAV of aspect 41, wherein the heterologous polynucleotide is a therapeutic gene.

43. A composition comprising the recombinant rAAV of any one of aspects 40-42.

44. The composition of aspect 43 further comprising a pharmaceutically acceptable carrier.

45. A method for delivering a transgene to a subject comprising:

administering a recombinant AAV (rAAV) to a subject, wherein the rAAV comprises:

(i) a capsid protein of any one of aspects 23-38, and

(ii) at least one transgene, and wherein the rAAV infects cells of a target tissue of the subject.

46. The method of aspect 45, wherein the at least one transgene encodes a protein.

47. The method of aspect 46, wherein the protein is an immunoglobulin heavy chain or light chain or fragment thereof.

48. The method of aspect 45, wherein the at least one transgene encodes a small interfering nucleic acid.

49. The method of aspect 48, wherein the small interfering nucleic acid is a miRNA.

50. The method of aspect 48, wherein the small interfering nucleic acid is a miRNA sponge or TuD RNA that inhibits the activity of at least one miRNA in the subject or animal.

51. The method of aspect 49, wherein the miRNA is expressed in a cell of the target tissue.

52. The method of aspect 45, wherein the target tissue is skeletal muscle, heart, liver, pancreas, brain or lung.

53. The method of aspect 45, wherein the transgene expresses a transcript that comprises at least one binding site for a miRNA, wherein the miRNA inhibits activity of the transgene, in a tissue other than the target tissue, by hybridizing to the binding site.

54. The method of aspect 45, wherein the at least one transgene encodes a gene product that mediates genome editing.

55. The method of aspect 45, wherein the transgene comprises a tissue specific promoter or inducible promoter.

56. The method of aspect 55, wherein the tissue specific promoter is a liver-specific thyroxin binding globulin (TBG) promoter, an insulin promoter, a glucagon promoter, a somatostatin promoter, a pancreatic polypeptide (PPY) promoter, a synapsin-1 (Syn) promoter, a creatine kinase (MCK) promoter, a mammalian desmin (DES) promoter, a a-myosin heavy chain (a-MHC) promoter, or a cardiac Troponin T (cTnT) promoter.

57. The method of any one of aspects 45 to 56, wherein the rAAV is administered intravenously, intravascularly, transdermally, intraocularly, intrathecally, orally, intramuscularly, subcutaneously, intranasally, or by inhalation.

58. The method of any one of aspects 45 to 57, wherein the subject is selected from a mouse, a rat, a rabbit, a dog, a cat, a sheep, a pig, and a non-human primate.

59. The method of any one of aspects 45 to 57, wherein the subject is a human.

60. An isolated nucleic acid encoding an AAV capsid protein containing an amino acid sequence selected from the group consisting of SEQ ID No:5865 to 11444 and 11445.

61. A composition comprising the isolated AAV capsid protein of any one of aspects 23 to 38.

62. The composition of aspect 61 further comprising a pharmaceutically acceptable carrier.

63. A kit for producing a rAAV, the kit comprising: a container housing an isolated nucleic acid of aspect 60.

64. The kit of aspect 63 further comprising instructions for producing the rAAV.

65. The kit of aspect 63 or aspect 64, further comprising at least one container housing a recombinant AAV vector, wherein the recombinant AAV vector comprises a transgene.

66. A method for coating a virus or viral particle with membrane fragments comprising:

lysing donor cells in a hypotonic solution, which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane;

removing cells and cell debris by one or more rounds of centrifugation, leaving a membrane enriched fraction;

extruding the membrane enriched faction through polycarbonate membrane(s) to generate purified membrane fragments; and

coating virus or viral particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s).

67. The method of aspect 66, wherein the viruses or viral particles are non-enveloped viruses or viral particles.

68. The method of aspect 66, wherein the viruses or viral particles are enveloped viruses or viral particles which have had their viral envelope removed.

69. The method of any one of aspects 66-68, wherein the viruses or viral particles are selected from retroviruses, adenovirus, adeno-associated virus, hybrid adenoviruses, alphavirus, herpes simplex virus, poxvirus, Epstein-Barr virus and lentivirus.

70. The method of aspect 69, wherein the viruses or viral particles are adeno-associated viruses (AAV).

71. The method of any one of aspects 66-70, wherein the viruses or viral particles have been modified by directed evolution to have increased neutralizing antibody-evasion properties, as well as enhanced gene delivery, gene targeting, and/or enhanced capacity to infect.

72. The method of any one of aspects 66-71, wherein the viruses or viral particles have been modified by one or more amino acid substitutions in one or more regions of a viral capsid protein so as to reduce the affinity of the viral capsid protein for the major histocompatibility complex.

73. The method of any one of aspects 66-71, wherein the donor cells are mammalian cells.

74. The method of aspect 73, wherein the donor cells are human cells.

75. The method of aspect 74, where the donor cells are human stem cells, human progenitor cells, human primary cells, human somatic cells, human germline cells, or human tumor cells.

76. The method of any one of aspects 66-75, wherein the membranes of the donor cells have been modified to express or present a targeting ligand.

77. The method of aspect 76, wherein the targeting ligand is used to improve entry of the coated viruses or viral particles into target cells, inhibit components of the immune response to the coated viruses or viral particles, or to target the coated viruses or viral particles to certain cell types or organs.

78. The method of aspect 76 or aspect 77, wherein the targeting ligand is a peptide, antibody or antibody fragment.

79. The method of aspect 78, wherein the targeting ligand comprises a peptide of any one of SEQ ID Nos:5865 to 11445.

80. Coated viruses or viral particles made by the method of any one of aspects 66-79.

81. The coated viruses or viral particles of aspect 80, wherein the coated viruses or viral particles have been modified to comprise a targeting ligand.

82. The coated viruses or viral particles of aspect 81, wherein the coated viruses or viral particles are used to deliver transgene(s) into target cells.

83. The coated viruses or viral particles of aspect 81 or aspect 82, wherein the coated viruses or viral particles are used to genome engineer target cells.

84. A pharmaceutical composition comprising the coated viruses or viral particles of any one of aspect 80 to 83 and a pharmaceutically acceptable carrier, diluent, binder and/or filler.

85. A method of treating a subject suffering from a disease or disorder in need of treatment thereof, comprising administering the coated viruses or viral particles of any one of aspects 80 to 83, or the pharmaceutical composition of aspect 84.

86. An engineered viral particle comprising an artificially prepared lipid envelope.

87. A method of preparing an engineered retroviral particle, the method comprising treating a retroviral particle with a detergent to remove a lipid envelop to obtain naked retroviral particles, isolating the naked retroviral particles and co-extruding a lipid envelop with the naked retroviral particles to obtain an engineered retroviral particle.

[0094] The following examples are intended to illustrate but not limit the disclosure. While they are typical of those that might be used, other procedures known to those skilled in the art may alternatively be used.

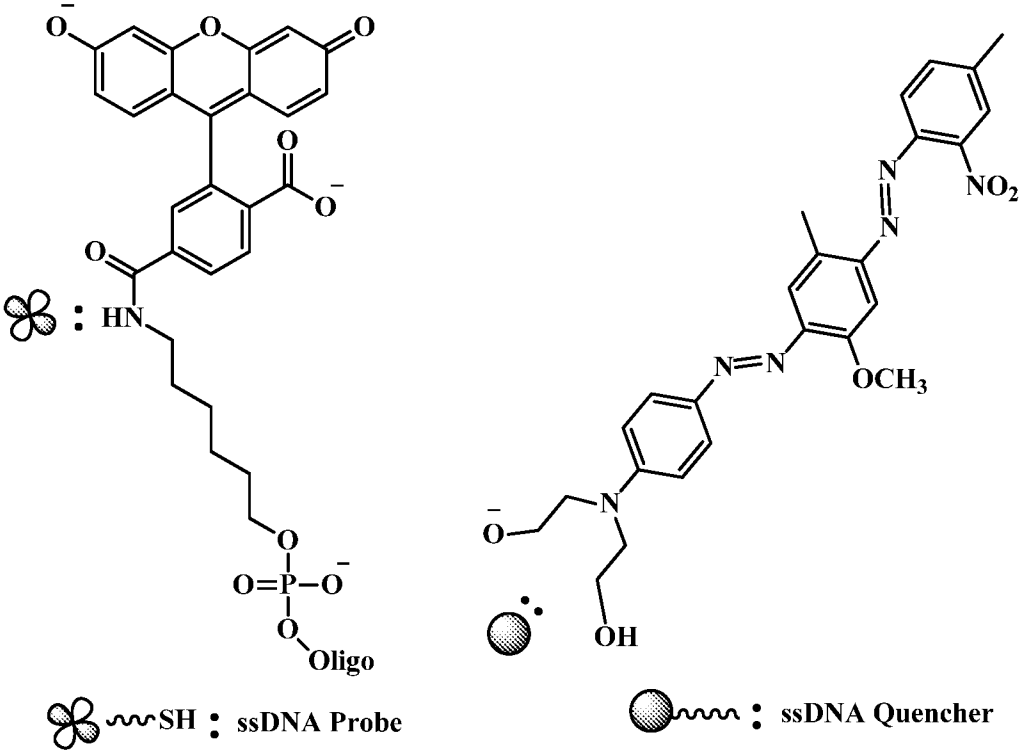
EXAMPLES

[0095] ***Protocol for producing membrane bound AAVs:*** Adherent cells are grown to at least 70% confluency. The cells are detached by using 0.05% trypsin, pelleted by centrifuging at 500 x g, and washed with PBS (x3). The cells are taken up in hypotonic lysis buffer: 0.2 mM EDTA in ddH_20 + protease inhibitor (1 mini tablet for a 10 mL solution). The suspension is then adjusted with 1x PBS and DNase is added. The lysed cells are then centrifuged at 18,000 x g for 7 mins, the supernatant is removed, and the pelleted material is re-suspended in FBS (7x). After washing the pelleted material in 10 mM Tris-HCl + 0.2 mM EDTA, the pelleted material is resuspended in ddH_20 and sonicated briefly (a few seconds). A series of extrusions are then performed using 400 nm, 200 nm, 100nm, and then 50 nm polycarbonate membranes to purify the membrane fragments. The resulting membrane fragments were then coated onto AAVs by co-extruding the membrane fragments and AAVs using 200 nm, 100 nm, and then 50 nm polycarbonate membranes. The coated AAVs are then centrifuged at 18,000 x g for 10 mins in order to isolate membrane coated AAVs from empty membranes.

[0096] ***Alternate Protocol for Coating AAVs:*** The method used to lyse cells and create membrane fragments is based upon the methods described in Fang *et al.* (Nano Letters 14(4):2181-2188 (2014)). Briefly, the cells are placed in a hypotonic solution (consisting of 20 mM Tris-HCl pH = 7.5 (Mediatech), 10 mM KCl (Sigma Aldrich), 2 mM $MgCl_2$ (Sigma Aldrich), and 1 EDTA-free mini protease inhibitor tablet (Pierce) per 10 mL of solution. Dounce homogenization with a tight-fitting pestle or sonication can also be used to disrupt and fractionate the cell membrane. Once the cells have lysed, the cell contents are removed by centrifugation (*e.g.*, centrifuging at 20,000 x g). The pelleted material is discarded and the supernatant is centrifuged at 100,000 x g and the pellet containing the plasma membrane material is collected. The pelleted membranes are washed once with 10 mM Tris-HCl pH = 7.5 and 1 mM EDTA, and then physically serially extruded through a 400 nm, 200 nm, 100 nm and 50 nm polycarbonate membrane. The resulting membrane fragments were then coated onto AAVs by co-extruding the membrane fragments and AAVs were coextruded through a 50 nm polycarbonate membrane.

[0097] ***Determining AAVs are coated with membranes using transmission electron microscopy (TEM)***. Purified membranes are characterized by using transmission electron microscopy (TEM) by negatively staining with uranyl acetate. Briefly, a drop of membrane solution (at 1 mg/mL) is deposited onto glow-discharged carbon-coated grid; after 5 minutes, the grid is rinsed with 10 drops deionized water; and then 1% uranyl acetate (3 drops) is added to negatively stain membrane particles. The same TEM procedure is then performed with the sample containing AAV and membrane fragments to confirm presence of membrane bound AAVs. Additionally, a control sample of PEG coated AAV can be used. Whereby, the same sizing protocol is used with PEG coated AAVs and AAVs. A Coulter Counter can be further used to measure size of particles.

[0098] ***Fluorescence Quenching Test:*** The donor cells are linked to a fluorescent probe via a NHS-PEG(2)-maleimide linker. The NHS-PEG(2)-maleimide linker reacts to amine groups of membrane proteins of the donor cells, and also reacts with the probe's thiol group, thereby linking the probe to membrane proteins of the donor cells. The fluorescent probe has the general structure of:



whereby, the 3' end of the probe has a disulfide attached to the single stranded DNA probe, with the fluorescent dye 6-FAM at the 5' end. The fluorescent probe is the quenched using a quencher that is attached to a complementary ssDNA sequence.

[0099] ***Determining the protein composition of the membrane***: A bicinchoninic acid assay (BCA assay) is first performed in order to get all samples to the same protein concentration of 1 mg/mL in loading buffer (lithium dodecyl sulfate). The samples are heated at 70 °C for 10 mins. 20 uL of samples are loaded into each well of a 4-12% Bis-Tris (buffering agent) 10-well minigel in MOPS running buffer. The gel is then stained with Coomassie blue, and washed by keeping the stained gel in water over night. The washed gel is then imaged to give a general protein profile, and is further compared with a stained gel from the donor cell type. The gel is then transferred to nitrocellulose membrane and western blot is performed for the specific markers using horseradish peroxidase (HRP)-conjugated anti-mouse IgG or anti-rabbit IgG antibodies to Pan-cadherin (membrane marker), Na/K ATPase (membrane pump), CD47 (membrane marker), Histone H3 (nucleus), Cytochrome c oxidase (mitochondria), and GAPDH (cytosol). For controls, antibodies for markers specific to the donor cells are used; and the protein composition to empty membrane vesicles from the donor cells is evaluated.

[00100] ***Elimination half-life of coated AAVs in serum:*** For membrane-coated AAVs, the stability of the AAVs in serum is evaluated in serum over several hours (AAVs are suspended in 100% FBS and the absorbance is measured with a microplate reader over several hours), and are compared with uncoated AAVs and PEG coated AAVs.

[00101] ***Long term storage of Coated AAVs:*** The coated AAVs are lyophilized in 5 wt % sucrose, then reconstituted with water. The sizes of the coated AAVs prior to lyophilization and reconstitution are then compared. The coated AAVs can be further compared to uncoated AAVs and PEG coated AAVs.

[00102] ***Integrity of the membrane after cellular uptake:*** The viral capsid is tagged with red fluorescent dye; the membrane proteins are tagged with green fluorescent dye**.** Whether the membrane-bound AAV is fusogenic is determined based upon colocalization of the signals (*i.e.*, overlapping fluorescent signals).

[00103] ***Engineered AAV design:*** To engineer rationally designed AAV capsids for improved *in vivo* efficacy and organ specificity, the AAV5 and AAV9 capsids were first modified with peptide insertions at two distinct sites in each serotype. To determine the insertion sites in each of these capsids, amino acid sites at the top of AAV variable regions (*e.g.*, AAV9 VR-VII) were first located within the loop that protrudes from the capsid surface and are important to AAV-cell interactions. For suitable locations for peptide library insertion (see **FIG. 6A**), positions N443 (AAV5-Loop1) and S576 (AAV5-Loop2) were

identified for AAV5, and positions Q456 (AAV9-Loop1) and A587 (AAV9-Loop2) were identified for AAV9. These sites have been linked to the endogenous binding sites of AAV5 to α2-3 *N*-linked sialic acid and platelet derived growth factor receptor and of AAV9 to galactose and the 37/67 kDa laminin receptor. Accordingly, disruption of these regions via library insertion most likely will inhibit wild-type receptor-mediated cellular interactions. To ensure proper folding and presentation of the peptide library, the peptide was flanked with a 2 amino acid sequence containing a small Glycine-Serine (GS) flexible linker. However, it was further proposed that AAV variants could be engineered with alternative linkers such as longer flexible linkers (*e.g.*, Gly_8) or more rigid linkers (*e.g.*, $[EAAAK]_3$).

[00104] Next, to efficiently clone in the ligand library, a ligation-based approach was utilized with Type IIS restriction enzymes. For this, cloning vectors were created for each of the 4 serotypes in which the target insertion site was modified to contain the flanking GS residues with the PaqCI type IIS recognition sites on either end of an ~60 base-pair filler DNA sequence. Upon treatment with the PaqCI restriction enzyme, the filler DNA is excised leaving sticky end overhangs which are complementary to the sticky ends generated by PaqCI treatment of the peptide library (see **FIG. 6B).** These two components can then be ligated together to obtain a plasmid pool which has the peptide library cloned into specific regions of the AAV capsid gene. Through next generation sequencing of this plasmid pool, it was found that greater than 98% of all peptides present in the originally designed library were successfully cloned into each AAV capsid gene using this cloning approach (see **FIG. 7A-D).**

[00105] Furthermore, while the initial screening pool of modified capsids was composed of AAV5 and AAV9 capsids, this approach could be applied to further engineer a broad range of AAV serotypes. This includes, but is not limited to, wild-type AAV serotypes such as AAV1-5 and AAV7-9, as well as the over 100 AAV variants which have been identified in human and non-human primate tissues. Additionally, this approach could be applied to pseudotyped AAV vectors which comprise mixed capsids and genomes from different AAV serotypes, as well as previously engineered AAV variants such as AAV-PHP.eB with improved transduction of neurons and glia in the central nervous system, AAV-PHP.S with improved tropism for neurons within the peripheral nervous system, and AAV-DJ which specializes in highly efficient gene transfer *in vivo*. Finally, while the initial screen was performed with AAV capsids encapsulating a linear single-stranded DNA genome, this approach could be utilized with self-complementary AAV (scAAV) genomes to enable differing gene expression dynamics *in vivo*.

[00106] ***Design of displayed peptide library:*** Each AAV library consisted of 275,298 peptides, derived from 6,465 proteins. These protein sources were mined from a variety of protein families, including all protein ligands cataloged in the Guide to Pharmacology database (Harding et al. 2018), toxins, nuclear localization signals (NLS), viral receptor binding domains, albumin and Fc binding domains, transmembrane domains, histones, granzymes, and predicted cell penetrating motifs (see **FIG. 5**). In addition to peptides coding for functional biomolecules, 444 control peptides coding for FLAG-tags with premature stop codons were also included. Because the constructs introduce a stop-codon in the AAV capsids, none of them should successfully package or transduce cells *in vivo*.

[00107] ***Method for identifying infective AAV variants:*** Utilizing the plasmid pool described above, AAV capsids were generated by transfecting HEK293T cells with the plasmid library pool and an adenoviral helper plasmid at a ratio to prevent capsid cross-packaging. AAVs were purified via iodixanol gradient ultracentrifugation and a subset of the capsids were subjected to next generation sequencing to determine which peptide inserts were successfully packaged. Greater than 80% of the starting peptide pool was identified across all the serotypes (see **FIG. 7A-D**).

[00108] Each AAV capsid pool was then diluted to administer a final viral dose of 0.5E12 viral genomes/mouse for AAV5 libraries, and 1E12 viral genomes/mouse for AAV9 libraries. AAV libraries were delivered via retro-orbital injections to two mice for each AAV serotype library. Following a two-week transduction period *in vivo* the liver, brain, skeletal muscle, large intestine, spleen, kidney, lungs, heart, and pancreas were collected from each mouse. DNA was isolated from each tissue using TriZol extraction and the region of the AAV capsid containing the peptide insert was selectively PCR-amplified and prepared for next generation sequencing (e.g., see **FIG. 5**). Once sequenced, the total count of each peptide was quantified across all organs for each serotype and normalized relative to the average read depth of all the samples.

[00109] To analyze the top transducing AAV variants in each organ, the log2(fold-change) (log2FC) value was then calculated for each organ and then compared to the count of that AAV variant in the capsid pool along with a significance value calculated using a one-sample t-test (see **FIG. 8A**). It was found in all organs that over 17,000 AAV variants which have an FDR adjusted p-value<0.05 and a log2FC greater than 1. As expected, many of the significant hits targeted the liver, and surprisingly, several hits appear to transduce all tissues (see **FIG. 8A**). To identify the absolute top performing AAV variants, a series of filtering

steps were devised to stratify variants. First, the Levenshtein distance was calculated between 'hit' peptides to identify motifs that are consistently able to successfully transduce *in vivo* (see **FIG. 8A**). To filter the ~18,000 initial hits, only 'hit' peptides were considered where a similar (>50% sequence homology) peptide was detected among the hit pool. The goal of this filtering is to ensure that the 'hit' peptide motifs are internally reproducible. Second, to ensure that the high increase in counts across organs was due to a strong transduction capability rather than low count values in the capsid pool, out all AAV variants were filtered out with a log2count value less than 3 in the capsid pool. Finally, a log2FC derived Z-score was calculated for each organ sample, to rank how each peptide performs relative to all others in a particular organ. Peptides were only considered with a Z-score>2.5 in at least one organ. The filtering process resulted in a list of 400 top performing displayed-peptides across the four AAV capsids/loops. Log2FC values for these top performing hits are shown in **FIG. 8B-E**.

[00110] A subset of 112 AAV additional variants which appear to be strong transducers across organs were also identified (see **FIG. 9A**). These additional variants were identified by taking the average transduction level across all organs, and ranking the AAV variants on this metric.

[00111] ***Engineered lentiviral design:*** In addition to screening engineered AAVs, this methodology was adapted to engineering peptide-decorated lentiviral particles. To display peptides on lentiviral particles, a plasmid was built which contains the expression machinery to constitutively express peptides tethered to an ICAM1 transmembrane domain, which has previously been shown to associate with budding lentiviral particles (see **FIG. 10A**). An identical library of peptides as in the AAV screens was then cloned into this lentiviral display backbone. The library plasmid also contained a puromycin resistance gene, which could be used to select successfully infected cells via the addition of puromycin to the cell culture media. This plasmid library of peptides was used, along with a double mutant VSVG plasmid (K47Q and R354Q), to produce a library of lentiviral particles in HEK293T cells (see **FIG. 10B**). The double mutant VSVG retains the ability to promote fusion of the lentiviral particles to the target cells, but is devoid of native receptor binding capabilities. For lentiviral production, cells were transfected with a 1:100 dilution of the transfer vector to prevent cross-packaging of peptide genomes to the incorrect lentiviral particle.

[00112] ***Method for identifying infective lentiviral variants:*** To identify cell type specific lentiviral variants, five cell lines were subjected to targeted transduction using the

library of peptide-displaying lentiviral particles (see FIG. 10C). These cells were chosen to span a variety of tissue types, with the goal of identifying tissue specific lentiviral particles. The cells were transduced overnight in complete DMEM media, and changed to puromycin containing media after 48 h. After 3 days of selection in puromycin containing media, genomic DNA was isolated from the surviving cells via a Qiagen DNeasy genomic DNA isolation kit. Genomic DNA was then used as a template for PCR reactions (5μg gDNA / 100μl PCR reaction) to amplify the integrated DNA coding for the displayed peptides. A second PCR was then performed to attach indices and prep the samples for sequencing on an Illumina NovaSeq. Deep sequencing was then performed to identify peptide variants which promote infection of each of the above-mentioned cell types.

[00113] It will be understood that various modifications may be made without departing from the spirit and scope of this disclosure. Accordingly, other embodiments are within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A viral vector having a capsid protein comprising a heterologous targeting peptide in a range of 10-30 amino acids in length.

2. The viral vector of claim 1, wherein the heterologous targeting peptide is about 15-25 amino acids in length.

3. The viral vector of claim 1 or 2, wherein the heterologous targeting peptide is about 20 amino acids in length.

4. The viral vector of any one of claim 1-3, wherein the viral vector is an adeno-associated virus (AAV).

5. The viral vector of any one of claim 1-3, wherein the viral vector is a lentiviral vector.

6. The viral vector of claim 1, wherein the capsid protein is a VP1 capsid protein.

7. The viral vector of claim 1, wherein the capsid protein is a VP2 capsid protein.

8. The viral vector of claim 1, wherein the capsid protein is a VP3 capsid protein.

9. The viral vector of any one of claim 6-8, wherein the heterologous targeting peptide is inserted into an AAV capsid protein at loop 1 and/or loop 2.

10. The viral vector of any one of claims 1-3 or 9, wherein the viral vector is an AAV5.

11. The viral vector of any one of claims 1-3 or 9, wherein the viral vector is an AAV9.

12. The viral vector of claim 10, wherein the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

13. The viral vector of claim 11, wherein the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

14. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to hepatocytes or liver tissue.

15. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to neuronal cells or brain tissue.

16. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to pancreatic cells or pancreas tissue.

17. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to cardiac cells or heart tissue.

18. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to lung tissue.

19. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to intestinal tissue.

20. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to spleen tissue.

21. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to renal cells or kidney tissue.

22. The viral vector of claim 1, wherein the heterologous targeting peptide targets the viral vector to muscle cells or tissue.

23. An adeno-associated virus (AAV) capsid protein comprising a heterologous targeting peptide cloned into loop 1 and/or loop 2 of the capsid protein, wherein the heterologous targeting peptide is about 10-30 amino acids in length.

24. The AAV capsid protein of claim 23, wherein the capsid protein is a VP1 capsid protein.

25. The AAV capsid protein of claim 23, wherein the capsid protein is a VP2 capsid protein.

26. The AAV capsid protein of claim 23, wherein the capsid protein is a VP3 capsid protein.

27. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide is about 15-25 amino acids in length.

28. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide is about 20 amino acids in length.

29. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide is flanked by a linker peptide at the N-terminal and C-terminal ends of the heterologous targeting peptide.

30. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets hepatocytes or liver tissue.

31. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets neuronal cells or brain tissue.

32. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets pancreatic cells or pancreas tissue.

33. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets cardiac cells or heart tissue.

34. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets lung tissue.

35. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets intestinal tissue.

36. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets spleen tissue.

37. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets renal cells or kidney tissue.

38. The AAV capsid protein of claim 23, wherein the heterologous targeting peptide targets muscle cells or tissue.

39. A recombinant AAV (rAAV) comprising a capsid protein of any one of claims 23-38.

40. A recombinant AAV (rAAV) comprising a capsid protein having a targeting peptide in loop 1 and/or loop 2 wherein the targeting peptide is independently selected from SEQ ID Nos:5865 to 11445.

41. The recombinant AAV of claim 40, wherein the recombinant AAV further comprises a heterologous polynucleotide for gene delivery.

42. The recombinant AAV of claim 41, wherein the heterologous polynucleotide is a therapeutic gene.

43. A composition comprising the recombinant rAAV of any one of claims 40-42.

44. The composition of claim 43 further comprising a pharmaceutically acceptable carrier.

45. A method for delivering a transgene to a subject comprising:
administering a recombinant AAV (rAAV) to a subject, wherein the rAAV comprises:

(i) a capsid protein of any one of claims 23-38, and

(ii) at least one transgene, and wherein the rAAV infects cells of a target tissue of the subject.

46. The method of claim 45, wherein the at least one transgene encodes a protein.

47. The method of claim 46, wherein the protein is an immunoglobulin heavy chain or light chain or fragment thereof.

48. The method of claim 45, wherein the at least one transgene encodes a small interfering nucleic acid.

49. The method of claim 48, wherein the small interfering nucleic acid is a miRNA.

50. The method of claim 48, wherein the small interfering nucleic acid is a miRNA sponge or TuD RNA that inhibits the activity of at least one miRNA in the subject or animal.

51. The method of claim 49, wherein the miRNA is expressed in a cell of the target tissue.

52. The method of claim 45, wherein the target tissue is skeletal muscle, heart, liver, pancreas, brain or lung.

53. The method of claim 45, wherein the transgene expresses a transcript that comprises at least one binding site for a miRNA, wherein the miRNA inhibits activity of the transgene, in a tissue other than the target tissue, by hybridizing to the binding site.

54. The method of claim 45, wherein the at least one transgene encodes a gene product that mediates genome editing.

55. The method of claim 45, wherein the transgene comprises a tissue specific promoter or inducible promoter.

56. The method of claim 55, wherein the tissue specific promoter is a liver-specific thyroxin binding globulin (TBG) promoter, an insulin promoter, a glucagon promoter, a

somatostatin promoter, a pancreatic polypeptide (PPY) promoter, a synapsin-1 (Syn) promoter, a creatine kinase (MCK) promoter, a mammalian desmin (DES) promoter, a a-myosin heavy chain (a-MHC) promoter, or a cardiac Troponin T (cTnT) promoter.

57. The method of claim 45, wherein the rAAV is administered intravenously, intravascularly, transdermally, intraocularly, intrathecally, orally, intramuscularly, subcutaneously, intranasally, or by inhalation.

58. The method of claim 45, wherein the subject is selected from a mouse, a rat, a rabbit, a dog, a cat, a sheep, a pig, and a non-human primate.

59. The method of claim 45, wherein the subject is a human.

60. An isolated nucleic acid encoding an AAV capsid protein containing an amino acid sequence selected from the group consisting of SEQ ID No:5865 to 11444 and 11445.

61. A composition comprising the isolated AAV capsid protein of claim 23.

62. The composition of claim 61 further comprising a pharmaceutically acceptable carrier.

63. A kit for producing a rAAV, the kit comprising: a container housing an isolated nucleic acid of claim 60.

64. The kit of claim 63 further comprising instructions for producing the rAAV.

65. The kit of claim 63, further comprising at least one container housing a recombinant AAV vector, wherein the recombinant AAV vector comprises a transgene.

66. A method for coating a virus or viral particle with membrane fragments comprising:

lysing donor cells in a hypotonic solution, which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane;

removing cells and cell debris by one or more rounds of centrifugation, leaving a membrane enriched fraction;

extruding the membrane enriched faction through polycarbonate membrane(s) to generate purified membrane fragments; and

coating virus or viral particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s).

67. The method of claim 66, wherein the viruses or viral particles are non-enveloped viruses or viral particles.

68. The method of claim 66, wherein the viruses or viral particles are enveloped viruses or viral particles which have had their viral envelope removed.

69. The method of any one of claims 66-68, wherein the viruses or viral particles are selected from retroviruses, adenovirus, adeno-associated virus, hybrid adenoviruses, alphavirus, herpes simplex virus, poxvirus, Epstein-Barr virus and lentivirus.

70. The method of claim 69, wherein the viruses or viral particles are adeno-associated viruses (AAV).

71. The method of any one of claims 66-70, wherein the viruses or viral particles have been modified by directed evolution to have increased neutralizing antibody-evasion properties, as well as enhanced gene delivery, gene targeting, and/or enhanced capacity to infect.

72. The method of any one of claims 66-71, wherein the viruses or viral particles have been modified by one or more amino acid substitutions in one or more regions of a viral capsid protein so as to reduce the affinity of the viral capsid protein for the major histocompatibility complex.

73. The method of claim 66, wherein the donor cells are mammalian cells.

74. The method of claim 73, wherein the donor cells are human cells.

75. The method of claim 74, where the donor cells are human stem cells, human progenitor cells, human primary cells, human somatic cells, human germline cells, or human tumor cells.

76. The method of claim 66, wherein the membranes of the donor cells have been modified to express or present a targeting ligand.

77. The method of claim 76, wherein the targeting ligand is used to improve entry of the coated viruses or viral particles into target cells, inhibit components of the immune response to the coated viruses or viral particles, or to target the coated viruses or viral particles to certain cell types or organs.

78. The method of claim 76 or 77, wherein the targeting ligand is a peptide, antibody or antibody fragment.

79. The method of claim 78, wherein the targeting ligand comprises a peptide of any one of SEQ ID Nos:5865 to 11445.

80. Coated viruses or viral particles made by the method of any one of claim 66-79.

81. The coated viruses or viral particles of claim 80, wherein the coated viruses or viral particles have been modified to comprise a targeting ligand.

82. The coated viruses or viral particles of claim 81, wherein the coated viruses or viral particles are used to deliver transgene(s) into target cells.

83. The coated viruses or viral particles of claim 81 or 82, wherein the coated viruses or viral particles are used to genome engineer target cells.

84. A pharmaceutical composition comprising the coated viruses or viral particles of any one of claims 80 to 83 and a pharmaceutically acceptable carrier, diluent, binder and/or filler.

85. A method of treating a subject suffering from a disease or disorder in need of treatment thereof, comprising administering the coated viruses or viral particles of any one of claims 80 to 83, or the pharmaceutical composition of claim 84.

86. An engineered viral particle comprising an artificially prepared lipid envelope.

87. A method of preparing an engineered retroviral particle, the method comprising treating a retroviral particle with a detergent to remove a lipid envelop to obtain naked retroviral particles, isolating the naked retroviral particles and co-extruding a lipid envelop with the naked retroviral particles to obtain an engineered retroviral particle.

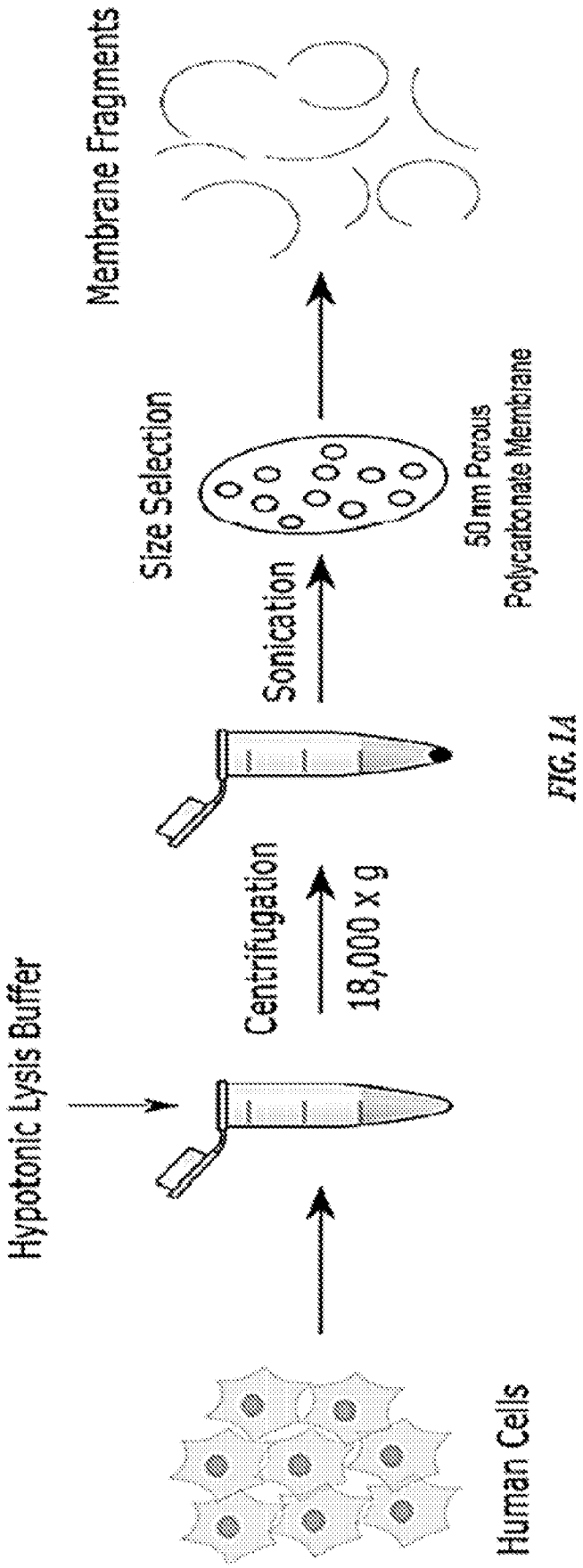

Membrane Fragments
Size Selection
50 nm Porous
Polycarbonate Membrane
Sonication
Centrifugation
18,000 x g
Hypotonic Lysis Buffer
Human Cells

FIG. 1A

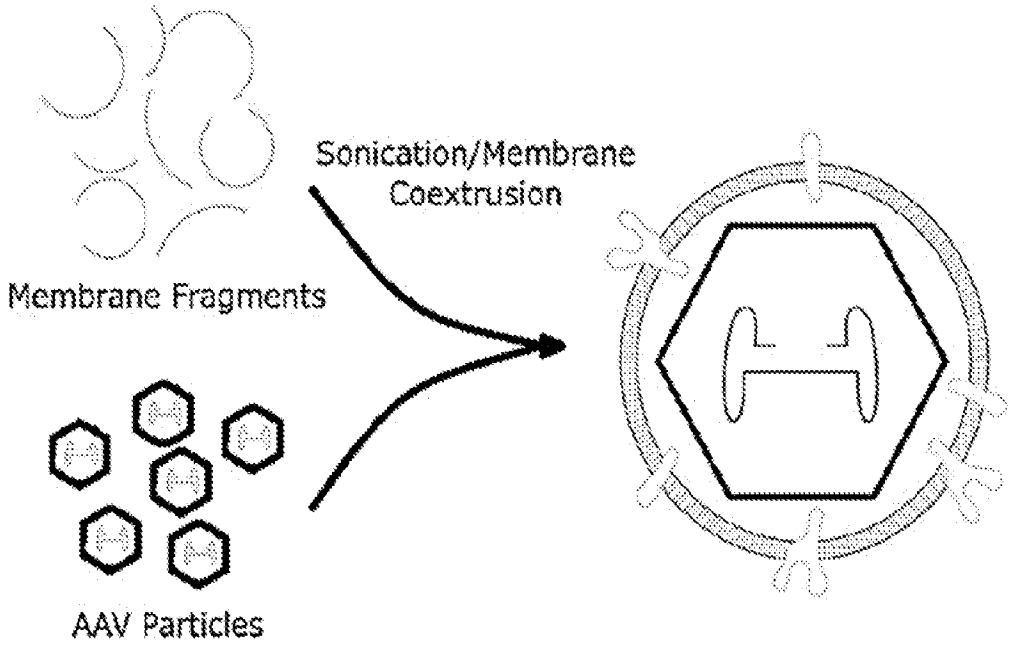

Sonication/Membrane
Coextrusion
Membrane Fragments
AAV Particles

FIG. 1B

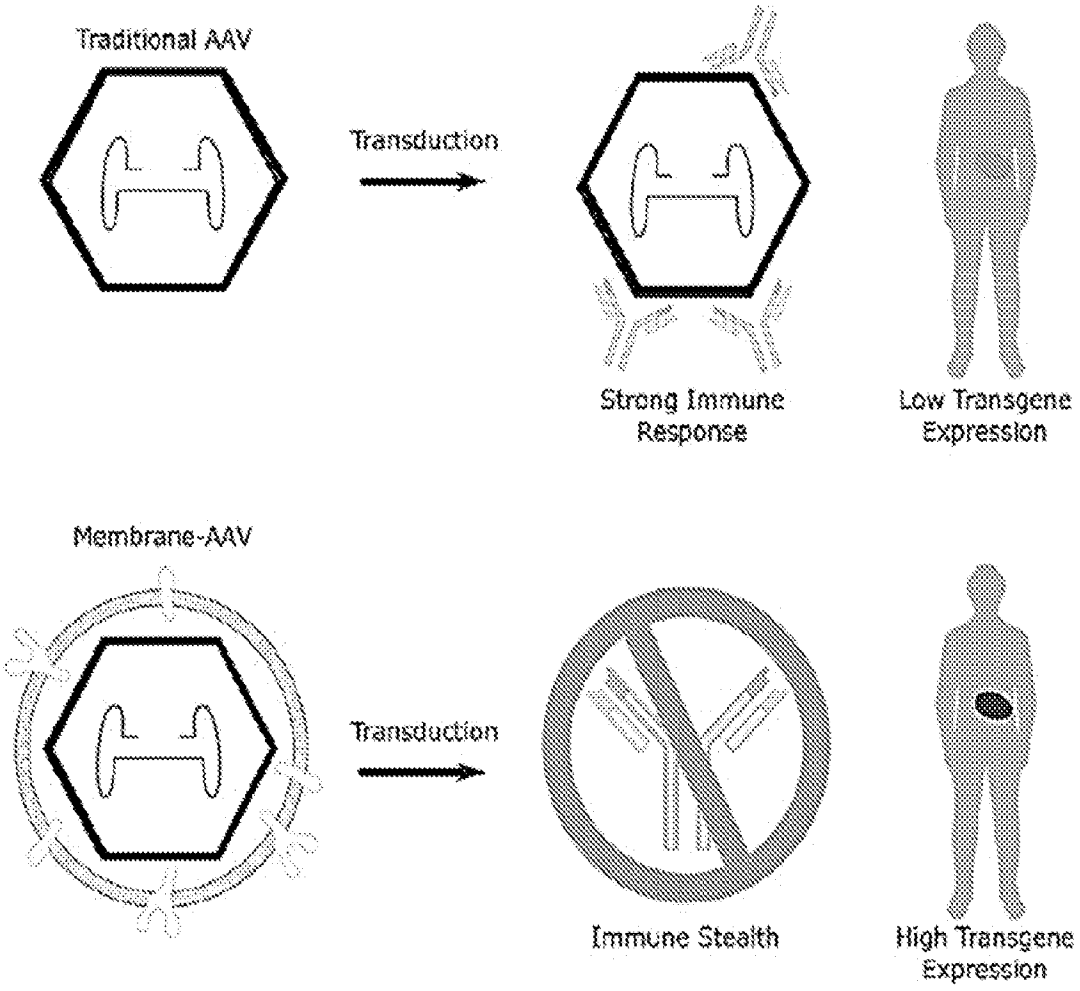

Traditional AAV
Transduction
Strong Immune
Response
Low Transgene
Expression
Membrane-AAV
Transduction
Immune Stealth
High Transgene
Expression

FIG. 2

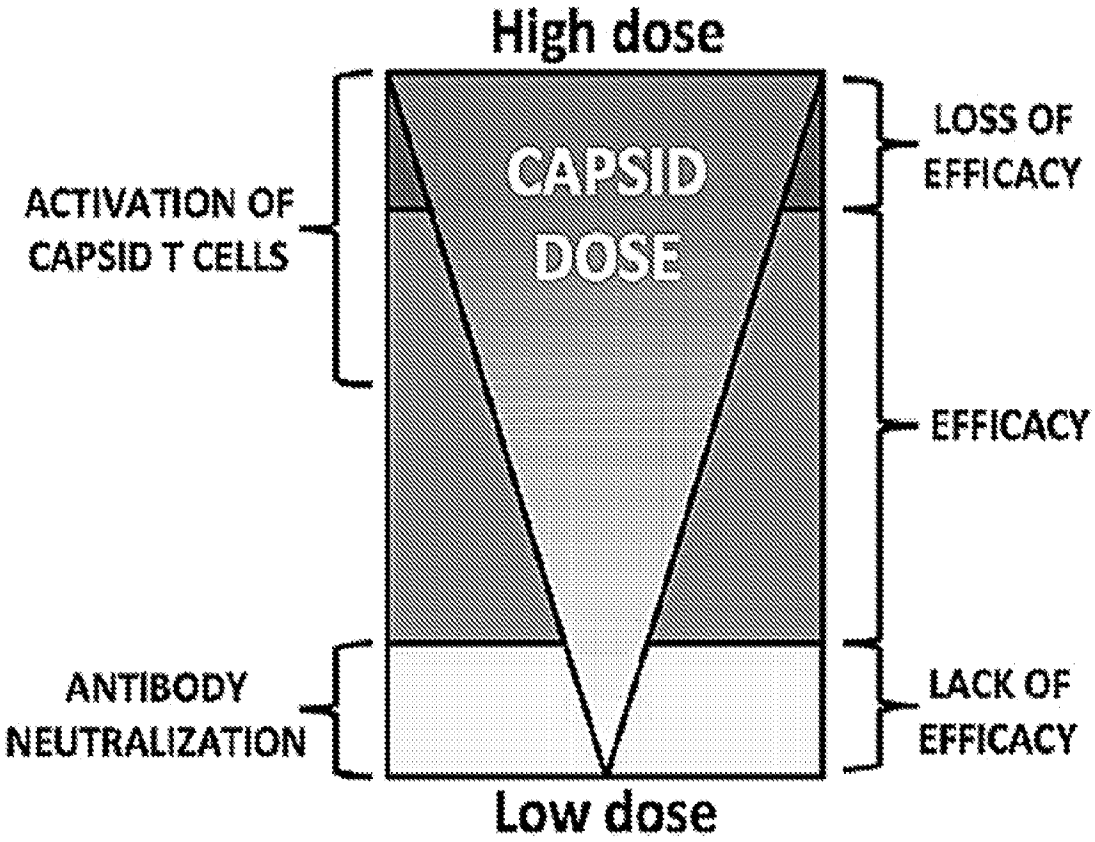

High dose
CAPSID
DOSE
ACTIVATION OF
CAPSID T CELLS
LOSS OF
EFFICACY
EFFICACY
ANTIBODY
NEUTRALIZATION
LACK OF
EFFICACY
Low dose

FIG. 3

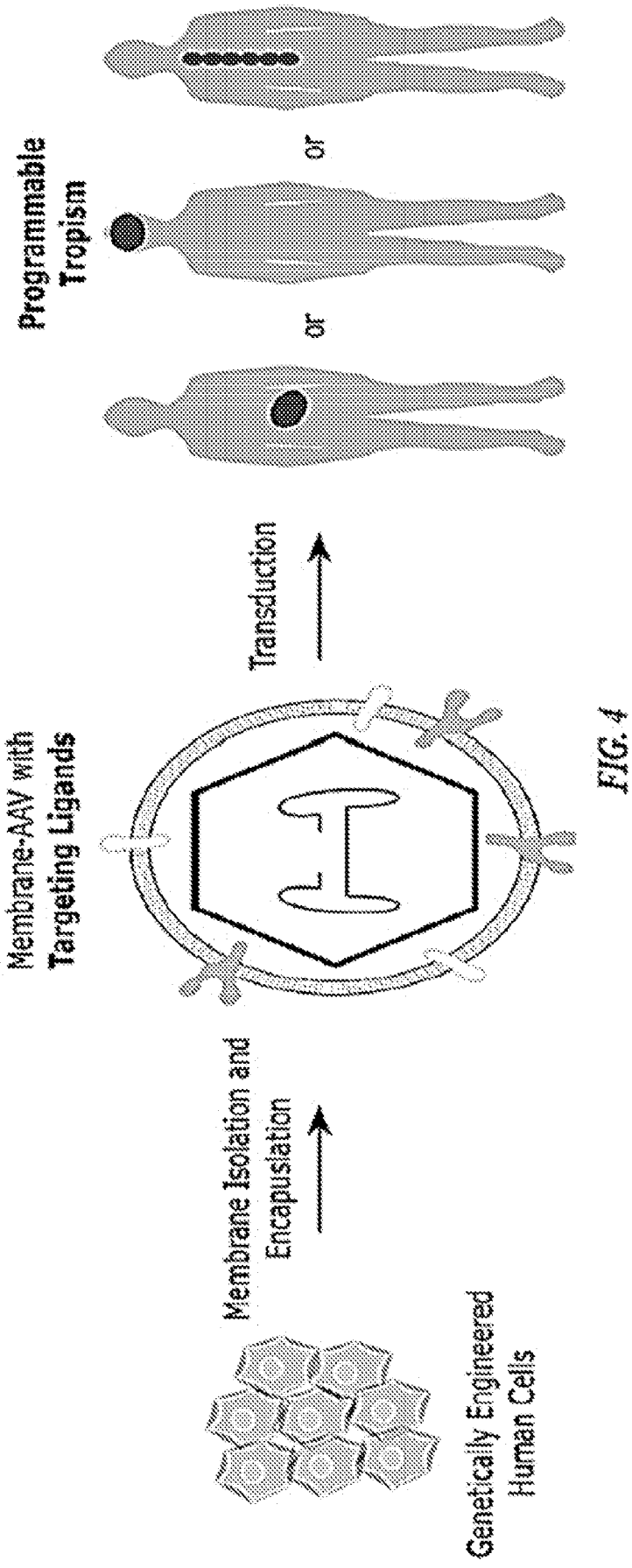

Genetically Engineered Human Cells
Membrane Isolation and Encapsulation
Membrane-AAV with Targeting Ligands
Transduction
Programmable Tropism
or
or

FIG. 4

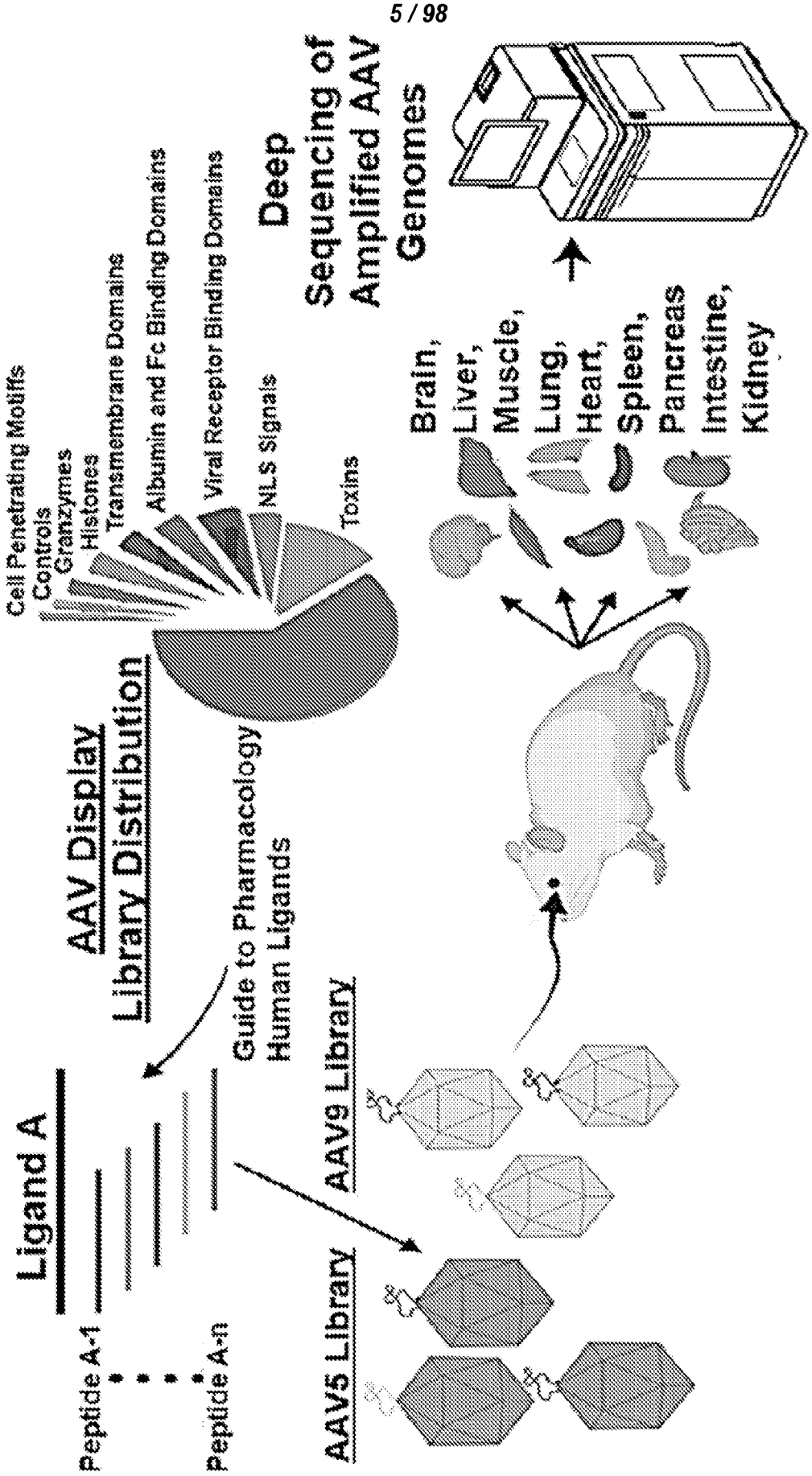

Ligand A
Peptide A-1
Peptide A-n
AAV5 Library
AAV9 Library
AAV Display
Library Distribution
Guide to Pharmacology
Human Ligands
Cell Penetrating Motifs
Controls
Granzymes
Histones
Transmembrane Domains
Albumin and Fc Binding Domains
Viral Receptor Binding Domains
NLS Signals
Toxins
Deep
Sequencing of
Amplified AAV
Genomes
Brain,
Liver,
Muscle,
Lung,
Heart,
Spleen,
Pancreas
Intestine,
Kidney

FIG. 5

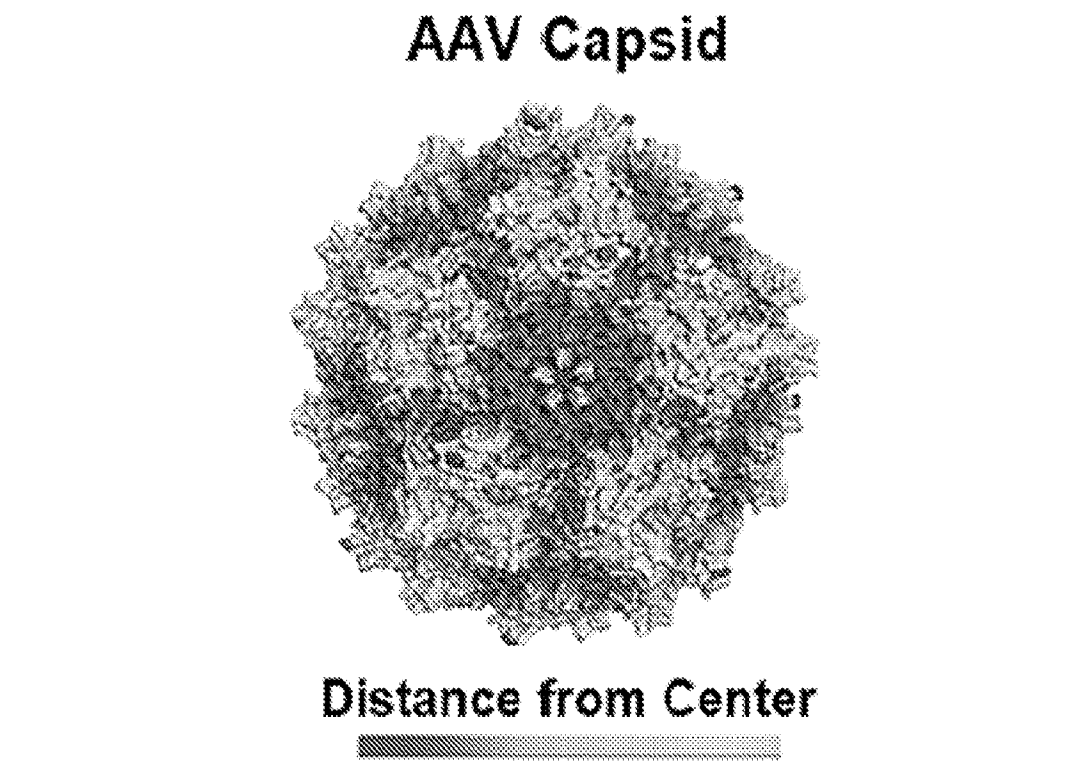


FIG. 6A

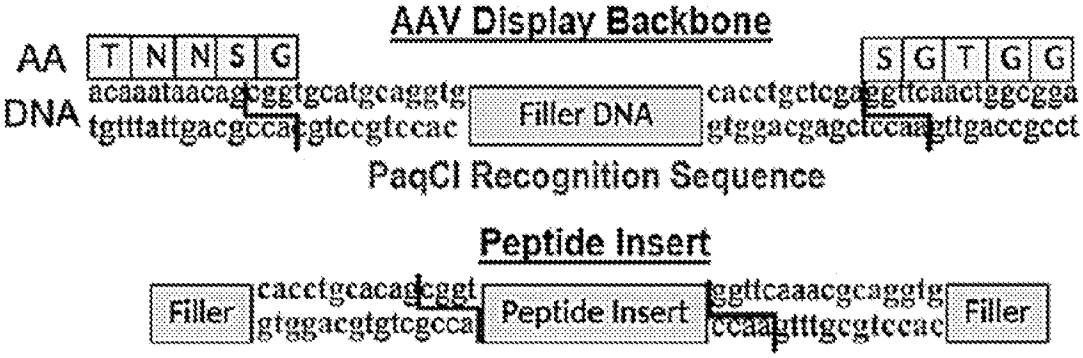


FIG. 6B

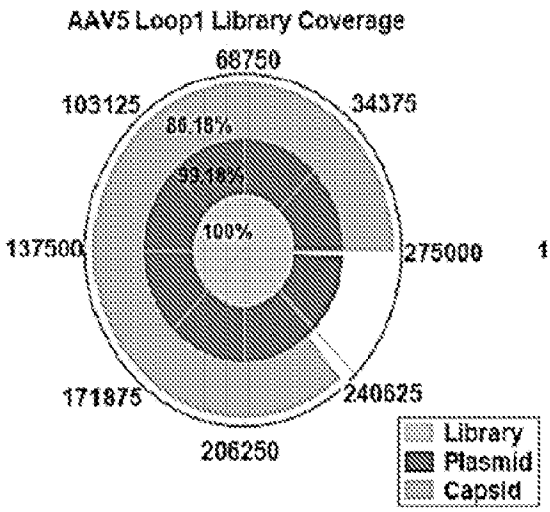


FIG. 7A

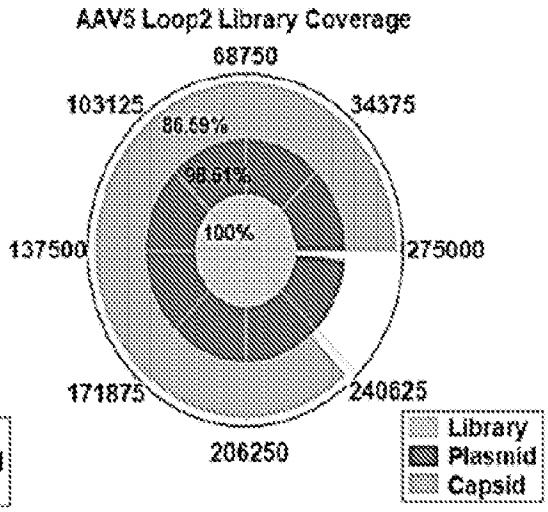


FIG. 7B

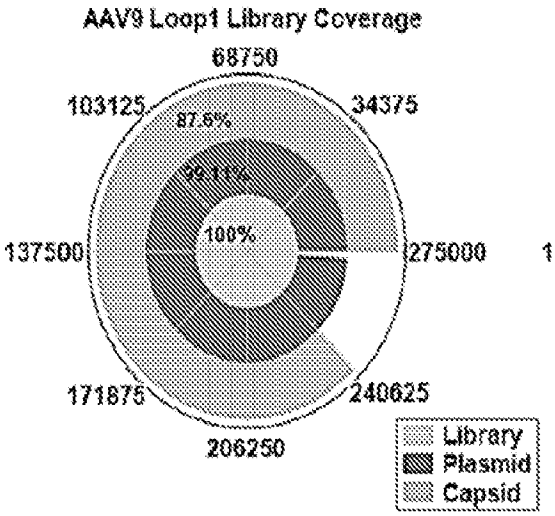


FIG. 7C

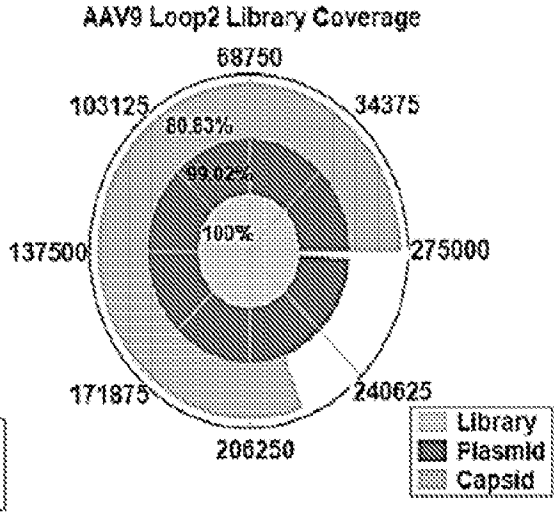


FIG. 7D

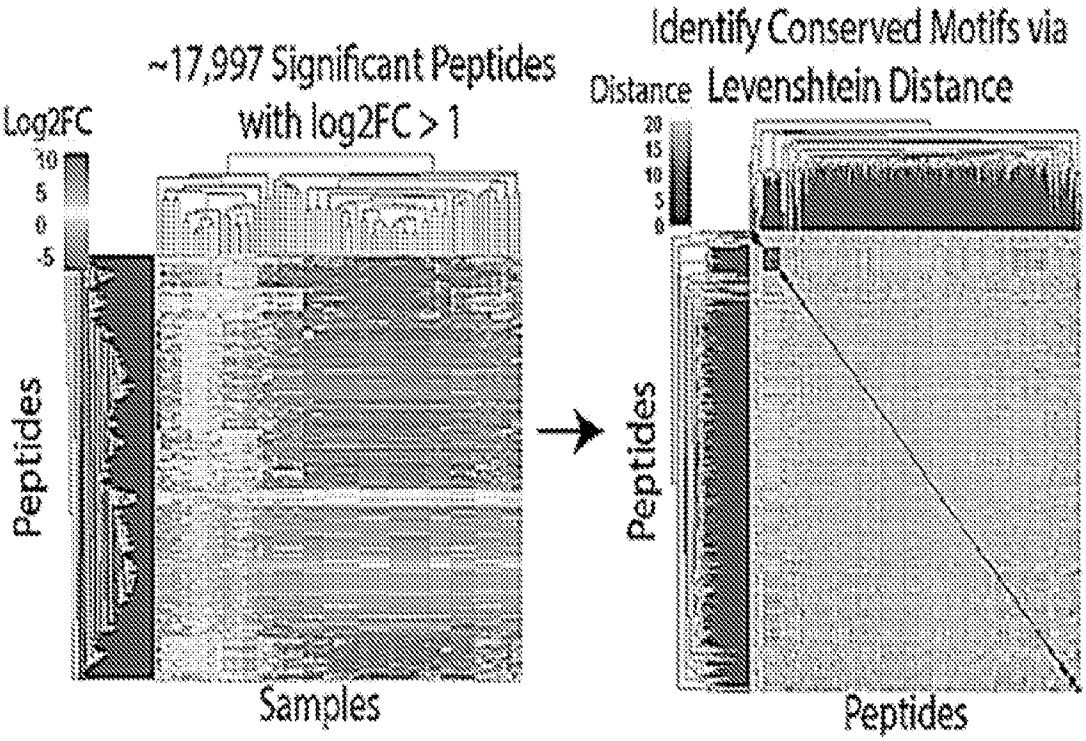


FIG. 8A

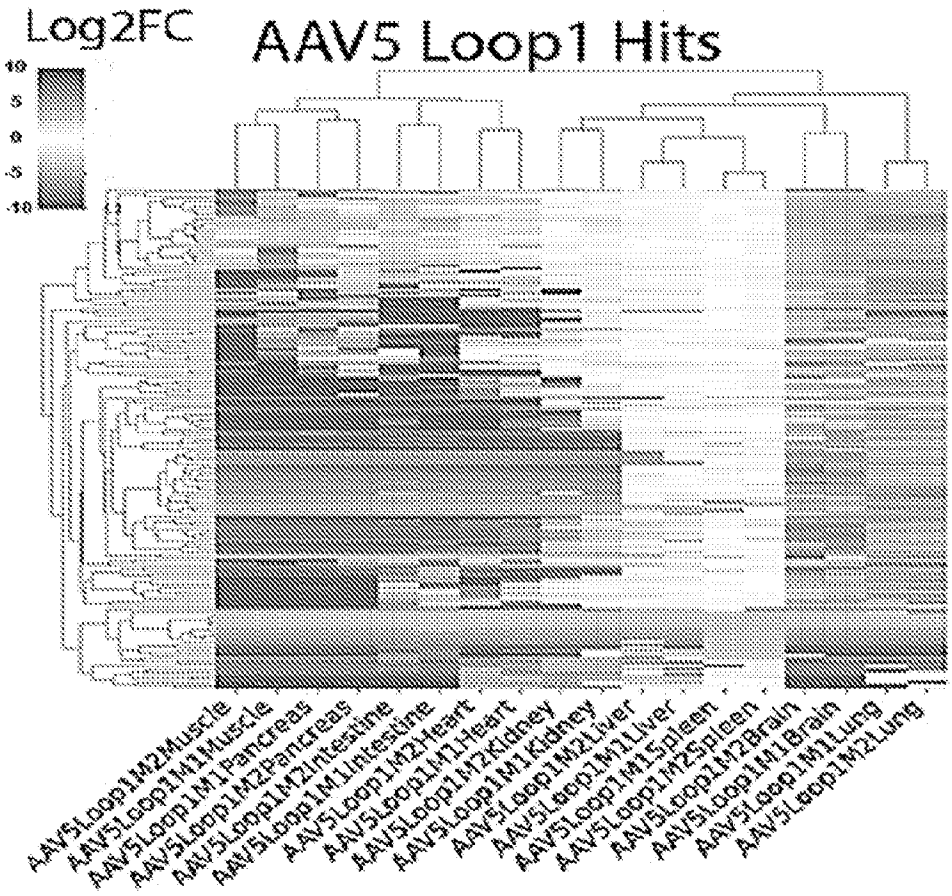

Log2FC
AAV5 Loop1 Hits
AAV5Loop1M2Muscle
AAV5Loop1M1Muscle
AAV5Loop1M1Pancreas
AAV5Loop1M2Pancreas
AAV5Loop1M2Intestine
AAV5Loop1M1Intestine
AAV5Loop1M2Heart
AAV5Loop1M1Heart
AAV5Loop1M2Kidney
AAV5Loop1M1Kidney
AAV5Loop1M2Liver
AAV5Loop1M1Liver
AAV5Loop1M1Spleen
AAV5Loop1M2Spleen
AAV5Loop1M2Brain
AAV5Loop1M1Brain
AAV5Loop1M1Lung
AAV5Loop1M2Lung

FIG. 8B

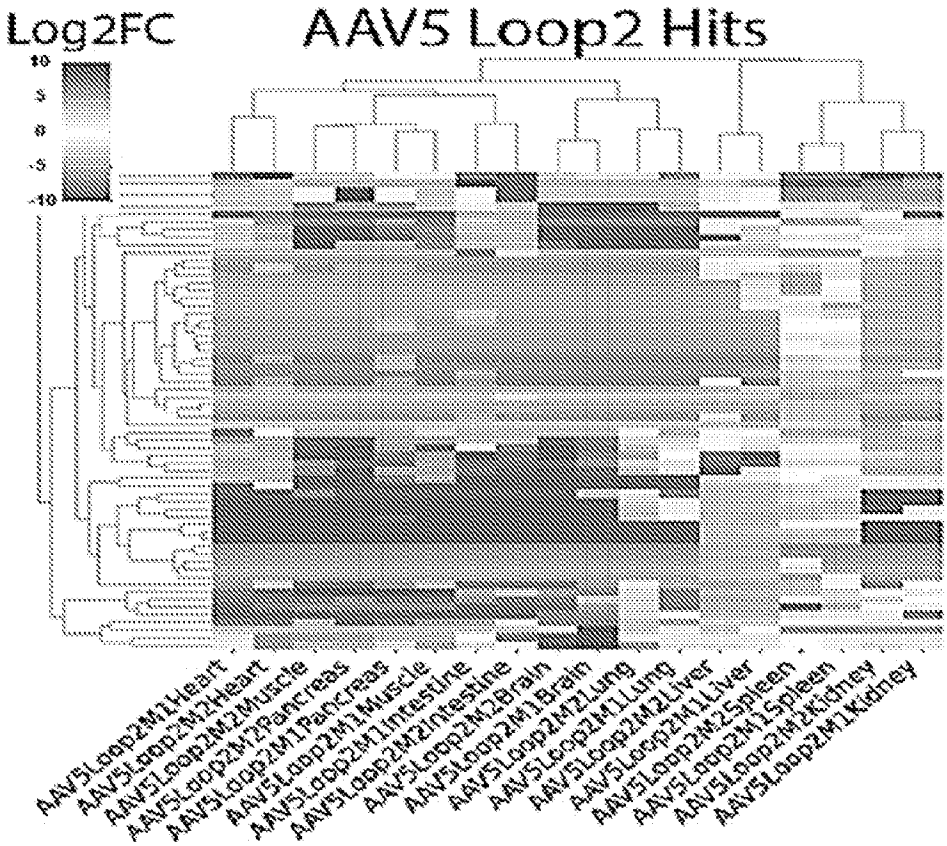

Log2FC
AAV5 Loop2 Hits
AAV5Loop2M1Heart
AAV5Loop2M2Heart
AAV5Loop2M2Muscle
AAV5Loop2M2Pancreas
AAV5Loop2M1Pancreas
AAV5Loop2M1Muscle
AAV5Loop2M2Intestine
AAV5Loop2M1Intestine
AAV5Loop2M2Brain
AAV5Loop2M1Brain
AAV5Loop2M2Lung
AAV5Loop2M1Lung
AAV5Loop2M2Liver
AAV5Loop2M1Liver
AAV5Loop2M2Spleen
AAV5Loop2M1Spleen
AAV5Loop2M2Kidney
AAV5Loop2M1Kidney

FIG. 8C

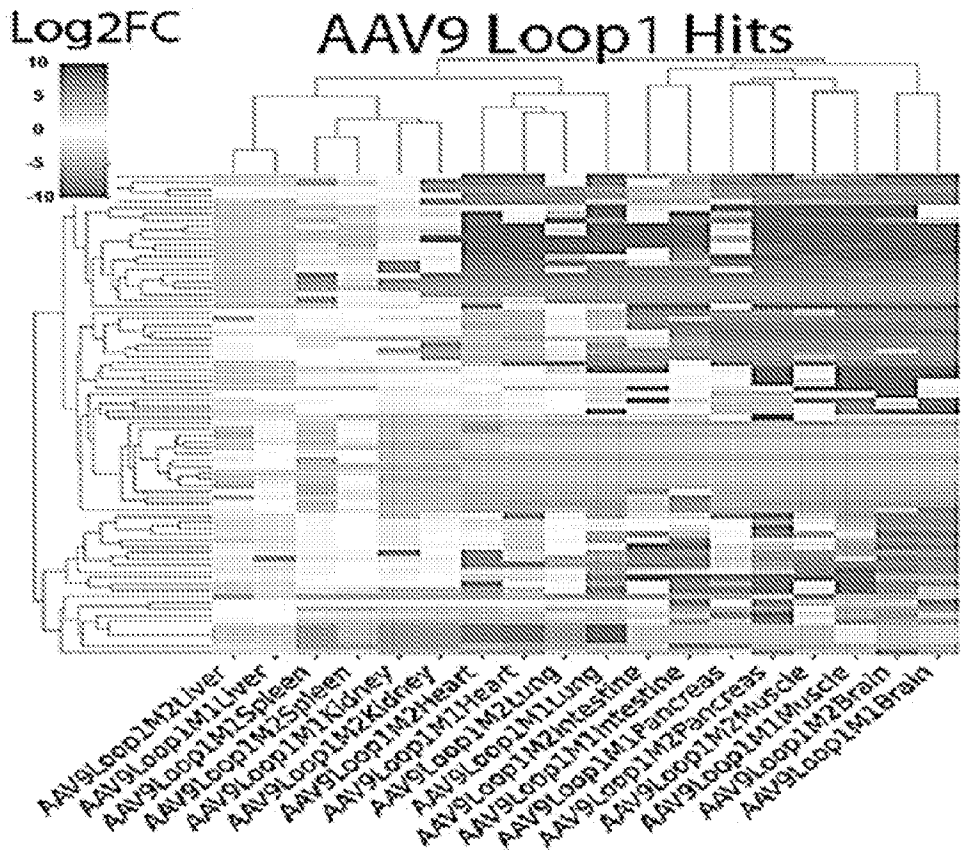

Log2FC
AAV9 Loop1 Hits
AAV9Loop1M2Liver
AAV9Loop1M1Liver
AAV9Loop1M1Spleen
AAV9Loop1M2Spleen
AAV9Loop1M1Kidney
AAV9Loop1M2Kidney
AAV9Loop1M2Heart
AAV9Loop1M1Heart
AAV9Loop1M2Lung
AAV9Loop1M1Lung
AAV9Loop1M2Intestine
AAV9Loop1M1Intestine
AAV9Loop1M1Pancreas
AAV9Loop1M2Pancreas
AAV9Loop1M2Muscle
AAV9Loop1M1Muscle
AAV9Loop1M1Brain
AAV9Loop1M2Brain

FIG. 8D

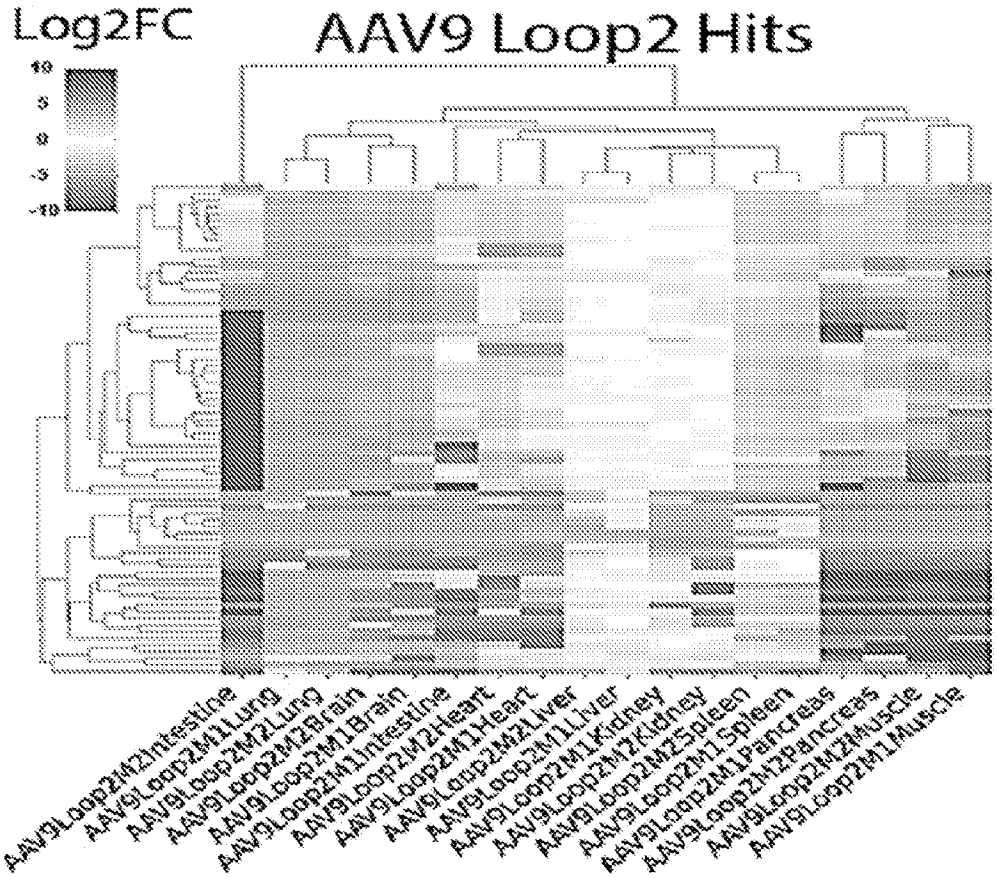

Log2FC
AAV9 Loop2 Hits
AAV9Loop2M2Intestine
AAV9Loop2M1Lung
AAV9Loop2M2Lung
AAV9Loop2M2Brain
AAV9Loop2M1Brain
AAV9Loop2M1Intestine
AAV9Loop2M2Heart
AAV9Loop2M1Heart
AAV9Loop2M2Liver
AAV9Loop2M1Liver
AAV9Loop2M1Kidney
AAV9Loop2M2Kidney
AAV9Loop2M2Spleen
AAV9Loop2M1Spleen
AAV9Loop2M1Pancreas
AAV9Loop2M2Pancreas
AAV9Loop2M2Muscle
AAV9Loop2M1Muscle

FIG. 8E

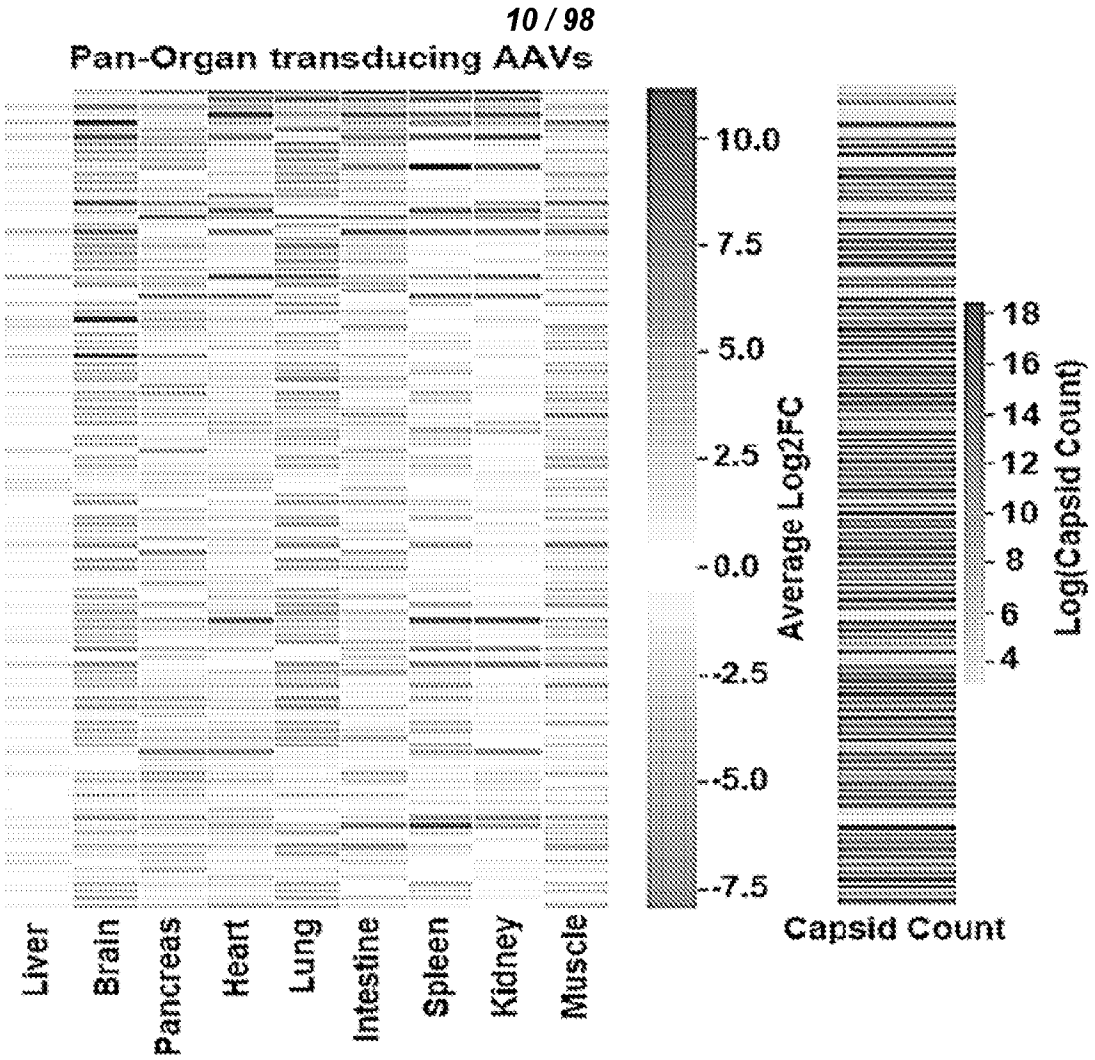

Pan-Organ transducing AAVs
Liver
Brain
Pancreas
Heart
Lung
Intestine
Spleen
Kidney
Muscle
10.0
7.5
5.0
2.5
0.0
-2.5
-5.0
-7.5
Average Log2FC
18
16
14
12
10
8
6
4
Log(Capsid Count)
Capsid Count

FIG. 9A

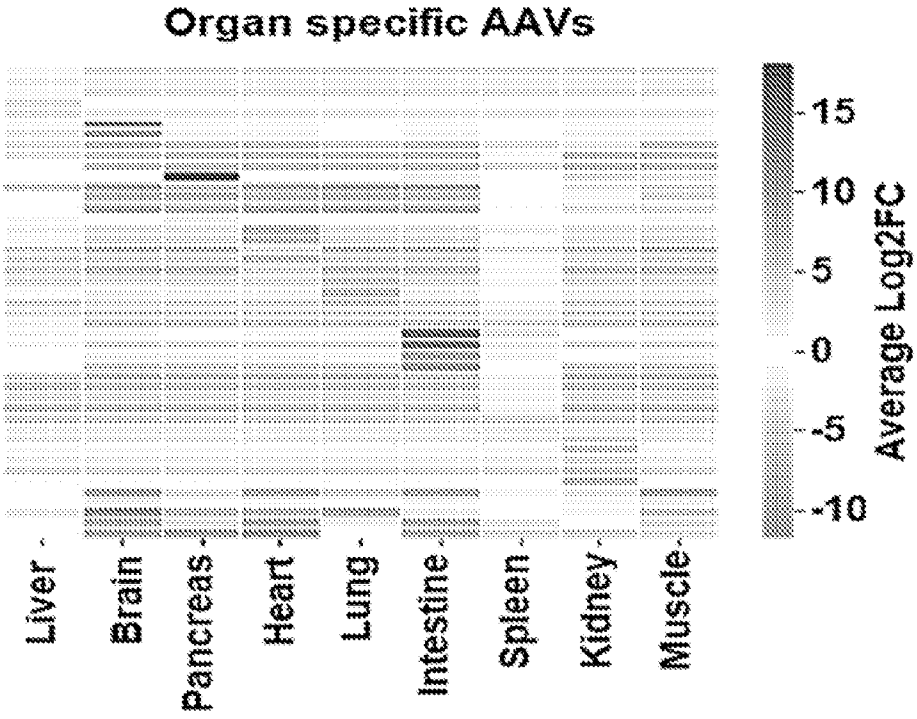

Organ specific AAVs
Liver
Brain
Pancreas
Heart
Lung
Intestine
Spleen
Kidney
Muscle
15
10
5
0
-5
-10
Average Log2FC

FIG. 9B

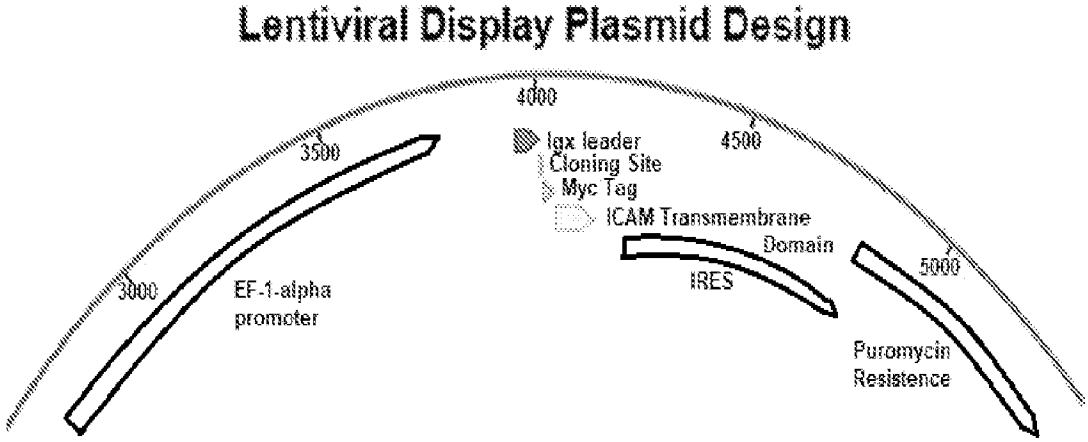


FIG. 10A

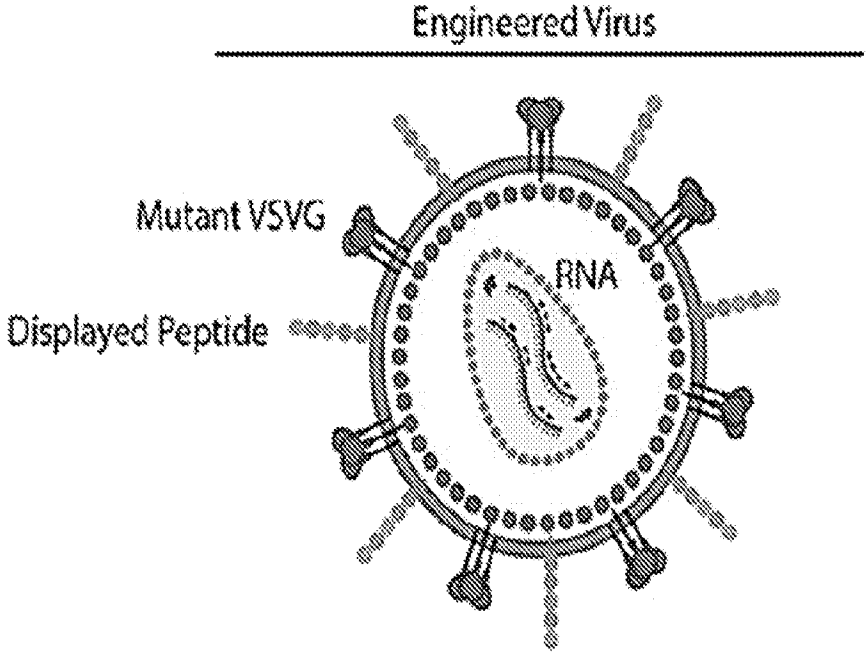


FIG. 10B

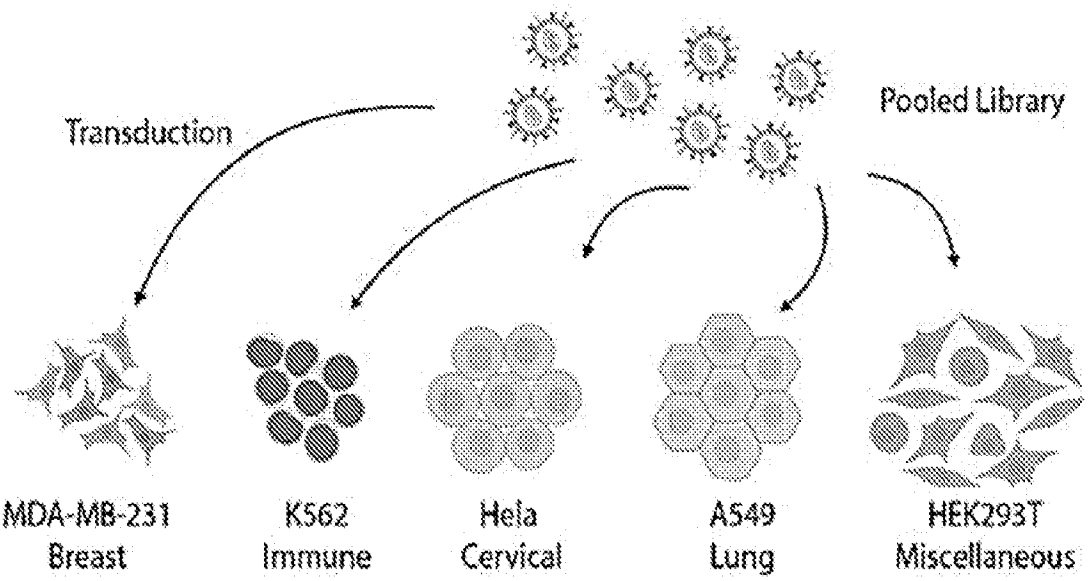


FIG. 10C

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
All - Top Transducer	1	5865	Spleen	2036	7748	Spleen	4112	9794
All - Top Transducer	2	5866	Spleen	2037	7749	Spleen	4113	9795
All - Top Transducer	3	5867	Spleen	813	6879	Spleen	4114	9796
All - Top Transducer	4	5868	Spleen	2038	7750	Spleen	4115	7403
All - Top Transducer	5	5869	Spleen	2039	7751	Spleen	4116	9797
All - Top Transducer	6	5870	Spleen	2040	7752	Spleen	4117	9798
All - Top Transducer	7	5871	Spleen	2041	7753	Spleen	901	6654
All - Top Transducer	8	5872	Spleen	2042	7754	Spleen	4118	9799
All - Top Transducer	9	5873	Spleen	2043	7755	Spleen	4119	9800
All - Top Transducer	10	5874	Spleen	2044	7756	Spleen	4120	9801
All - Top Transducer	11	5875	Spleen	2045	7757	Spleen	4055	7403
All - Top Transducer	12	5876	Spleen	2046	7758	Spleen	4121	9802
All - Top Transducer	13	5877	Spleen	2047	7759	Spleen	4122	9803
All - Top Transducer	14	5878	Spleen	2048	7760	Spleen	4123	9804
All - Top Transducer	15	5879	Spleen	2049	7761	Spleen	4124	9805
All - Top Transducer	16	5880	Spleen	2050	7762	Spleen	4125	9806
All - Top Transducer	17	5881	Spleen	2051	7763	Spleen	4126	9807
All - Top Transducer	18	5882	Spleen	2052	7764	Spleen	4127	9808
All - Top Transducer	19	5883	Spleen	2053	7765	Spleen	4128	9809
All - Top Transducer	2	5866	Spleen	2054	7766	Spleen	4129	9810
All - Top Transducer	20	5884	Spleen	2055	7767	Spleen	4130	9811
All - Top Transducer	21	5885	Spleen	2056	7768	Spleen	4131	9812
All - Top Transducer	22	5886	Spleen	2057	7769	Spleen	4132	9813

FIG. 11

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
All - Top Transducer	23	5887	Spleen	2058	7770	Spleen	4133	9814
All - Top Transducer	24	5888	Spleen	2059	7771	Spleen	4134	9815
All - Top Transducer	25	5889	Spleen	2060	7772	Spleen	4135	9816
All - Top Transducer	26	5890	Spleen	2061	7773	Spleen	4136	9817
All - Top Transducer	27	5891	Spleen	2062	7774	Spleen	4137	9818
All - Top Transducer	28	5892	Spleen	2063	7775	Spleen	4138	9819
All - Top Transducer	29	5893	Spleen	2064	7776	Spleen	4139	9820
All - Top Transducer	30	5894	Spleen	2065	7777	Spleen	4140	9821
All - Top Transducer	31	5895	Spleen	2066	7778	Spleen	1874	7589
All - Top Transducer	32	5896	Spleen	2067	7779	Spleen	4141	9822
All - Top Transducer	33	5897	Spleen	2068	7780	Spleen	4142	9823
All - Top Transducer	34	5898	Spleen	2069	7781	Spleen	4143	9824
All - Top Transducer	35	5899	Spleen	2070	7782	Spleen	4144	9825
All - Top Transducer	36	5900	Spleen	2071	7783	Spleen	4145	9826
All - Top Transducer	37	5901	Spleen	2072	7784	Spleen	4146	9827
All - Top Transducer	22	5886	Spleen	2073	7785	Spleen	1908	7622
All - Top Transducer	38	5902	Spleen	2074	7786	Spleen	4147	9828
All - Top Transducer	39	5903	Spleen	2075	7787	Spleen	4148	9829
All - Top Transducer	40	5904	Spleen	2076	7788	Spleen	4149	9830
All - Top Transducer	40	5904	Spleen	2077	7789	Spleen	4150	9831
All - Top Transducer	41	5905	Spleen	2078	7790	Spleen	4151	9832
All - Top Transducer	42	5906	Spleen	2079	7791	Spleen	4152	9833
All - Top Transducer	43	5907	Spleen	2080	6876	Spleen	4153	9834

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
All - Top Transducer	44	5908	Spleen	2081	7792	Spleen	4154	9835
All - Top Transducer	45	5909	Spleen	2082	7793	Spleen	4155	9836
All - Top Transducer	13	5877	Spleen	2083	7794	Spleen	4156	9837
All - Top Transducer	46	5910	Spleen	2084	7795	Spleen	4157	9838
All - Top Transducer	47	5911	Spleen	2085	7796	Spleen	4158	9839
All - Top Transducer	48	5912	Spleen	2086	7797	Spleen	4159	9840
All - Top Transducer	49	5913	Spleen	2087	7798	Spleen	4160	9841
All - Top Transducer	50	5914	Spleen	2088	7799	Spleen	4161	9842
All - Top Transducer	51	5915	Spleen	2089	7800	Spleen	4162	9843
All - Top Transducer	52	5916	Spleen	2090	7801	Spleen	4163	9844
All - Top Transducer	53	5917	Spleen	2091	7802	Spleen	4164	9845
All - Top Transducer	54	5918	Spleen	2092	7803	Spleen	4165	9846
All - Top Transducer	55	5919	Spleen	2093	7804	Spleen	4166	9847
All - Top Transducer	56	5920	Spleen	2094	7805	Spleen	4167	9848
All - Top Transducer	57	5921	Spleen	2095	7806	Spleen	4168	9849
All - Top Transducer	58	5922	Spleen	2096	7807	Spleen	4169	9850
All - Top Transducer	59	5923	Spleen	2097	7808	Spleen	4170	9851
All - Top Transducer	60	5924	Spleen	2098	7809	Spleen	4171	9852
All - Top Transducer	61	5925	Spleen	2099	7810	Spleen	4172	9853
All - Top Transducer	62	5926	Spleen	2100	7811	Spleen	4173	9854
All - Top Transducer	63	5913	Spleen	2101	7812	Spleen	4174	9855
All - Top Transducer	64	5927	Spleen	2102	7813	Spleen	4175	9856
All - Top Transducer	65	5928	Spleen	2103	7814	Spleen	4176	9857

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
All - Top Transducer	34	5898	Spleen	2104	7815	Spleen	4177	9858
All - Top Transducer	38	5902	Spleen	2105	7816	Spleen	4178	9859
All - Top Transducer	59	5923	Spleen	2106	7817	Spleen	4179	9860
All - Top Transducer	7	5871	Spleen	2107	7818	Spleen	2029	7741
All - Top Transducer	66	5929	Spleen	2108	7819	Spleen	4	5868
All - Top Transducer	40	5904	Spleen	2109	7820	Spleen	4180	9861
All - Top Transducer	67	5930	Spleen	2110	7821	Spleen	4181	9862
All - Top Transducer	2	5866	Spleen	2111	7822	Spleen	4182	9863
All - Top Transducer	68	5931	Spleen	2112	7823	Spleen	4183	9864
All - Top Transducer	69	5932	Spleen	2113	7824	Spleen	4184	9865
All - Top Transducer	70	5933	Spleen	2114	7825	Spleen	4185	9866
All - Top Transducer	71	5934	Spleen	2115	7826	Spleen	4186	9867
All - Top Transducer	72	5935	Spleen	2116	7827	Spleen	4187	9868
All - Top Transducer	73	5927	Spleen	2117	7828	Spleen	4188	9869
All - Top Transducer	6	5870	Spleen	2118	7829	Spleen	4189	9870
All - Top Transducer	74	5936	Spleen	2119	7830	Spleen	4190	9871
All - Top Transducer	75	5927	Spleen	2120	7831	Spleen	4191	9872
All - Top Transducer	76	5937	Spleen	2121	7832	Spleen	4192	9873
All - Top Transducer	77	5938	Spleen	2122	7833	Spleen	2098	7809
All - Top Transducer	78	5939	Spleen	2123	7834	Spleen	4193	9874
All - Top Transducer	79	5940	Spleen	2124	7835	Spleen	4194	9875
All - Top Transducer	80	5941	Spleen	2125	7836	Spleen	4195	9876
All - Top Transducer	81	5927	Spleen	2126	7837	Spleen	4196	9877

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
All - Top Transducer	82	5913	Spleen	2127	7838	Spleen	4197	9878
All - Top Transducer	83	5942	Spleen	2128	7839	Spleen	4198	9879
All - Top Transducer	84	5943	Spleen	2129	7840	Spleen	4199	9880
All - Top Transducer	85	5918	Spleen	2130	7841	Spleen	4200	9881
All - Top Transducer	86	5944	Spleen	2131	7842	Spleen	4201	9882
All - Top Transducer	87	5918	Spleen	2132	7843	Spleen	4202	9883
All - Top Transducer	88	5945	Spleen	2133	7844	Spleen	4203	9884
All - Top Transducer	89	5946	Spleen	2134	7845	Spleen	4204	9885
All - Top Transducer	90	5947	Spleen	2135	7846	Spleen	4205	9886
All - Top Transducer	41	5905	Spleen	2136	7847	Spleen	4206	9887
All - Top Transducer	91	5948	Spleen	2137	7848	Spleen	4207	9888
All - Top Transducer	92	5949	Spleen	2138	7849	Spleen	4208	9889
All - Top Transducer	93	5950	Spleen	2139	7850	Spleen	4209	9890
All - Top Transducer	94	5951	Spleen	2140	7851	Spleen	4210	9891
All - Top Transducer	95	5952	Spleen	2141	7852	Spleen	4211	9892
All - Top Transducer	96	5953	Spleen	2142	7853	Spleen	4212	9893
All - Top Transducer	52	5916	Heart	2143	7854	Spleen	4213	9894
All - Top Transducer	97	5954	Spleen	2144	7855	Spleen	4214	9895
All - Top Transducer	98	5955	Spleen	2145	7856	Spleen	4215	9896
All - Top Transducer	99	5956	Spleen	2146	7857	Spleen	4216	9897
Liver	100	5957	Spleen	2147	7858	Spleen	4217	9898
Liver	101	5958	Spleen	2148	7859	Spleen	4218	9899
Liver	102	5959	Spleen	2149	7860	Spleen	4219	9900
Liver	103	5960	Spleen	2150	7861	Spleen	4220	9901

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	104	5961	Spleen	2151	7862	Spleen	4221	9902
Liver	105	5962	Spleen	2152	7863	Spleen	4222	9903
Liver	106	5963	Spleen	2153	7864	Spleen	4223	9904
Liver	107	5964	Spleen	2154	7865	Spleen	4224	9905
Liver	108	5965	Spleen	2155	7866	Spleen	4225	9906
Liver	109	5966	Spleen	2156	7867	Spleen	4226	9907
Liver	110	5967	Spleen	2157	7868	Spleen	4227	9908
Liver	111	5968	Spleen	2158	7869	Spleen	4073	9760
Liver	112	5958	Spleen	2159	7870	Spleen	4228	9909
Liver	113	5969	Spleen	2160	7871	Spleen	4229	9910
Liver	114	5970	Spleen	2161	7872	Spleen	4230	9911
Liver	115	5971	Spleen	2162	7873	Spleen	4231	9912
Liver	116	5966	Spleen	2163	7874	Spleen	4232	9913
Liver	117	5972	Spleen	2164	7875	Spleen	4233	9914
Liver	118	5973	Spleen	2165	7876	Spleen	4234	9915
Liver	119	5966	Spleen	2166	7877	Spleen	4235	9916
Liver	120	5974	Spleen	2167	7878	Spleen	4236	9917
Liver	121	5975	Spleen	2168	7879	Spleen	4237	9918
Liver	122	5958	Spleen	2169	7880	Spleen	4076	9763
Liver	123	5976	Spleen	2170	7881	Spleen	4238	9919
Liver	124	5977	Spleen	2171	7882	Spleen	4239	9920
Liver	125	5978	Spleen	2172	7883	Spleen	4240	9921
Liver	126	5979	Spleen	2173	7884	Spleen	4241	9922
Liver	127	5966	Spleen	2174	7885	Spleen	4242	9923
Liver	128	5958	Spleen	2175	7886	Spleen	4243	9924
Liver	129	5980	Spleen	2176	7887	Spleen	4244	9925
Liver	130	5981	Spleen	2177	7888	Spleen	4245	9926
Liver	131	5982	Spleen	2178	7889	Spleen	4246	9927
Liver	132	5983	Spleen	2179	7890	Spleen	4247	9928

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	133	5984	Spleen	2180	7891	Spleen	4248	9939
Liver	134	5985	Spleen	2181	7892	Spleen	4249	9930
Liver	135	5986	Spleen	2182	7893	Spleen	4250	9931
Liver	136	5987	Spleen	2183	7894	Spleen	4251	9932
Liver	137	5988	Spleen	2184	7895	Spleen	4252	9933
Liver	138	5989	Spleen	2185	7896	Spleen	2324	8032
Liver	139	5958	Spleen	2186	7897	Spleen	4253	9934
Liver	140	5990	Spleen	2187	7898	Spleen	4254	9935
Liver	141	5991	Spleen	2188	7899	Spleen	4255	9936
Liver	142	5992	Spleen	2189	7900	Spleen	4256	9937
Liver	143	5993	Spleen	2190	7901	Spleen	4257	9938
Liver	144	5964	Spleen	2191	7902	Spleen	4258	9939
Liver	145	5994	Spleen	2192	7903	Spleen	4259	9940
Liver	146	5995	Spleen	2193	7904	Spleen	4260	9941
Liver	147	5996	Spleen	2194	7905	Spleen	4261	9942
Liver	148	5997	Spleen	2195	7906	Spleen	4262	9943
Liver	149	5998	Spleen	2196	7907	Spleen	4263	9944
Liver	150	5999	Spleen	2197	7908	Spleen	4264	9945
Liver	151	5958	Spleen	2198	7909	Spleen	4265	9946
Liver	152	6000	Spleen	2199	7910	Spleen	4266	9947
Liver	153	6001	Spleen	2200	7911	Spleen	4267	9948
Liver	154	6002	Spleen	2201	7912	Spleen	4268	9949
Liver	155	6003	Spleen	2202	7913	Spleen	4269	9885
Liver	156	6004	Spleen	2203	7914	Spleen	4270	9950
Liver	157	6005	Spleen	2204	7915	Spleen	4271	9951
Liver	158	6006	Spleen	2205	7916	Spleen	4272	9952
Liver	159	6007	Spleen	2206	7917	Spleen	4273	9953
Liver	160	6008	Spleen	2207	7918	Spleen	4274	9954
Liver	161	6009	Spleen	2208	7919	Spleen	4275	9955

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	162	6010	Spleen	2209	7920	Spleen	4276	9956
Liver	163	5958	Spleen	2210	7921	Spleen	4277	9957
Liver	164	5958	Spleen	2211	7922	Spleen	4278	9958
Liver	165	6011	Spleen	2212	7923	Spleen	4279	9959
Liver	166	6012	Spleen	2213	7924	Spleen	4280	9960
Liver	167	6013	Spleen	2214	7925	Spleen	4281	9961
Liver	168	5958	Spleen	2215	7926	Spleen	4282	9962
Liver	169	6014	Spleen	2216	7927	Spleen	4283	9963
Liver	170	6015	Spleen	2217	7928	Spleen	4284	9964
Liver	171	6016	Spleen	2218	7929	Spleen	4285	9965
Liver	172	6017	Spleen	2219	7930	Spleen	4286	9966
Liver	173	6018	Spleen	2220	7931	Spleen	4287	9967
Liver	174	6019	Spleen	2221	7932	Spleen	4288	9968
Liver	175	6020	Spleen	2222	7933	Spleen	4289	9969
Liver	176	6021	Spleen	2223	7934	Spleen	4290	9970
Liver	177	6022	Spleen	2224	7935	Spleen	4291	9971
Liver	178	6023	Spleen	1400	7126	Spleen	4292	9972
Liver	179	6024	Spleen	2225	7936	Spleen	4293	9973
Liver	180	6025	Spleen	2226	7937	Spleen	4294	9974
Liver	181	5958	Spleen	2227	7938	Spleen	4295	9975
Liver	182	5958	Spleen	2228	7939	Spleen	4296	9976
Liver	183	6026	Spleen	2229	7940	Spleen	4297	8226
Liver	184	6027	Spleen	2230	7685	Spleen	4298	9977
Liver	185	6028	Spleen	2231	7941	Spleen	4299	9978
Liver	186	6029	Spleen	2232	7942	Spleen	4300	9979
Liver	187	6030	Spleen	2233	7943	Spleen	4301	9980
Liver	188	6031	Spleen	2234	7944	Spleen	4302	9981
Liver	189	6032	Spleen	2235	7945	Spleen	4303	9982
Liver	190	5964	Spleen	2236	7946	Spleen	4304	9983

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	191	6033	Spleen	2237	7947	Spleen	4305	9984
Liver	192	6034	Spleen	2238	7948	Spleen	4306	9985
Liver	193	6035	Spleen	2239	7949	Spleen	4307	9986
Liver	194	6036	Spleen	2240	7950	Spleen	4308	9987
Liver	195	6034	Spleen	2241	7951	Spleen	4309	9988
Liver	196	6037	Spleen	2242	7952	Spleen	4310	9989
Liver	197	6038	Spleen	2243	7953	Spleen	4311	9990
Liver	198	5958	Spleen	2244	7954	Spleen	4312	9991
Liver	199	6039	Spleen	2245	7955	Spleen	4313	9992
Liver	200	6040	Spleen	2246	7956	Spleen	4314	9993
Liver	201	6014	Spleen	2247	7957	Spleen	4315	9994
Liver	202	6041	Spleen	2248	7958	Spleen	854	6618
Liver	203	6042	Spleen	2249	7959	Spleen	1030	6769
Liver	204	6043	Spleen	2250	7960	Spleen	4316	9995
Liver	205	6044	Spleen	2251	7961	Spleen	4317	9996
Liver	206	5958	Spleen	2252	7962	Spleen	4318	9997
Liver	207	6045	Spleen	2253	7963	Spleen	4319	9998
Liver	208	6046	Spleen	2254	7964	Spleen	4320	9999
Liver	209	6047	Spleen	2255	7965	Spleen	4321	10000
Liver	210	6048	Spleen	2256	7966	Spleen	4322	10001
Liver	211	6049	Spleen	2257	7967	Spleen	4323	10002
Liver	212	6040	Spleen	2258	7968	Spleen	4324	10003
Liver	213	6050	Spleen	2259	7969	Spleen	4325	10004
Liver	214	6051	Spleen	2260	7970	Spleen	4326	10005
Liver	215	6052	Spleen	2261	7685	Spleen	4327	10006
Liver	216	6053	Spleen	2262	7971	Spleen	4328	10007
Liver	217	6054	Spleen	2263	7972	Spleen	4329	10008
Liver	218	6055	Spleen	2264	7973	Spleen	2733	8437
Liver	219	6056	Spleen	2265	7974	Spleen	4330	10009

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	220	6057	Spleen	2266	7975	Spleen	4331	10010
Liver	221	6058	Spleen	2267	7976	Spleen	858	6622
Liver	222	6059	Spleen	2268	7977	Spleen	4332	10011
Liver	223	6060	Spleen	2269	7978	Spleen	4333	10012
Liver	224	6061	Spleen	2270	7979	Spleen	4334	10013
Liver	225	6062	Heart	1183	6911	Spleen	4335	10014
Liver	226	6063	Spleen	2271	7980	Spleen	4336	10015
Liver	227	6064	Spleen	2272	7981	Spleen	4337	10016
Liver	228	6065	Spleen	2273	7982	Spleen	4338	6727
Liver	229	6066	Spleen	2274	7983	Spleen	4339	10017
Liver	230	6067	Spleen	2275	7984	Spleen	4340	10018
Liver	231	6068	Spleen	2276	7765	Spleen	4341	10019
Liver	232	5964	Spleen	2277	7985	Spleen	4342	10020
Liver	233	6069	Spleen	2278	7986	Spleen	4343	10021
Liver	234	6070	Spleen	2279	7987	Spleen	4344	9981
Liver	235	6071	Spleen	2280	7988	Spleen	4345	10022
Liver	236	6040	Spleen	2281	7989	Spleen	4346	10023
Liver	237	6072	Spleen	2282	7990	Spleen	4347	10024
Liver	238	6073	Spleen	2283	7991	Spleen	4348	10025
Liver	239	6040	Spleen	2284	7992	Spleen	4349	10026
Liver	240	6074	Spleen	2285	7993	Spleen	4350	10027
Liver	241	6075	Spleen	2286	7994	Spleen	4351	10028
Liver	242	6076	Spleen	2287	7995	Spleen	4352	10029
Liver	243	6077	Spleen	2288	7996	Spleen	4353	10030
Liver	244	6078	Spleen	2289	7997	Spleen	4354	10031
Liver	245	6079	Spleen	2290	7998	Spleen	4355	10032
Liver	246	6080	Spleen	2291	7999	Spleen	4356	10033
Liver	247	6081	Spleen	2292	8000	Spleen	4357	10034
Liver	248	6082	Spleen	2293	8001	Spleen	4358	10019

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	249	6083	Spleen	2294	8002	Spleen	4359	10035
Liver	250	6084	Spleen	2295	8003	Spleen	4360	10036
Liver	251	6085	Spleen	2296	8004	Spleen	4361	10037
Liver	252	6086	Spleen	2297	8005	Spleen	4362	10038
Liver	253	6087	Spleen	2298	8006	Spleen	4363	10039
Liver	254	6088	Spleen	2299	8007	Spleen	4364	10040
Liver	255	6089	Spleen	2300	8008	Spleen	4365	10041
Liver	256	6090	Spleen	2301	8009	Spleen	4366	10042
Liver	257	6091	Spleen	2302	8010	Spleen	4367	10043
Liver	258	6092	Spleen	2303	8011	Spleen	4368	10044
Liver	259	6093	Spleen	2304	8012	Spleen	4369	10045
Liver	260	6094	Spleen	2305	8013	Spleen	4370	10046
Liver	261	6095	Spleen	2306	8014	Spleen	4371	10047
Liver	262	6096	Spleen	2307	8015	Kidney	4372	10048
Liver	263	6067	Spleen	2308	8016	Kidney	4373	10049
Liver	264	5964	Spleen	2309	8017	Kidney	1073	6802
Liver	265	6077	Spleen	2310	8018	Kidney	1076	6805
Liver	266	6097	Spleen	2311	8019	Kidney	4374	10050
Liver	267	6098	Spleen	2312	8020	Kidney	4375	10051
Liver	268	6099	Spleen	2313	8021	Kidney	4376	10052
Liver	269	6100	Spleen	2314	8022	Kidney	4377	10053
Liver	270	5980	Kidney	2315	8023	Kidney	1091	6820
Liver	271	6101	Spleen	2316	8024	Kidney	4378	10054
Liver	272	6102	Spleen	2317	8025	Kidney	4037	9727
Liver	273	6103	Spleen	2318	8026	Kidney	4379	10055
Liver	274	6104	Spleen	2319	8027	Kidney	4380	10056
Liver	275	6105	Spleen	2320	8028	Kidney	4381	10057
Liver	276	6106	Spleen	2321	8029	Kidney	4382	10058
Liver	277	6107	Spleen	2322	8030	Kidney	4383	10059

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	278	6108	Spleen	2323	8031	Kidney	4384	10060
Liver	279	6109	Spleen	2324	8032	Kidney	523	6341
Liver	280	6110	Spleen	2325	8033	Kidney	4385	10061
Liver	281	6111	Spleen	2326	8034	Kidney	4386	10062
Liver	282	6112	Spleen	2327	8035	Kidney	4038	9728
Liver	283	6113	Spleen	2328	8036	Kidney	4387	10063
Liver	284	6114	Spleen	2329	8037	Kidney	4388	10064
Liver	285	6115	Spleen	2330	8038	Kidney	4389	10065
Liver	286	6116	Spleen	2331	8039	Kidney	4390	10066
Liver	287	6117	Spleen	2332	8040	Kidney	4391	10067
Liver	288	6118	Spleen	2333	8041	Kidney	4392	10068
Liver	289	6119	Spleen	2334	8042	Kidney	4393	10069
Liver	290	6120	Spleen	2335	8043	Kidney	4394	10070
Liver	291	6121	Spleen	2336	8044	Kidney	4395	10071
Liver	292	6122	Spleen	2337	8045	Kidney	4396	10072
Liver	293	6123	Spleen	2338	8046	Kidney	4397	10073
Liver	294	6124	Spleen	2339	8047	Kidney	4398	10074
Liver	295	6125	Spleen	2340	8048	Kidney	4399	10075
Liver	296	6126	Spleen	2341	8049	Kidney	4400	10076
Liver	297	6127	Spleen	2342	8050	Kidney	4082	9768
Liver	298	6128	Spleen	2343	8051	Kidney	4401	10077
Liver	299	6129	Spleen	2344	8052	Kidney	4402	10078
Liver	300	5964	Spleen	2345	8053	Kidney	4403	10079
Liver	301	6130	Spleen	2346	8054	Kidney	4404	6357
Liver	302	6131	Spleen	2347	8055	Kidney	4405	10080
Liver	303	6132	Spleen	2348	8056	Kidney	4406	10081
Liver	304	6133	Spleen	2349	8057	Kidney	4407	10082
Liver	305	6134	Spleen	2350	8058	Kidney	4014	9708
Liver	306	6135	Spleen	2351	8059	Kidney	4408	6363

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	307	6136	Spleen	2352	8060	Kidney	4045	9735
Liver	308	6137	Spleen	2353	8061	Kidney	4409	10083
Liver	309	6138	Spleen	2354	8062	Kidney	4410	10084
Liver	310	6139	Spleen	2355	8063	Kidney	4411	10085
Liver	311	6140	Spleen	2356	8064	Kidney	4412	10086
Liver	312	6141	Spleen	2357	8065	Kidney	4413	10087
Liver	313	6112	Spleen	2358	7444	Kidney	4414	10088
Liver	314	6142	Spleen	2359	8066	Kidney	4415	10089
Liver	315	6143	Spleen	2360	8067	Kidney	4015	9709
Liver	316	6144	Spleen	2361	8068	Kidney	4416	10090
Liver	317	6145	Spleen	2362	8069	Kidney	4417	10091
Liver	318	6146	Spleen	2363	8070	Kidney	4418	10092
Liver	319	6147	Spleen	2364	8071	Kidney	4419	10093
Liver	320	6148	Spleen	2365	8072	Kidney	4420	10094
Liver	321	6149	Spleen	2366	8073	Kidney	4421	10095
Liver	322	6150	Spleen	2367	8074	Kidney	4422	10096
Liver	323	6151	Spleen	2368	8075	Kidney	4423	10097
Liver	324	6152	Spleen	2369	6599	Kidney	4424	10098
Liver	325	6153	Spleen	2370	8076	Kidney	757	6357
Liver	326	6154	Spleen	2371	8077	Kidney	4425	10099
Liver	327	6155	Spleen	2372	8078	Kidney	1202	6930
Liver	328	6156	Spleen	2373	6599	Kidney	4426	10100
Liver	329	6157	Spleen	2374	8079	Kidney	4427	10101
Liver	330	6158	Spleen	2375	8080	Kidney	4428	10102
Liver	331	6159	Spleen	2376	8081	Kidney	4429	10103
Liver	332	6091	Spleen	2377	8082	Kidney	4430	10104
Liver	333	6160	Spleen	2378	8083	Kidney	4431	10105
Liver	334	6161	Spleen	2379	8084	Kidney	4432	10106
Liver	335	6162	Spleen	2380	8085	Kidney	4433	10107

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	336	6163	Spleen	2381	8086	Kidney	4434	10108
Liver	337	6164	Spleen	2382	8087	Kidney	4435	10109
Liver	338	6165	Spleen	2383	8088	Kidney	4436	10110
Liver	339	6166	Spleen	2384	8089	Kidney	4437	10111
Liver	340	6167	Spleen	2385	8090	Kidney	4438	10112
Liver	341	6168	Spleen	2386	8091	Kidney	4439	10113
Liver	342	6169	Spleen	2387	8092	Kidney	4440	10114
Liver	343	6170	Spleen	2388	8093	Kidney	4441	10115
Liver	344	6171	Spleen	2389	8094	Kidney	4442	10116
Liver	345	6172	Spleen	2390	8095	Kidney	4443	10117
Liver	346	6173	Spleen	2391	8096	Kidney	4444	10118
Liver	347	6174	Spleen	2392	8097	Kidney	4445	10119
Liver	348	6175	Spleen	2393	8098	Kidney	4446	10120
Liver	349	6176	Spleen	2394	8099	Kidney	4447	10121
Liver	350	6177	Spleen	2395	8100	Kidney	543	6357
Liver	351	6178	Spleen	2396	8101	Kidney	4448	10122
Liver	352	6179	Spleen	2397	8102	Kidney	4449	10123
Liver	353	6180	Spleen	2398	8103	Kidney	4450	10124
Liver	354	6181	Spleen	2399	8104	Kidney	4451	10125
Liver	355	6182	Spleen	2400	8105	Kidney	4452	10126
Liver	356	5964	Spleen	2401	8106	Kidney	4453	10127
Liver	357	6183	Spleen	2402	8107	Kidney	4454	10128
Liver	358	6184	Spleen	2403	8108	Kidney	4455	10129
Liver	359	6185	Spleen	2404	8109	Kidney	4456	10130
Liver	360	6186	Spleen	2405	8110	Kidney	4457	10131
Liver	361	6187	Spleen	2406	8111	Kidney	4458	10132
Liver	362	6188	Spleen	2407	8112	Kidney	4459	10133
Liver	363	6189	Spleen	2408	8113	Kidney	4460	10134
Liver	364	6190	Spleen	2409	8114	Kidney	4047	9737

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	365	6191	Spleen	2410	8115	Kidney	4461	10135
Liver	366	6192	Spleen	2411	8116	Kidney	4462	10136
Liver	367	6193	Spleen	2412	8117	Kidney	4463	10137
Liver	368	6194	Spleen	2413	8118	Kidney	4464	10138
Liver	369	6195	Spleen	2414	8119	Kidney	4465	6357
Liver	370	6196	Spleen	2415	8120	Kidney	4466	10139
Liver	371	6197	Spleen	2416	8121	Kidney	4467	6363
Liver	372	6103	Spleen	2417	8122	Kidney	4468	6357
Liver	373	6198	Spleen	2418	8123	Kidney	4469	10140
Liver	374	6199	Spleen	2419	8124	Spleen	4470	10141
Liver	375	6200	Spleen	2420	8125	Kidney	880	6638
Liver	376	6201	Spleen	2421	8126	Kidney	4471	10142
Liver	377	6202	Spleen	2422	8127	Kidney	4472	10143
Liver	378	6203	Spleen	2423	8128	Kidney	4473	10144
Liver	379	6204	Spleen	2424	8129	Kidney	4474	10145
Liver	380	6205	Spleen	2425	8130	Kidney	4475	10146
Liver	381	6200	Spleen	2426	8131	Kidney	1050	6357
Liver	382	6206	Spleen	2427	8132	Kidney	4476	10147
Liver	383	6207	Spleen	2428	8133	Kidney	4477	10148
Liver	384	6208	Spleen	2429	8134	Kidney	4478	10149
Liver	385	6209	Spleen	2430	8135	Kidney	4479	10150
Liver	386	6210	Spleen	2431	8136	Kidney	4480	10151
Liver	387	6211	Spleen	2432	8137	Kidney	4481	10152
Liver	388	6212	Spleen	2433	8138	Kidney	4482	10153
Liver	389	6213	Spleen	2434	8139	Kidney	4483	10154
Liver	390	6214	Spleen	2435	8140	Kidney	4484	10155
Liver	391	6215	Spleen	2436	8141	Kidney	4485	10156
Liver	392	6195	Spleen	2437	8142	Kidney	4486	10157
Liver	393	6216	Spleen	2438	8143	Kidney	266	6097

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	394	6217	Spleen	2439	8144	Kidney	4487	10158
Liver	395	6218	Spleen	2440	8145	Kidney	4488	10159
Liver	396	6219	Spleen	2441	8146	Kidney	1721	7439
Liver	397	6220	Spleen	2442	8147	Kidney	4489	10160
Liver	398	6221	Spleen	2443	8148	Kidney	4490	10161
Liver	399	6222	Spleen	2444	8149	Kidney	4491	10162
Liver	400	6223	Spleen	2445	8150	Kidney	4492	10163
Liver	401	6224	Spleen	2446	8151	Kidney	4493	10164
Liver	402	6225	Spleen	2447	8152	Kidney	4494	10165
Liver	403	6226	Spleen	2448	8153	Kidney	4495	10166
Liver	404	6227	Spleen	2449	8154	Kidney	4496	10167
Liver	405	6228	Spleen	2450	8155	Kidney	4497	10168
Liver	406	6229	Spleen	2451	8156	Kidney	4498	10169
Liver	407	6230	Spleen	2452	8157	Kidney	4499	10170
Liver	408	6231	Spleen	2453	8158	Kidney	646	6439
Liver	409	6232	Spleen	2454	8159	Kidney	4500	10171
Liver	410	6233	Spleen	2455	8160	Kidney	4501	10172
Liver	411	6234	Spleen	2456	8161	Kidney	649	6442
Liver	412	6235	Spleen	2457	8162	Kidney	4502	10173
Liver	413	6236	Spleen	2458	8163	Kidney	761	6357
Liver	414	6237	Spleen	2459	8164	Kidney	4503	10174
Liver	415	6238	Spleen	2460	8165	Kidney	4504	10175
Liver	416	6239	Spleen	2461	8166	Kidney	4505	10176
Liver	417	6181	Spleen	2462	8167	Kidney	4506	10177
Liver	418	6240	Spleen	2463	8168	Kidney	1738	7456
Liver	419	6241	Spleen	2464	8169	Kidney	4507	10178
Liver	420	6242	Spleen	2465	8170	Kidney	4508	10179
Liver	421	6243	Spleen	2466	8171	Kidney	4509	10180
Liver	422	6244	Spleen	2467	8172	Kidney	4510	6357

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	423	6077	Spleen	2468	8173	Kidney	4511	10181
Liver	424	6245	Spleen	2469	8174	Kidney	4512	10182
Liver	425	6246	Spleen	2470	8175	Kidney	4513	10183
Liver	426	6247	Spleen	2471	8176	Kidney	4514	6357
Liver	427	6248	Spleen	2472	8177	Kidney	4515	10184
Liver	428	6249	Spleen	2473	8178	Kidney	4516	10185
Liver	429	6250	Spleen	2474	8179	Kidney	4517	10186
Liver	430	6251	Spleen	2475	8180	Kidney	4518	10187
Liver	431	6252	Spleen	2476	8181	Kidney	4519	10188
Liver	432	6253	Spleen	2477	8182	Kidney	4520	10189
Liver	433	6254	Spleen	2478	8183	Kidney	4521	10190
Liver	434	6255	Spleen	2479	8184	Kidney	4522	10191
Liver	435	6091	Spleen	2480	8185	Kidney	4523	10192
Liver	436	6256	Spleen	2481	8186	Kidney	4524	10193
Liver	437	6257	Spleen	2482	8187	Kidney	1293	7019
Liver	438	6258	Spleen	2483	8188	Kidney	4525	10194
Liver	439	6259	Spleen	2484	8189	Kidney	4526	10195
Liver	440	6181	Spleen	2485	8190	Kidney	4527	10196
Liver	441	6260	Spleen	2486	8191	Kidney	4528	10197
Liver	442	6261	Spleen	2487	8192	Kidney	4529	10198
Liver	443	6262	Spleen	2488	8193	Kidney	4530	10199
Liver	444	6263	Spleen	2489	8194	Kidney	4531	10200
Liver	445	6264	Spleen	2490	8195	Kidney	4532	10201
Liver	446	6265	Spleen	2491	8196	Kidney	4533	10202
Liver	447	6266	Spleen	2492	8197	Kidney	4534	10203
Liver	448	6267	Spleen	2493	8198	Kidney	4535	6357
Liver	449	6268	Spleen	2494	8199	Kidney	4536	10204
Liver	450	6269	Spleen	2495	8200	Kidney	4537	10205
Liver	451	6270	Spleen	2496	8201	Kidney	4538	10206

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	452	6271	Spleen	2497	8202	Kidney	4539	10187
Liver	453	6272	Spleen	2498	8203	Kidney	4540	10207
Liver	454	6273	Spleen	2499	8204	Kidney	4024	9718
Liver	455	6274	Spleen	2500	8205	Kidney	4541	10208
Liver	456	6275	Spleen	2501	8206	Kidney	4542	10209
Liver	457	6276	Spleen	2502	8207	Kidney	4543	10210
Liver	458	6277	Spleen	2503	8208	Kidney	4544	6439
Liver	459	6278	Spleen	2504	8209	Kidney	4545	10211
Liver	460	6279	Spleen	2505	8210	Kidney	4546	10212
Liver	461	6280	Spleen	2506	8211	Kidney	4547	10213
Liver	462	6281	Spleen	2507	8212	Kidney	4548	10214
Liver	463	6214	Spleen	2508	8213	Kidney	4549	10215
Liver	464	6282	Spleen	2509	8214	Kidney	4025	9719
Liver	465	6283	Spleen	2510	8215	Kidney	4550	10216
Liver	466	6284	Spleen	2511	8216	Kidney	901	6654
Liver	467	6285	Spleen	2512	8217	Kidney	4551	10217
Liver	468	6286	Spleen	2513	8218	Kidney	4552	10218
Liver	469	6287	Spleen	2514	8219	Kidney	4553	10219
Liver	470	6288	Spleen	2515	8220	Kidney	4554	10220
Liver	471	6289	Spleen	2516	8221	Kidney	4555	10221
Liver	472	6290	Spleen	2517	7121	Kidney	4556	10222
Liver	473	6291	Spleen	2518	8222	Kidney	4557	10223
Liver	474	6292	Spleen	2519	8223	Kidney	4558	10224
Liver	475	6293	Spleen	2520	8224	Kidney	4559	10225
Liver	476	6294	Spleen	2521	8225	Kidney	4560	10226
Liver	477	6295	Spleen	2522	8226	Kidney	4561	10227
Liver	478	6296	Spleen	2523	8227	Kidney	4562	10228
Liver	479	6297	Spleen	2524	8228	Kidney	670	6462
Liver	480	6298	Spleen	2525	8229	Kidney	4563	10229

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	481	6299	Spleen	2526	8230	Kidney	4564	10230
Liver	482	6300	Kidney	2527	8231	Kidney	311	6140
Liver	483	6301	Spleen	2528	8232	Kidney	4565	10231
Liver	484	6302	Spleen	2529	8233	Kidney	4566	10232
Liver	485	6303	Spleen	2530	8234	Kidney	4567	10233
Liver	486	6304	Spleen	2531	8235	Kidney	4568	10234
Liver	487	6305	Liver	2532	8236	Kidney	4569	6485
Liver	488	6306	Spleen	2533	8237	Kidney	4570	10235
Liver	489	6307	Spleen	2534	8238	Kidney	4571	10236
Liver	490	6308	Spleen	2535	8239	Kidney	4572	10237
Liver	491	6309	Spleen	2536	8240	Kidney	4573	10238
Liver	492	6310	Spleen	2537	8241	Kidney	4574	10239
Liver	493	6311	Spleen	2538	8242	Kidney	4575	10240
Liver	494	6312	Spleen	2539	8243	Kidney	4576	10241
Liver	495	6313	Spleen	2540	8244	Kidney	4577	10242
Liver	496	6314	Spleen	2541	8245	Kidney	2909	8613
Liver	497	6315	Spleen	2542	8246	Kidney	4578	6357
Liver	498	6316	Spleen	2543	8247	Kidney	4579	10243
Liver	499	6317	Spleen	2544	8248	Kidney	4580	6696
Liver	500	6318	Spleen	2545	8249	Kidney	4581	10244
Liver	501	6319	Spleen	2546	8250	Kidney	4582	10245
Liver	502	6320	Spleen	2547	8251	Kidney	4583	10246
Liver	503	6321	Spleen	2548	8252	Kidney	4584	10247
Liver	504	6322	Spleen	2549	8253	Kidney	4585	10248
Liver	505	6323	Spleen	2550	8254	Kidney	4586	10249
Liver	506	6324	Spleen	2551	8255	Kidney	4587	10250
Liver	507	6325	Spleen	2552	8256	Kidney	4588	10251
Liver	508	6326	Spleen	2553	8257	Kidney	4589	10252
Liver	509	6327	Spleen	2554	8258	Kidney	4590	10253

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	510	6328	Spleen	2555	8259	Kidney	4591	10254
Liver	511	6329	Spleen	2556	8260	Kidney	4592	6445
Liver	512	6330	Spleen	2557	8261	Kidney	4593	10255
Liver	513	6331	Spleen	2558	8262	Kidney	4594	10256
Liver	514	6332	Spleen	2559	8263	Kidney	4595	10257
Liver	515	6333	Spleen	2560	8264	Kidney	4596	10258
Liver	516	6334	Spleen	2561	8265	Kidney	4597	6363
Liver	517	6335	Spleen	2562	8266	Kidney	4598	10259
Liver	518	6336	Spleen	2563	8267	Kidney	4599	10260
Liver	519	6337	Spleen	2564	8268	Kidney	4600	10261
Liver	520	6338	Spleen	2565	8269	Spleen	4601	10262
Liver	521	6339	Spleen	2566	8270	Kidney	4602	10263
Liver	522	6340	Spleen	2567	8271	Kidney	4603	10264
Liver	25	5889	Spleen	2568	8272	Kidney	4604	10265
Brain	122	5958	Spleen	2569	8273	Kidney	1874	7589
Brain	523	6341	Spleen	2570	8274	Kidney	4605	10266
Brain	524	5966	Spleen	2571	8275	Kidney	4606	10267
Brain	525	6342	Spleen	2572	8276	Kidney	4607	10268
Brain	31	5895	Spleen	2573	8277	Kidney	4608	10269
Brain	526	6343	Spleen	2574	8278	Kidney	4609	10270
Brain	527	6344	Spleen	2575	8279	Kidney	4610	10271
Brain	16	5880	Spleen	2576	8280	Kidney	4611	10272
Brain	528	6345	Spleen	2577	8281	Kidney	4612	10273
Brain	88	5945	Spleen	2578	8282	Kidney	2921	8625
Brain	529	6346	Spleen	2579	8283	Kidney	4613	10274
Brain	530	6347	Spleen	2580	8284	Kidney	4614	6445
Brain	531	6348	Spleen	2581	8285	Kidney	4615	10275
Brain	532	6349	Spleen	2582	8286	Kidney	4616	10276
Brain	533	6350	Spleen	2583	8287	Kidney	4617	6361

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Brain	534	6351	Spleen	2584	8288	Kidney	4618	10277
Brain	535	6352	Spleen	2585	8289	Kidney	4619	10278
Brain	536	6353	Spleen	2586	8290	Kidney	923	6675
Brain	537	6354	Spleen	2587	8291	Kidney	4620	10279
Brain	538	6355	Spleen	2588	8292	Kidney	4621	10280
Pancreas	101	5958	Spleen	2589	8293	Kidney	4622	10281
Pancreas	539	5927	Spleen	2590	8294	Kidney	4623	10282
Pancreas	540	6356	Spleen	2591	8295	Kidney	4624	10283
Pancreas	541	6010	Spleen	2592	8296	Kidney	4625	6790
Pancreas	542	5913	Spleen	2593	8297	Kidney	4626	10284
Pancreas	543	6357	Spleen	2594	8298	Kidney	4627	10285
Pancreas	544	6358	Spleen	2595	8299	Kidney	4628	10286
Pancreas	545	6359	Spleen	2596	8300	Kidney	4629	10287
Pancreas	546	6360	Spleen	2597	8301	Kidney	4630	10288
Pancreas	547	6361	Spleen	2598	8302	Kidney	4631	10289
Pancreas	548	6362	Spleen	2599	8303	Kidney	4632	6792
Pancreas	549	6363	Spleen	2600	8304	Kidney	4158	9839
Pancreas	550	6361	Spleen	2601	8305	Kidney	4633	10290
Pancreas	551	6356	Spleen	2602	8306	Kidney	4634	10291
Heart	552	6364	Spleen	2603	8307	Kidney	4635	10292
Heart	103	5960	Spleen	2604	8308	Kidney	4636	10293
Heart	553	6365	Spleen	2605	8309	Kidney	4637	10294
Heart	554	6366	Spleen	2606	8310	Kidney	4638	10295
Heart	555	6367	Spleen	2607	8311	Kidney	4639	10296
Heart	556	6368	Spleen	2608	8312	Kidney	4640	10297
Heart	557	5927	Spleen	2609	8313	Kidney	4641	10298
Heart	121	5975	Spleen	2610	8314	Kidney	4642	10299
Heart	122	5958	Spleen	2611	8315	Kidney	4643	10300
Heart	558	6369	Spleen	2612	8316	Kidney	4644	10301

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	559	6370	Spleen	2613	8317	Kidney	4645	10302
Heart	560	6371	Spleen	2614	8318	Kidney	4646	10303
Heart	561	6372	Spleen	2615	8319	Kidney	4647	6445
Heart	562	6373	Spleen	2616	8320	Kidney	4648	10304
Heart	563	6374	Spleen	2617	8321	Kidney	4649	10305
Heart	81	5927	Spleen	2618	8322	Kidney	4650	10306
Heart	564	6375	Spleen	2619	8323	Kidney	4651	10307
Heart	565	6376	Spleen	2620	8324	Kidney	4652	10308
Heart	566	6377	Spleen	2621	8325	Kidney	4653	10309
Heart	567	6378	Spleen	2622	8326	Kidney	4654	10310
Heart	568	6379	Spleen	2623	8327	Kidney	4655	10311
Heart	569	6380	Spleen	2624	8328	Kidney	4656	10312
Heart	570	6381	Spleen	2625	8329	Kidney	4657	10313
Heart	571	6382	Spleen	2626	8330	Kidney	4658	10314
Heart	3	5867	Spleen	2627	8331	Kidney	4659	10315
Heart	572	6383	Spleen	2628	8332	Kidney	4660	10316
Heart	573	6384	Spleen	2629	8333	Kidney	4661	10317
Heart	574	5966	Spleen	2630	8334	Kidney	4662	6494
Heart	575	5966	Spleen	2631	8335	Kidney	4663	10318
Heart	162	6010	Spleen	2632	8336	Kidney	4664	10319
Heart	576	6385	Spleen	2633	8337	Kidney	4665	10320
Heart	577	6386	Spleen	2634	8338	Kidney	4666	10321
Heart	578	6387	Spleen	2635	8339	Kidney	4667	6681
Heart	579	6010	Spleen	2636	8340	Kidney	4668	10322
Heart	82	5913	Spleen	2637	8341	Kidney	4669	10323
Heart	580	6388	Spleen	2638	8342	Kidney	4670	10324
Heart	581	6389	Spleen	2639	8343	Kidney	4671	10325
Heart	582	6390	Spleen	2640	8344	Kidney	4672	10326
Heart	583	6391	Spleen	2641	8345	Kidney	4673	10327

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	49	5913	Spleen	2642	8346	Kidney	4674	10328
Heart	584	6392	Spleen	2643	8347	Kidney	4675	10234
Heart	585	5913	Spleen	2644	8348	Kidney	4676	10329
Heart	586	6393	Spleen	2645	8349	Kidney	4677	6790
Heart	587	6394	Spleen	2646	8350	Kidney	4678	10294
Heart	588	5927	Spleen	2647	8351	Kidney	4679	10330
Heart	589	5913	Spleen	2648	8352	Kidney	4680	10331
Heart	590	6359	Spleen	2649	8353	Kidney	4681	10332
Heart	591	6395	Spleen	2650	8354	Kidney	4682	10333
Heart	592	6396	Spleen	2651	8355	Kidney	4201	9882
Heart	593	6397	Spleen	2652	8356	Kidney	4683	10334
Heart	594	6359	Spleen	2653	8357	Kidney	4684	10335
Heart	185	6028	Spleen	2654	8358	Kidney	4685	10336
Heart	595	6398	Spleen	2655	8359	Kidney	4686	6439
Heart	596	6357	Spleen	2656	8360	Kidney	4687	10337
Heart	597	6399	Spleen	2657	8361	Kidney	4688	10338
Heart	598	6400	Spleen	2658	8362	Kidney	4689	10339
Heart	599	6401	Spleen	2659	8363	Kidney	4690	6445
Heart	600	6402	Spleen	2660	8364	Kidney	4691	10340
Heart	601	6403	Spleen	2661	8365	Kidney	4692	10341
Heart	602	6391	Spleen	2662	8366	Kidney	4693	10342
Heart	603	5918	Spleen	2663	8367	Kidney	4694	10343
Heart	604	6404	Spleen	2664	8368	Kidney	4695	10344
Heart	605	6405	Spleen	2665	8369	Kidney	723	6508
Heart	606	6406	Spleen	2666	8370	Kidney	4696	10345
Heart	607	6407	Spleen	2667	8371	Kidney	4697	10346
Heart	608	6408	Spleen	2668	8372	Kidney	4698	10347
Heart	609	6409	Spleen	2669	8373	Kidney	4699	10348
Heart	610	6410	Spleen	2670	8374	Kidney	4700	10349

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	611	6411	Spleen	2671	8375	Kidney	4218	9899
Heart	612	5913	Spleen	2672	8376	Kidney	4701	6494
Heart	613	6412	Spleen	2673	8377	Kidney	4702	10350
Heart	614	6413	Spleen	2674	8378	Kidney	4703	10351
Heart	615	6391	Spleen	2675	8379	Kidney	4704	10352
Heart	616	6414	Spleen	2676	8380	Kidney	4705	10353
Heart	617	6415	Spleen	2677	8381	Kidney	4706	10354
Heart	618	6416	Spleen	2678	8382	Kidney	4707	10355
Heart	619	6417	Spleen	2679	8383	Kidney	4073	9760
Heart	620	6418	Spleen	2680	8384	Kidney	4708	10356
Heart	621	6419	Spleen	2681	8385	Kidney	4709	10357
Heart	622	5913	Spleen	2682	8386	Kidney	4710	10358
Heart	623	6420	Spleen	2683	8387	Kidney	4711	10359
Heart	624	6421	Spleen	2684	8388	Kidney	4712	10360
Heart	625	6422	Spleen	2685	8389	Kidney	4713	10361
Heart	626	6423	Spleen	2686	8390	Kidney	4714	10362
Heart	627	6424	Spleen	2687	8391	Kidney	4715	6494
Heart	628	6425	Spleen	2688	8392	Kidney	4716	10363
Heart	629	6426	Spleen	2689	8393	Kidney	4717	10364
Heart	630	6427	Spleen	2690	8394	Kidney	4718	10365
Heart	631	6428	Spleen	2691	8395	Kidney	4719	10366
Heart	632	6429	Spleen	2692	8396	Kidney	4720	10367
Heart	633	6430	Spleen	2693	8397	Kidney	4721	10368
Heart	634	6431	Spleen	2694	8398	Kidney	4722	10369
Heart	635	6432	Spleen	2695	8399	Kidney	4723	10370
Heart	636	6362	Spleen	2696	8400	Kidney	4724	10371
Heart	257	6091	Spleen	2697	8401	Kidney	4725	10372
Heart	637	6433	Spleen	2698	8402	Kidney	4726	10373
Heart	638	6434	Spleen	2699	8403	Kidney	4727	10374

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	639	5913	Spleen	2700	8404	Kidney	4728	10375
Heart	640	6435	Spleen	2701	8405	Kidney	4729	10376
Heart	641	6436	Spleen	2702	8406	Kidney	4730	10377
Heart	642	6437	Spleen	2703	8407	Kidney	4731	10378
Heart	85	5918	Spleen	2704	8408	Kidney	4732	6200
Heart	643	5966	Spleen	2705	8409	Kidney	4733	10379
Heart	644	5913	Spleen	2706	8410	Kidney	4734	10380
Heart	645	6438	Spleen	2707	8411	Kidney	2955	8659
Heart	646	6439	Spleen	2708	8412	Kidney	4735	10381
Heart	647	6440	Spleen	2709	8413	Kidney	4736	10382
Heart	648	6441	Spleen	2710	8414	Kidney	4737	10383
Heart	649	6442	Spleen	2711	8415	Kidney	4738	10384
Heart	650	6443	Spleen	2712	8416	Kidney	4739	10385
Heart	651	6444	Spleen	2713	8417	Kidney	4740	10386
Heart	652	6445	Spleen	2714	8418	Kidney	4741	10387
Heart	277	6107	Spleen	2715	8419	Kidney	4742	10388
Heart	653	6446	Spleen	2716	8420	Kidney	4743	10389
Heart	654	6447	Spleen	2717	8421	Kidney	4744	10390
Heart	655	6010	Spleen	2718	8422	Kidney	4745	10391
Heart	656	6448	Spleen	2719	8423	Kidney	4746	10392
Heart	657	6449	Spleen	2720	8424	Kidney	4747	10393
Heart	658	6450	Spleen	2721	8425	Kidney	4748	10394
Heart	659	6451	Spleen	2722	8426	Kidney	2394	8099
Heart	660	6452	Spleen	2723	8427	Kidney	4749	10395
Heart	287	6117	Spleen	2724	8428	Kidney	4750	10396
Heart	661	6453	Spleen	2725	8429	Kidney	4751	10397
Heart	662	6454	Spleen	2726	8430	Kidney	2961	8665
Heart	663	6455	Spleen	2727	8431	Kidney	4752	10398
Heart	664	6456	Spleen	2728	8432	Kidney	4753	10399

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	665	6457	Spleen	2729	8433	Kidney	4754	10400
Heart	298	6128	Spleen	2730	8434	Kidney	4755	10401
Heart	666	6458	Spleen	2731	8435	Kidney	4756	10402
Heart	667	6459	Spleen	2732	8436	Kidney	4757	10403
Heart	668	6460	Spleen	2733	8437	Kidney	4758	10404
Heart	669	6461	Spleen	2734	8438	Kidney	4759	10405
Heart	88	5945	Spleen	2735	8439	Kidney	4760	10406
Heart	670	6462	Spleen	2736	8440	Kidney	4761	10407
Heart	671	6463	Spleen	2737	8441	Kidney	4762	10408
Heart	317	6145	Spleen	2738	8442	Kidney	4763	10409
Heart	672	6464	Spleen	2739	8443	Kidney	4764	10410
Heart	673	6465	Spleen	2740	8444	Kidney	4765	10411
Heart	674	6466	Spleen	2741	8445	Kidney	4766	10412
Heart	675	6467	Spleen	2742	8446	Kidney	4767	10413
Heart	676	6468	Spleen	2743	8447	Kidney	4768	10414
Heart	677	6469	Spleen	2744	8448	Kidney	4769	10415
Heart	332	6091	Spleen	2745	8449	Kidney	4770	10416
Heart	678	6470	Spleen	2746	8450	Kidney	4771	10417
Heart	679	6471	Spleen	2747	8451	Kidney	4772	10418
Heart	680	6363	Spleen	2748	8452	Kidney	4773	10419
Heart	681	6472	Spleen	2749	8453	Kidney	4774	10420
Heart	682	6473	Spleen	2750	8454	Kidney	4775	10421
Heart	683	6474	Spleen	2751	8455	Kidney	4776	10422
Heart	684	6475	Spleen	2752	8456	Kidney	4777	10423
Heart	685	6442	Spleen	2753	8457	Kidney	4778	10424
Heart	686	6476	Spleen	2754	8458	Kidney	4779	10425
Heart	687	6477	Spleen	2755	8459	Kidney	4780	10426
Heart	688	6478	Spleen	2756	8460	Kidney	4781	10427
Heart	689	6479	Spleen	2757	8461	Kidney	4782	10428

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	690	6480	Spleen	2758	8462	Kidney	4783	10429
Heart	691	6481	Spleen	2759	8463	Kidney	4784	10430
Heart	692	6482	Spleen	2760	8464	Kidney	4785	10431
Heart	693	6483	Spleen	2761	8465	Kidney	4786	10432
Heart	694	6484	Spleen	2762	8466	Kidney	4787	10433
Heart	695	6485	Spleen	2763	8467	Kidney	4788	10434
Heart	696	6486	Spleen	2764	8468	Kidney	4789	10435
Heart	697	6456	Spleen	2765	8469	Kidney	4790	10436
Heart	698	6487	Spleen	2766	8470	Kidney	4791	10437
Heart	699	6488	Spleen	2767	8471	Kidney	4792	10438
Heart	700	6489	Spleen	2768	8472	Kidney	4793	10439
Heart	701	6490	Spleen	2769	8473	Kidney	4794	10440
Heart	702	6491	Spleen	2770	8474	Kidney	4795	10441
Heart	703	6492	Spleen	2771	8475	Kidney	4796	10442
Heart	704	6493	Liver	2772	8476	Kidney	4797	10443
Heart	705	6473	Spleen	2773	8477	Kidney	4798	10444
Heart	706	6494	Spleen	2774	8478	Kidney	4799	10445
Heart	386	6210	Spleen	2775	8479	Kidney	4800	10446
Heart	707	6495	Spleen	2776	8480	Kidney	4801	10447
Heart	708	6181	Spleen	2777	8481	Kidney	4802	10448
Heart	709	6496	Spleen	2778	8482	Kidney	4803	10449
Heart	710	6497	Spleen	2779	8483	Kidney	4804	10450
Heart	399	6222	Spleen	2780	8484	Kidney	4805	10451
Heart	711	6498	Spleen	2781	8485	Kidney	4806	10452
Heart	402	6225	Spleen	2782	8486	Kidney	4807	10453
Heart	712	6499	Spleen	2783	8487	Kidney	4808	10454
Heart	713	6500	Spleen	2784	8488	Kidney	4809	10455
Heart	714	6501	Spleen	2785	8489	Kidney	4810	10456
Heart	715	6502	Spleen	2786	8490	Liver	2972	8676

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	716	6503	Spleen	2787	8491	Liver	4811	10457
Heart	717	6484	Spleen	2788	8492	Liver	102	5959
Heart	418	6240	Spleen	2789	8493	Liver	4812	10458
Heart	718	6504	Spleen	2790	8494	Liver	106	5963
Heart	719	6505	Spleen	2791	8495	Liver	108	5965
Heart	720	6506	Spleen	2792	8496	Liver	2987	8691
Heart	721	6210	Spleen	2793	8497	Liver	4813	10459
Heart	722	6507	Spleen	2794	8498	Liver	2990	8694
Heart	723	6508	Spleen	2795	8499	Liver	2993	8697
Heart	724	6509	Spleen	2796	8500	Brain	4814	10460
Heart	725	6510	Spleen	2797	8501	Liver	3001	8705
Heart	726	6511	Spleen	2798	8502	Liver	3005	8709
Heart	727	6512	Spleen	2799	8503	Liver	3009	8713
Heart	728	6513	Spleen	2800	8504	Liver	4815	10461
Heart	729	6514	Spleen	2801	8505	Liver	4816	10462
Heart	730	6515	Spleen	2802	8506	Liver	1077	6806
Heart	731	6516	Spleen	2803	8507	Liver	4817	10463
Heart	732	6517	Spleen	2804	8508	Liver	3013	8717
Heart	733	6518	Spleen	2805	8509	Liver	4818	10464
Heart	734	6519	Spleen	2806	8510	Liver	4819	10465
Heart	735	6210	Spleen	2807	8511	Liver	4820	10466
Heart	736	6520	Spleen	2808	8512	Liver	3021	8725
Heart	737	6521	Spleen	2809	8513	Liver	4821	10467
Heart	738	6484	Spleen	2810	8514	Liver	97	5954
Heart	739	6210	Spleen	2811	8515	Liver	1087	6816
Heart	740	6522	Spleen	2812	8516	Liver	4822	10468
Heart	741	6269	Spleen	2813	8517	Liver	4823	10469
Heart	742	6523	Spleen	2814	8518	Liver	3041	8744
Heart	743	6524	Spleen	2815	8519	Liver	4824	10470

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	744	6525	Spleen	2816	8520	Liver	4825	10471
Heart	745	6526	Spleen	2817	8521	Liver	3051	8753
Heart	746	6527	Spleen	2818	8522	Liver	4826	10472
Heart	486	6304	Spleen	2819	8523	Liver	1092	6821
Heart	747	6507	Spleen	2820	8524	Liver	120	5974
Heart	748	6528	Spleen	2821	8525	Liver	4827	8670
Heart	749	6507	Spleen	2822	8526	Liver	4828	10473
Heart	750	6529	Spleen	2823	8527	Liver	3060	8762
Heart	751	6530	Spleen	2824	8528	Liver	3063	8765
Heart	752	6531	Spleen	2825	8529	Liver	3064	8766
Heart	753	6532	Spleen	2826	8530	Liver	4829	10474
Heart	754	6533	Spleen	2827	8531	Liver	3065	8767
Heart	25	5889	Spleen	2828	8532	Liver	4830	10475
Heart	755	6534	Spleen	2829	8533	Liver	3067	8769
Lung	756	6535	Spleen	2830	8534	Liver	3068	8770
Lung	757	6357	Spleen	2831	8535	Liver	4831	10476
Lung	758	6536	Spleen	2832	8536	Liver	4832	8670
Lung	759	6537	Spleen	2833	8537	Liver	3075	8777
Lung	760	6538	Spleen	2834	8538	Liver	3076	8778
Lung	761	6357	Spleen	2835	8539	Liver	3081	8783
Lung	762	6539	Spleen	2836	8540	Liver	4833	10477
Lung	763	6540	Spleen	2837	8541	Liver	131	5982
Lung	764	6541	Spleen	2838	8542	Liver	3093	8795
Lung	695	6485	Spleen	2839	8543	Liver	4834	10478
Lung	765	6542	Spleen	2840	8544	Liver	133	5984
Lung	766	6485	Spleen	2841	8545	Liver	1104	6833
Lung	767	6543	Spleen	2842	8546	Liver	4835	10479
Lung	28	5892	Spleen	2843	8547	Liver	4836	10480
Intestine	768	6544	Spleen	2844	8548	Liver	3114	8815

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Intestine	769	6545	Spleen	2845	8549	Liver	4837	10481
Intestine	770	6546	Spleen	2846	8550	Liver	3119	8820
Intestine	771	6547	Spleen	2847	8551	Liver	3121	8822
Intestine	653	6446	Spleen	2848	8552	Liver	4838	10482
Intestine	659	6451	Spleen	2849	8553	Liver	3130	8831
Intestine	772	6548	Spleen	2850	8554	Liver	143	5993
Intestine	773	6549	Spleen	2851	8555	Liver	4839	10483
Intestine	774	6550	Spleen	2852	8556	Liver	4840	10484
Intestine	775	6551	Spleen	2853	8557	Liver	3143	8843
Intestine	776	6552	Spleen	2854	8558	Liver	4841	10485
Intestine	777	6553	Spleen	2855	8559	Liver	3149	8849
Spleen	778	5927	Spleen	2856	8560	Liver	3152	8852
Spleen	779	6554	Spleen	2857	8561	Liver	4842	10486
Spleen	780	6555	Spleen	2858	8562	Liver	4843	10487
Spleen	781	6359	Spleen	2859	8563	Liver	4844	10488
Spleen	782	5918	Spleen	2860	8564	Liver	153	6001
Spleen	49	5913	Spleen	2861	8565	Liver	3171	8871
Spleen	585	5913	Spleen	2862	8566	Liver	4845	10489
Spleen	783	6359	Spleen	2863	8567	Liver	4846	10490
Spleen	594	6359	Spleen	2864	8568	Liver	4393	10069
Spleen	784	6556	Spleen	2865	8569	Liver	4847	10491
Spleen	785	6557	Spleen	2866	8570	Liver	3184	8884
Spleen	612	5913	Spleen	2867	8571	Liver	4848	10492
Spleen	786	5927	Spleen	2868	8572	Liver	3191	8891
Spleen	787	6558	Spleen	2869	8573	Liver	4849	10493
Spleen	788	5918	Kidney	2870	8574	Liver	4850	10494
Spleen	789	6559	Kidney	2871	8575	Liver	4851	10495
Spleen	790	6359	Kidney	2872	8576	Liver	3201	8901
Spleen	639	5913	Kidney	2873	8577	Liver	4852	10496

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	85	5918	Kidney	2874	8578	Liver	4853	10497
Spleen	791	6560	Kidney	2875	8579	Liver	4854	10498
Spleen	644	5913	Kidney	2876	8580	Liver	4855	10499
Spleen	792	6561	Kidney	2877	8581	Liver	4856	10500
Spleen	793	6562	Kidney	2878	8582	Liver	4857	10501
Spleen	794	6563	Kidney	2879	8583	Liver	4858	10502
Spleen	795	6564	Kidney	2880	8584	Liver	4859	10503
Spleen	796	6565	Kidney	2881	8585	Liver	3235	8935
Spleen	797	6566	Kidney	2882	8586	Liver	4860	10504
Spleen	798	6567	Kidney	2883	8587	Liver	4861	10505
Spleen	799	6356	Kidney	2884	8588	Liver	4862	10506
Spleen	800	6568	Kidney	2885	8589	Liver	4863	10507
Spleen	801	6569	Kidney	2886	8590	Liver	3249	8949
Spleen	802	6356	Kidney	2887	8591	Liver	3254	8954
Brain	803	6570	Kidney	2888	8592	Liver	1153	6881
Spleen	804	6571	Kidney	2889	8593	Liver	4864	10508
Spleen	805	6572	Kidney	2890	8594	Liver	3276	8976
Spleen	806	6356	Kidney	2891	8595	Liver	3282	8982
Spleen	807	6573	Kidney	2892	8596	Liver	1160	6888
Spleen	808	6574	Kidney	2893	8597	Liver	4865	10509
Spleen	809	6575	Kidney	2894	8598	Liver	3284	8984
Spleen	810	6576	Kidney	2895	8599	Liver	4866	10510
Spleen	811	6577	Kidney	2896	8600	Liver	3291	8991
Spleen	812	6578	Kidney	2897	8601	Liver	4867	10511
Spleen	551	6356	Kidney	2898	8602	Liver	4868	10512
Spleen	813	6579	Kidney	1595	7315	Liver	1514	7235
Spleen	814	6580	Kidney	2899	8603	Liver	4869	10513
Spleen	815	6581	Kidney	2900	8604	Liver	4870	10514
Spleen	816	6582	Kidney	2901	8605	Liver	4871	10515

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	817	6583	Kidney	2902	8606	Liver	4408	6363
Spleen	818	6569	Kidney	2903	8607	Liver	4872	10516
Spleen	819	6584	Kidney	2904	8608	Liver	4873	10517
Spleen	820	6585	Kidney	2905	8609	Liver	4874	10518
Spleen	821	6586	Kidney	2906	8610	Liver	4875	10519
Spleen	822	6587	Kidney	2907	8611	Liver	4876	10520
Spleen	823	6588	Kidney	2908	8612	Liver	4877	10521
Spleen	824	6589	Kidney	2909	8613	Liver	4878	10503
Brain	825	6590	Kidney	2910	8614	Liver	4879	10522
Spleen	826	6591	Kidney	1619	7338	Liver	4880	10523
Spleen	827	6592	Kidney	2911	8615	Liver	4881	10524
Spleen	828	6593	Kidney	2912	8616	Liver	4882	6363
Spleen	829	6594	Kidney	2913	8617	Liver	4883	10525
Spleen	830	6595	Kidney	2914	8618	Liver	4884	10526
Brain	831	6596	Kidney	2915	8619	Liver	4885	10527
Spleen	832	6597	Kidney	2916	8620	Liver	1193	6921
Spleen	833	6598	Kidney	2917	8621	Liver	4886	10528
Spleen	834	6599	Kidney	2918	8622	Liver	4887	10529
Spleen	835	6600	Kidney	2919	8623	Liver	4888	10530
Spleen	836	6601	Kidney	2920	8624	Liver	610	6410
Spleen	837	6602	Kidney	2921	8625	Liver	4889	10531
Spleen	838	6603	Kidney	2922	8626	Liver	4890	10532
Spleen	839	6604	Kidney	2923	8627	Liver	4891	10533
Spleen	840	6605	Kidney	2924	8628	Liver	4892	10534
Spleen	841	6606	Kidney	2925	8629	Liver	4893	10535
Spleen	842	6607	Kidney	2926	8630	Liver	4894	10536
Spleen	843	6608	Kidney	2927	8631	Liver	4895	6362
Spleen	844	6609	Kidney	2928	8632	Liver	1207	6935
Spleen	845	6610	Kidney	2929	8633	Liver	4896	10537

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Brain	846	6611	Kidney	2930	8634	Liver	4897	10503
Spleen	847	6554	Kidney	2931	8635	Liver	4898	10538
Spleen	848	6612	Kidney	2932	8636	Liver	1210	6938
Spleen	849	6613	Kidney	2933	8637	Liver	4899	10539
Spleen	850	6614	Kidney	2934	8638	Liver	4900	10540
Spleen	851	6615	Kidney	2935	8639	Liver	4901	10541
Spleen	852	6616	Kidney	2936	8640	Liver	4902	10542
Spleen	853	6617	Kidney	2937	8641	Liver	4903	10543
Spleen	854	6618	Kidney	2938	8642	Liver	4904	10544
Spleen	855	6619	Kidney	2939	8643	Liver	4905	10545
Spleen	856	6620	Kidney	2940	8644	Liver	4906	10546
Spleen	857	6621	Kidney	2941	8645	Liver	4907	10547
Spleen	858	6622	Kidney	2942	8646	Liver	3463	9161
Spleen	859	6623	Kidney	2943	8647	Liver	4908	10548
Spleen	860	6624	Kidney	2944	8648	Liver	3470	9168
Spleen	861	6625	Kidney	2945	8649	Liver	4909	10549
Kidney	553	6365	Kidney	2946	8650	Liver	1228	6956
Kidney	862	5927	Kidney	2947	8651	Liver	4910	10550
Kidney	68	5931	Kidney	2948	8652	Liver	4911	10551
Kidney	863	6626	Kidney	2949	8653	Liver	4912	10552
Kidney	864	6627	Kidney	2950	8654	Liver	1230	6958
Kidney	865	6628	Kidney	2951	8655	Liver	4913	10553
Kidney	866	6629	Kidney	2952	8656	Liver	4914	10554
Kidney	867	6630	Kidney	2953	8657	Liver	4915	10555
Kidney	169	6014	Kidney	2307	8015	Liver	4916	10556
Kidney	49	5913	Kidney	2954	8658	Liver	4917	10557
Kidney	868	6631	Kidney	2955	8659	Liver	1236	6964
Kidney	869	6632	Kidney	2956	8660	Liver	4918	10558
Kidney	192	6034	Kidney	2957	8661	Liver	4919	10559

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	201	6014	Kidney	2958	8662	Liver	4920	10560
Kidney	870	6576	Kidney	2959	8663	Liver	4921	10561
Kidney	871	5913	Kidney	2960	8664	Liver	4922	10562
Kidney	872	6633	Kidney	2961	8665	Liver	4923	10563
Kidney	873	6634	Kidney	2962	8666	Liver	1558	7278
Kidney	786	5927	Kidney	2963	8667	Liver	4924	6362
Kidney	874	6442	Kidney	2964	8668	Liver	4467	6363
Kidney	875	6635	Kidney	2965	8669	Liver	4925	10564
Kidney	876	6636	Muscle	1457	7181	Liver	4926	10565
Kidney	877	6360	Muscle	66	5929	Liver	4927	10566
Kidney	878	6637	Muscle	24	5888	Liver	3573	9271
Kidney	879	5913	Liver	2966	8670	Liver	636	6362
Kidney	880	6638	Liver	2967	8671	Liver	4928	10567
Kidney	881	6639	Liver	2968	8672	Liver	4929	10568
Kidney	882	6640	Liver	2969	8673	Liver	258	6092
Kidney	883	6641	Liver	2970	8674	Liver	4930	10569
Kidney	884	6515	Liver	552	6364	Liver	3592	9290
Kidney	85	5918	Liver	2971	8675	Liver	4931	10570
Kidney	44	5908	Liver	2972	8676	Liver	4932	10571
Kidney	885	6642	Liver	2973	8677	Liver	4933	10572
Kidney	886	6643	Liver	2974	8678	Liver	4934	10573
Kidney	887	6644	Liver	2975	8679	Liver	4935	10574
Kidney	888	6645	Liver	102	5959	Liver	4936	10575
Kidney	889	6442	Liver	103	5960	Liver	268	6099
Kidney	890	6646	Liver	2976	8680	Liver	46	5910
Kidney	657	6449	Liver	2977	8681	Liver	4937	10576
Kidney	660	6452	Liver	2978	8682	Liver	4938	10577
Kidney	891	6647	Liver	104	5961	Liver	645	6438
Kidney	892	5913	Liver	2979	8683	Liver	4939	10578

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	893	6645	Liver	553	6365	Liver	4940	10579
Kidney	894	6648	Liver	2980	8684	Liver	4941	10580
Kidney	895	6649	Liver	2981	8685	Liver	4942	10581
Kidney	896	6650	Liver	2982	8686	Liver	4943	10582
Kidney	897	6651	Liver	2983	8687	Liver	4944	10583
Kidney	898	6652	Liver	2984	8688	Liver	3639	9337
Kidney	899	6439	Liver	2985	8689	Liver	3641	9339
Kidney	900	6653	Liver	2986	8690	Liver	275	6105
Kidney	901	6654	Liver	108	5965	Liver	3647	9345
Kidney	902	6655	Liver	2987	8691	Liver	4945	6466
Kidney	903	6656	Liver	2988	8692	Liver	4946	10584
Kidney	904	6657	Liver	2989	8693	Liver	4947	10585
Kidney	905	6658	Liver	2990	8694	Liver	4948	10586
Kidney	906	6445	Liver	2991	8695	Liver	4949	10510
Kidney	907	6659	Liver	2992	8696	Liver	4950	10587
Kidney	908	6660	Liver	2993	8697	Liver	4951	10588
Kidney	909	6661	Liver	2994	8698	Liver	3653	9351
Kidney	910	6662	Liver	2995	8699	Liver	4952	10503
Kidney	911	6663	Liver	2996	8700	Liver	4953	10589
Kidney	912	6664	Liver	93	5950	Liver	4954	10590
Kidney	913	6665	Liver	2997	8701	Liver	4955	10591
Kidney	914	6666	Liver	2998	8702	Liver	4956	10592
Kidney	915	6667	Liver	2999	8703	Liver	4957	10593
Kidney	69	5932	Liver	3000	8704	Liver	4958	10594
Kidney	916	6668	Liver	3001	8705	Liver	4959	10595
Kidney	917	6669	Liver	3002	8706	Liver	4960	10510
Kidney	918	6670	Liver	3003	8707	Liver	4961	10596
Kidney	919	6671	Liver	1075	6804	Liver	4523	10192
Kidney	920	6672	Liver	3004	8708	Liver	4962	10597

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	921	6673	Liver	3005	8709	Liver	4963	10598
Kidney	354	6181	Liver	3006	8710	Liver	4964	10599
Kidney	922	6674	Liver	3007	8711	Liver	4965	10600
Kidney	923	6675	Liver	3008	8712	Liver	4966	10601
Kidney	924	6676	Liver	3009	8713	Liver	4967	10602
Kidney	925	6677	Liver	3010	8714	Liver	4968	10603
Kidney	926	6678	Liver	3011	8715	Liver	4969	10604
Kidney	927	6679	Liver	3012	8716	Liver	4970	10605
Kidney	928	6680	Liver	1077	6806	Liver	4971	10606
Kidney	929	6681	Liver	3013	8717	Liver	660	6452
Kidney	930	6682	Liver	3014	8718	Liver	287	6117
Kidney	931	6683	Liver	3015	8719	Liver	4972	10607
Kidney	932	6684	Liver	3016	8720	Liver	4973	10608
Kidney	933	6685	Liver	3017	8721	Liver	4974	10609
Kidney	934	6686	Liver	3018	8722	Liver	4975	10610
Kidney	935	6687	Liver	3019	8723	Liver	4976	10611
Kidney	936	6688	Liver	3020	8724	Liver	4977	10612
Kidney	937	6361	Liver	3021	8725	Liver	4978	10503
Kidney	938	6155	Liver	3022	8726	Liver	3707	9404
Kidney	939	6689	Liver	3023	8727	Liver	3713	9410
Kidney	940	6690	Liver	3024	8728	Liver	4979	10613
Kidney	941	6691	Liver	3025	8670	Liver	4980	10614
Kidney	942	6692	Liver	3026	8729	Liver	4981	10615
Kidney	943	6693	Liver	3027	8730	Liver	4982	10616
Kidney	944	6694	Liver	3028	8731	Liver	4983	6181
Kidney	945	6442	Liver	3029	8732	Liver	4984	6362
Kidney	946	6442	Liver	3030	8733	Liver	4985	10617
Kidney	4	5868	Liver	3031	8734	Liver	4986	10618
Kidney	947	6695	Liver	97	5954	Liver	4987	10619

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	948	6500	Liver	3032	8735	Liver	4988	10620
Kidney	949	6696	Liver	1087	6816	Liver	4989	10621
Kidney	950	6697	Liver	3033	8736	Liver	4990	10622
Kidney	951	6698	Liver	1465	7189	Liver	4991	10623
Kidney	952	6699	Liver	3034	8737	Liver	4992	10624
Kidney	953	6700	Liver	3035	8738	Liver	4993	10625
Kidney	954	6701	Liver	3036	8739	Liver	4994	10626
Kidney	955	6702	Liver	56	5920	Liver	4995	10627
Kidney	956	6703	Liver	3037	8740	Liver	4996	10628
Kidney	957	6704	Liver	3038	8741	Liver	4997	10629
Kidney	958	6705	Liver	3039	8742	Brain	4998	10630
Kidney	959	6706	Liver	3040	8743	Liver	4999	10631
Kidney	960	6652	Liver	48	5912	Liver	5000	10632
Kidney	961	6707	Liver	3041	8744	Liver	5001	10633
Kidney	962	6708	Liver	3042	8745	Liver	5002	9033
Kidney	963	6709	Liver	3043	8746	Liver	5003	6181
Kidney	964	6710	Liver	3044	8670	Liver	5004	10634
Kidney	965	6711	Liver	3045	8747	Liver	5005	10635
Kidney	966	6712	Liver	3046	8748	Liver	5006	10636
Kidney	967	6713	Liver	3047	8749	Liver	3763	9460
Brain	968	6714	Liver	3048	8750	Liver	5007	10637
Kidney	969	6715	Liver	3049	8751	Liver	548	6362
Kidney	970	6716	Liver	3050	8752	Liver	5008	10638
Kidney	971	6717	Liver	3051	8753	Liver	5009	10639
Kidney	972	6718	Liver	117	5972	Liver	3782	9479
Kidney	973	6719	Liver	3052	8754	Liver	5010	6466
Kidney	974	6720	Liver	3053	8755	Liver	5011	10640
Kidney	975	6721	Liver	118	5973	Liver	674	6466
Kidney	976	6722	Liver	1092	6821	Liver	5012	10641

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	977	6181	Liver	3054	8756	Brain	79	5940
Kidney	978	6723	Liver	3055	8757	Liver	5013	10642
Kidney	979	6724	Liver	3056	8758	Liver	5014	10643
Kidney	980	6725	Liver	3057	8759	Liver	327	6155
Kidney	981	6726	Liver	3058	8760	Liver	5015	10644
Kidney	982	6727	Liver	3059	8761	Liver	5016	10645
Kidney	983	6728	Liver	3060	8762	Liver	5017	10646
Kidney	984	6729	Liver	3061	8763	Liver	5018	10647
Kidney	741	6269	Liver	121	5975	Liver	5019	10648
Kidney	985	6730	Liver	3062	8764	Liver	43	5907
Kidney	986	6731	Liver	3063	8765	Liver	5020	10649
Kidney	987	6214	Liver	3064	8766	Liver	5021	10650
Kidney	988	6732	Liver	3065	8767	Liver	5022	10651
Kidney	989	6733	Liver	3066	8768	Liver	5023	6362
Kidney	990	6734	Liver	3067	8769	Liver	5024	10652
Kidney	991	6735	Liver	3068	8770	Liver	3834	9530
Kidney	992	6736	Liver	3069	8771	Liver	5025	10653
Kidney	993	6737	Liver	3070	8772	Liver	5026	10654
Kidney	994	6738	Liver	3071	8773	Liver	5027	10655
Kidney	995	6739	Liver	3072	8774	Liver	5028	10656
Kidney	996	6740	Liver	3073	8775	Liver	5029	10657
Kidney	997	6503	Liver	3074	8776	Liver	5030	10580
Kidney	998	6741	Liver	3075	8777	Liver	346	6173
Kidney	999	6576	Liver	3076	8778	Liver	5031	10658
Kidney	1000	6742	Liver	3077	8779	Liver	5032	10659
Kidney	1001	6743	Liver	3078	8780	Liver	5033	10660
Kidney	1002	6744	Liver	1100	6829	Liver	5034	6790
Kidney	1003	6717	Liver	3079	8781	Liver	5035	10661
Kidney	1004	6745	Liver	3080	8782	Liver	354	6181

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	1005	6746	Liver	3081	8783	Liver	5036	10662
Kidney	1006	6747	Liver	3082	8784	Liver	5037	10663
Kidney	1007	6748	Liver	3083	8785	Liver	5038	10664
Kidney	1008	6749	Liver	3084	8786	Liver	5039	10665
Kidney	1009	6750	Liver	1410	7136	Liver	5040	10666
Kidney	1010	6751	Liver	3085	8787	Liver	5041	6466
Kidney	1011	6752	Liver	3086	8788	Liver	5042	10667
Kidney	1012	6753	Liver	3087	8789	Liver	5043	10668
Kidney	1013	6754	Liver	3088	8790	Liver	5044	10669
Kidney	1014	6755	Liver	3089	8791	Liver	5045	10670
Kidney	1015	6756	Liver	129	5980	Liver	5046	10671
Kidney	1016	6757	Liver	3090	8792	Liver	5047	10672
Kidney	1017	6758	Liver	3091	8793	Liver	5048	10673
Kidney	23	5889	Liver	1477	7201	Liver	5049	10674
Kidney	1018	6759	Liver	3092	8794	Liver	5050	10675
Kidney	1019	6760	Liver	131	5982	Liver	5051	10676
Kidney	1020	6761	Liver	3093	8795	Liver	5052	10677
Kidney	1021	6762	Liver	3094	8796	Liver	5053	10678
Kidney	1022	6763	Liver	3095	8797	Liver	5054	10679
Kidney	1023	6764	Liver	3096	8798	Liver	5055	10680
Kidney	1024	6765	Liver	3097	8799	Liver	5056	10681
Kidney	1025	6766	Liver	3098	8800	Liver	5057	6363
Kidney	1026	6599	Liver	3099	8801	Liver	5058	10682
Kidney	1027	6741	Liver	134	5985	Liver	5059	10683
Kidney	1028	6767	Liver	3100	8802	Liver	5060	10684
Kidney	1029	6768	Liver	3101	8686	Liver	5061	10685
Kidney	1030	6769	Liver	3102	8803	Liver	5062	10686
Brain	1031	6770	Liver	3103	8804	Liver	938	6155
Kidney	1032	6771	Liver	3104	8805	Liver	1643	7362

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Kidney	1033	6772	Liver	3105	8806	Liver	5063	10687
Kidney	1034	6773	Liver	3106	8807	Liver	5064	10688
Kidney	1035	6774	Liver	3107	8808	Liver	5065	10689
Kidney	1036	6775	Liver	3108	8809	Liver	5066	10690
Kidney	1037	6776	Liver	3109	8810	Liver	5067	10691
Kidney	1038	6777	Liver	3110	8811	Liver	5068	10692
Kidney	1039	6778	Liver	3111	8812	Liver	5069	10693
Kidney	1040	6779	Liver	3112	8813	Liver	5070	10694
Kidney	1041	6780	Liver	3113	8814	Liver	399	6222
Kidney	1042	6781	Liver	3114	8815	Liver	711	6498
Kidney	1043	6782	Liver	3115	8816	Liver	5071	10695
Kidney	1044	6783	Liver	3116	8817	Liver	5072	10696
Kidney	1045	6784	Liver	3117	8818	Liver	5073	10697
Kidney	1046	6785	Liver	1107	6836	Liver	5074	10698
Kidney	1047	6786	Liver	3118	8819	Liver	5075	10699
Muscle	1048	6787	Liver	138	5989	Liver	5076	10700
Muscle	585	5913	Liver	1108	6837	Liver	5077	10701
Muscle	1049	6788	Liver	3119	8820	Liver	5078	10702
Muscle	635	6432	Liver	1109	6838	Liver	5079	6200
Muscle	1050	6357	Liver	3120	8821	Liver	5080	10703
Muscle	1051	6789	Liver	3121	8822	Liver	5081	6269
Muscle	644	5913	Liver	140	5990	Liver	5082	10704
Muscle	1052	6356	Liver	3122	8823	Liver	5083	10705
Muscle	1053	6442	Liver	1110	6839	Liver	5084	10706
Muscle	1054	6442	Liver	3123	8824	Liver	1392	7118
Muscle	1055	6445	Liver	3124	8825	Liver	5085	6494
Muscle	1056	6790	Liver	3125	8826	Liver	5086	10707
Muscle	799	6356	Liver	3126	8827	Liver	421	6243
Muscle	91	5948	Liver	3127	8828	Liver	5087	10708

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Muscle	1057	6356	Liver	3128	8829	Liver	5088	9471
Muscle	1058	6445	Liver	3129	8830	Liver	5089	10709
Muscle	1059	6718	Liver	3130	8831	Liver	5090	10710
Muscle	1060	6791	Liver	143	5993	Liver	5091	9471
Muscle	1061	6718	Liver	144	5964	Liver	3966	9661
Muscle	1062	6792	Liver	3131	8832	Liver	5092	10711
Muscle	1063	6792	Liver	3132	8833	Liver	5093	10712
Liver	1064	6793	Liver	3133	8834	Liver	5094	10713
Liver	1065	6794	Liver	3134	8835	Liver	5095	10714
Liver	103	5960	Liver	3135	8836	Liver	5096	10715
Liver	1066	6795	Liver	3136	8670	Liver	5097	10716
Liver	1067	6796	Liver	147	5996	Liver	5098	10717
Liver	1068	6797	Liver	3137	8837	Liver	5099	9471
Liver	1069	6798	Liver	3138	8838	Liver	5100	10718
Liver	1070	6799	Liver	3139	8839	Liver	5101	6181
Liver	1071	6800	Liver	3140	8840	Liver	5102	6200
Liver	1072	6801	Liver	3141	8841	Liver	5103	10719
Liver	1073	6802	Liver	3142	8842	Liver	5104	10720
Liver	1074	6803	Liver	3143	8843	Liver	5105	10721
Liver	1075	6804	Liver	3144	8844	Liver	5106	10722
Liver	1076	6805	Liver	3145	8845	Liver	5107	10723
Liver	1077	6806	Liver	3146	8846	Liver	5108	10724
Heart	1078	6807	Liver	1118	6847	Liver	5109	6269
Liver	1079	6808	Liver	3147	8847	Liver	5110	10725
Liver	1080	6809	Liver	3148	8848	Liver	5111	6515
Liver	1081	6810	Liver	3149	8849	Liver	5112	10715
Liver	1082	6811	Liver	19	5883	Liver	5113	10726
Liver	1083	6812	Liver	3150	8850	Liver	5114	10727
Liver	1084	6813	Liver	3151	8851	Liver	5115	10728

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1085	6814	Liver	3152	8852	Liver	5116	6269
Liver	97	5954	Liver	570	6381	Liver	5117	10729
Liver	1086	6815	Liver	3153	8853	Liver	5118	10730
Liver	1087	6816	Liver	3154	8854	Liver	5119	10731
Liver	1088	6817	Liver	1123	6852	Liver	5120	10732
Liver	1089	6818	Liver	1124	6853	Liver	5121	10733
Liver	1090	6819	Liver	3155	8855	Liver	5122	10734
Liver	48	5912	Liver	3156	8856	Liver	5123	10735
Liver	1091	6820	Liver	3157	8857	Liver	5124	10736
Liver	1092	6821	Liver	3158	8858	Liver	5125	10737
Liver	1093	6822	Liver	3159	8859	Liver	5126	10738
Liver	121	5975	Liver	1125	6854	Liver	5127	10739
Liver	1094	6823	Liver	3160	8860	Liver	5128	10740
Liver	1095	6824	Liver	3161	8861	Brain	77	5938
Liver	1096	6825	Liver	3162	8862	Brain	1457	7181
Liver	1097	6826	Liver	3163	8863	Brain	33	5897
Liver	1098	6827	Liver	3164	8864	Brain	4817	10463
Liver	1099	6828	Liver	1126	6855	Brain	37	5901
Liver	558	6369	Liver	152	6000	Brain	1406	7132
Liver	1100	6829	Liver	3165	8865	Brain	45	5909
Liver	1101	6830	Liver	3166	8866	Brain	97	5954
Liver	1102	6831	Liver	1127	6856	Brain	48	5912
Liver	51	5915	Liver	3167	8867	Brain	72	5935
Liver	1103	6832	Liver	3168	8868	Brain	5129	10741
Liver	1104	6833	Liver	3169	8869	Brain	13	5877
Liver	1105	6834	Liver	154	6002	Brain	5130	10742
Liver	1106	6835	Liver	3170	8870	Brain	22	5886
Liver	1107	6836	Liver	3171	8871	Brain	5131	10743
Liver	1108	6837	Liver	3172	8872	Brain	3076	8778

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1109	6838	Liver	155	6003	Brain	55	5919
Liver	1110	6839	Liver	3173	8873	Brain	5132	10744
Liver	1111	6840	Liver	3174	8874	Brain	5133	10745
Liver	1112	6841	Liver	3175	8875	Brain	1476	7200
Liver	1113	6842	Liver	3176	8876	Brain	1414	7140
Liver	1114	6843	Liver	3177	8877	Brain	140	5990
Liver	1115	6844	Liver	3178	8878	Brain	5134	10746
Liver	1116	6845	Liver	3179	8879	Brain	34	5898
Liver	1117	6846	Liver	3180	8880	Brain	5135	10747
Liver	1118	6847	Liver	3181	8881	Brain	5136	10748
Liver	1119	6848	Liver	3182	8882	Brain	1487	7210
Liver	1120	6849	Liver	1130	6859	Brain	30	5894
Liver	1121	6850	Liver	3183	8883	Brain	99	5956
Liver	1122	6851	Liver	3184	8884	Brain	1488	7211
Liver	1123	6852	Liver	3185	8885	Brain	52	5916
Liver	1124	6853	Liver	3186	8886	Brain	10	5874
Liver	1125	6854	Liver	3187	8887	Brain	40	5904
Liver	1126	6855	Liver	3188	8888	Brain	1451	7175
Liver	1127	6856	Liver	3189	8889	Brain	6	5870
Liver	1128	6857	Liver	3190	8890	Brain	3198	8898
Liver	1129	6858	Liver	3191	8891	Brain	825	6590
Liver	1130	6859	Liver	1133	6862	Brain	1503	7224
Liver	1131	6860	Liver	3192	8892	Brain	162	6010
Liver	1132	6861	Liver	3193	8893	Brain	26	5890
Liver	1133	6862	Liver	1496	7218	Brain	5137	10749
Liver	3	5867	Liver	1417	7143	Heart	55	5919
Liver	1134	6863	Liver	1418	7144	Brain	76	5937
Liver	1135	6864	Liver	3194	8894	Brain	5138	10750
Liver	1136	6865	Liver	3195	8895	Brain	5139	10751

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1137	6274	Liver	3196	8896	Brain	5140	10752
Liver	1138	6866	Liver	3197	8897	Brain	5141	10753
Liver	1139	6867	Liver	3198	8898	Brain	74	5936
Liver	1140	6868	Liver	3199	8899	Brain	92	5949
Liver	1141	6869	Liver	3200	8900	Brain	1535	7256
Liver	1142	6870	Liver	3201	8901	Brain	5142	10754
Liver	1143	6871	Liver	1499	7220	Brain	5143	10755
Liver	1144	6872	Liver	3202	8902	Brain	1542	7262
Liver	576	6385	Liver	3203	8903	Heart	99	5956
Liver	577	6386	Liver	158	6006	Brain	5144	10756
Liver	1145	6873	Liver	3204	8904	Brain	5145	10757
Liver	1146	6874	Liver	3205	8905	Brain	5146	6010
Liver	1147	6875	Liver	3206	8906	Heart	52	5916
Liver	1148	6876	Liver	3207	8907	Brain	71	5934
Liver	1149	6877	Liver	1138	6866	Brain	5147	10758
Liver	1150	6878	Liver	3208	8908	Brain	1580	7300
Liver	67	5930	Liver	3209	8909	Brain	5148	10759
Liver	1151	6879	Liver	3210	8910	Brain	4527	10196
Liver	1152	6880	Liver	3211	8911	Brain	5149	10760
Liver	1153	6881	Liver	3212	8912	Brain	53	5917
Liver	1154	6882	Liver	3213	8913	Brain	5150	10761
Liver	1155	6883	Liver	3214	8914	Brain	5151	10762
Liver	1156	6884	Liver	3215	8915	Brain	5152	10763
Liver	1157	6885	Liver	3216	8916	Brain	5153	10764
Liver	1158	6886	Liver	3217	8917	Brain	5154	10765
Liver	1159	6887	Liver	160	6008	Brain	65	5928
Liver	1160	6888	Liver	3218	8918	Brain	1646	7365
Liver	1161	6889	Liver	3219	8919	Pancreas	5131	10743
Liver	76	5937	Liver	3220	8920	Pancreas	563	6374

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1162	6890	Liver	3221	8921	Pancreas	5155	10766
Liver	1163	6891	Liver	3222	8922	Heart	41	5905
Liver	1164	6892	Liver	1140	6868	Heart	803	6570
Liver	49	5913	Liver	3223	8923	Pancreas	768	6544
Liver	1165	6893	Liver	3224	8924	Pancreas	5156	10767
Heart	1166	6894	Liver	3225	8925	Kidney	5157	10768
Liver	1167	6895	Liver	3226	8926	Pancreas	5141	10753
Liver	1168	6896	Liver	3227	8927	Kidney	5158	10769
Liver	1169	6897	Liver	3228	8928	Pancreas	4895	6362
Liver	1170	6898	Liver	3229	8929	Pancreas	39	5903
Liver	1171	6899	Liver	3230	8930	Pancreas	5159	10770
Liver	1172	6900	Liver	3231	8931	Pancreas	5160	6360
Liver	1173	6901	Liver	1445	7169	Pancreas	4949	10510
Liver	1174	6902	Liver	3232	8932	Pancreas	654	6447
Liver	1175	6903	Liver	3233	8933	Pancreas	5161	10771
Liver	1176	6904	Liver	578	6387	Pancreas	692	6482
Liver	1177	6905	Liver	3234	8934	Heart	5162	10772
Liver	1178	6906	Liver	3235	8935	Heart	45	5909
Liver	1179	6907	Liver	3236	8936	Heart	4375	10051
Liver	1180	6908	Liver	3237	8937	Heart	5163	10773
Liver	74	5936	Liver	3238	8938	Heart	72	5935
Liver	1181	6909	Liver	3239	8939	Heart	57	5921
Liver	1182	6910	Liver	3240	8940	Heart	5164	10774
Liver	1183	6911	Liver	3241	8941	Heart	15	5879
Liver	1184	6912	Liver	3242	8942	Heart	5165	10775
Liver	1185	6913	Liver	1506	7227	Heart	562	6373
Liver	1186	6914	Liver	3243	8943	Heart	5166	10776
Liver	598	6400	Liver	3244	8944	Heart	2871	8575
Liver	1187	6915	Liver	3245	8945	Heart	5167	10777

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1188	6916	Liver	3246	8946	Heart	5168	10778
Liver	196	6037	Liver	3247	8947	Heart	866	6629
Liver	1189	6917	Liver	3248	8948	Heart	5169	10779
Liver	1190	6918	Liver	3249	8949	Heart	32	5896
Liver	1191	6919	Liver	3250	8950	Heart	5170	10780
Liver	1192	6920	Liver	3251	8951	Heart	1485	7208
Liver	1193	6921	Liver	3252	8952	Heart	5171	10781
Liver	526	6343	Liver	3253	8953	Heart	5172	10782
Liver	1194	6922	Liver	3254	8954	Heart	5173	10783
Liver	1195	6923	Liver	3255	8955	Kidney	5174	10784
Liver	1196	6924	Liver	3256	8956	Kidney	2527	8231
Liver	1197	6925	Liver	3257	8957	Heart	5175	10785
Liver	1198	6926	Liver	3258	8958	Heart	572	6383
Liver	1199	6927	Liver	3259	8959	Heart	5176	10786
Liver	1200	6928	Liver	3260	8960	Kidney	846	6611
Liver	1201	6929	Liver	3261	8961	Heart	5177	10787
Liver	1202	6930	Liver	3262	8962	Heart	5178	10788
Liver	1203	6931	Liver	3263	8963	Heart	5179	10789
Liver	1204	6932	Liver	3264	8964	Heart	5180	10790
Liver	1205	6933	Liver	3265	8965	Kidney	5181	10791
Liver	1206	6934	Liver	3266	8966	Heart	5182	10792
Liver	1207	6935	Liver	3267	8967	Heart	5183	10793
Liver	1208	6936	Liver	3268	8968	Heart	5184	10794
Liver	1209	6937	Liver	3269	8969	Heart	5185	10795
Liver	1210	6938	Liver	3270	8970	Heart	5186	10796
Liver	1211	6939	Liver	3271	8971	Heart	5187	10797
Liver	1212	6940	Liver	3272	8972	Heart	4014	9708
Liver	1213	6941	Liver	3273	8973	Heart	5188	10798
Liver	1214	6942	Liver	3274	8974	Heart	5189	10799

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1215	6943	Liver	3275	8975	Heart	587	6394
Liver	1216	6944	Liver	3276	8976	Heart	4045	9735
Liver	1217	6945	Liver	3277	8977	Heart	1176	6904
Liver	1218	6946	Liver	3278	8978	Heart	5190	10800
Liver	1219	6947	Liver	3279	8979	Heart	4416	10090
Liver	1220	6948	Liver	3280	8980	Heart	1522	7243
Liver	1221	6949	Liver	3281	8981	Heart	5191	10801
Liver	1222	6950	Liver	3282	8982	Heart	5192	10802
Liver	1223	6951	Liver	1160	6888	Heart	5193	10803
Liver	1224	6952	Liver	3283	8983	Heart	5194	10804
Liver	1225	6953	Liver	1161	6889	Heart	5195	10805
Liver	228	6065	Liver	3284	8984	Heart	5196	10806
Liver	1226	6954	Liver	3285	8985	Heart	5197	10807
Liver	1227	6955	Liver	3286	8986	Heart	5198	10808
Liver	1228	6956	Liver	1162	6890	Liver	5199	10809
Liver	1229	6957	Liver	3287	8987	Heart	1188	6916
Liver	1230	6958	Liver	3288	8988	Heart	1189	6917
Liver	1231	6959	Liver	3289	8989	Heart	5200	10810
Liver	1232	6960	Liver	3290	8990	Heart	5201	10811
Liver	1233	6961	Liver	3291	8991	Heart	607	6407
Liver	1234	6962	Liver	3292	8992	Heart	5202	10812
Liver	1235	6963	Liver	3293	8993	Heart	1427	7151
Liver	1236	6964	Liver	3294	8994	Heart	5203	10813
Liver	1237	6965	Liver	3295	8995	Heart	5204	10814
Liver	1238	6966	Liver	3296	8996	Heart	5205	10815
Liver	1239	6967	Liver	3297	8997	Heart	5206	10816
Liver	1240	6968	Liver	3298	8998	Heart	1212	6940
Liver	1241	6969	Liver	3299	8999	Heart	4901	10541
Liver	1242	6970	Liver	3300	9000	Heart	5207	10817

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1243	6971	Liver	3301	9001	Heart	5208	10818
Liver	1244	6972	Liver	3302	9002	Heart	5209	10819
Liver	1245	6973	Liver	1514	7235	Heart	5210	10820
Liver	1246	6974	Liver	3303	9003	Heart	5211	10821
Liver	1247	6975	Liver	3304	9004	Heart	5212	6363
Liver	1248	6976	Liver	1515	7236	Heart	5213	10822
Liver	1249	6977	Liver	3305	9005	Heart	623	6420
Liver	1250	6978	Liver	3306	6994	Heart	5214	10823
Liver	1251	6979	Liver	3307	9006	Heart	5215	10824
Liver	1252	6440	Liver	3308	9007	Heart	5216	10825
Liver	1253	6980	Liver	3309	9008	Heart	5217	10826
Liver	1254	6981	Liver	3310	9009	Heart	5218	10827
Liver	1255	6982	Liver	3311	9010	Heart	5219	10828
Liver	1256	6983	Liver	3312	9011	Heart	877	6360
Liver	1257	6984	Liver	3313	9012	Heart	5220	10829
Liver	1258	6985	Liver	3314	9013	Heart	4934	6362
Liver	1259	6986	Liver	3315	9014	Heart	5221	10830
Liver	1260	6987	Liver	3316	9015	Heart	5222	10831
Liver	1261	6988	Liver	3317	9016	Heart	5223	10832
Liver	1262	6989	Liver	587	6394	Heart	5224	10833
Liver	1263	6457	Liver	3318	9017	Heart	636	6362
Liver	1264	6990	Liver	3319	9018	Heart	4018	9712
Liver	1265	6991	Liver	3320	9019	Heart	5225	10834
Liver	1266	6992	Liver	3321	9020	Heart	5226	10835
Liver	1267	6993	Liver	3322	9021	Heart	5227	10836
Liver	1268	6994	Liver	3323	9022	Heart	46	5910
Liver	1269	6995	Liver	3324	9023	Heart	5228	10837
Liver	1270	6996	Liver	3325	9024	Heart	5229	6466
Liver	1271	6997	Liver	3326	9025	Heart	5230	10838

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1272	6998	Liver	1175	6903	Heart	60	5924
Liver	1273	6999	Liver	183	6026	Heart	5231	10839
Liver	1274	7000	Liver	3327	9026	Heart	29	5893
Liver	1275	7001	Liver	3328	9027	Heart	1439	7163
Liver	1276	7002	Liver	3329	9028	Heart	5232	6361
Liver	1277	7003	Liver	3330	9029	Heart	5233	10840
Liver	647	6440	Liver	3331	9030	Heart	659	6451
Liver	1278	7004	Liver	3332	9031	Heart	5234	10841
Liver	1279	7005	Liver	3333	9032	Heart	4973	10608
Liver	1280	7006	Liver	3334	9033	Heart	5235	10842
Liver	1281	7007	Liver	3335	9034	Heart	5236	10843
Liver	1282	7008	Liver	3336	9035	Heart	5237	6358
Liver	1283	7009	Liver	3337	9036	Heart	5238	6362
Liver	1284	7010	Liver	3338	9037	Heart	5239	10844
Liver	1285	7011	Liver	3339	9038	Heart	5240	10845
Liver	1286	7012	Liver	3340	9039	Heart	5241	10846
Liver	1287	7013	Liver	3341	9040	Heart	5242	10847
Liver	1288	7014	Liver	869	6632	Heart	5243	10848
Liver	1289	7015	Liver	3342	9041	Heart	5244	10849
Liver	1290	7016	Liver	3343	9042	Heart	5245	10850
Liver	1291	7017	Liver	3344	9043	Heart	5246	10851
Liver	1292	7018	Liver	3345	9044	Heart	5247	10852
Liver	1293	7019	Liver	3346	9045	Heart	5248	10853
Liver	1294	7020	Liver	3347	9046	Heart	5249	10854
Liver	1295	7021	Liver	1521	7242	Heart	5250	10855
Liver	1296	7022	Liver	1522	7243	Heart	5251	10856
Liver	1297	7023	Liver	3348	9047	Heart	5252	10857
Liver	1298	7024	Liver	3349	9048	Heart	5253	10858
Liver	1299	7025	Liver	3350	9049	Heart	5254	10859

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1300	7026	Liver	1186	6914	Heart	5255	10860
Liver	1301	7027	Liver	3351	9050	Heart	5256	10861
Liver	1302	7028	Liver	3352	9051	Heart	5257	10862
Liver	1303	7029	Liver	3353	9052	Heart	5258	10863
Liver	1304	7030	Liver	3354	9053	Heart	5259	10864
Liver	1305	7031	Liver	3355	9054	Heart	5260	6361
Liver	1306	7032	Liver	3356	9055	Heart	5261	10865
Liver	1307	7033	Liver	192	6034	Heart	5262	10866
Liver	1308	7034	Liver	3357	9056	Heart	5263	10867
Liver	1309	7035	Liver	3358	9057	Heart	5264	6471
Liver	1310	7036	Liver	3359	9058	Heart	5265	10868
Liver	1311	7037	Liver	3360	9059	Heart	5266	10869
Liver	1312	7038	Liver	3361	9060	Heart	5267	10870
Liver	1313	7039	Liver	3362	9061	Heart	5268	10871
Liver	1314	7040	Liver	194	6036	Heart	5269	10872
Liver	1315	7041	Liver	3363	9062	Heart	5270	10873
Liver	1316	7042	Liver	3364	9063	Heart	5271	10874
Liver	1317	7043	Liver	3365	9064	Heart	4778	10424
Liver	1318	7044	Liver	3366	9065	Heart	5272	10875
Liver	1319	7045	Liver	3367	9066	Lung	5273	10876
Liver	1320	7046	Liver	3368	9067	Lung	1404	7130
Liver	1321	7047	Liver	1188	6916	Lung	1456	7180
Liver	1322	7048	Liver	3369	9068	Lung	5274	10877
Liver	1323	7049	Liver	196	6037	Lung	1457	7181
Liver	1324	7050	Liver	1527	7248	Lung	9	5873
Liver	1325	7051	Liver	3370	9069	Lung	1458	7182
Liver	1326	7052	Liver	3371	9070	Lung	1459	7183
Liver	1327	7053	Liver	3372	9071	Lung	33	5897
Liver	1328	7054	Liver	3373	9072	Lung	1460	7184

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1329	7055	Liver	3374	9073	Lung	35	5899
Liver	1330	7056	Liver	3375	9074	Lung	20	5884
Liver	1331	7057	Liver	3376	9075	Lung	1461	7185
Liver	1332	7058	Liver	3377	9076	Lung	1405	7131
Liver	1333	7059	Liver	3378	9077	Lung	4817	10463
Liver	1334	7060	Liver	3379	9078	Lung	37	5901
Liver	1335	7061	Liver	3380	9079	Lung	1081	6810
Liver	1336	7062	Liver	3381	9080	Lung	45	5909
Liver	1337	7063	Liver	42	5906	Lung	5275	10878
Liver	1338	7064	Liver	3382	9081	Lung	97	5954
Liver	1339	7065	Liver	3383	9082	Lung	12	5876
Liver	1340	7066	Liver	3384	9083	Lung	66	5929
Liver	1341	7067	Liver	3385	9084	Lung	5276	10879
Liver	1342	7068	Liver	3386	9085	Lung	48	5912
Liver	1343	7069	Liver	3387	9086	Lung	1467	7191
Liver	1344	7070	Liver	1535	7256	Lung	72	5935
Liver	1345	7071	Liver	3388	9087	Lung	1469	7193
Liver	1346	7072	Liver	3389	9088	Lung	47	5911
Liver	1347	7073	Liver	3390	9089	Lung	5129	10741
Liver	1348	7074	Liver	3391	9090	Lung	13	5877
Liver	1349	7075	Liver	3392	9091	Lung	22	5886
Liver	1350	7076	Liver	3393	9092	Lung	1408	7134
Liver	1351	7077	Liver	3394	9093	Lung	5131	10743
Liver	1352	7078	Liver	3395	9094	Lung	1409	7135
Liver	1353	7079	Liver	3396	9095	Lung	1473	7197
Liver	1354	7080	Liver	3397	9096	Lung	5277	10880
Liver	1355	7081	Liver	1194	6922	Lung	3076	8778
Liver	1356	7082	Liver	3398	9097	Liver	5278	10881
Liver	1357	7083	Liver	3399	9098	Lung	15	5879

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1358	7084	Liver	3400	9099	Lung	5279	10882
Liver	1359	7085	Liver	609	6409	Lung	5132	10744
Liver	1360	7086	Liver	3401	9100	Lung	5133	10745
Liver	1361	7087	Liver	3402	9101	Lung	1411	7137
Liver	1362	7088	Liver	3403	9102	Lung	1476	7200
Liver	1363	7089	Liver	3404	9103	Lung	5280	6010
Liver	1364	7090	Liver	3405	9104	Lung	1477	7201
Liver	1365	7091	Liver	3406	9105	Lung	5281	10883
Liver	1366	7092	Liver	3407	9106	Lung	136	5987
Liver	1367	7093	Liver	3408	9107	Lung	21	5885
Liver	1368	7094	Liver	3409	9108	Lung	140	5990
Liver	1369	7095	Liver	3410	9109	Lung	5134	10746
Liver	1370	7096	Liver	3411	9110	Lung	34	5898
Liver	364	6190	Liver	3412	9111	Lung	5282	10884
Liver	1371	7097	Liver	3413	9112	Lung	5135	10747
Liver	1372	7098	Liver	3414	9113	Lung	146	5995
Liver	1373	7099	Liver	3415	9114	Lung	1485	7208
Liver	1374	7100	Liver	3416	9115	Lung	24	5888
Liver	1375	7101	Liver	3417	9116	Lung	19	5883
Liver	1376	7102	Liver	3418	9117	Lung	5283	10885
Liver	1377	7103	Liver	3419	8670	Lung	5136	10748
Liver	1378	7104	Liver	3420	9118	Lung	61	5925
Liver	1379	7105	Liver	3421	9119	Lung	1487	7210
Liver	1380	7106	Liver	3422	9120	Lung	30	5894
Liver	1381	7107	Liver	1537	7258	Liver	5284	10886
Liver	1382	7108	Liver	3423	9121	Lung	5285	10887
Liver	1383	7109	Liver	3424	9122	Lung	1488	7211
Liver	1384	7110	Liver	3425	9123	Lung	4814	10460
Liver	1385	7111	Liver	3426	9124	Lung	1491	7214

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1386	7112	Liver	1209	6937	Lung	5286	10888
Liver	1387	7113	Liver	3427	9125	Lung	5287	10889
Liver	1388	7114	Liver	1210	6938	Lung	10	5874
Liver	1389	7115	Liver	3428	9126	Lung	5288	10890
Liver	1390	7116	Liver	3429	9127	Lung	40	5904
Liver	1391	7117	Liver	3430	9128	Lung	5289	10891
Liver	1392	7118	Liver	3431	9129	Lung	6	5870
Liver	1393	7119	Liver	3432	9130	Lung	1417	7143
Liver	1394	7120	Liver	3433	9131	Lung	1418	7144
Liver	1395	7121	Liver	3434	9132	Lung	5290	10892
Liver	1396	7122	Liver	3435	9133	Lung	3209	8909
Liver	1397	7123	Liver	3436	9134	Lung	4998	10630
Liver	1398	7124	Liver	3437	9135	Lung	5291	10893
Liver	1399	7125	Liver	3438	9136	Lung	5292	10894
Liver	1400	7126	Liver	3439	9137	Lung	5293	10895
Liver	1401	7127	Liver	3440	9138	Lung	1503	7224
Liver	1402	7128	Liver	3441	9139	Lung	98	5955
Liver	1403	7129	Liver	3442	9140	Lung	1504	7225
Liver	89	5946	Liver	3443	9141	Lung	26	5890
Liver	455	6274	Liver	3444	9142	Lung	38	5902
Brain	1404	7130	Liver	3445	9143	Lung	5294	10896
Brain	9	5873	Liver	3446	9144	Lung	5295	10897
Brain	20	5884	Liver	3447	9145	Lung	5296	10898
Brain	1074	6803	Liver	217	6054	Lung	5137	10749
Brain	1405	7131	Liver	3448	9146	Lung	1508	7229
Brain	1406	7132	Liver	3449	9147	Lung	67	5930
Brain	12	5876	Liver	3450	9148	Lung	5297	10899
Brain	66	5929	Liver	3451	9149	Lung	79	5940
Brain	1090	6819	Liver	3452	9150	Lung	76	5937

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Liver	1407	7133	Liver	3453	9151	Lung	5138	10750
Brain	121	5975	Liver	3454	9152	Lung	1422	7147
Brain	1408	7134	Liver	3455	9153	Lung	5298	10900
Brain	1409	7135	Spleen	2012	7725	Lung	58	5922
Brain	1410	7136	Liver	3456	9154	Lung	1516	7237
Brain	1411	7137	Liver	3457	9155	Lung	5299	10901
Brain	1412	7138	Liver	3458	9156	Lung	5300	10902
Brain	1413	7139	Liver	3459	9157	Lung	3313	9012
Brain	523	6341	Liver	3460	9158	Lung	5140	10752
Brain	1414	7140	Liver	3461	9159	Lung	5141	10753
Brain	34	5898	Liver	3462	9160	Lung	5301	10903
Brain	61	5925	Liver	3463	9161	Lung	5302	10904
Brain	1415	7141	Liver	221	6058	Lung	74	5936
Brain	1416	7142	Liver	3464	9162	Lung	1522	7243
Brain	6	5870	Liver	3465	9163	Lung	186	6029
Brain	1417	7143	Liver	3466	9164	Lung	14	5878
Brain	1418	7144	Liver	3467	9165	Lung	1523	7244
Brain	1419	7145	Liver	3468	9166	Lung	1525	7246
Brain	59	5923	Liver	3469	9167	Lung	62	5926
Brain	1420	5987	Liver	226	6063	Lung	5303	10905
Brain	1421	7146	Liver	3470	9168	Lung	1425	7149
Brain	1422	7147	Liver	3471	9169	Lung	92	5949
Liver	1423	7148	Liver	3472	9170	Lung	42	5906
Brain	31	5895	Liver	758	6536	Lung	5304	10906
Brain	1424	5960	Liver	3473	9171	Lung	1534	7255
Lung	55	5919	Liver	3474	9172	Lung	1535	7256
Brain	1425	7149	Liver	3475	9173	Lung	5305	10907
Lung	99	5956	Liver	3476	9174	Lung	5306	10908
Brain	1426	7150	Liver	3477	9175	Lung	5307	10909

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Brain	1427	7151	Liver	3478	9176	Lung	5308	10910
Brain	1428	7152	Liver	3479	9177	Lung	5309	10911
Brain	1429	7153	Liver	3480	9178	Lung	5310	10912
Brain	1430	7154	Liver	3481	9179	Lung	1427	7151
Brain	236	6040	Liver	3482	9180	Lung	4893	10535
Brain	1431	7155	Liver	3483	9181	Lung	3420	9118
Brain	1432	7156	Liver	3484	9182	Lung	1538	7259
Brain	1433	7157	Liver	3485	9183	Lung	5143	10755
Brain	1434	7158	Liver	3486	9184	Lung	3430	9128
Lung	52	5916	Liver	3487	9185	Lung	1429	7153
Brain	1435	7159	Liver	3488	9186	Lung	5311	10913
Brain	1436	7160	Liver	1550	7270	Lung	1542	7262
Brain	16	5880	Liver	3489	9187	Lung	1545	7265
Brain	1437	7161	Liver	3490	9188	Lung	5130	10742
Brain	36	5900	Liver	3491	9189	Lung	5312	10914
Brain	1438	7162	Liver	3492	9190	Lung	1547	7267
Brain	1439	7163	Liver	3493	9191	Lung	5313	10915
Brain	1440	7164	Liver	3494	9192	Lung	1551	7271
Lung	41	5905	Liver	3495	9193	Lung	5314	10916
Brain	1441	7165	Liver	3496	9194	Lung	1430	7154
Brain	1442	7166	Liver	3497	9195	Lung	1553	7273
Brain	1443	7167	Liver	3498	9196	Lung	5315	6010
Pancreas	33	5897	Liver	3499	9197	Lung	55	5919
Pancreas	72	5935	Liver	234	6070	Lung	5144	10756
Pancreas	24	5888	Liver	3500	9198	Lung	5145	10757
Pancreas	10	5874	Liver	3501	9199	Lung	5316	10917
Pancreas	38	5902	Liver	1236	6964	Lung	5317	10918
Heart	33	5897	Liver	3502	9200	Lung	1563	7283
Heart	37	5901	Liver	3503	9201	Lung	5318	10919

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Heart	78	5939	Liver	3504	9202	Lung	5319	10920
Heart	1444	7168	Liver	3505	9203	Lung	99	5956
Heart	1445	7169	Liver	3506	9204	Lung	5320	10921
Heart	1446	7170	Liver	3507	9205	Lung	71	5934
Heart	1447	7171	Liver	3508	9206	Lung	5321	10922
Heart	1431	7155	Liver	3509	9207	Lung	5322	10923
Lung	803	6570	Liver	3510	9208	Lung	5323	10924
Heart	1448	7172	Liver	3511	9209	Lung	5324	10925
Heart	1449	7173	Liver	3512	9210	Lung	5325	10926
Heart	1450	7174	Liver	1237	6965	Lung	5326	10927
Lung	1451	7175	Liver	3513	9211	Lung	5327	10928
Heart	1452	7176	Liver	3514	9212	Lung	5328	10929
Heart	1453	7177	Liver	238	6073	Lung	5329	10930
Heart	1454	7178	Liver	3515	9213	Lung	1438	7162
Lung	1455	7179	Liver	3516	9214	Lung	1578	7298
Lung	1456	7180	Liver	3517	9215	Lung	1579	7299
Lung	1457	7181	Liver	240	6074	Lung	1580	7300
Lung	9	5873	Liver	3518	9216	Lung	29	5893
Lung	1458	7182	Liver	3519	9217	Lung	5330	10931
Lung	1459	7183	Liver	876	6636	Lung	5331	10932
Lung	33	5897	Liver	3520	9218	Lung	5148	10759
Lung	93	5950	Liver	3521	9219	Lung	5332	10933
Lung	1460	7184	Liver	3522	9220	Lung	5333	10934
Lung	35	5899	Liver	3523	9221	Lung	5334	10935
Lung	1461	7185	Liver	3524	9222	Lung	5335	10936
Lung	1405	7131	Liver	3525	9223	Lung	5336	10937
Lung	1406	7132	Liver	3526	9224	Lung	5337	10938
Lung	115	5971	Liver	3527	9225	Lung	1589	7309
Lung	1462	7186	Liver	3528	9226	Lung	5338	10939

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1463	7187	Liver	3529	9227	Lung	5149	10760
Lung	1464	7188	Liver	3530	9228	Lung	5339	10940
Lung	1465	7189	Liver	245	6079	Lung	53	5917
Lung	12	5876	Liver	1248	6976	Lung	1599	7319
Lung	1466	7190	Liver	3531	9229	Lung	5340	10941
Lung	56	5920	Liver	3532	9230	Lung	5341	10942
Lung	48	5912	Liver	3533	9231	Lung	5150	10761
Lung	1467	7191	Liver	3534	9232	Lung	5342	10943
Lung	1468	7192	Liver	3535	9233	Lung	5343	10944
Lung	72	5935	Liver	3536	9234	Lung	1604	7324
Lung	1469	7193	Liver	3537	9235	Lung	5344	10945
Lung	1470	7194	Liver	3538	9236	Lung	70	5933
Lung	1471	7195	Liver	1556	7276	Lung	5345	10946
Lung	13	5877	Liver	3539	9237	Lung	5346	10947
Lung	825	6590	Liver	3540	9238	Lung	5151	10762
Lung	22	5886	Liver	3541	9239	Lung	5347	10948
Lung	1472	7196	Liver	3542	9240	Lung	5152	10763
Lung	1473	7197	Liver	3543	9241	Lung	5348	10949
Lung	15	5879	Liver	3544	9242	Lung	5349	10950
Lung	779	6554	Liver	3545	9243	Lung	5350	10951
Lung	1474	7198	Liver	3546	9244	Lung	5351	10952
Lung	1475	7199	Liver	3547	9245	Lung	5352	10953
Lung	1411	7137	Liver	1434	7158	Lung	5353	10954
Lung	1476	7200	Liver	3548	9246	Lung	5354	10955
Lung	1477	7201	Liver	3549	9247	Lung	5355	10956
Lung	1478	7202	Liver	3550	9248	Lung	5356	10957
Lung	1479	7203	Liver	3551	9249	Lung	5357	10958
Lung	1480	7204	Liver	3552	9250	Lung	5358	10959
Lung	1414	7140	Liver	3553	9251	Lung	5359	10960

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	136	5987	Liver	3554	9252	Lung	5360	10961
Lung	1481	7205	Liver	3555	9253	Lung	5361	10962
Lung	1482	7204	Liver	3556	9254	Lung	5154	10765
Lung	1483	7206	Liver	3557	9255	Lung	5362	10963
Lung	21	5885	Liver	3558	9256	Lung	1633	7352
Lung	140	5990	Liver	3559	9257	Lung	5363	10964
Lung	34	5898	Liver	253	6087	Lung	5364	10965
Lung	1484	7207	Liver	3560	9258	Lung	5365	10966
Lung	146	5995	Liver	3561	9259	Lung	5366	10967
Lung	1485	7208	Liver	1561	7281	Lung	1642	7361
Lung	24	5888	Liver	3562	9260	Lung	1643	7362
Lung	150	5999	Liver	3563	9261	Lung	65	5928
Lung	19	5883	Liver	3564	9262	Lung	1646	7365
Lung	1486	7209	Liver	3565	9263	Lung	5367	10968
Lung	78	5939	Liver	3566	9264	Lung	1655	7374
Lung	61	5925	Liver	3567	9265	Lung	5368	10969
Lung	1487	7210	Liver	3568	9266	Lung	5369	10970
Lung	30	5894	Liver	3569	9267	Lung	5370	10971
Lung	1488	7211	Liver	3570	9268	Lung	5371	10972
Lung	1489	7212	Liver	3571	9269	Lung	3951	9646
Lung	1490	7213	Liver	3572	9270	Lung	431	6252
Lung	1491	7214	Liver	3573	9271	Lung	5372	10973
Lung	1492	7215	Liver	3574	9272	Lung	5373	10974
Lung	10	5874	Liver	3575	9273	Lung	5374	10975
Lung	1493	5987	Liver	3576	9274	Lung	5375	10976
Lung	1494	7216	Liver	3577	9275	Lung	5376	10977
Lung	1495	7217	Liver	3578	9276	Lung	5377	10978
Lung	6	5870	Liver	3579	9277	Lung	5378	10979
Lung	1496	7218	Liver	3580	9278	Lung	5379	10980

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1497	6064	Liver	3581	9279	Lung	5380	10981
Lung	1417	7143	Liver	3582	9280	Lung	5381	10982
Lung	1418	7144	Liver	1266	6992	Lung	5382	10983
Lung	1498	7219	Liver	3583	9281	Lung	5383	10984
Lung	1499	7220	Liver	260	6094	Lung	5384	10985
Lung	1500	7221	Liver	3584	9282	Lung	4003	9697
Lung	1501	7222	Liver	3585	9283	Intestine	5385	10986
Lung	1502	7223	Liver	3586	9284	Intestine	1081	6810
Lung	1503	7224	Liver	3587	9285	Intestine	13	5877
Lung	1504	7225	Liver	3588	9286	Intestine	57	5921
Lung	38	5902	Liver	3589	9287	Intestine	68	5931
Lung	1505	7226	Liver	3590	9288	Intestine	22	5886
Lung	1506	7227	Liver	3591	9289	Intestine	5386	10987
Lung	59	5923	Liver	3592	9290	Intestine	27	5891
Spleen	1507	7228	Liver	3593	9291	Intestine	67	5930
Lung	1508	7229	Liver	3594	9292	Intestine	5387	10988
Lung	1509	7230	Liver	262	6096	Intestine	5388	10988
Lung	1510	7231	Liver	3595	9293	Intestine	608	6408
Lung	1511	7232	Liver	3596	9294	Intestine	5389	10989
Lung	1420	5987	Liver	3597	9295	Intestine	2888	8592
Lung	1512	7233	Liver	3598	9296	Intestine	46	5910
Lung	76	5937	Liver	3599	9297	Intestine	5390	10990
Lung	1513	7234	Liver	3600	9298	Intestine	5391	10991
Lung	1514	7235	Liver	3601	9299	Spleen	5392	10992
Lung	1515	7236	Liver	3602	9300	Spleen	5393	10993
Lung	58	5922	Liver	1568	7288	Spleen	1482	7204
Lung	1516	7237	Liver	3603	9301	Spleen	5394	10994
Lung	177	6022	Liver	3604	9302	Spleen	5395	10995
Lung	1517	7238	Liver	3605	9303	Spleen	5396	10996

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1518	7239	Liver	3606	9304	Spleen	5397	10997
Lung	1519	7240	Liver	3607	9305	Spleen	5398	10998
Lung	74	5936	Liver	3608	9306	Spleen	5399	10999
Lung	1520	7241	Liver	3609	9307	Spleen	5400	7304
Lung	1521	7242	Liver	3610	9308	Spleen	5401	11000
Lung	1522	7243	Liver	3611	9309	Spleen	5402	11001
Lung	1523	7244	Liver	3612	9310	Spleen	5403	11002
Lung	1524	7245	Liver	3613	9311	Spleen	1227	6955
Lung	1525	7246	Liver	3614	9312	Spleen	5404	11003
Lung	62	5926	Liver	3615	9313	Spleen	5405	11004
Spleen	1526	7247	Liver	3616	9314	Spleen	5406	11005
Lung	1527	7248	Liver	3617	9315	Spleen	5407	11006
Lung	1528	7249	Liver	3618	9316	Spleen	5408	11007
Lung	200	6040	Liver	3619	9317	Spleen	5409	11008
Lung	1529	7250	Liver	3620	9318	Spleen	5410	11009
Lung	203	6042	Liver	645	6438	Spleen	5411	11010
Lung	1530	7251	Liver	3621	9319	Spleen	5412	11011
Lung	1531	7252	Liver	270	5980	Spleen	793	6562
Lung	1532	7253	Liver	3622	9320	Spleen	5413	11012
Lung	1533	7254	Liver	3623	9321	Spleen	5414	11013
Lung	1534	7255	Liver	3624	9322	Spleen	794	6563
Lung	1535	7256	Liver	3625	9323	Spleen	5415	11014
Lung	1536	7257	Liver	3626	9324	Spleen	5416	11015
Lung	8	5872	Liver	3627	9325	Spleen	5417	11016
Lung	1427	7151	Liver	3628	9326	Spleen	5418	11017
Lung	1537	7258	Liver	1278	7004	Spleen	5419	11018
Lung	1538	7259	Liver	3629	9327	Spleen	5420	11019
Lung	1539	7260	Liver	3630	9328	Spleen	5421	11020
Lung	212	6040	Liver	3631	9329	Spleen	3777	9474

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1540	7261	Liver	3632	9330	Spleen	5422	6778
Lung	1541	6064	Liver	3633	9331	Spleen	5423	11021
Lung	1428	7152	Liver	3634	9332	Spleen	5424	11022
Lung	1542	7262	Liver	3635	9333	Spleen	5425	11023
Lung	1543	7263	Liver	3636	9334	Spleen	5426	11024
Lung	1544	7264	Liver	3637	9335	Spleen	5427	11025
Lung	1545	7265	Liver	3638	9336	Spleen	5428	11026
Lung	1546	7266	Liver	3639	9337	Spleen	5429	11027
Lung	1547	7267	Liver	3640	9338	Spleen	5430	11028
Lung	1548	7268	Liver	3641	9339	Spleen	5431	11029
Lung	1549	7269	Liver	3642	9340	Spleen	5432	11030
Lung	1550	7270	Liver	3643	9341	Spleen	5433	11031
Lung	1551	7271	Liver	3644	9342	Spleen	5434	11032
Lung	1552	7272	Liver	3645	9343	Spleen	5435	11033
Lung	234	6070	Liver	3646	9344	Spleen	5436	11034
Lung	1553	7273	Liver	3647	9345	Spleen	5437	11035
Lung	236	6040	Liver	3648	9346	Spleen	5438	11036
Spleen	1554	7274	Liver	3649	9347	Spleen	5439	11037
Lung	1431	7155	Liver	3650	9348	Spleen	5440	11038
Lung	238	6073	Liver	3651	9349	Spleen	5441	11039
Lung	239	6040	Liver	3652	9350	Spleen	5442	11040
Lung	1432	7156	Liver	3653	9351	Spleen	5443	11041
Lung	1555	7275	Liver	3654	9352	Spleen	5444	11042
Lung	245	6079	Liver	3655	9353	Spleen	5445	11043
Lung	1556	7276	Liver	3656	9354	Spleen	5446	11044
Lung	1557	7277	Liver	3657	9355	Spleen	5447	11045
Lung	1558	7278	Liver	3658	9356	Spleen	5448	11046
Lung	1559	7279	Liver	3659	9357	Spleen	5449	11047
Lung	1560	7280	Liver	3660	9358	Spleen	5450	6678

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1561	7281	Liver	3661	9359	Spleen	5451	6678
Lung	1562	7282	Liver	3662	9360	Spleen	5452	11048
Lung	1563	7283	Liver	3663	9361	Spleen	5453	11049
Lung	1564	7284	Liver	3664	9362	Spleen	5454	11050
Lung	1565	7285	Liver	3665	9363	Spleen	5455	11051
Spleen	1566	7286	Liver	3666	9364	Spleen	5456	11052
Lung	1567	7287	Liver	3667	9365	Spleen	774	6550
Lung	1568	7288	Liver	3668	9366	Spleen	5457	11053
Lung	1569	7289	Liver	3669	9367	Spleen	5458	11054
Lung	268	6099	Liver	3670	9368	Spleen	5459	11055
Lung	1570	7290	Liver	3671	9369	Spleen	5460	11056
Lung	1437	7161	Liver	3672	9370	Spleen	5461	11057
Lung	1571	7291	Liver	3673	9371	Spleen	5462	11058
Lung	1572	7292	Liver	3674	9372	Spleen	5463	11059
Lung	1573	7293	Liver	3675	9373	Spleen	5464	11060
Lung	1574	7294	Liver	3676	9374	Spleen	5465	11061
Lung	1575	7295	Liver	3677	9375	Spleen	5466	11062
Lung	1576	7296	Liver	3678	9376	Spleen	5467	11063
Lung	1577	7297	Liver	3679	9377	Spleen	5468	11064
Lung	1438	7162	Liver	3680	9378	Spleen	5469	8410
Lung	1578	7298	Liver	3681	9379	Spleen	5470	11065
Lung	1579	7299	Liver	3682	9380	Spleen	5471	11066
Lung	1580	7300	Liver	3683	9381	Spleen	5472	11067
Lung	1581	7301	Liver	3684	9382	Spleen	5473	11068
Lung	1582	7302	Liver	3685	9383	Spleen	5474	11069
Lung	1583	7303	Liver	3686	9384	Spleen	5475	11070
Lung	279	6109	Liver	3687	9385	Spleen	5476	11071
Lung	1448	7172	Liver	3688	9386	Spleen	5477	11072
Spleen	1584	7304	Liver	3689	9387	Spleen	5478	11073

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1585	7305	Liver	3690	9388	Lung	52	5916
Lung	1586	7306	Liver	3691	9389	Spleen	5479	11074
Lung	1587	7307	Liver	3692	9390	Spleen	5480	11075
Lung	1588	7308	Liver	3693	9391	Spleen	3972	9667
Lung	1589	7309	Liver	3694	9392	Spleen	5481	11076
Lung	1590	7310	Liver	3695	9393	Spleen	5482	6554
Lung	1591	7311	Liver	3696	9394	Spleen	5483	7444
Lung	1592	7312	Liver	3697	9395	Spleen	5484	11077
Lung	1593	7313	Liver	3698	9396	Spleen	5485	11078
Lung	1594	7314	Liver	3699	6159	Spleen	5486	11079
Lung	1595	7315	Liver	3700	9397	Spleen	5487	11080
Lung	1596	7316	Liver	3701	9398	Spleen	5488	11081
Lung	1597	7317	Liver	3702	9399	Spleen	5489	11082
Lung	1598	7318	Liver	3703	9400	Spleen	5490	11083
Lung	1599	7319	Liver	3704	9401	Spleen	5491	11084
Lung	1600	7320	Liver	3705	9402	Spleen	5492	6554
Lung	1601	7321	Liver	3706	9403	Lung	1451	7175
Lung	1602	7322	Liver	3707	9404	Spleen	5493	11085
Lung	1603	7323	Liver	3708	9405	Spleen	5494	11086
Lung	1604	7324	Liver	3709	9406	Spleen	5495	11087
Lung	1605	7325	Liver	3710	9407	Pancreas	55	5919
Lung	1606	7326	Liver	3711	9408	Spleen	5496	11088
Lung	310	6139	Liver	3712	9409	Spleen	5497	11089
Lung	1607	7327	Liver	3713	9410	Spleen	5498	11090
Lung	1608	7328	Liver	3714	9411	Spleen	5499	11091
Lung	1609	7329	Liver	3715	9412	Spleen	5500	11092
Lung	1610	7330	Liver	3716	9413	Spleen	5501	11093
Lung	314	6142	Liver	3717	9414	Spleen	5502	11094
Lung	1611	7331	Liver	1309	7035	Spleen	5503	11095

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1612	7332	Liver	3718	9415	Spleen	5504	11096
Lung	1613	7333	Liver	1596	7316	Spleen	5505	11097
Lung	1614	7334	Liver	3719	9416	Spleen	5506	11098
Lung	1615	6112	Liver	3720	9417	Spleen	5507	11099
Lung	1616	7335	Liver	3721	9418	Spleen	5508	11100
Lung	1617	7336	Liver	3722	9419	Spleen	5509	11101
Lung	1618	7337	Liver	3723	9420	Spleen	5510	11102
Lung	1619	7338	Liver	3724	9421	Spleen	5511	11103
Lung	1620	7339	Liver	3725	9422	Spleen	5512	11104
Lung	1621	7340	Liver	3726	9423	Spleen	5513	11105
Lung	1622	7341	Liver	3727	9424	Spleen	5514	11106
Lung	1623	7342	Liver	3728	9425	Spleen	5515	11107
Lung	1624	7343	Liver	3729	9426	Spleen	5516	11108
Lung	1625	7344	Liver	3730	9427	Spleen	5517	11109
Lung	1626	7345	Liver	1600	7320	Spleen	5518	11110
Lung	1627	7346	Liver	3731	9428	Spleen	5519	8080
Lung	1628	7347	Liver	3732	9429	Spleen	5520	11111
Lung	1629	7348	Liver	3733	9430	Spleen	5521	11112
Lung	1630	7349	Liver	3734	9431	Spleen	5522	11113
Lung	1631	7350	Liver	3735	9432	Spleen	5523	11114
Lung	1632	7351	Liver	3736	9433	Spleen	5524	11115
Lung	1633	7352	Liver	3737	9434	Spleen	5525	11116
Spleen	1634	7353	Liver	3738	9435	Spleen	5526	11117
Lung	1635	7354	Liver	3739	9436	Spleen	5527	11118
Lung	699	6488	Liver	3740	9437	Spleen	5528	11119
Lung	1636	7355	Liver	3741	9438	Spleen	5529	11120
Lung	700	6489	Liver	3742	9439	Spleen	5530	11121
Lung	1637	7356	Liver	3743	9440	Spleen	5531	11122
Lung	1638	7357	Liver	3744	9441	Spleen	5532	11123

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1639	7358	Liver	3745	9442	Spleen	5533	6748
Lung	1640	7359	Liver	3746	9443	Spleen	5534	11124
Lung	1641	7360	Liver	3747	9444	Spleen	5535	11125
Lung	1642	7361	Liver	3748	9445	Spleen	5536	11126
Lung	1643	7362	Liver	302	6131	Spleen	5537	11127
Lung	1644	7363	Liver	303	6132	Spleen	5538	11128
Lung	1645	7364	Liver	3749	9446	Spleen	5539	11129
Lung	1646	7365	Liver	3750	9447	Spleen	5540	11130
Lung	1647	7366	Liver	3751	9448	Spleen	5541	11131
Lung	1648	7367	Liver	3752	9449	Spleen	5542	11132
Lung	1649	7368	Liver	3753	9450	Spleen	5543	11133
Lung	394	6217	Liver	3754	9451	Spleen	5544	11134
Lung	1650	7369	Liver	3755	9452	Pancreas	52	5916
Lung	1651	7370	Liver	3756	9453	Spleen	5545	11135
Lung	1652	7371	Liver	3757	9454	Spleen	5546	11136
Lung	1653	7372	Liver	3758	9455	Spleen	5547	11137
Lung	1654	7373	Liver	3759	9456	Spleen	5548	11138
Lung	1655	7374	Liver	3760	9457	Spleen	5549	11139
Lung	1656	7375	Liver	3761	9458	Spleen	5550	11140
Lung	1657	7376	Liver	3762	9459	Spleen	5551	11141
Lung	1658	7377	Liver	3763	9460	Spleen	5552	11142
Lung	1659	7378	Liver	3764	9461	Spleen	5553	11143
Lung	1660	7379	Liver	3765	9462	Spleen	5554	11144
Lung	1661	7380	Liver	3766	9463	Spleen	5555	11145
Lung	1662	7381	Liver	3767	9464	Spleen	5556	11146
Lung	1663	7382	Liver	3768	9465	Spleen	5557	11147
Lung	1664	7383	Liver	3769	9466	Spleen	5558	11148
Lung	1665	7384	Liver	3770	9467	Spleen	5559	11149
Lung	1666	7385	Liver	3771	9468	Spleen	5560	11150

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Lung	1667	7386	Liver	3772	9469	Spleen	5561	11151
Lung	1668	7387	Liver	3773	9470	Spleen	5562	11152
Lung	1669	7388	Liver	3774	9471	Spleen	5563	11153
Lung	1670	6599	Liver	3775	9472	Spleen	5564	11154
Lung	1671	7389	Liver	3776	9473	Spleen	5565	11155
Lung	1672	7390	Liver	3777	9474	Spleen	5566	11156
Lung	1673	7391	Liver	3778	9475	Spleen	5567	11157
Spleen	1674	7392	Liver	314	6142	Spleen	5568	11158
Spleen	1675	7393	Liver	3779	9476	Spleen	5569	11159
Spleen	1676	7394	Liver	3780	9477	Spleen	5570	11160
Spleen	1677	7395	Liver	3781	9478	Spleen	5571	11161
Spleen	1678	7396	Liver	3782	9479	Spleen	5572	11162
Spleen	1679	7397	Liver	3783	9480	Spleen	5573	7126
Spleen	1680	7398	Liver	3784	9481	Spleen	5574	11163
Spleen	1681	7399	Liver	3785	9482	Spleen	5575	11164
Spleen	1682	7400	Liver	3786	9483	Spleen	5576	11165
Spleen	1683	7401	Liver	3787	9484	Spleen	5577	11166
Spleen	1684	7402	Liver	3788	9485	Spleen	5578	11167
Spleen	1685	7403	Liver	3789	6159	Spleen	5579	11168
Spleen	1686	7404	Liver	3790	9486	Spleen	5580	11169
Spleen	1687	7405	Liver	3791	9487	Spleen	5581	11170
Spleen	1688	7406	Liver	3792	9488	Spleen	5582	11171
Spleen	1689	7407	Liver	3793	9489	Spleen	5583	11172
Spleen	1690	7408	Liver	3794	9490	Spleen	5584	11173
Spleen	1691	7409	Liver	3795	9491	Spleen	5585	11174
Spleen	1692	7410	Liver	3796	9492	Spleen	5586	11175
Spleen	1693	7411	Liver	3797	9493	Spleen	2779	8483
Spleen	1694	7412	Liver	3798	9494	Spleen	5587	11176
Spleen	1695	7413	Liver	3799	9495	Spleen	5588	11177

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1696	7414	Liver	3800	9496	Spleen	5589	11178
Spleen	1697	7415	Liver	3801	9497	Spleen	5590	11179
Spleen	1698	7416	Liver	1340	7066	Spleen	5591	11180
Spleen	1699	7417	Liver	3802	9498	Spleen	5592	11181
Spleen	1700	7418	Liver	3803	9499	Spleen	5593	11182
Spleen	1701	7419	Liver	3804	9500	Spleen	5594	11183
Spleen	1702	7420	Liver	3805	9501	Spleen	5595	11184
Spleen	1703	7421	Liver	3806	9502	Spleen	5596	11185
Spleen	1704	7422	Liver	3807	9503	Spleen	5597	11186
Spleen	1705	7423	Liver	3808	9504	Spleen	5598	11187
Spleen	1706	7424	Liver	3809	9505	Spleen	2812	8516
Spleen	1707	7425	Liver	3810	9506	Spleen	5599	11188
Spleen	1708	7426	Liver	3811	9507	Spleen	5600	11189
Spleen	1709	7427	Liver	3812	9508	Spleen	5601	11190
Spleen	1710	7428	Liver	3813	9509	Spleen	5602	11191
Spleen	1711	7429	Liver	3814	9510	Spleen	5603	11192
Spleen	1712	7430	Liver	3815	9511	Spleen	5604	11193
Spleen	1713	7431	Liver	3816	9512	Spleen	5605	11194
Spleen	1714	7432	Liver	3817	9513	Kidney	5606	11195
Spleen	1715	7433	Liver	3818	9514	Kidney	5607	11196
Spleen	1716	7434	Liver	3819	9515	Kidney	5608	11197
Spleen	1717	7435	Liver	1347	7073	Kidney	5609	11198
Spleen	1718	7436	Liver	3820	9516	Kidney	5610	11199
Spleen	1719	7437	Liver	3821	9517	Kidney	4037	9727
Spleen	1720	7438	Liver	3822	9518	Kidney	5611	11200
Spleen	1721	7439	Liver	3823	9519	Kidney	5612	11201
Spleen	1722	7440	Liver	3824	9520	Kidney	5165	10775
Spleen	1723	7441	Liver	3825	9521	Kidney	5613	11202
Spleen	1724	7442	Liver	3826	9522	Kidney	5614	11203

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1725	7443	Liver	3827	9523	Kidney	5615	11204
Spleen	1726	7444	Liver	335	6162	Kidney	3095	8797
Spleen	1727	7445	Liver	3828	9524	Kidney	563	6374
Spleen	1728	7446	Liver	3829	9525	Kidney	5616	11205
Spleen	1729	7447	Liver	3830	9526	Kidney	5617	11206
Spleen	1730	7448	Liver	3831	9527	Kidney	5169	10779
Spleen	1731	7449	Liver	3832	9528	Kidney	5618	11207
Spleen	1732	7450	Liver	3833	9529	Kidney	5619	11208
Spleen	1733	7451	Liver	3834	9530	Kidney	5620	11209
Spleen	1734	7452	Liver	3835	9531	Kidney	5621	11210
Spleen	1735	7453	Liver	3836	9532	Kidney	4394	10070
Spleen	1736	7454	Liver	3837	9533	Kidney	4395	10071
Spleen	1737	7455	Liver	3838	9534	Kidney	5622	11211
Spleen	1738	7456	Liver	1627	7346	Kidney	5623	11212
Spleen	1739	7457	Liver	3839	9535	Kidney	3227	8927
Spleen	1740	7403	Liver	3840	9536	Kidney	5177	10787
Spleen	1741	7458	Liver	3841	9537	Kidney	5624	11213
Spleen	1742	7459	Liver	3842	9538	Kidney	577	6386
Spleen	1743	7460	Liver	3843	9539	Kidney	5625	10834
Spleen	1744	7461	Liver	3844	9540	Kidney	5626	11214
Spleen	1745	7462	Liver	3845	9541	Kidney	5627	11215
Spleen	1746	7463	Liver	3846	9542	Kidney	5628	11216
Spleen	1747	7436	Liver	342	6169	Kidney	5629	11217
Spleen	1748	7464	Liver	3847	9543	Kidney	5630	11218
Spleen	1749	7465	Liver	3848	9544	Kidney	5631	11219
Spleen	1750	7466	Liver	3849	9545	Kidney	1165	6893
Spleen	1751	7467	Liver	3850	9546	Kidney	5632	11220
Spleen	1752	7468	Liver	3851	9547	Kidney	5633	11221
Spleen	1753	7469	Liver	3852	9548	Kidney	5634	11222

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1754	7470	Liver	3853	9549	Kidney	5635	11223
Spleen	1755	7471	Liver	3854	9550	Kidney	5636	11224
Spleen	1756	7472	Liver	3855	9551	Kidney	5637	11225
Spleen	1757	7473	Liver	3856	9552	Kidney	5195	10805
Spleen	1758	7474	Liver	3857	9553	Kidney	5638	11226
Spleen	1759	7475	Liver	351	6178	Kidney	601	6403
Spleen	1760	7476	Liver	3858	9554	Kidney	5198	10808
Spleen	1761	7477	Liver	3859	9555	Kidney	1188	6916
Spleen	1762	7478	Liver	3860	9556	Kidney	5639	11227
Spleen	1763	7479	Liver	3861	9557	Kidney	5640	11228
Spleen	1764	7480	Liver	3862	9558	Kidney	5641	11229
Spleen	1765	7481	Liver	3863	9559	Kidney	5642	11230
Spleen	1766	7482	Liver	3864	9560	Kidney	5643	11231
Spleen	1767	7483	Liver	3865	9561	Kidney	5644	11232
Spleen	1768	7484	Liver	3866	9562	Kidney	5645	11233
Spleen	1769	7485	Liver	3867	9563	Kidney	5646	11234
Spleen	1770	7486	Liver	3868	9564	Kidney	4436	10110
Spleen	1771	7487	Liver	3869	9565	Kidney	1212	6940
Spleen	1772	7488	Liver	3870	9566	Kidney	95	5952
Spleen	1773	7489	Liver	3871	9567	Kidney	1214	6942
Spleen	1774	7490	Liver	3872	9568	Kidney	5647	11235
Spleen	1775	7491	Liver	3873	9569	Kidney	5648	11236
Spleen	1776	7492	Liver	3874	9570	Kidney	618	6416
Spleen	1777	7493	Liver	3875	9571	Kidney	5649	11237
Spleen	1778	7494	Liver	3876	9572	Kidney	5650	11238
Spleen	1779	7495	Liver	1633	7352	Kidney	5651	11239
Spleen	1780	7496	Liver	3877	9573	Kidney	5652	11240
Spleen	1781	7497	Liver	3878	9574	Kidney	5653	11241
Spleen	1782	7498	Liver	3879	9575	Kidney	5216	10825

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1783	7499	Liver	3880	9576	Kidney	5654	11242
Spleen	1784	7500	Liver	3881	9577	Kidney	5655	11243
Spleen	1785	7403	Liver	3882	9578	Kidney	5656	11244
Spleen	1786	7501	Liver	3883	9579	Kidney	5657	11245
Spleen	1787	7502	Liver	3884	9580	Kidney	5658	11246
Spleen	1788	7503	Liver	3885	9581	Kidney	5659	11247
Spleen	1789	7504	Liver	3886	9582	Kidney	5660	11248
Spleen	1790	7505	Liver	3887	9583	Kidney	5661	11249
Spleen	1791	7506	Liver	3888	9584	Kidney	5662	11250
Spleen	1792	7507	Liver	3889	9585	Kidney	877	6360
Spleen	1793	7508	Liver	3890	9586	Kidney	2886	8590
Spleen	1794	7509	Liver	3891	9587	Pancreas	41	5905
Spleen	1795	7510	Liver	3892	9588	Kidney	5663	11251
Spleen	1796	7511	Liver	3893	9589	Kidney	5664	11252
Spleen	1797	7512	Liver	374	6199	Pancreas	803	6570
Spleen	1798	7513	Liver	3894	9590	Kidney	5665	11253
Spleen	1799	7514	Liver	3895	9591	Spleen	5666	11254
Spleen	1800	7515	Liver	3896	9592	Kidney	5667	11255
Spleen	1801	7516	Liver	3897	9593	Kidney	5668	11256
Spleen	1802	7517	Liver	3898	9594	Kidney	5669	11257
Spleen	1803	7518	Liver	3899	9595	Kidney	5670	11258
Spleen	1804	7519	Liver	3900	9596	Kidney	5671	11259
Spleen	1805	7520	Liver	3901	9597	Kidney	5672	11260
Spleen	1806	7521	Liver	3902	9598	Kidney	5673	11261
Spleen	1807	7522	Liver	3903	9599	Kidney	5674	11262
Spleen	1808	7523	Liver	3904	9600	Kidney	5675	11263
Spleen	1809	7524	Liver	3905	9601	Spleen	5676	11264
Spleen	1810	7525	Liver	3906	9602	Kidney	5677	11265
Spleen	1811	7526	Liver	384	6208	Kidney	5678	11266

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1812	7527	Liver	3907	9603	Kidney	5679	11267
Spleen	1813	7528	Liver	3908	9604	Kidney	5680	11268
Spleen	1814	7529	Liver	3909	9605	Kidney	2893	8597
Spleen	1815	7530	Liver	3910	9606	Kidney	5681	11269
Spleen	1816	7531	Liver	3911	9607	Kidney	2895	8599
Spleen	1817	7532	Liver	3912	9608	Kidney	5682	11270
Spleen	1818	7533	Liver	3913	9609	Kidney	5683	11271
Spleen	1819	7534	Liver	3914	9610	Kidney	5684	11272
Spleen	1820	7535	Liver	3915	9611	Kidney	5685	11273
Spleen	1617	7336	Liver	3916	9471	Kidney	5686	11274
Spleen	1821	7536	Liver	3917	9612	Kidney	5687	11275
Spleen	1822	7537	Liver	3918	9613	Kidney	5688	11276
Spleen	1823	7538	Liver	3919	9614	Kidney	5689	11277
Spleen	1824	7539	Liver	3920	9615	Kidney	5690	11278
Spleen	1825	7540	Liver	3921	9616	Kidney	4106	9789
Spleen	1826	7541	Liver	3922	9617	Kidney	5691	11279
Spleen	1827	7542	Liver	3923	9618	Kidney	5692	11280
Spleen	1828	7543	Liver	3924	9619	Kidney	4523	10192
Spleen	1829	7544	Liver	3925	9620	Kidney	5693	11281
Spleen	1830	7545	Liver	3926	9621	Kidney	5694	11282
Spleen	1831	7546	Liver	408	6231	Kidney	5695	11283
Spleen	1832	7547	Liver	3927	9622	Kidney	4528	10197
Spleen	1833	7548	Liver	3928	9623	Kidney	4533	10202
Spleen	1834	7549	Liver	3929	9624	Kidney	5696	11284
Spleen	1835	7550	Liver	3930	9625	Kidney	5697	11285
Spleen	1836	7551	Liver	3931	9626	Kidney	5698	11286
Spleen	1837	7552	Liver	3932	9627	Kidney	5699	11287
Spleen	1838	7553	Liver	3933	9628	Kidney	5700	11288
Spleen	1839	7554	Liver	3934	9629	Kidney	5701	11289

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1840	7555	Liver	3935	9630	Kidney	5702	11290
Spleen	1841	7556	Liver	3936	9631	Kidney	5703	11291
Spleen	1842	7557	Liver	3937	9632	Kidney	5704	11292
Spleen	1843	7558	Liver	3938	9633	Spleen	4470	10141
Spleen	1844	7559	Liver	3939	9634	Kidney	4542	10209
Spleen	1845	7560	Liver	3940	9635	Kidney	5705	11293
Spleen	1846	7561	Liver	3941	9636	Kidney	5706	11294
Spleen	1847	7562	Liver	3942	9637	Kidney	5707	11295
Spleen	1848	7563	Liver	3943	9638	Kidney	5708	11296
Spleen	1849	7564	Liver	3944	9639	Kidney	5709	11297
Spleen	1850	7565	Liver	3945	9640	Kidney	5710	11298
Spleen	1851	7566	Liver	3946	9641	Kidney	5711	11299
Spleen	1852	7567	Liver	3947	9642	Kidney	5712	11300
Spleen	1853	7568	Liver	3948	9643	Kidney	2900	8604
Spleen	1854	7569	Liver	3949	9644	Kidney	5713	11301
Spleen	1855	7570	Liver	3950	9645	Kidney	5714	11302
Spleen	1856	7571	Liver	3951	9646	Kidney	1775	7491
Spleen	1857	7572	Liver	3952	9647	Kidney	5715	11303
Spleen	1858	7573	Liver	3953	9648	Kidney	5716	11304
Spleen	1859	7574	Liver	3954	9649	Kidney	5717	11305
Spleen	1860	7575	Liver	3955	9650	Kidney	5718	11306
Spleen	1861	7576	Spleen	3956	9651	Kidney	5719	11307
Spleen	1862	7577	Liver	3957	9652	Kidney	5720	11308
Spleen	1863	7578	Liver	3958	9653	Kidney	5721	11309
Spleen	1864	7579	Liver	3959	9654	Kidney	5722	11310
Spleen	1865	7580	Liver	3960	9655	Kidney	5723	11311
Spleen	1866	7581	Liver	3961	9656	Kidney	5724	10843
Spleen	1867	7582	Liver	3962	9657	Kidney	5725	11312
Spleen	1868	7583	Liver	3963	9658	Kidney	5726	11313

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1869	7584	Liver	3964	9659	Kidney	5727	11314
Spleen	1870	7585	Liver	3965	9660	Kidney	5728	11315
Spleen	1871	7586	Liver	3966	9661	Kidney	4570	10235
Spleen	1872	7587	Liver	3967	9662	Kidney	5729	11316
Spleen	1873	7588	Liver	3968	9663	Kidney	5730	11317
Spleen	1874	7589	Liver	3969	9664	Kidney	5731	11318
Spleen	1875	7590	Liver	3970	9665	Kidney	5732	11319
Spleen	1876	7591	Liver	3971	9666	Kidney	5733	11320
Spleen	1877	7592	Liver	3972	9667	Kidney	5734	11321
Spleen	1878	7593	Liver	3973	9668	Kidney	5735	11322
Spleen	1879	7594	Liver	3974	9669	Kidney	5736	11323
Spleen	1880	7403	Liver	3975	9670	Kidney	5737	11324
Spleen	1881	7595	Liver	3976	9671	Kidney	5738	11325
Spleen	1882	7596	Liver	3977	9672	Kidney	5739	11326
Spleen	1883	7597	Liver	3978	9673	Kidney	5740	6442
Spleen	1884	7598	Liver	3979	9674	Kidney	5741	11327
Spleen	1885	7599	Liver	3980	9033	Kidney	5742	11328
Spleen	1886	7600	Liver	3981	9675	Kidney	5743	11329
Spleen	1887	7601	Liver	3982	9676	Kidney	5744	11330
Spleen	1888	7602	Liver	3983	9677	Kidney	5745	6361
Spleen	1889	7603	Liver	3984	9678	Kidney	5746	11331
Spleen	1890	7604	Liver	3985	9679	Kidney	1058	6445
Spleen	1891	7605	Liver	3986	9680	Kidney	5747	11332
Spleen	1892	7606	Liver	3987	9681	Kidney	5748	11333
Spleen	1893	7607	Liver	3988	9682	Kidney	5749	11334
Spleen	1894	7608	Liver	3989	9683	Kidney	5750	11335
Spleen	1895	7609	Liver	3990	9684	Kidney	1879	7594
Spleen	1896	7610	Liver	3991	9685	Kidney	5751	11336
Spleen	1897	7611	Liver	3992	9686	Kidney	5752	11337

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1898	7612	Liver	3993	9687	Kidney	5753	11338
Spleen	1899	7613	Liver	3994	9688	Kidney	5754	11339
Spleen	1900	7614	Liver	3995	9689	Kidney	5755	11340
Spleen	1901	7615	Liver	3996	9690	Kidney	5756	11341
Spleen	1902	7616	Liver	3997	9691	Kidney	5757	11342
Spleen	1903	7617	Liver	3998	9692	Kidney	5758	11343
Spleen	1904	7618	Liver	3999	9693	Kidney	4623	10282
Spleen	1905	7619	Liver	4000	9694	Kidney	5759	11344
Spleen	1906	7620	Liver	4001	9695	Kidney	695	6485
Spleen	1907	7621	Liver	4002	9696	Kidney	5760	11345
Spleen	1908	7622	Liver	4003	9697	Kidney	5761	11346
Spleen	1909	7623	Liver	4004	9698	Kidney	5762	11347
Spleen	1910	7624	Liver	4005	9699	Kidney	5763	11348
Spleen	1911	7625	Liver	4006	9700	Kidney	5764	11349
Spleen	1912	7626	Liver	4007	9701	Kidney	5765	11350
Spleen	1913	7627	Liver	4008	9702	Kidney	5766	11351
Spleen	1914	7628	Brain	45	5909	Kidney	5767	11352
Spleen	1915	7629	Brain	22	5886	Kidney	5768	11353
Spleen	1916	7630	Brain	523	6341	Kidney	5769	11354
Spleen	1917	7631	Brain	1415	7141	Kidney	5770	11355
Spleen	1918	7632	Brain	38	5902	Kidney	5771	11356
Spleen	1919	7633	Brain	31	5895	Kidney	5772	6500
Spleen	1920	7634	Pancreas	45	5909	Kidney	5773	11357
Spleen	1921	7635	Pancreas	38	5902	Kidney	5774	11358
Spleen	1922	7636	Heart	72	5935	Kidney	5775	11359
Spleen	1923	7637	Heart	4009	9703	Kidney	5776	11360
Spleen	1924	7638	Heart	22	5886	Kidney	5777	11361
Spleen	1925	7639	Heart	561	6372	Kidney	5778	11362
Spleen	1926	7640	Heart	4010	9704	Kidney	5779	11363

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1927	7641	Heart	4011	9705	Kidney	5780	11364
Spleen	1928	7642	Heart	4012	9706	Kidney	5781	11365
Spleen	1929	7643	Heart	768	6544	Kidney	5782	11366
Spleen	1930	7644	Heart	4013	9707	Kidney	5783	11367
Spleen	1931	7645	Heart	4014	9708	Kidney	4646	10303
Spleen	1932	7646	Heart	4015	9709	Kidney	5784	11368
Spleen	1933	7647	Kidney	3956	9651	Kidney	5785	11369
Spleen	1934	7648	Heart	4016	9710	Kidney	5786	11370
Spleen	1935	7649	Heart	4017	9711	Kidney	5787	11371
Spleen	1936	7650	Heart	4018	9712	Kidney	5788	11372
Spleen	1937	7651	Heart	4019	9713	Kidney	5789	11373
Spleen	1938	7652	Heart	4020	9714	Kidney	5790	11374
Spleen	1939	7653	Kidney	4021	9715	Kidney	5791	11375
Spleen	1940	7654	Heart	4022	9716	Kidney	713	6500
Spleen	1941	7655	Heart	4023	9717	Kidney	5792	11376
Spleen	1942	7656	Heart	4024	9718	Kidney	5793	11377
Spleen	1943	7657	Heart	4025	9719	Kidney	5794	11378
Spleen	1944	7658	Heart	4026	9720	Kidney	5795	11379
Spleen	1945	7659	Heart	4027	9721	Kidney	2	5866
Spleen	1946	7660	Heart	4028	6790	Kidney	5796	11380
Spleen	1947	7661	Heart	4029	9722	Kidney	2127	7838
Spleen	1948	7662	Heart	4030	9723	Kidney	5797	11381
Spleen	1949	7663	Heart	4031	9724	Kidney	4686	6439
Spleen	1950	7664	Heart	4032	6494	Kidney	5798	11382
Spleen	1951	7665	Heart	4033	9725	Kidney	5799	11383
Spleen	1952	7666	Heart	4034	9726	Kidney	5800	11384
Spleen	1953	7667	Intestine	4035	6358	Kidney	5801	11385
Spleen	1954	7062	Intestine	4036	5927	Kidney	5802	11386
Spleen	1955	7668	Intestine	4037	9727	Kidney	5803	6269

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1956	7669	Intestine	4038	9728	Kidney	5804	11387
Spleen	1957	7670	Intestine	4039	9729	Kidney	5805	11388
Spleen	1958	7671	Intestine	4040	9730	Kidney	5806	11389
Spleen	1959	7672	Intestine	4041	9731	Kidney	5807	11390
Spleen	1960	7673	Intestine	4042	9732	Kidney	5808	11391
Spleen	1961	7674	Intestine	4043	9733	Kidney	5809	11392
Spleen	1962	7675	Intestine	4044	9734	Kidney	5091	9471
Spleen	1963	7676	Intestine	4014	9708	Kidney	5810	11393
Spleen	1964	7677	Intestine	4045	9735	Kidney	5811	11394
Spleen	1965	7678	Intestine	4046	9736	Kidney	5812	11395
Spleen	1966	7679	Intestine	4047	9737	Kidney	5813	11396
Spleen	1967	7680	Intestine	4048	9738	Kidney	5814	11397
Spleen	1968	7681	Intestine	4049	9739	Kidney	5815	11398
Spleen	1969	7682	Intestine	4050	6357	Kidney	2267	7976
Spleen	1970	7683	Intestine	4051	9740	Kidney	5816	11399
Spleen	1971	7684	Intestine	4052	9741	Kidney	5817	11400
Spleen	1972	7685	Intestine	544	6358	Kidney	5818	11401
Spleen	1973	7686	Intestine	4053	9742	Kidney	5819	11402
Spleen	1974	7687	Intestine	4054	9743	Kidney	5820	11403
Spleen	1975	7688	Intestine	4055	7403	Kidney	4728	10375
Spleen	1976	7689	Intestine	4056	9744	Kidney	5821	11404
Spleen	1977	7690	Intestine	4057	9745	Kidney	5822	11405
Spleen	1978	7691	Intestine	4058	9746	Kidney	5823	11406
Spleen	1979	7692	Intestine	4059	9747	Kidney	5824	11407
Spleen	1980	7693	Intestine	4060	9748	Kidney	4740	10386
Spleen	1981	7694	Intestine	4061	9749	Kidney	5825	6200
Spleen	1982	7695	Intestine	4062	9750	Kidney	5826	11408
Spleen	1983	7696	Intestine	4063	6494	Kidney	2358	7444
Spleen	1984	7697	Intestine	4064	9751	Kidney	5827	11409

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	1985	7698	Intestine	4065	9752	Kidney	5828	11410
Spleen	1986	7699	Intestine	4066	9753	Kidney	5829	11411
Spleen	1987	7700	Intestine	4067	9754	Kidney	5830	11412
Spleen	1988	7701	Intestine	4068	9755	Kidney	5831	11413
Spleen	1989	7702	Intestine	4069	9756	Kidney	5832	11414
Spleen	1990	7703	Intestine	4070	9757	Kidney	5833	11415
Spleen	1991	7704	Intestine	4071	9758	Kidney	5834	11416
Spleen	1992	7705	Intestine	4072	9759	Kidney	5835	11417
Spleen	1993	7706	Intestine	4073	9760	Kidney	5836	11418
Spleen	1994	7707	Intestine	4074	9761	Kidney	4272	9952
Spleen	1995	7708	Intestine	4075	9762	Kidney	5837	11419
Spleen	1996	7709	Intestine	4076	9763	Kidney	5838	6585
Spleen	1997	7710	Intestine	4077	6494	Kidney	5839	11420
Spleen	1998	7711	Spleen	4078	9764	Kidney	5840	11421
Spleen	1999	7712	Spleen	4079	9765	Kidney	5841	11422
Spleen	2000	7713	Spleen	4080	9766	Kidney	5842	11423
Spleen	2001	7714	Spleen	4081	9767	Kidney	2469	8174
Spleen	2002	7715	Spleen	4082	9768	Kidney	5843	11424
Spleen	2003	7716	Spleen	4043	9733	Kidney	5844	11425
Spleen	2004	7717	Spleen	4083	7436	Kidney	5845	11426
Spleen	2005	7718	Spleen	4084	9769	Kidney	5846	11427
Spleen	2006	7719	Spleen	4085	9770	Kidney	5847	11428
Spleen	2007	7720	Spleen	4086	9771	Kidney	2557	8261
Spleen	2008	7721	Spleen	1220	6948	Kidney	5848	11429
Spleen	2009	7722	Spleen	4087	9772	Kidney	5849	11430
Spleen	2010	7723	Spleen	4088	9773	Spleen	4601	10262
Spleen	2011	7724	Spleen	4089	9774	Kidney	5850	11431
Spleen	2012	7725	Spleen	4090	9775	Kidney	5554	11144
Spleen	2013	7726	Spleen	4091	9776	Kidney	5851	11432

FIG. 11 (Cont'd)

Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)	Organ	SEQ ID NO (nt)	SEQ ID NO (pp)
Spleen	2014	7727	Spleen	4092	9777	Kidney	5852	11433
Spleen	2015	7728	Spleen	4093	9778	Kidney	5853	11434
Spleen	2016	7729	Spleen	4094	9779	Kidney	5854	11435
Spleen	2017	7730	Spleen	4095	9780	Kidney	4780	10426
Spleen	2018	7685	Spleen	4096	9781	Kidney	5855	11436
Spleen	2019	7731	Spleen	877	6360	Kidney	5856	11437
Spleen	2020	7732	Spleen	4097	9782	Kidney	5857	11438
Spleen	2021	7733	Spleen	4098	9783	Kidney	5858	11439
Spleen	2022	7734	Spleen	4099	9784	Kidney	5859	11440
Spleen	2023	7735	Spleen	4100	7436	Kidney	5860	11441
Spleen	2024	7736	Spleen	1740	7403	Kidney	5861	11442
Spleen	2025	7737	Spleen	4101	9785	Kidney	5862	11443
Spleen	2026	7738	Spleen	4102	7467	Kidney	5863	11444
Spleen	2027	7739	Spleen	4103	9786	Kidney	5601	11190
Spleen	2028	7740	Spleen	4104	9787	Kidney	5864	11445
Spleen	2029	7741	Spleen	4105	9788	Muscle	45	5909
Spleen	2030	7742	Spleen	1746	7463	Muscle	97	5954
Spleen	2031	7743	Spleen	4106	9789	Muscle	48	5912
Spleen	2032	7744	Spleen	4107	9790	Muscle	22	5886
Spleen	2033	7745	Spleen	4108	9791	Muscle	40	5904
Spleen	2034	7746	Spleen	4109	9792	Muscle	92	5949
Spleen	2035	7747	Spleen	4110	7436	Muscle	5144	10756
			Spleen	4111	9793	Muscle	5322	10923

FIG. 11 (Cont'd)

Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)
K562	11446	11785	HEK	11559	11883	A549	11673	11989
K562	11447	11786	HEK	11560	11884	A549	11674	11990
K562	11448	11787	HEK	5445	11043	A549	11675	11991
K562	11449	11788	HEK	11561	11885	A549	11676	11992
K562	11450	11789	HEK	11562	11886	A549	1367	7093
K562	11451	11790	HEK	11563	6439	A549	11677	11993
K562	11452	11791	HEK	11564	11887	A549	11678	11994
K562	11453	6684	HEK	11565	9730	A549	2397	8102
K562	11454	11792	HEK	11566	11866	A549	11679	11995
K562	11455	11793	HEK	4895	6362	A549	11680	11996
K562	11456	11794	HEK	11567	11888	A549	11681	11997
K562	11457	11795	HEK	11568	11889	A549	11682	11998
K562	11458	6732	HEK	823	6588	A549	11683	11999
K562	11459	11796	HEK	11569	11398	A549	11684	12000
K562	11460	11797	HEK	11570	11890	A549	11685	12001
K562	11461	11798	MDA	11571	11891	A549	11686	12002
K562	11462	11799	MDA	11572	11892	A549	11687	12003
K562	11463	11800	MDA	11573	11893	A549	11688	12004
K562	11464	11801	MDA	11574	11894	A549	11689	12005
K562	11465	11802	MDA	11575	11895	A549	11690	12006
K562	11466	11803	MDA	11576	11896	A549	11691	12007
Hela	11467	11398	MDA	11577	11897	A549	11692	12008
Hela	11468	11804	MDA	11578	11898	A549	11693	12009
Hela	11469	11805	MDA	11579	11899	A549	11694	12010
Hela	11470	6359	MDA	11580	11900	A549	11695	12011
Hela	11471	11806	MDA	11581	11901	A549	11696	12012
Hela	11472	11807	MDA	11582	11902	A549	11697	12013
Hela	11473	11808	MDA	11583	11903	A549	11698	12014

FIG. 12

Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)
Hela	5681	11269	MDA	11584	11904	A549	11699	12015
Hela	11474	11809	MDA	11585	11905	A549	11700	12016
Hela	11475	7062	MDA	11586	11906	A549	11701	12017
Hela	11476	11810	MDA	11587	11907	A549	11702	6973
Hela	11477	11811	MDA	11588	11908	A549	398	6221
Hela	11478	7870	MDA	11589	11909	A549	11703	12018
Hela	11479	11812	MDA	11590	11910	A549	11704	12019
Hela	11480	11813	MDA	11591	11911	A549	11705	12020
Hela	11481	11814	MDA	11592	11912	A549	11706	12021
Hela	11482	11815	MDA	11593	11913	A549	11707	12022
Hela	11483	11816	MDA	11594	9877	A549	11708	12023
Hela	11484	11817	MDA	11595	11914	A549	212	6040
Hela	11485	11818	MDA	11596	11915	A549	11709	12024
Hela	11486	11792	MDA	11597	11916	A549	11710	8463
Hela	11487	11819	MDA	11598	11917	A549	11711	12025
Hela	11488	11820	MDA	11599	11918	A549	11712	12026
Hela	11489	11821	MDA	1694	7412	A549	11713	12027
Hela	11490	7344	MDA	11600	11919	A549	11714	12024
Hela	11491	11822	MDA	11601	11920	A549	11715	12028
Hela	11492	11823	MDA	11602	11921	A549	11716	12029
Hela	11493	11824	MDA	11603	11922	A549	11717	12030
Hela	11494	11825	MDA	11604	11923	A549	11718	12031
Hela	11495	11826	MDA	11605	11924	A549	11719	12032
Hela	11496	11827	MDA	11606	11925	A549	201	6014
Hela	5235	10842	MDA	11607	11926	A549	11720	12033
Hela	11497	11828	MDA	11608	11927	A549	11721	12034
Hela	11498	11829	MDA	11609	11928	A549	11722	12035
Hela	11499	11830	MDA	11610	11929	A549	11723	12036

FIG. 12 (Cont'd)

Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)
Hela	11500	6361	MDA	11611	11930	A549	11724	12037
Hela	11501	11831	MDA	11612	11931	A549	11725	12038
Hela	11502	11832	MDA	11613	11932	A549	11726	12039
Hela	11503	11833	MDA	11614	11933	A549	11727	12040
Hela	11504	11834	MDA	11615	11934	A549	11728	12041
Hela	11505	11835	MDA	11616	11935	A549	11729	12042
Hela	11506	11836	MDA	11617	11936	A549	11730	12043
Hela	11507	11837	MDA	11618	11937	A549	11731	12044
Hela	11508	11838	MDA	11619	8038	A549	11732	12045
Hela	11509	11800	MDA	11620	11938	A549	11733	12046
Hela	11510	11839	MDA	11621	11939	A549	11734	12047
Hela	11511	11840	MDA	11622	11940	A549	11735	12048
Hela	11512	11841	MDA	11623	11941	A549	11736	12049
Hela	11513	11842	MDA	11624	11942	A549	11737	12050
Hela	11514	11843	MDA	11625	11943	A549	11738	12051
Hela	11515	11844	MDA	11626	11944	A549	4347	10024
Hela	11516	11845	MDA	11627	11945	A549	11739	12052
Hela	11517	11846	MDA	11628	11946	A549	11740	12053
Hela	11518	11847	MDA	11629	11947	A549	11741	12054
Hela	11519	11848	MDA	11630	11948	A549	11742	12055
Hela	11520	11849	MDA	11631	11949	A549	11743	12056
Hela	2453	8158	MDA	11632	11950	A549	11744	12057
Hela	11521	11850	MDA	11633	11951	A549	11745	12058
Hela	11522	11851	MDA	11634	11952	A549	11746	12059
Hela	11523	11852	MDA	11635	11953	A549	11747	12060
Hela	11524	11853	MDA	11636	11954	A549	11748	12061
Hela	11525	6077	MDA	11637	11955	A549	11749	12062
Hela	11526	11854	MDA	11638	11956	A549	11750	12063

FIG. 12 (Cont'd)

Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)
Hela	11527	11855	MDA	11639	11957	A549	11751	12064
Hela	11528	11856	MDA	11640	11958	A549	11752	12065
Hela	11529	11857	MDA	11641	11959	A549	11753	12066
Hela	11530	11858	MDA	11642	11174	A549	11754	12067
Hela	11531	11859	MDA	11643	11960	A549	11755	12068
Hela	11532	6356	MDA	11644	11961	A549	11756	12069
Hela	11533	11860	MDA	11645	11962	A549	11757	12070
Hela	11534	11861	MDA	11646	11963	A549	11758	12071
Hela	11535	11862	MDA	11647	11964	A549	11759	12072
HEK	11536	11863	MDA	11648	10365	A549	11760	12073
HEK	11537	11864	MDA	11649	11965	A549	11761	12074
HEK	11538	11865	MDA	11650	11966	A549	11762	12075
HEK	11539	11866	MDA	11651	11967	A549	11763	7366
HEK	1218	6946	MDA	11652	11968	A549	11764	12076
HEK	11540	11867	MDA	11653	11969	A549	11765	12077
HEK	11541	10866	MDA	11654	11970	A549	11766	12078
HEK	11542	6360	MDA	11655	11971	A549	11767	12079
HEK	11543	11868	MDA	11656	11972	A549	11768	12080
HEK	11544	11869	MDA	11657	11973	A549	11769	12081
HEK	11545	11870	MDA	11658	11974	A549	11770	12082
HEK	11546	11871	MDA	11659	11975	A549	11771	12083
HEK	11547	11872	MDA	11660	11976	A549	5095	10714
HEK	11548	11873	MDA	11661	11977	A549	11772	12084
HEK	11549	11874	A549	11662	11978	A549	11773	12085
HEK	11550	11875	A549	11663	11979	A549	11774	12086
HEK	11551	11876	A549	4512	10182	A549	11775	12087
HEK	11552	6722	A549	11664	11980	A549	11776	12088
HEK	11553	11877	A549	11665	11981	A549	11777	12089

FIG. 12 (Cont'd)

Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)	Cell	SEQ ID NO(nt)	SEQ ID NO (pp)
HEK	11554	11878	A549	11666	11982	A549	11778	12090
HEK	11555	11879	A549	11667	11983	A549	11779	12091
HEK	11556	11880	A549	11668	11984	A549	11780	12092
HEK	11557	11881	A549	11669	11985	A549	11781	12093
HEK	11558	11882	A549	11670	11986	A549	11782	12094
HEK	589	5913	A549	11671	11987	A549	11783	12095
			A549	11672	11988	A549	11784	12096

FIG. 12 (Cont'd)

Loop1 insertion sites highlighted in lightest gray

Loop2 insertion sites highlighted in medium gray

Peptides are inserted between the two highlighted DNA/AA positions, with a serine-glycine (DNA: agcggt) linker on the 5' end, and a glycine-serine (DNA: ggttca) linker on the 3' end.

AAV5 DNA:

Atgtcttttgttgatcaccctccagattggttggaagaagttggtgaaggtcttcgcgagtttttgggccttgaagcgggcccaccga
aaccaaaacccaatcagcagcatcaagatcaagcccgtggtcttgtgctgcctggttataactatctcggacccggaaacggtct
cgatcgaggagagcctgtcaacagggcagacgaggtcgcgcgagagcacgacatctcgtacaacgagcagcttgaggcgg
gagacaacccctacctcaagtacaaccacgcggacgccgagtttcaggagaagctcgccgacgacacatccttcgggggaa
acctcggaaaggcagtctttcaggccaagaaaagggttctcgaacctttggcctggttgaagagggtgctaagacggccccta
ccggaaagcggatagacgaccactttccaaaaagaaagaaggctcggaccgaagaggactccaagccttccacctcgtcag
acgccgaagctggacccagcggatcccagcagctgcaaatcccagcccaaccagcctcaagtttgggagctgatacaatgtct
gcgggaggtggcggcccattgggcgacaataaccaaggtgccgatggagtgggcaatgcctcgggagattggcattgcgattc
cacgtggatgggggacagagtcgtcaccaagtccacccgaacctgggtgctgcccagctacaacaaccaccagtaccgaga
gatcaaaagcggctccgtcgacggaagcaacgccaacgcctactttggatacagcacccccctgggggtactttgactttaaccg
cttccacagccactggagcccccgagactggcaaagactcatcaacaactactggggcttcagaccccggtccctcagagtca
aaatcttcaacattcaagtcaaagaggtcacggtgcaggactccaccaccaccatcgccaacaacctcacctccaccgtccaa
gtgtttacggacgacgactaccagctgccctacgtcgtcggcaacgggaccgagggatgcctgccggccttccctccgcaggtc
tttacgctgccgcagtacggttacgcgacgctgaaccgcgacaacacagaaaatcccaccgagaggagcagcttcttctgccta
gagtactttcccagcaagatgctgagaacgggcaacaactttgagtttacctacaactttgaggaggtgcccttccactccagcttc
gctcccagtcagaacctgttcaagctggccaacccgctggtggaccagtacttgtaccgcttcgtgagcacaaataacactggcg
gagtccagttcaacaagaacctggccgggagatacgccaacacctacaaaaactggttcccggggcccatgggccgaaccc
agggctggaacctgggctccggggtcaaccgcgccagtgtcagcgccttcgccacgaccaataggatggagctcgagggcg
cgagttaccaggtgcccccgcagccgaacggcatgaccaacaacctccagggcagcaacacctatgccctggagaacacta
tgatcttcaacagccagccggcgaacccgggcaccaccgccacgtacctcgagggcaacatgctcatcaccagcgagagcg
agacgcagccggtgaaccgcgtggcgtacaacgtcggcgggcagatggccaccaacaaccagagctccaccactgccccc
gcgaccggcacgtacaacctccaggaaatcgtgcccggcagcgtgtggatggagagggacgtgtacctccaaggacccatct
gggccaagatcccagagacgggggcgcactttcacccctctccggccatgggcggattcggactcaaacacccaccgcccat
gatgctcatcaagaacacgcctgtgcccggaaatatcaccagcttctcggacgtgcccgtcagcagcttcatcacccagtacag
caccgggcaggtcaccgtggagatggagtgggagctcaagaaggaaaactccaagaggtggaacccagagatccagtaca
caaacaactacaacgacccccagtttgtggactttgccccggacagcaccggggaatacagaaccaccagacctatcggaac
ccgataccttacccgacccctttaa

FIG. 13

AAV5 Amino Acids:

MSFVDHPPDWLEEVGEGLREFLGLEAGPPKPKPNQQHQDQARGLVLPGYNYLGPGNGLD
RGEPVNRADEVAREHDISYNEQLEAGDNPYLKYNHADAEFQEKLADDTSFGGNLGKAVFQ
AKKRVLEPFGLVEEGAKTAPTGKRIDDHFPKRKKARTEEDSKPSTSSDAEAGPSGSQQLQI
PAQPASSLGADTMSAGGGGPLGDNNQGADGVGNASGDWHCDSTWMGDRVVTKSTRTW
VLPSYNNHQYREIKSGSVDGSNANAYFGYSTPWGYFDFNRFHSHWSPRDWQRLINNYWG
FRPRSLRVKIFNIQVKEVTVQDSTTTIANNLTSTVQVFTDDDYQLPYVVGNGTEGCLPAFPP
QVFTLPQYGYATLNRDNTENPTERSSFFCLEYFPSKMLRTGNNFEFTYNFEEVPFHSSFAP
SQNLFKLANPLVDQYLYRFVSTNNTGGVQFNKNLAGRYANTYKNWFPGPMGRTQGWNLG
SGVNRASVSAFATTNRMELEGASYQVPPQPNGMTNNLQGSNTYALENTMIFNSQPANPGT
TATYLEGNMLITSESETQPVNRVAYNVGGQMATNNQSSTTAPATGTYNLQEIVPGSVWME
RDVYLQGPIWAKIPETGAHFHPSPAMGGFGLKHPPPMMLIKNTPVPGNITSFSDVPVSSFIT
QYSTGQVTVEMEWELKKENSKRWNPEIQYTNNYNDPQFVDFAPDSTGEYRTTRPIGTRYL
TRPL

FIG. 13 (Cont'd)

Loop1 insertion sites highlighted in lightest gray

Loop2 insertion sites highlighted in medium gray

Peptides are inserted between the two highlighted DNA/AA positions, with a serine-glycine (DNA: agcggt) linker on the 5' end, and a glycine-serine (DNA: ggttca) linker on the 3' end.

AAV9 DNA:

Atggctgccgatggttatcttccagattggctcgaggacaaccttagtgaaggaattcgcgagtggtgggctttgaaacctggagc
ccctcaacccaaggcaaatcaacaacatcaagacaacgctcgaggtcttgtgcttccgggttacaaataccttggacccggcaa
cggactcgacaaggggagccggtcaacgcagcagacgcggcggccctcgagcacgacaaggcctacgaccagcagctc
aaggccggagacaacccgtacctcaagtacaaccacgccgacgccgagttccaggagcggctcaaagaagatacgtcttttg
ggggcaacctcgggcgagcagtcttccaggccaaaaagaggcttcttgaacctcttggtctggttgaggaagcggctaagacg
gctcctggaaagaagaggcctgtagagcagtctcctcaggaaccggactcctccgcgggtattggcaaatcgggtgcacagcc
cgctaaaaagagactcaatttcggtcagactggcgacacagagtcagtcccagaccctcaaccaatcggagaacctcccgca
gccccctcaggtgtgggatctcttacaatggcttcaggtggtggcgcaccagtggcagacaataacgaaggtgccgatggagtg
ggtagttcctcgggaaattggcattgcgattcccaatggctgggggacagagtcatcaccaccagcacccgaacctgggccctg
cccacctacaacaatcacctctacaagcaaatctccaacagcacatctggaggatcttcaaatgacaacgcctacttcggctac
agcacccccctgggggtattttgacttcaacagattccactgccacttctcaccacgtgactggcagcgactcatcaacaacaactg
gggattccggcctaagcgactcaacttcaagctcttcaacattcaggtcaaagaggttacggacaacaatggagtcaagaccat
cgccaataaccttaccagcacggtccaggtcttcacggactcagactatcagctcccgtacgtgctcgggtcggctcacgaggg
ctgcctcccgccgttcccagcggacgttttcatgattcctcagtacgggtatctgacgcttaatgatggaagccaggccgtgggtcg
ttcgtccttttactgcctggaatatttcccgtcgcaaatgctaagaacgggtaacaacttccagttcagctacgagtttgagaacgtac
ctttccatagcagctacgctcacagccaaagcctggaccgactaatgaatccactcatcgaccaatacttgtactatctctcaaag
actattaacggttctggacagaatcaacaaacgctaaaattcagtgtggccggacccagcaacatggctgtccagggaagaaa
ctacatacctggacccagctaccgacaacaacgtgtctcaaccactgtgactcaaaacaacaacagcgaatttgcttggcctgg
agcttcttcttgggctctcaatggacgtaatagcttgatgaatcctggacctgctatggccagccacaaagaaggagaggaccgtt
tctttcctttgtctggatctttaatttttggcaaacaaggaactggaagagacaacgtggatgcggacaaagtcatgataaccaacg
aagaagaaattaaaactactaacccggtagcaacggagtcctatggacaagtggccacaaaccaccagagtgcccaagca
caggcgcagaccggctgggttcaaaaccaaggaatacttccgggtatggtttggcaggacagagatgtgtacctgcaaggacc
catttgggccaaaattcctcacacggacggcaactttcacccttctccgctgatgggagggtttggaatgaagcacccgcctcctc
agatcctcatcaaaaacacacctgtacctgcggatcctccaacggccttcaacaaggacaagctgaactctttcatcacccagta
ttctactggccaagtcagcgtggagatcgagtgggagctgcagaaggaaaacagcaagcgctggaacccggagatccagta
cacttccaactattacaagtctaataatgttgaatttgctgttaatactgaaggtgtatatagtgaaccccgccccattggcaccagat
acctgactcgtaatctgtaa

FIG. 14

AAV9 Amino Acids:

MAADGYLPDWLEDNLSEGIREWWALKPGAPQPKANQQHQDNARGLVLPGYKYLGPGNGL
DKGEPVNAADAAALEHDKAYDQQLKAGDNPYLKYNHADAEFQERLKEDTSFGGNLGRAVF
QAKKRLLEPLGLVEEAAKTAPGKKRPVEQSPQEPDSSAGIGKSGAQPAKKRLNFGQTGDT
ESVPDPQPIGEPPAAPSGVGSLTMASGGGAPVADNNEGADGVGSSSGNWHCDSQWLGD
RVITTSTRTWALPTYNNHLYKQISNSTSGGSSNDNAYFGYSTPWGYFDFNRFHCHFSPRD
WQRLINNNWGFRPKRLNFKLFNIQVKEVTDNNGVKTIANNLTSTVQVFTDSDYQLPYVLGS
AHEGCLPPFPADVFMIPQYGYLTLNDGSQAVGRSSFYCLEYFPSQMLRTGNNFQFSYEFE
NVPFHSSYAHSQSLDRLMNPLIDQYLYYLSKTINGSGQNQQTLKFSVAGPSNMAVQGRNYI
PGPSYRQQRVSTTVTQNNNSEFAWPGASSWALNGRNSLMNPGPAMASHKEGEDRFFPL
SGSLIFGKQGTGRDNVDADKVMITNEEEIKTTNPVATESYGQVATNHQSAQAQAQTGWVQ
NQGILPGMVWQDRDVYLQGPIWAKIPHTDGNFHPSPLMGGFGMKHPPPQILIKNTPVPADP
PTAFNKDKLNSFITQYSTGQVSVEIEWELQKENSKRWNPEIQYTSNYYKSNNVEFAVNTEG
VYSEPRPIGTRYLTRNL

FIG. 14 (Cont'd)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/23177

A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. C07K 7/00; C07K 14/00; C07K 14/005; C07K 14/075; C12N 15/79; C12N 15/86 (2022.01)
ADD. A61K 48/00 (2022.01)

CPC - INV. C07K 7/00; C07K 14/00; C07K 14/005; C07K 14/075; C07K 19/00; C12N 15/79; A61K 48/0025; A61K 48/0058; C12N 15/86
ADD. A61K 48/00; C07K 2319/01; C07K 2319/33; C12N 2750/00; C12N 2810/85

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	WO 2016/054554 A1 (UNIVERSITY OF MASSACHUSETTS) 07 April 2016; claim 1, 4, 5, 6, 7, 12, 13, 17, 50, 70; page 4, lines 14-32, page 5, lines 1-7	1,2, 3, 6-9, 14, 23-30, 39, 45-59 --- 40-44, 60-65
A	WO 03016497 A2 (INCYTE GENOMICS, INC.) 23 February 2003; page 23, lines 15-16	40-44, 60-65
A	US 2018/0126003 A1 (CUREVAC AG) 10 May 2018; paragraph [0016], Table 1, column 4, "Protein SEQ ID NO"; claim 1	40-44, 60-65
A	WO 00058473 A2 (CURAGEN CORPORATION) 05 October 2000; claim 1; page 2148, SEQ ID NO: 2918	40-44, 60-65
A	NOORAEI. "Virus like particles: preparation, immunogenicity and their roles as nanovaccines and drug nanocarriers" 10.1186/s12951-021-00806-7, 2/21/2021. Journal of Nanobiotechology. . 21 February 2021; Entire Document	14, 30

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2022 (14.07.2022)	SEP 08 2022
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/23177

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:

   a. ☒ forming part of the international application as filed:

      ☒ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

2. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US22/23177

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4-5, 10-13, 71-72, 80-85
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
-***-Please See Supplemental Page-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Groups I+, 1-3, 6-9, 14-65 and hepatocytes (target cells), liver (target tissue), SEQ ID NO: 5865 (targeting peptide), a liver-specific TBG promoter (tissue specific promoter)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US22/23177

-***-Continued From Box No. III: Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Groups I+, 1-3, 6-9, 14-65 and hepatocytes (target cells), liver (target tissue), SEQ ID NO: 5865 (targeting peptide), a liver-specific TBG promoter (tissue specific promoter) are directed towards viral vectors, AAV capsid proteins, recombinant AAVs, methods, isolated nucleic acids, compositions, and kits comprising capsid proteins with targeting peptides.

Groups II+, 66-70, 73-79 and SEQ ID NO: 5865 (targeting peptide) are directed towards methods for coating a virus or viral particle with membrane fragments.

Group III, Claims 86-87 are directed towards engineered viral particles and methods using artificial lipid envelopes.

The inventions listed as Groups I+, II+, and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I+ include recombinant AAV, not present in any of the other Groups; the special technical features of Group II+ include lysing donor cells in a hypotonic solution, not present in any of the other Groups; the special technical features of Group III include an artificially prepared lipid envelope, not present in any of the other Groups.

The viral vectors, AAV capsid proteins, recombinant AAVs, methods, isolated nucleic acids, compositions, and kits of Claims 1-3, 6-9, 14, 23-30, 39, 40-44 (each in-part), 45-51, 52 (in-part), 53-59, 60 (in-part), 61-62, 63-65 (each in-part) are believed to encompass the first named invention of Groups I+ and are the claims that will be searched without fee to the extent that they encompass hepatocytes (first exemplary target cells), liver (first exemplary target tissue), SEQ ID NO: 5865 (first exemplary targeting peptide), a liver-specific TBG promoter (first exemplary tissue specific promoter).

This first named invention of Group I+ has been selected to encompass the first species of each of the genera found in claims 14, 30, 40 and 60 based on the guidance set forth in section 10.54 of the PCT International Search and Preliminary Examination Guidelines.

Applicant is invited to elect additional target cell(s), target tissue(s), tissue specific promoter(s), and targeting peptide(s), with specified SEQ ID NO: for each, or with specified substitution(s) at specified site(s) of a SEQ ID NO:, such that the sequence of each elected species is fully specified (i.e. no optional or variable residues or substituents), and where available as an option within at least one searchable claim, to be searched. Additional target cell(s), target tissue(s), tissue specific promoter(s), and targeting peptide(s), will be searched upon the payment of additional fees. Applicants must specify the searchable claims that encompass any additionally elected target cell(s), target tissue(s), tissue specific promoter(s), and targeting peptide(s). Applicants must further indicate, if applicable, the claims which encompass the first named invention, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined. An exemplary election would be neuronal cells (target cells), brain tissue (target tissue), SEQ ID NO: 5866 (targeting peptide), and a synapsin-1 promoter (tissue specific promoter).

The methods of Claims 66-70, 73-78, and 79 (in-part) are believed to encompass the first named invention of Groups II+ and are the claims that can be searched with payment of a fee for Groups II+, to the extent that they encompass SEQ ID NO: 5865 (first exemplary targeting peptide).

This first named invention of Group II+ has been selected to encompass the first species of each of the genera found in claim 79 based on the guidance set forth in section 10.54 of the PCT International Search and Preliminary Examination Guidelines.

Applicant is invited to elect additional targeting peptide(s), with specified SEQ ID NO: for each, or with specified substitution(s) at specified site(s) of a SEQ ID NO:, such that the sequence of each elected species is fully specified (i.e. no optional or variable residues or substituents), and where available as an option within at least one searchable claim, to be searched. Additional sequence(s) will be searched upon the payment of additional fees. Applicants must specify the searchable claims that encompass any additionally elected targeting peptide(s). Applicants must further indicate, if applicable, the claims which encompass the first named invention of Groups II+, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention of Groups II+ to be searched/examined. An exemplary election would be SEQ ID NO: 5866 (targeting peptide).

Groups I+, II+, and III share the technical features including: a viral particle.

However, these shared technical features are previously disclosed by US 10,920,244 B2 (Bell et al.) (hereinafter 'Bell').

Bell discloses a viral particle (an AAV vector; abstract).

Groups I+ share the technical features including: a viral vector having a capsid protein comprising a heterologous targeting peptide in a range of 10-30 amino acids in length; an adeno-associated virus "AAV" capsid protein comprising a heterologous targeting peptide cloned into loop 1 and/or loop 2 of the capsid protein, wherein the heterologous targeting peptide is about 10-30 amino acids in length; a recombinant AAV "rAAV" comprising a capsid protein; a recombinant AAV "rAAV" comprising a capsid protein having a targeting peptide in loop 1 and/or loop 2; a composition comprising the recombinant rAAV; a method for delivering a transgene to a subject comprising: administering a recombinant AAV "rAAV" to a subject, wherein the rAAV comprises: i) the capsid protein, and ii) at least one transgene, and wherein the rAAV infects cells of a target tissue of the subject; an isolated nucleic acid encoding an AAV capsid protein containing an amino acid sequence; a composition comprising the isolated AAV capsid protein; a kit for producing a rAAV, the kit comprising: a container housing the isolated nucleic acid; these shared technical features are previously disclosed by Bell in view of WO 2016/131009 A1 (UNIVERSITY OF MASSACHUSETTS) (hereinafter 'Mass').

-***-Continued Within the Next Supplemental Box-***-

-***-Continued from previous Supplemental Box-***-

Bell discloses a viral vector having a capsid protein comprising a heterologous targeting peptide in a range of 10-30 amino acids in length (an AAV capsid comprising a heterologous targeting peptide, where the targeting peptide comprises a peptide fragment from 45 amino acids or shorter, where the fragment can be amino acids 447-469; column 2, lines 55-60; column 5, lines 15-28); an adeno-associated virus "AAV" capsid protein comprising a heterologous targeting peptide cloned into loop 1 and/or loop 2 of the capsid protein (an AAV capsid comprising a heterologous targeting peptide cloned into a loop of the capsid protein, where the loops include loop domains I and II; column 3, lines 44-49; column 4, lines 28-31), wherein the heterologous targeting peptide is about 10-30 amino acids in length (where the targeting peptide comprises a peptide fragment from 45 amino acids or shorter, where the fragment can be amino acids 447-469; column 5, lines 15-28); a recombinant AAV "rAAV" comprising a capsid protein (an rAAV comprising a capsid protein; column 4, lines 28-31; column 9, lines 60-61); a recombinant AAV "rAAV" comprising a capsid protein having a targeting peptide in loop 1 and/or loop 2 (a recombinant AAV with an AAV capsid comprising a heterologous targeting peptide cloned into a loop of the capsid protein, where the loops include loop domains I and II; column 3, lines 44-49; column 4, lines 28-31; column 9, lines 60-61); a composition comprising the recombinant rAAV (a pharmaceutical composition comprising the rAAV; column 9, lines 60-61; column 16, lines 22-26); a method for delivering a transgene to a subject (administering an AAV comprising a transgene to a subject; column 9, lines 25-35; column 16, lines 35-39) comprising: administering a recombinant AAV "rAAV" to a subject (administering an rAAV to a subject; column 16, lines 35-39), wherein the rAAV comprises: i) the capsid protein (an rAAV comprising a capsid protein; column 9, lines 25-35), and ii) at least one transgene (a transgene; column 9, lines 25-35), and wherein the rAAV infects cells of a target tissue of the subject (the rAAV infects targeted host cells; column 11, lines 5-15; column 16, lines 35-39); an isolated nucleic acid encoding an AAV capsid protein containing an amino acid sequence (a nucleic acid sequence encoding an AAV capsid protein containing an amino acid sequence; column 9, lines 28-30; column 21, lines 10-15); a composition comprising the isolated AAV capsid protein (a composition comprising an AAV capsid; column 16, lines 22-24);

Bell does not disclose a kit for producing a rAAV, the kit comprising: a container housing the isolated nucleic acid.

Mass discloses a kit for producing a rAAV (a kit for producing a rAAV; page 4, lines 9-13), the kit comprising: a container housing the isolated nucleic acid (the kit comprising a container housing an isolated nucleic acid; page 4, lines 9-13).

It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the rAAV and nucleic acid, as previously disclosed by Bell, with a kit and a container; as previously disclosed by Mass, to provide the benefit of packaging the rAAV for ease of delivery and use by professionals.

Groups II+ share the technical features including: a method for coating a virus or viral particle with membrane fragments comprising: lysing donor cells in a hypotonic solution, which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane; removing cells and cell debris by one or more rounds of centrifugation, leaving a membrane enriched fraction; extruding the membrane enriched faction through polycarbonate membrane(s) to generate purified membrane fragments; and coating virus or viral particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s); these shared technical features are previously disclosed by the publication entitled 'Erythrocyte membrane-camouflaged polymeric nanoparticles as a biomimetic delivery platform' to Hu, C. et al. (hereinafter 'Hu') in view of Bell.

Hu discloses a method for coating a particle with membrane fragments (a method for coating a nanoparticle with membrane fragments; abstract) comprising: lysing donor cells in a hypotonic solution (lysing RBCs in a hypotonic environment; page 10980, second column, second paragraph), which optionally may be combined with Dounce homogenization or sonication, in order to fractionate the cell membrane (to remove the cell contents and fragment the membrane; abstract; page 10980, second column, second paragraph); removing cells and cell debris by one or more rounds of centrifugation (RBCs were centrifuged after hypotonic medium treatment to provide RBCs devoid of cytoplasmic contents; page 10984, first column, fourth paragraph); extruding the membrane enriched faction through polycarbonate membrane(s) to generate purified membrane fragments (extruding the RBCs through porous polycarbonate membranes to create RBC-membrane derived vesicles; page 10980, second column, second paragraph; page 10984, first column, fifth paragraph); and coating particles by coextruding the virus or viral particles with the purified membrane fragments through polycarbonate membrane(s) (fusing the RBC-membrane -derived vesicles with the nanoparticles through mechanical extrusion with a porous polycarbonate membrane; page 10980, second column, second paragraph; page 10984, second column, second paragraph), and Hu further discloses centrifugation, leaving an enriched fraction (centrifuging blood to purify RBCs; page 10980, second column, second paragraph).

Hu does not disclose a virus or viral particle.

Bell discloses a viral particle (an AAV vector; abstract).

It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method for coating a particle with membrane fragments, as previously disclosed by Hu, with a viral particle, as previously disclosed by Bell, to provide the benefit of extending the residence time in a subject of a viral particle which is being used therapeutically.

Since none of the special technical features of the Groups I+, II+, and III inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by the Bell and Hu references, unity of invention is lacking.