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(54) **Title**: NOVEL VACCINE ADJUVANTS BASED ON TARGETING ADJUVANTS TO ANTIBODIES DIRECTLY TO ANTIGEN-PRESENTING CELLS

(57) **Abstract**: Compositions and methods for enhancing an immune response with an adjuvant composition comprising: an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to at least a portion of a TLR agonist; and a pharmaceutically acceptable carrier are disclosed herein. The conjugate and agonist are each comprised in an amount such that, in combination with the other, are effective to produce the immune response in a human or animal subject in need of immunostimulation.

NOVEL VACCINE ADJUVANTS BASED ON TARGETING ADJUVANTS TO ANTIBODIES DIRECTLY TO ANTIGEN-PRESENTING CELLS

Technical Field of the Invention

The present invention relates in general to the dendritic cell (DC)-targeting vaccines, and more particularly, to the enhancing vaccine efficacy by directly linking adjuvants (e.g., TLR ligands) directly to DC-targeting vaccines.

Background Art

Without limiting the scope of the invention, its background is described in connection with novel adjuvants, dendritic cell (DC) vaccines, and strategies for enhancing immune responses to DC vaccines.

U.S. Patent Application Publication No. 20090004194 (Kedl, 2007) relates to novel protein and DNA conjugates which promote antigen specific cellular immunity. The use of these polypeptide conjugates and DNA conjugates as immune adjuvants for treating various chronic diseases including cancer, infectious diseases, autoimmune diseases, allergic and inflammatory diseases. The Kedl invention discloses fusion proteins and DNA conjugates containing a TLR/CD40/agonist and optional antigen combination. The use of these protein and DNA conjugates as immune adjuvants and as vaccines for treatment of various chronic diseases is also taught.

U.S. Patent Application Publication No. 20080220011 (Steven, 2008) provides a fusion protein comprising a flagellin adjuvant and a tumor antigen. Also provided are compositions comprising a flagellin adjuvant and a tumor antigen. The invention further provides pharmaceutical formulations and methods for inducing an immune response against a tumor antigen and methods of treating a tumor in a subject.

U.S. Patent Application Publication No. 20080248068 (Ljunggren et al. 2008) is directed to flagellin and its use as an adjuvant for vaccination. The invention can be used in vaccine formulations to improve immunity against any other antigen administered at the same localization. The antigen can be administered in the same construct as Flagellin or in any other formulation given at the same localization. As an alternative, flagellin can be used to stimulate immunity against antigens expressed at a specific location. Flagellin can also be used to induce local inflammation with the purpose of creating a model for inflammation.

U.S. Patent No. 7,404,963 issued to Sotomayor and Suarez (2008) provides adjuvants, vaccines, and related methods that are useful in eliciting immune responses, particularly immune responses against tumor antigens. According to the Sotomayor invention flagellin is capable of inhibiting tolerance when it is administered in conjunction with a tolerogenic antigen. This effect is likely mediated by the ability of flagellin to induce IL-12 while keeping IL-10 levels low. Furthermore, flagellin can be

provided in an extended-releasing manner by using a flagellin-expressing cell. Preferably, the flagellin-expressing cell is treated such that it is no longer capable of replicating, yet retaining the ability to express flagellin, such as by lethal irradiation.

Disclosure of the Invention

The present invention describes compositions and methods for making novel vaccine adjuvants based on targeting adjuvants with antibodies directly to antigen-presenting cells. The present invention was found to enhance vaccine efficacy by linking adjuvants (e.g., TLR ligands) directly to DC-targeting vaccines. As shown herein, the compositions and methods of the present invention are broadly applicable to all DC-targeting vaccines and extensible to making adjuvants with unexpected novel properties.

The present invention in one embodiment discloses an adjuvant composition comprising an anti-dendritic cell (DC)-specific antibody or binding fragment thereof conjugated to a TLR agonist; and at least one antigen, wherein the antigen and the agonist are effective to produce an immune response in a human or animal subject in need of immunostimulation.

The DC-specific antibody or fragment described hereinabove is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR. In one aspect, the composition described above further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof. In another aspect the composition further comprises antigenic peptides selected from one or more bacterial antigens, wherein the bacterial antigens comprise antigens derived from Bacillus, Escherichia, Listeria, Neisseria, Nocardia, Salmonella, Staphylococcus, Streptococcus, or combinations and modifications thereof.

In yet another aspect the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and

lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia. In a specific aspect the tumor associated antigens are selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

In other aspects related to the composition of the present invention DC-specific antibody is humanized. In another aspect the TLR agonist comprises at least one of a flagellin from Salmonella enterica, a flagellin from Vibrio cholerae, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof. In yet another aspect the antigen is conjugated to the antibody and TLR agonist. In another aspect the antigen and the antibody are a single fusion protein. In another aspect the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

The present invention in another embodiment provides a vaccine composition comprising: (i) an antigen and (ii) an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to at least a portion of a TLR agonist in an amount effective to produce an immune response in a human or animal subject in need of immunostimulation. The DC-specific antibody or fragment used in the vaccine hereinabove is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR. The vaccine composition further comprises antigenic peptides selected. Non-limiting examples of antigenic peptides that may be used in the vaccine composition of the present invention have been previously described. The vaccine composition further comprises antigenic peptides selected from one or more bacterial antigens. A list of non-limiting bacterial antigens has been previously described hereinabove. In another aspect the vaccine further comprises antigenic peptides

selected from cancer peptides selected from tumor associated antigens comprising antigens that have been previously described.

In yet another aspect the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67. In one aspect the DC-specific antibody is humanized. In another aspect the TLR agonist comprises at least one of a flagellin from Salmonella enterica, a flagellin from Vibrio cholerae, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof. In yet another aspect the antigen is conjugated to the antibody and TLR agonist. In another aspect the antigen and the antibody are a single fusion protein. In yet another aspect the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

In yet another embodiment the instant invention discloses a method for increasing effectiveness of antigen presentation by an antigen presenting cell comprising: contacting the antigen presenting cell with a composition comprising: (i) an antigen; and (ii) an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or binding fragment thereof conjugated to a TLR agonist, wherein the antigen and adjuvant are provided in an amount effective to produce an immune response in a human or animal subject in need of immunostimulation. *Ex vivo* methods of increasing effectiveness of antigen presentation by antigen presenting cells have been previously described in U.S. Patent Application Publication No. 20100135994 (Banchereau et al. 2010) and in U.S. Patent Application Serial No. U.S. Serial No. 13/100,684 (Banchereau et al. 2011), relevant portions of which are incorporated herein by reference.

In one aspect the DC-specific antibody or fragment is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR. In a related aspect the anti-DC-specific antibody is selected from pairs of SEQ ID NOS.: 7 and 9, 11 and 13, 15 and 17, 19 and 21, 23 and 25, 27 and 29, 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53, 55 and 57, 59 and 61, 63 and 65, 67 and 69, 71 and 73, 75 and 77, 79 and 81, 83

and 85, 87 and 89, 91 and 93, 95 and 97, 99 and 101, 1-3 and 105, 107 and 109, 111 and 113, 115 and 117, 119 and 121, 123 and 125, 127 and 129, 131 and 132, 133 and 134.

In one aspect the composition further comprises antigenic peptides, non-limiting examples of the antigenic peptides have been described previously. In another aspect the composition further comprises antigenic peptides selected from cancer peptides as previously described. The antigenic peptides are selected from tumor associated antigens. Non-limiting examples of tumor associated antigens are described hereinabove.

In related aspects of the method the DC-specific antibody is humanized and the composition is administered to the human or animal subject by an oral route, a nasal route, topically or as an injection (the injection is selected from intradermal, intramucosal, subcutaneous, intravenous, intraperitoneal, intramuscular, and intravenous injections). In one aspect the TLR agonist comprises at least one of a flagellin from Salmonella enterica, a flagellin from Vibrio cholerae, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof. In another aspect the antigen is conjugated to the antibody and TLR agonist. In yet another aspect the antigen and the antibody are a single fusion protein. In another aspect the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

The present invention further provides a method for a treatment, a prophylaxis or a combination thereof against one or more cancers in a human subject comprising the steps of: (i) identifying the human subject in need of the treatment, the prophylaxis or a combination thereof against the one or more cancers and (ii) administering a vaccine composition comprising: a) an antigen and b) an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to a TLR agonist; and a pharmaceutically acceptable carrier, wherein the antigen and adjuvant are provided in an amount effective to produce an immune response for the treatment, the prophylaxis or a combination thereof against the one or more cancers.

Another embodiment of the present invention relates to a method of providing immunostimulation by activation of one or more dendritic cells (DCs) to a human subject for a prophylaxis, a therapy or a combination thereof against one or more viral, bacterial, fungal, parasitic, protozoal, and parasitic diseases, and allergic disorders comprising the steps of: i) identifying the human subject in need of immunostimulation for the prophylaxis, the therapy or a combination thereof against the one or more viral, bacterial, fungal, parasitic, protozoal, and parasitic diseases, and allergic disorders; ii) isolating one or more DCs from the human subject; iii) activating the isolated DCs with an amount of a composition effective for forming activated DCs comprising: a) an antigen and b) an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to a TLR agonist; and a pharmaceutically acceptable carrier, in an amount effective to

produce an immune response in a human or animal subject in need of immunostimulation; and iv) reintroducing the activated DCs into the human subject.

In yet another embodiment the instant invention discloses an adjuvant composition comprising an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to at least a portion of a TLR agonist wherein the anti-DC-specific antibody is selected from pairs of SEQ ID NOS.: 7 and 9, 11 and 13, 15 and 17, 19 and 21, 23 and 25, 27 and 29, 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53, 55 and 57, 59 and 61, 63 and 65, 67 and 69, 71 and 73, 75 and 77, 79 and 81, 83 and 85, 87 and 89, 91 and 93, 95 and 97, 99 and 101, 1-3 and 105, 107 and 109, 111 and 113, 115 and 117, 119 and 121, 123 and 125, 127 and 129, 131 and 132, 133 and 134.

In one aspect of the adjuvant composition hereinabove the composition further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof.

In another aspect the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia. In yet another aspect the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-

Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67. In a specific aspect the DC-specific antibody is humanized. In other related aspects the TLR agonist comprises at least one of a flagellin from Salmonella enterica, a flagellin from Vibrio cholerae, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof and the antigen and the antibody are a single fusion protein. In another aspect the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

Description of the Drawings

For a more complete understanding of the features and advantages of the present invention, reference is now made to the detailed description of the invention along with the accompanying figures and in which:

FIGS. 1A-1D show flagellin and the several antibody-flagellin constructs of the present invention: FIG. 1A Residues from the conserved N-terminal and C-terminal regions are together sufficient to activate TLR5 – central residues are expendable for this function, FIG. 1B An example of a active configuration of flagellin fused directly to a DC-targeting antibody to direct the activation properties of the flagellin fragment specifically to cells expressing the particular DC receptor and combining immunostimulatory properties of the flagellin with those of the anti-DC receptor antibody, FIG. 1C A variant of 1B wherein fragments of the two conserved flagellin domains are separated by a linker or antigen sequence – in the example given in FIG. 3A, this configuration with a particular linker sequence is not active, FIG. 1D A variant of FIG. 1A wherein an antigen or protein-protein interaction domain (dockerin in this case) is directly linked between the flagellin and antibody domains. Figs 3 and 4 show examples of immune stimulation by such a variant.

FIG. 2 shows the design of the studies used to test the activity of the antibody-flagellin constructs of the present invention;

FIGS. 3A to 3C show the secretion of IL-6 when various types of cells were activated with the constructs of the present invention;

FIGS. 4A to 4D show the dose titration of the various constructs as measured by the secretion of IL-6 and IL-1 beta. The data demonstrate that the immune stimulation by the flagellin fragments becomes dependent upon DC receptor interaction (in this case LOX-1) mediated by the DC-targeting antibody portion of the construct – a control hIgG4-flagellin construct is only active at much higher concentrations. Other controls show that it is the direct fusion of the flagellin fragments to the DC-targeting antibody that accounts for the enhanced immunostimulatory potency; and

FIG. 5 shows heat maps of gene expression for the listed genes using an anti-LOX-1 antibody with or without linked flagellin. The exact combination of up-regulated immune stimulatory molecules will

vary with different anti-DC receptor antibody constructs linked to the flagellin fragment because different combinations of target cells will be engaged and there will be different combinations of signaling via the flagellin and the DC-targeting antibody.

Description of the Invention

While the making and using of various embodiments of the present invention are discussed in detail below, it should be appreciated that the present invention provides many applicable inventive concepts that can be embodied in a wide variety of specific contexts. The specific embodiments discussed herein are merely illustrative of specific ways to make and use the invention and do not delimit the scope of the invention.

To facilitate the understanding of this invention, a number of terms are defined below. Terms defined herein have meanings as commonly understood by a person of ordinary skill in the areas relevant to the present invention. Terms such as "a", "an," and "the" are not intended to refer to only a singular entity, but include the general class of which a specific example may be used for illustration. The terminology herein is used to describe specific embodiments of the invention, but their usage does not delimit the invention, except as outlined in the claims.

As used herein the term "Antigen Presenting Cells" (APC) are cells that are capable of activating T cells, and include, but are not limited to, certain macrophages, B cells and dendritic cells. "Dendritic cells" (DCs) refers to any member of a diverse population of morphologically similar cell types found in lymphoid or non-lymphoid tissues. These cells are characterized by their distinctive morphology, high levels of surface MHC-class II expression (Steinman, et al., Ann. Rev. Immunol. 9:271 (1991); incorporated herein by reference for its description of such cells). These cells can be isolated from a number of tissue sources, and conveniently, from peripheral blood, as described herein. Dendritic cell binding proteins refers to any protein for which receptors are expressed on a dendritic cell. Examples include GM-CSF, IL-1, TNF, IL-4, CD40L, CTLA4, CD28, and FLT-3 ligand.

For the purpose of the present invention, the term "vaccine composition" is intended to mean a composition which can be administered to humans or to animals in order to induce an immune system response; this immune system response can result in a production of antibodies or simply in the activation of certain cells, in particular antigen-presenting cells, T lymphocytes and B lymphocytes. The vaccine composition can be a composition for prophylactic purposes or for therapeutic purposes, or both. As used herein, the term "antigen" refers to any antigen that can be used in a vaccine, whether it involves a whole microorganism or a portion thereof, and various types : (e.g., peptide, protein, glycoprotein, polysaccharide, glycolipid, lipopeptide, etc). They may be viral antigens, bacterial antigens, or the like; the term "antigen" also comprises the polynucleotides, the sequences of which are chosen so as to encode the antigens whose expression by the individuals to which the polynucleotides are administered is desired, in the case of the immunization technique referred to as

DNA immunization. They may also be a set of antigens, in particular in the case of a multivalent vaccine composition which comprises antigens capable of protecting against several diseases, and which is then generally referred to as a vaccine combination, or in the case of a composition which comprises several different antigens in order to protect against a single disease, as is the case for certain vaccines against whooping cough or the flu, for example. The term "antibodies" refers to immunoglobulins, whether natural or partially or wholly produced artificially, e.g. recombinant. An antibody may be monoclonal or polyclonal. The antibody may, in some cases, be a member of one, or a combination immunoglobulin classes, including: IgG, IgM, IgA, IgD, and IgE.

The terms "adjuvant" or "immunoadjuvant" may be used interchangeably and refer to a substance that enhances, augments or potentiates the host's immune response to an antigen, e.g., an antigen that is part of a vaccine. Non-limiting examples of some commonly used vaccine adjuvants include insoluble aluminum compounds, calcium phosphate, liposomes, Virosomes™, ISCOMS®, microparticles (e.g., PLG), emulsions (e.g., MF59, Montanides), virus-like particles & viral vectors. Flagellin, a TLR5 agonist from Salmonella entericum is used as an adjuvant in the present invention. It will be understood that flagellin from other bacterial sources (e.g., Vibrio cholerae) may also be used, other TLR5 agonists, TLR7 agonists, TLR9 agonists, or any combinations or modifications thereof may also be used.

The term "conjugate" as used herein refers to any substance formed from the joining together of two parts. Representative conjugates in accordance with the present invention include those formed by joining together of the antigen with the antibody and the TLR agonist. The term "conjugation" refers to the process of forming the conjugate and is usually done by physical coupling, e.g. covalent binding, co-ordination covalent, or secondary binding forces, e.g. Van der Waals bonding forces. The process of linking the antigen to the antibody and the TLR agonist can also be done via a non-covalent association such as a dockerin-cohesin association (as described in U.S. Patent Publication No. 20100135994, Banchereau et al. relevant portions incorporated herein by reference) or by a direct chemical linkage by forming a peptide or chemical bond.

As used herein, the term "flagellin" refers to a flagellin protein from any source including, but not limited to, any bacterial species. The flagellin may be from a species of Salmonella (Salmonella enterica as exemplified herein) or from other species of bacteria (for e.g. Vibrio cholerae). Also specifically contemplated are fragments, variants, analogs, homologs, or derivatives of said flagellin, and combinations thereof. The various fragments, variants, analogs, homologs or derivatives described herein may be 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, or 99% identical to a wild-type flagellin from a specific bacterial species, e.g., Salmonella.

The term "gene" is used to refer to a functional protein, polypeptide or peptide-encoding unit. As will be understood by those in the art, this functional term includes genomic sequences, cDNA sequences,

or fragments or combinations thereof, as well as gene products, including those that may have been altered by the hand of man. Purified genes, nucleic acids, protein and the like are used to refer to these entities when identified and separated from at least one contaminating nucleic acid or protein with which it is ordinarily associated

As used herein, the term "nucleic acid" or "nucleic acid molecule" refers to polynucleotides, such as deoxyribonucleic acid (DNA) or ribonucleic acid (RNA), oligonucleotides, fragments generated by the polymerase chain reaction (PCR), and fragments generated by any of ligation, scission, endonuclease action, and exonuclease action. Nucleic acid molecules can be composed of monomers that are naturally-occurring nucleotides (such as DNA and RNA), or analogs of naturally-occurring nucleotides (e.g., α-enantiomeric forms of naturally-occurring nucleotides), or a combination of both. Modified nucleotides can have alterations in sugar moieties and/or in pyrimidine or purine base moieties. Sugar modifications include, for example, replacement of one or more hydroxyl groups with halogens, alkyl groups, amines, and azido groups, or sugars can be functionalized as ethers or esters. Moreover, the entire sugar moiety can be replaced with sterically and electronically similar structures, such as aza-sugars and carbocyclic sugar analogs. Examples of modifications in a base moiety include alkylated purines and pyrimidines, acylated purines or pyrimidines, or other well-known heterocyclic substitutes. Nucleic acid monomers can be linked by phosphodiester bonds or analogs of such linkages. Analogs of phosphodiester linkages include phosphorothioate, phosphorodithioate, phosphoroselenoate, phosphorodiselenoate, phosphoroanilothioate, phosphoranilidate, phosphoramidate, and the like. The term "nucleic acid molecule" also includes so-called "peptide nucleic acids," which comprise naturally-occurring or modified nucleic acid bases attached to a polyamide backbone. Nucleic acids can be either single stranded or double stranded.

As used in this application, the term "amino acid" means one of the naturally occurring amino carboxylic acids of which proteins are comprised. The term "polypeptide" as described herein refers to a polymer of amino acid residues joined by peptide bonds, whether produced naturally or synthetically. Polypeptides of less than about 10 amino acid residues are commonly referred to as "peptides." A "protein" is a macromolecule comprising one or more polypeptide chains. A protein may also comprise non-peptidic components, such as carbohydrate groups. Carbohydrates and other non-peptidic substituents may be added to a protein by the cell in which the protein is produced, and will vary with the type of cell. Proteins are defined herein in terms of their amino acid backbone structures; substituents such as carbohydrate groups are generally not specified, but may be present nonetheless.

As used herein, the term "in vivo" refers to being inside the body. The term "in vitro" used as used in the present application is to be understood as indicating an operation carried out in a non-living system.

As used herein, the term "treatment " or "treating" means any administration of a compound of the present invention and includes (1) inhibiting the disease in an animal that is experiencing or displaying the pathology or symptomatology of the diseased (i.e., arresting further development of the pathology and/or symptomatology), or (2) ameliorating the disease in an animal that is experiencing or displaying the pathology or symptomatology of the diseased (i.e., reversing the pathology and/or symptomatology).

The present invention describes novel vaccine adjuvants based on targeting adjuvants with antibodies directly to antigen-presenting cells. The present invention was found to enhance vaccine efficacy by directly linking adjuvants (e.g., TLR ligands) directly to DC-targeting vaccines. As shown herein, the compositions and methods of the present invention are broadly applicable to all DC-targeting vaccines and extensible to making adjuvants with unexpected novel properties. While antigens directly linked to adjuvants (e.g., TLR's) are well known – e.g., development of Hep B vaccine linked to CpG (Dynavax) or Flu antigens linked to flagellin (Vaxigen). The present invention is an adjuvant that is directly linked to a DC-targeting vaccine (e.g., anti-DC receptor antibody fused to antigen). Several aspects of the present invention have advantages over the prior art, including dose-sparing (by sending the adjuvant directly to the antigen-presenting cell that actually receives antigen), unexpectedly, this discovery provides a method of making the agonist activity of the adjuvant strictly dependent upon the type of DC receptor targeted.

Compositions and methods described herein can be used in a prophylaxis, a therapy or a combination thereof against one or more viral, bacterial, fungal, parasitic, protozoal, and parasitic diseases, allergic disorders, and cancers. Non-limiting examples of diseases against which a prophylaxis, a therapy, alleviation of symptoms or combinations thereof can be achieved using the composition of the present invention include HIV infections, hepatitis, influenza, avian flu, herpes, genitourinary, prostate, and neurological tumors, arthritis, asthma, eczema, bacterial infections selected from anthrax, cholecystitis, bacteremia, cholangitis, urinary tract infection (UTI), listeriosis, meningococcal infections, salmonellosis, necrotizing fasciitis and streptococcal toxic shock syndrome, pneumonia, skin infections, or any combinations or modifications thereof.

Flagellin from Salmonella enterica has been exemplified in the present invention. However, a skilled artisan will understand that flagellin from many bacterial species (for e.g., Vibrio cholerae) can be substituted for the flagellin that is used herein. In addition to flagellin other TLR5 agonists may also be used. For extending the invention to other TLRs, it may be necessary to employ chemical linkages since some or all of the other known TLR ligands are non-protein. Some agonists like TLR7 and TLR9, are well described chemical entities and methods to link them to proteins, while maintaining their intrinsic TLR agonistic properties, have benne previously described. For some other agonists active compounds are known, but their protein-linking chemistries are not well described

Compositions and method described hereinabove use TLR agonists conjugated an anti-dendritic cell (DC)-specific antibody or binding fragment thereof. However, a skilled artisan will recognize that other non-TLR based ligands, agonists, or other moieties (for e.g. infammasome) may be conjugated to the antibody to achieve the desired in vivo or ex vivo effects.

It will be understood by the skilled artisan that the composition comprising the antigen-TLR agonist-antibody, may have different possible arrangements for the individual species or moieties. For example, the TLR agonist (or flagellin as used herein) may be linked to the heavy chain (ANTIBODY L CHAIN-ANTIGEN+H CHAIN-TLR AGONIST or the light-chain (ANTIBODY H CHAIN-ANTIGEN+ L CHAIN- TLR AGONIST or ANTIBODY H CHAIN-ANTIGEN- TLR AGONIST +L CHAIN) of the anti-dendritic cell (DC)-specific antibody. The conjugate may also be prepared by linking the TLR agonist/flagellin through a dockerin-cohesin attachment (for e.g. ANTIBODY H CHAIN-ANTIGEN-DOCKERIN:COHESIN-FLGN). It will be understood that the flagellin used herein may be substituted or replaced by any TLR agonist that may be linked by similar chemical or physical methods. The present invention may also include the combination wherein the antigen and the antibody are a single fusion protein.

DC-targeting linked adjuvant attachment A (SEQ ID NO: 1): Vector C959 encodes rAB-pIRES2[mAnti-DCIR_9E8_H-LV-hIgG4H-C-Flex-v1-Flgn-1-Flgn-2].

QVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMGLSWIRQPSGKGLEWLAHIYWDDDKRYNP
SLKSRLTISKDTSSNQVFLKITIVDTADAATYYCARSSHYYGYGYGGYFDVWGAGTTVTVSS
AKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLY
SLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKP
KDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTV
LHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVK
GFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEAL
HNHYTQKSLSLSLGK***AS***QTPTNTISVTPTNNSTPTNNSNPKPNPA**SIERLSSGLRINSAKDDAAG**
QAIANRFTANIKGLTQASRNANDGISIAQTTEGALNEINNNLQRVRELAVQSANSTNSQS
DLDSIQAEITQRLNEIDRVSGQTQFNGVKVLAQDNTLTIQVGANDGETIDIDLKQINSQT
LGLDSLNVQ*AS*QPELAEAAAKTTENPLQKIDAALAQVDALRSDLGAVQNRFNSAITNLGNT
VNNLSEARSRIEDSDYATEVSNMSRAQILQAS

Bold is the N-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 14-161.

Underlined is the C-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 405-484.

Italics is a flexible linker sequence from gb|AAT79550.1| cellulosomal anchoring scaffoldin B precursor [Bacteroides cellulosolvens].

The amino terminus up to the first AS sequence is the heavy chain of mouse Anti-DCIR_9E8 variable region fused to -hIgG4H constant region. AS sequences in bold-italics are joining sequences from construction of the expression vector.

When co-transfected with appropriate L chain expression vector into mammalian cells (e.g., CHO-S cells) this vector directs efficient secretion of a typical embodiment of a DC-targeting agent linked to a flagellin-based adjuvant.

C1099 encodes mouse Anti-DCIR_9E8_H-LV-hIgG4H-C-Dockerin-v2-Flgn-1-Flgn-2] (SEQ ID NO: 2).

QVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMGLSWIRQPSGKGLEWLAHIYWDDDKRYNP
SLKSRLTISKDTSSNQVFLKITIVDTADAATYYCARSSHYYGYGYGGYFDVWGAGTTVTVSS
AKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLY
SLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKP
KDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTV
LHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVK
GFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEAL
HNHYTQKSLSLSLGK***AS***SEDTQPPAPTLIGDVNADGKIDSTDLTLLKRYLLRSATLTEEKILNADTD
GNGTVNSTDLNYLKKYILRVISVFPAEGNKPPTPTPTKTPVATPSPTQPLFTPSFKDVT***AS*****IERLSSG**
LRINSAKDDAAGQAIANRFTANIKGLTQASRNANDGISIAQTTEGALNEINNNLQRVREL
AVQSANSTNSQSDLDSIQAEITQRLNEIDRVSGQTQFNGVKVLAQDNTLTIQVGANDGET
IDIDLKQINSQTLGLDSLNVQ*AS*QPELAEAAAKTTENPLQKIDAALAQVDALRSDLGAVQN
RFNSAITNLGNTVNNLSEARSRIEDSDYATEVSNMSRAQILQAS

Italics are |YP_001036450.1| alpha-L-arabinofuranosidase B [Clostridium thermocellum ATCC 27405| residues 166-274 – this is a dockerin domain that functions fully for binding (e.g., cohesin-antigen fusions) when fused between other domains.

Bold is the N-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 14-161.

Underlined is the C-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 405-484.

AS sequences in bold-italics are joining sequences from construction of the expression vector.

When co-transfected with appropriate L chain expression vector into mammalian cells (e.g., CHO-S cells) this vector directs efficient secretion of a typical embodiment of a DC-targeting agent linked to a flagellin-based adjuvant and linked to cohesin-antigen via the dockerin domain. In related embodiments - any desired antigen can also be directly fused in place of the dockerin domain.

C566 E.coli-pET28 vector encoding expression of [Cohesin-var1-FluM1-6xHis] (SEQ ID NO: 3)

MDLDAVRIKVDTVNAKPGDTVNIPVRFSGIPSKGIANADFVYSYDPNVLEIIEIKPGELIVDPNP
TKSFDTAVYPDRKMIVFLFAEDSGTGAYAITKDGVFATIVAKVKEGAPNGLSVIKFVEVGGF
ANNDLVEQKTQFFDGGVNVGDTTEPATPTTPVTTPTTTDDLDAASLLTEVETYVLSIIPSGPL
KAEIAQRLEDVFAGKNTDLEVLMEWLKTRPILSPLTKGILGFVFTLTVPSERGLQRRRFVQNA
LNGNGDPNNMDKAVKLYRKLKREITFHGAKEIALSYSAGALASCMGLIYNRMGAVTTEVAF
GLVCATCEQIADSQHRSHRQMVTTTNPLIRHENRMVLASTTAKAMEQMAGSSEQAAEAMDI
ASQARQMVQAMRTIGTHPSSSAGLKDDLLENLQAYQKRMGVQMQRFKLEHHHHHH

Bold is the cohesin domain showing an underlined single C to A change that maintains dockerin binding and 3 C residues (bold-underlined) that permit site-specific maleimide linkage of TLRL adducts. Underlined is the Flu M1 antigen sequence. AS sequences in bold-italics are joining sequences from construction of the expression vector.

In related forms – any cohesin-antigen with free cys residues can vbe conveniently decorated with TLR7-L compound and linked with any anti-DC receptor-dockerin-antigen vaccine.

C1450 encodes mouse Anti-DCIR_9E8_H-LV-hIgG4H-C-Flex-v1-v1C2 (SEQ ID NO: 4):

QVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMGLSWIRQPSGKGLEWLAHIYWDDDKRYNP
SLKSRLTISKDTSSNQVFLKITIVDTADAATYYCARSSHYYGYGYGGYFDVWGAGTTVTVSS
AKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLY
SLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKP
KDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTV
LHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVK
GFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEAL
HNHYTQKSLSLSLGK***AS***QTPTNTISVTPTNNSTPTNNSNPKPNP***AS***CQTPTNTISVTPTNNSTPTNN
SNPKPCP***AS***

Bold is a flexible linker sequence bearing two C residues (underlined) for site-specific linking TLRL adducts. When co-transfected with appropriate L chain expression vector into mammalian cells (e.g., CHO-S cells) this vector directs efficient secretion of a typical embodiment of a DC-targeting agent linked to a chemical-based adjuvant. In related embodiments – other vectors can be prepared with any desired antigen directly fused to the C-terminal codon. AS sequences in bold-italics are joining sequences from construction of the expression vector. Italics is a flexible linker (supra).

C1180 directs the expression of a mammalian cell expressed 6xHis-Cohesin-Flgn-1-Flgn-2 fusion protein (SEQ ID NO: 5):

LDITSHHHHHHD*DLDAVRIKVDTVNAKPGDTVRIPVRFSGIPSKGIANCDFVYSYDPNVLEIIEIEPG
DIIVDPNPDKSFDTAVYPDRKIIVFLFAEDSGTGAYAITKDGVFATIVAKVKEGAPNGLSVIKFVEVG
GFANNDLVEQKTQFFDGGVNVGDTTEPATPTTPVTTPTTTDDLDAA**AS**IERLSSGLRINSAKDDA*

AGQAIANRFTANIKGLTQASRNANDGISIAQTTEGALNEINNNLQRVRELAVQSANSTNS QSDLDSIQAEITQRLNEIDRVSGQTQFNGVKVLAQDNTLTIQVGANDGETIDIDLKQINS QTLGLDSLNVQASQPELAEAAAKTTENPLQKIDAALAQVDALRSDLGAVQNRFNSAITNLG NTVNNLSEARSRIEDSDYATEVSNMSRAQILQAS

Italics is the cohesin domain. Bold is the N-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 14-161. Underlined is the C-terminal part of phase-2 flagellin [Salmonella enterica] gb|AAL30512.1|AF425736_1 residues 405-484. AS sequences in bold-italics are joining sequences from construction of the expression vector. This form permits linking of functional Flgn to any anti-DC receptor-Dockerin-antigen vaccine.

Some other non-limiting examples of constructs with different DC-specific antibodies or fragments are presented herein below:

Anti_CLEC_6_9B9.2G12_Hv-V-hIgG4H-C (SEQ ID NO: 6):

ATGGGCAGGCTTACTTCTTCATTCTTGCTACTGATTGTCCCTGCATATGTCCTGTCCCAGG
TTACTCTGAAAGAGTCTGGCCCTGGGATATTGCAGCCCTCCCAGACCCTCAGTCTGACCT
GTTCTTTCTCTGGGTTTTCACTGAGCACTTCTGGTATGAGTGTAGGCTGGATTCGTCAGCC
TTCAGGGAAGGGTCTGGAGTGGCTGGCTCACATTTGGTGGAATGATGATAAGTACTATA
ATCCAGTCCTGAAAAGCCGGCTCACAATCTCCAAGGAGACCTCCAACAACCAGGTATTC
CTCAAGATCGCCAGTGTGGTCTCTGCAGATACTGCCACATACTACTGTGCTCGATTCTAT
GGTAACTGTCTTGACTACTGGGGCCAAGGCACCACTCTCACAGTCTCCTCGGCCAAAACA
aagggcccATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGC
CCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGG
CGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTC
CCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCA
ACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGT
CCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTC
CCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTG
GTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGA
GGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGG
TCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAG
GTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCA
GCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACC
AGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGG
GAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGA
CGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGA

ATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCC
TCTCCCTGTCTCTGGGTAAAGCTAGCTGATTAATTAA

Anti_CLEC_6_9B9.2G12_Hv-V-hIgG4H-C (SEQ ID NO: 7):

MGRLTSSFLLLIVPAYVLSQVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMSVGWIRQPSGK
GLEWLAHIWWNDDKYYNPVLKSRLTISKETSNNQVFLKIASVVSADTATYYCARFYGNCLD
YWGQGTTLTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGV
HTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPE
FEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQ
FNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEE
MTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQE
GNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti_CLEC_6_9B9.2G12_Kv-V-hIgGK-C (SEQ ID NO: 8):

ATGATGTCCTCTGCTCAGTTCCTTGGTCTCCTGTTGCTCTGTTTTCAAGGTACCAGATGTG
ATATCCAGATGACACAGACTACATCCTCCCTGTCTGCCTCTCTGGGAGACAGAGTCACCA
TCAGTTGCAGGGCAAGTCAGGACATTAGCAATTATTTAAACTGGTATCAGCAGAAACCA
GATGGAACTGTTAAACTCCTGATCTACTACACATCAATATTACAATTAGGAGTCCCATCA
AGATTCAGTGGCAGTGGGTCTGAAACAGATTATTCTCTCACCATTAGCAACCTGGAGCAA
GAAGATATTGCCACTTACTTTTGCCAACAGGGTGATTCGCTTCCATTCACGTTCGGCTCG
GGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCA
TCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti_CLEC_6_9B9.2G12_Kv-V-hIgGK-C (SEQ ID NO: 9):

MMSSAQFLGLLLLCFQGTRCDIQMTQTTSSLSASLGDRVTISCRASQDISNYLNWYQQKPDG
TVKLLIYYTSILQLGVPSRFSGSGSETDYSLTISNLEQEDIATYFCQQGDSLPFTFGSGTKLEIKR
TVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKD
STYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-ASGPR_49C11_7H-LV-hIgG4H-C (SEQ ID NO: 10):

ATGAGAGCGCTGATTCTTTTGTGCCTGTTCACAGCCTTTCCTGGTATCCTGTCTGATGTGC
AGCTTCAGGAGTCAGGACCTGACCTGGTGAAACCTTCTCAGTCACTTTCACTCACCTGCA
CTGTCACTGGCTACTCCATCACCAGTGGTTATAGCTGGCACTGGATCCGGCAGTTTCCAG
GAAACAAACTGGAATGGATGGGCTACATACTCTTCAGTGGTAGCACTAACTACAACCCA

TCTCTGAAAAGTCGAATCTCTATCACTCGAGACACATCCAAGAACCAGTTCTTCCTGCAG
TTGAATTCTGTGACTACTGAGGACACAGCCACATATTTCTGTGCAAGATCTAACTATGGT
TCCTTTGCTTCCTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAACAACGGGC
CCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCCTG
GGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGCGC
CCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCCCT
CAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAACG
TAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTCCC
CCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCCCC
CCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGGTG
GACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAGGT
GCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGTCA
GCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGGTC
TCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCC
CCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCAGG
TCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGGAG
AGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGG
CTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAATG
TCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCTCT
CCCTGTCTCTGGGTAAAGCTAGCTGATTAATTAA

Anti-ASGPR_49C11_7H-LV-hIgG4H-C (SEQ ID NO: 11):

MRALILLCLFTAFPGILSDVQLQESGPDLVKPSQSLSLTCTVTGYSITSGYSWHWIRQFPGNKL
EWMGYILFSGSTNYNPSLKSRISITRDTSKNQFFLQLNSVTTEDTATYFCARSNYGSFASWGQ
GTLVTVSAAKTTGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPA
VLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFEGGP
SVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTY
RVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQ
VSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFS
CSVMHEALHNHYTQKSLSLSLGKAS

Anti-ASGPR_49C11_7K-LV-hIgGK-C (SEQ ID NO: 12):

ATGGATTTTCAAGTGCAGATTTTCAGCTTCCTGCTAATCAGTGCCTCAGTCATAATATCCA
GAGGACAAATTGTTCTCACCCAGTCTCCAGCAATCATGTCTGCATCTCCAGGGGAGAAGG
TCACCATGACCTGCAGTGCCAGCTCAAGTGTAAGTCACATGCACTGGTACCAGCAGAAG
TCAGGCACTTCCCCCAAAAGATGGATTTATGACACATCCAGACTGGCTTCTGGAGTCCCT
GCTCGCTTCAGTGGCAGTGGGTCTGGGACCTCTTACTCTCTCACAATCAGCAGCATGGAG

GCTGAAGATGCTGCCACTTATTACTGCCAGCAGTGGAGTAGTCACCCATGGTCGTTCGGT
GGAGGCACCAAACTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCG
CCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTC
TATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTC
CCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACC
CTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCA
TCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-ASGPR_49C11_7K-LV-hIgGK-C (SEQ ID NO: 13):

MDFQVQIFSFLLISASVIISRGQIVLTQSPAIMSASPGEKVTMTCSASSSVSHMHWYQQKSGTS
PKRWIYDTSRLASGVPARFSGSGSGTSYSLTISSMEAEDAATYYCQQWSSHPWSFGGGTKLEI
KRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDS
KDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-ASGPR_4G2.2_Hv-V-hIgG4H-C (SEQ ID NO: 14):

ATGGCTTGGGTGTGGACCTTGCTATTCCTGATGGCAGCTGCCCAAAGTGCCCAAGCACAG
ATCCAGTTGGTGCAGTCTGGACCTGAGCTGAAGAAGCCTGGAGAGACAGTCAAGATCTC
CTGCAAGGCTTCTGGGTATACCTTCACAAACTATGGAATGAACTGGGTGAAGCAGGTTCC
AGGAAAAGGTTTAAGGTGGATGGGCTGGATGGACACCTTCACTGGAGAGCCAACATATG
CTGATGACTTCAAGGGACGGTTTGCCTTCTCTTTGGAAACCTCTGCCAGCACTGCCTATTT
GCAGATCAACAGCCTCAAAAATGAGGACACGGCTACTTATTTCTGTGCAAGAGGGGGGA
TTTTACGACTCAACTACTTTGACTACTGGGGCCAAGGCACCACTCTCACAGTCTCCTCAG
CCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGA
GCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGT
GGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAG
GACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCT
ACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCC
AAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTC
TTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACG
TGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGA
TGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGT
ACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTAC
AAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGC
CAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGA
CCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCC
GTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCT
GGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGC

AGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACAC
AGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGATTAATTAA

Anti-ASGPR_4G2.2_Hv-V-hIgG4H-C (SEQ ID NO: 15):

MAWVWTLLFLMAAAQSAQAQIQLVQSGPELKKPGETVKISCKASGYTFTNYGMNWVKQVP
GKGLRWMGWMDTFTGEPTYADDFKGRFAFSLETSASTAYLQINSLKNEDTATYFCARGGIL
RLNYFDYWGQGTTLTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSG
ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCP
PCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKT
KPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTL
PPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVD
KSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-ASGPR_4G2.2_Kv-V-hIgGK-C (SEQ ID NO: 16):

ATGAAGTTTCCTTCTCAACTTCTGCTCTTACTGCTGTTTGGAATCCCAGGCATGATATGTG
ACATCCAGATGACACAATCTTCATCCTCCTTTTCTGTATCTCTAGGAGACAGAGTCACCA
TTACTTGCAAGGCAAGTGAGGACATATATAATCGGTTAGGCTGGTATCAGCAGAAACCA
GGAAATGCTCCTAGGCTCTTAATATCTGGTGCAACCAGTTTGGAAACTGGGGTTCCTTCA
AGATTCAGTGGCAGTGGATCTGGAAAGGATTACGCTCTCAGCATTACCAGTCTTCAGACT
GAAGATCTTGCTACTTATTACTGTCAACAGTGTTGGACTTCTCCGTACACGTTCGGAGGG
GGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCA
TCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-ASGPR_4G2.2_Kv-V-hIgGK-C (SEQ ID NO: 17):

MKFPSQLLLLLLFGIPGMICDIQMTQSSSSFSVSLGDRVTITCKASEDIYNRLGWYQQKPGNAP
RLLISGATSLETGVPSRFSGSGSGKDYALSITSLQTEDLATYYCQQCWTSPYTFGGGTKLEIKR
TVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKD
STYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-ASGPR_5F10H-LV-hIgG4H-C (SEQ ID NO: 18):

ATGGGATGGAGCTGGATCTTTCTCTTTCTCTTGTCAGGAACTGGAGGTGTCCTCTCTGAG
GTCCAGCTGCAACAGTCTGGACCTGAGCTGGTGAAGCCTGGGGCTTCAGTGAAGATGTC
CTGCAAGGCTTCTGGATACACCTTCACTGACTACTACATGAAGTGGGTGAAGCAGAGCC
ATGGAAAGAGCCTTGAGTGGATTGGAGATATTAATCCTAACTATGGTGATACTTTCTACA

ACCAGAAGTTCGAGGGCAAGGCCACATTGACTGTAGACAAATCCTCCAGGACAGCCTAC
ATGCAGCTCAACAGCCTGACATCTGAGGACTCTGCAGTCTATTATTGTGGAAGAGGGGA
CTATGGATACTTCGATGTCTGGGGCGCAGGGACCACGGTCACCGTCTCCTCAGCCAAAAC
AAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGC
CGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTC
AGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTA
CTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTG
CAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATG
GTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGT
TCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGG
TGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTG
GAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGT
GGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCA
AGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGG
CAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAA
CCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTG
GGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCG
ACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGG
AATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGC
CTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-ASGPR_5F10H-LV-hIgG4H-C (SEQ ID NO: 19):

MGWSWIFLFLLSGTGGVLSEVQLQQSGPELVKPGASVKMSCKASGYTFTDYYMKWVKQSH
GKSLEWIGDINPNYGDTFYNQKFEGKATLTVDKSSRTAYMQLNSLTSEDSAVYYCGRGDYG
YFDVWGAGTTVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALT
SGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCP
APEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPR
EEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLLSLGKAS

Anti-ASGPR_5F10K-LV-hIgGK-C (SEQ ID NO: 20):

ATGGAGACACATTCTCAGGTCTTTGTATACATGTTGCTGTGGTTGTCTGGTGTTGAAGGA
GACATTGTGATGACCCAGTCTCACAAATTCATGTCCACATCAGTAGGAGACAGGGTCAG
CATCACCTGCAAGGCCAGTCAGGATGTGGGTACTGCTGTAGCCTGGTATCAACAGAAAC
CAGGGCAATCTCCTAAACTACTGATTTACTGGGCATCCACCCGGCACACTGGAGTCCCTG
ATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACCATTAACAATGTGCAGT

CTGAAGACTTGGCAGATTATTTCTGTCAGCAATATAGCAGCAATCCGTACATGTTCGGAG
GGGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-ASGPR_5F10K-LV-hIgGK-C (SEQ ID NO: 21):

METHSQVFVYMLLWLSGVEGDIVMTQSHKFMSTSVGDRVSITCKASQDVGTAVAWYQQKP
GQSPKLLIYWASTRHTGVPDRFTGSGSGTDFTLTINNVQSEDLADYFCQQYSSNPYMFGGGT
KLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-ASGPR1H11_H-V-hIgG4H-C (SEQ ID NO: 22):

ATGGGATGGAGCTGGATCTTTCTCTTTCTCCTGTCAGGAACTGCAGGTGTCCTCTCTGAG
GTCCAGCTGCAACAGTCTGGACCTGAGTTGGTGAAGCCTGGGGCTTCAGTGAAGATATCC
TGCAAGACTTCTGGATACACATTCACTGAATACACCATGCACTGGGTGAGGCAGAGCCA
TGGAAAGAGCCTTGAGTGGATTGGAGGTATTAATCCTATCAATGGTGGTCCTACCTACAA
CCAGAAGTTCAAGGGCAAGGCCACATTGACTGTTGACAAGTCCTCCAGCACAGCCTACA
TGGAGCTCCGCAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGATGGGACT
ATGGTAGTCGAGATGTTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCCTCAG
CCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGA
GCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTACCGGTGACG
GTGTCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAG
TCCTCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACG
AAGACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGT
TGAGTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACC
ATCAGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGA
GGTCACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGT
ACGTGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAA
CAGCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCA
AGGAGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATC
TCCAAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGA
GGAGATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCG
ACATCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCC
TCCCGTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAG

CAGGTGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACC
ACTACACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-ASGPR1H11_H-V-hIgG4H-C (SEQ ID NO: 23):

MGWSWIFLFLLSGTAGVLSEVQLQQSGPELVKPGASVKISCKTSGYTFTEYTMHWV
RSHGKSLEWIGGINPINGGPTYNQKFKGKATLTVDKSSSTAYMELRSLTSEDSAVYY
CARWDYGSRDVMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKD
YFPEPVPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVD
HKPSNTKVDKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVV
DVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTVLHQDWLNGKEY
KCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVKGFYPSDI
AVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEALH
NHYTQKSLSLSLGKAS

Anti-ASGPR1H11K-LV-var2-hIgGK-C (SEQ ID NO: 24):

ATGGAATCACAGACTCTGGTCTTCATATCCATACTGCTCTGGTTATATGGTGCTGATGGG
AACATTGTAATGACTCAATCTCCCAAATCCATGTCCATGTCAGTAGGGGAGAGGGTCACC
TTGAGCTGCAAGGCCAGTGAGAATGTGGGAACTTATGTATCCTGGTATCAACAGAGACC
AGAACAGTCTCCAAAACTGCTGATATACGGGGCATCCAACCGGTACACTGGGGTCCCCG
ATCGCTTCACAGGCAGTGGATCTGCAACAGATTTCACTCTGACCATCAGCAGTGTGCAGG
CTGAGGACCTTGCAGATTATCACTGTGGACAGACTTACAGCTATATATTCACGTTCGGCT
CGGGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-ASGPR1H11K-LV-var2-hIgGK-C (SEQ ID NO: 25):

METHSQVFVYMLLWLSGVEGNIVMTQSPKSMSMSVGERVTLSCKASENVGTYVSWYQQRP
EQSPKLLIYGASNRYTGVPDRFTGSGSATDFTLTISSVQAEDLADYHCGQTYSYIFTFGSGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-CD1d_2B5.3G10_H-V-hIgG4H-C (SEQ ID NO: 26):

ATGGGATGGAGCCGGATCTTTCTCTTCCTCCTGTCAATAACTGCAGGTGTCCATTGCCAG
GTCCAGGTGCAGCAGTCGGGACCTGAGTTGGTGAAGCCTGGGGCCTCAGTGAAGATTTC

CTGCAAAGCCTCTGGCGACGCATTCAGTAGTTCTTGGATGAACTGGGTGAAGCAGAGGC
CTGGACAGGGTCTTGAGTGGATTGGACGGATTTATCTTGGAGATGGAGATATTAATTACA
ATGGGAAGTTCAAGGGCAGGGCCACACTGACTGCAGACAAATCCTCCAGCACAGCCTAC
ATGCAGCTCAGCAGCCTGACCTCTGTGGACTCTGCGGTCTATTTCTGCGCGAGGCAGCTC
GGGCTATGGTATGTTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCCTCAGCC
AAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAG
CACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTG
GAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGG
ACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTA
CACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCA
AATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCT
TCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGT
GCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGAT
GGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGT
ACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTAC
AAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGC
CAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGA
CCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCC
GTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCT
GGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGC
AGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACAC
AGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-CD1d_2B5.3G10_H-V-hIgG4H-C (SEQ ID NO: 27):

MGWSRIFLFLLSITAGVHCQVQVQQSGPELVKPGASVKISCKASGDAFSSSWMNWVKQRPG
QGLEWIGRIYLGDGDINYNGKFKGRATLTADKSSSTAYMQLSSLTSVDSAVYFCARQLGLW
YVMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGA
LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPP
CPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTK
PREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPP
SQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKS
RWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-CD1d_2B5.3G10_K-V-hIgGK-C (SEQ ID NO: 28):

ATGAGTGTGCCCACTCAGGTCCTGGGGTTGCTGCTGCTGTGGCTTACAGGTGCCAGATGT
GACATCCAGATGGCTCAGTCTCCAGCCTCCCTATCTGCATCTGTGGGAGAAACTGTCACC
ATCACATGTCGAGCAAGTGAGAATATTTACAGTTATTTAGCATGGTATCAGCAGAAACA

GGGAAAATCTCCTCAGCTCCTGGTCTATAATGCAAAAACCTTAGCAGAAGGTGTGCCATC
AAGGTTCAGTGGCAGTGGATCAGGCACACAGTTTTCTCTGAAGATCAACAGCCTGCAGC
CTGAAGATTTTGGGAGTTATTACTGTCAACATCATTATGGTTTTCCGTGGACGTTCGGTGG
AGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCC
ATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTA
TCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCC
AGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-CD1d_2B5.3G10_K-V-hIgGK-C (SEQ ID NO: 29):

MSVPTQVLGLLLLWLTGARCDIQMAQSPASLSASVGETVTITCRASENIYSYLAWYQQKQGK
SPQLLVYNAKTLAEGVPSRFSGSGSGTQFSLKINSLQPEDFGSYYCQHHYGFPWTFGGGTKLE
IKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQD
SKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-CD1d_2H11.2G5_H-V-hIgG4H-C (SEQ ID NO: 30):

ATGAACTTCGGGCTCAGCTTGATTTTCCTTGTCCTCATTTTAAAAGGTGTCCAGTGTGAGG
TGCAGCTGGTGGAGTCTGGGGGAGACTTAGTGAAGCCTGGAGGGTCCCTGAAACTCTCC
TGTGCAGCCTCTGGATTCACTTTCAGTAGCTATGGCATGTCTTGGGTTCGCCAGACTCCA
GACAAGAGGCTGGAGTGGGTCGCAGTCATTAGTAGTGGTGGAAGTTCCACCTTCTATCCA
GACAGTGTGAAGGGGCGATTCACCATCTCCAGAGACAATGCCAAGAACACCCTGTACCT
GCAAATGAGCAGTCTGAAGTCTGAGGACACAGCCGTGTATTACTGTTCAAGAGGAGGTT
ACTACTTTGACTACTGGGGCCAAGGCACCACTCTCACAGTCTCCGCAGCCAAAACAAAG
GGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCC
CTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGC
GCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCC
CTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAA
CGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTC
CCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCC
CCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGG
TGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAG
GTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGT
CAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGG
TCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAG
CCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCA
GGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGG

AGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGAC
GGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAA
TGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCT
CTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-CD1d_2H11.2G5_H-V-hIgG4H-C (SEQ ID NO: 31):

MNFGLSLIFLVLILKGVQCEVQLVESGGDLVKPGGSLKLSCAASGFTFSSYGMSWVRQTPDK
RLEWVAVISSGGSSTFYPDSVKGRFTISRDNAKNTLYLQMSSLKSEDTAVYYCSRGGYYFDY
WGQGTTLTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVH
TFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEF
EGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQF
NSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEM
TKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEG
NVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-CD1d_2H11.2G5_K-V-hIgGK-C (SEQ ID NO: 32):

ATGAGGTTCCAGGTTCAGGTTCTGGGGCTCCTTCTGCTCTGGATATCAGGTGCCCAGTGT
GATGTCCAGATAACCCAGTCTCCATCTTATCTTGCTGCATCTCCTGGAGAAACCATTACT
ATTAATTGCAGGGCAAGCAAGACCATTAGCAAATATTTAGCCTGGTATCAAGAGAAACC
TGAGAAAACTGATAAGCTTCTTATCTACTCTGGATCCACTTTGCAATCTGGAATTCCATC
AAGGTTCAGTGGCAGTGGATCTGGTACAGATTTCACTCTCACCATCAGTGGCCTGGAGCC
TGAAGATTTTGCAATGTATTACTGTCAACAGCATAATGAATACCCGTGGACGTTCGGTGG
AGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCC
ATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTA
TCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCC
AGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-CD1d_2H11.2G5_K-V-hIgGK-C (SEQ ID NO: 33):

MRFQVQVLGLLLLWISGAQCDVQITQSPSYLAASPGETITINCRASKTISKYLAWYQEKPEKT
DKLLIYSGSTLQSGIPSRFSGSGSGTDFTLTISGLEPEDFAMYYCQQHNEYPWTFGGGTKLEIK
RTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSK
DSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-CD40_11B6.1C3_H-LV-hIgG4H-C (SEQ ID NO: 34):

ATGGGATGGAGCTGGATCTTTCTCTTTCTCCTGTCAGGAACTGCAGGTGTCCTCTCTGAG
GTCCAGCTGCAACAGTCTGGACCTGAGCTGGTGAAGCCTGGGGCTTCAGTGAAGATATC

CTGCAAGGCTTCTGGTTACTCATTCACTGGCTACTACATGCACTGGGTGAAGCAAAGCCA
TGTAAAGAGCCTTGAGTGGATTGGACGTATTAATCCTTACAATGGTGCTACTAGCTACAA
CCAGAATTTCAAGGACAAGGCCAGCTTGACTGTAGATAAGTCCTCCAGCACAGCCTACA
TGGAGCTCCACAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGAGAGGACT
ACGTCTACTGGGGCCAAGGCACCACTCTCACAGTCTCCTCAGCCAAAACGAAGGGCCCA
TCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCCTGGGC
TGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGCGCCCTG
ACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCCCTCAGC
AGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAACGTAGA
TCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTCCCCCAT
GCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCCCCCCAA
AACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGGTGGAC
GTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAGGTGCA
TAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGTCAGCG
TCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGGTCTCC
AACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCCCCG
AGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCAGGTCA
GCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGGAGAGC
AATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGGCTC
CTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAATGTCT
TCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCTCTCCC
TGTCTCTGGGTAAAGCTAGCTGA

[0001] Anti-CD40_11B6.1C3_H-LV-hIgG4H-C (SEQ ID NO: 35):

MGWSWIFLFLLSGTAGVLSEVQLQQSGPELVKPGASVKISCKASGYSFTGYYMHWV
KQSHVKSLEWIGRINPYNGATSYNQNFKDKASLTVDKSSSTAYMELHSLTSEDSAVY
YCAREDYVYWGQGTTLTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPV
TVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKV
DKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPE
VQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNK
GLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEALHNHYTQKS
LSLSLGKAS

Anti-CD40_11B6.1C3_K-LV-hIgGK-C (SEQ ID NO: 36):

ATGAAGTTGCCTGTTAGGCTGTTGGTGCTGATGTTCTGGATTCCTGCTTCCAGCAGTGATG
TTGTGATGACCCAAACTCCACTCTCCCTGCCTGTCAGTCTTGGAGATCAAGCCTCCATCTC
TTGCAGATCTAGTCAGAGCCTTGTACACAGTAATGGAAACACCTATTTACATTGGTACCT
GCAGAAGCCAGGCCAGTCTCCAAAGCTCCTGATCTACAAAGTTTCCAACCGATTTTCTGG
GGTCCCAGACAGGTTCAGTGGCAGTGGATCAGGGACAGATTTCGCACTCAAGATCAGTA
GAGTGGAGGCTGAGGATCTGGGAGTTTATTTCTGCTCTCAAAGTACACATGTTCCGTGGA
CGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCA
TCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGA
ATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCG
GGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAG
CAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAG
TCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-CD40_11B6.1C3_K-LV-hIgGK-C (SEQ ID NO: 37):

MKLPVRLLVLMFWIPASSSDVVMTQTPLSLPVSLGDQASISCRSSQSLVHSNGNTYLHWYLQ
KPGQSPKLLIYKVSNRFSGVPDRFSGSGSGTDFALKISRVEAEDLGVYFCSQSTHVPWTFGGG
TKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVT
EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-CD40_12B4.2C10_H-LV-hIgG4H-C (SEQ ID NO: 38):

ATGGAATGGAGTTGGATATTTCTCTTTCTTCTGTCAGGAACTGCAGGTGTCCACTCTGAG
GTCCAGCTGCAGCAGTCTGGACCTGAGCTGGTAAAGCCTGGGGCTTCAGTGAAGATGTC
CTGCAAGGCTTCTGGATACACATTCACTGACTATGTTTTGCACTGGGTGAAACAGAAGCC
TGGGCAGGGCCTTGAGTGGATTGGATATATTAATCCTTACAATGATGGTACTAAGTACAA
TGAGAAGTTCAAAGGCAAGGCCACACTGACTTCAGACAAATCCTCCAGCACAGCCTACA
TGGAGCTCAGCAGCCTGACCTCTGAGGACTCTGCGGTCTATTACTGTGCAAGGGGCTATC
CGGCCTACTCTGGGTATGCTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCCT
CAGCCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCG
AGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTG
TCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCC
TCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAG
ACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGA
GTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATC
AGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGT
CACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACG
TGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAG
CACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGG

AGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCC
AAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGA
GATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACA
TCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCC
GTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGG
TGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTAC
ACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-CD40_12B4.2C10_H-LV-hIgG4H-C (SEQ ID NO: 39):

MEWSWIFLFLLSGTAGVHSEVQLQQSGPELVKPGASVKMSCKASGYTFTDYVLHWVKQKP
GQGLEWIGYINPYNDGTKYNEKFKGKATLTSDKSSSTAYMELSSLTSEDSAVYYCARGYPAY
SGYAMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSG
ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCP
PCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKT
KPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTL
PPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVD
KSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-CD40_12B4.2C10_K-LV-v2-hIgGK-C (SEQ ID NO: 40):

ATGATGTCCTCTGCTCAGTTCCTTGGTCTCCTGTTGCTCTGTTTTCAAGGTACCAGATGTG
ATATCCAGATGACACAGACTACATCCTCCCTGTCTGCCTCTCTGGGAGACAGAGTCACCA
TCAGTTGCAGGGCAAGTCAGGACATTAGCAATTATTTAAACTGGTATCAGCAGAAACCA
GATGGAACTGTTAAACTCCTGATCTACTACACATCAAGATTACACTCAGGAGTCCCATCA
AGGTTCAGTGGCAGTGGGTCTGGAACAGATTATTCTCTCACCATTAGCAACCTGGAGCAA
GAAGATATTGCCACTTACTTTTGCCATCATGGTAATACGCTTCCGTGGACGTTCGGTGGA
GGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCA
TCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-CD40_12B4.2C10_K-LV-v2-hIgGK-C (SEQ ID NO: 41):

MMSSAQFLGLLLLCFQGTRCDIQMTQTTSSLSASLGDRVTISCRASQDISNYLNWYQQKPDG
TVKLLIYYTSRLHSGVPSRFSGSGSGTDYSLTISNLEQEDIATYFCHHGNTLPWTFGGGTKLEI
KRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDS
KDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-CD40_12E12.3F3_H-V-hIgG4H-C (SEQ ID NO: 42):

ATGAACTTGGGGCTCAGCTTGATTTTCCTTGTCCTTGTTTTAAAAGGTGTCCAGTGTGAAG
TGAAGCTGGTGGAGTCTGGGGGAGGCTTAGTGCAGCCTGGAGGGTCCCTGAAACTCTCC
TGTGCAACCTCTGGATTCACTTTCAGTGACTATTACATGTATTGGGTTCGCCAGACTCCAG
AGAAGAGGCTGGAGTGGGTCGCATACATTAATTCTGGTGGTGGTAGCACCTATTATCCAG
ACACTGTAAAGGGCCGATTCACCATCTCCAGAGACAATGCCAAGAACACCCTGTACCTG
CAAATGAGCCGGCTGAAGTCTGAGGACACAGCCATGTATTACTGTGCAAGACGGGGGTT
ACCGTTCCATGCTATGGACTATTGGGGTCAAGGAACCTCAGTCACCGTCTCCTCAGCCAA
AACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCAC
AGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGA
ACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGAC
TCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACA
CCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAA
TATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTC
CTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGC
GTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGG
CGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACC
GTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAG
TGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAA
AGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCA
AGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTG
GAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGG
ACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAG
GAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAG
AAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-CD40_12E12.3F3_H-V-hIgG4H-C (SEQ ID NO: 43):

MNLGLSLIFLVLVLKGVQCEVKLVESGGGLVQPGGSLKLSCATSGFTFSDYYMYWVRQTPE
KRLEWVAYINSGGGSTYYPDTVKGRFTISRDNAKNTLYLQMSRLKSEDTAMYYCARRGLPF
HAMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGA
LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPP
CPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTK
PREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPP
SQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKS
RWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-CD40_12E12.3F3_K-LV-hIgGK-C (SEQ ID NO: 44):

ATGATGTCCTCTGCTCAGTTCCTTGGTCTCCTGTTGCTCTGTTTTCAAGGTACCAGATGTG
ATATCCAGATGACACAGACTACATCCTCCCTGTCTGCCTCTCTAGGAGACAGAGTCACCA
TCAGTTGCAGTGCAAGTCAGGGCATTAGCAATTATTTAAACTGGTATCAGCAGAAACCA
GATGGAACTGTTAAACTCCTGATCTATTACACATCAATTTTACACTCAGGAGTCCCATCA
AGGTTCAGTGGCAGTGGGTCTGGGACAGATTATTCTCTCACCATCGGCAACCTGGAACCT
GAAGATATTGCCACTTACTATTGTCAGCAGTTTAATAAGCTTCCTCCGACGTTCGGTGGA
GGCACCAAACTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCA
TCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-CD40_12E12.3F3_K-LV-hIgGK-C (SEQ ID NO: 45):

MMSSAQFLGLLLLCFQGTRCDIQMTQTTSSLSASLGDRVTISCSASQGISNYLNWYQQKPDG
TVKLLIYYTSILHSGVPSRFSGSGSGTDYSLTIGNLEPEDIATYYCQQFNKLPPTFGGGTKLEIK
RTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSK
DSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_24A5.4A5_H-V-hIgG4H-C (SEQ ID NO: 46):

ATGGATTGGCTGTGGAACTTGCTATTCCTGATGGCAGCTGCCCAAAGTGCCCAAGCACAG
ATCCAGTTGGTGCAGTCTGGACCTGAGCTGAAGAAGCCTGGAGAGACAGTCAAGATCTC
CTGCAAGGCTTCTGGGTATTCCTTCACAAACTATGGAATGAACTGGGTGAAACAGGCTCC
AGGAAAGGGTTTAAAGTGGATGGGCTGGATAAACACCTACACTGGAGAGTCAACATATG
CTGATGACTTCAAGGGACGGTTTGCCTTCTCTTTGGAAACCTCTGCCAGCACTGCCTATTT
GCAGATCAGTAACCTCAAAAATGAGGACATGGCTACATATTTCTGTGCTAGAGGGGACT
TTAGGTACTACTATTTTGACTACTGGGGCCAAGGCACCACTCTCACAGGCTCCTCAGCCA
AAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGC
ACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGG
AACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGA
CTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTAC
ACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAA
ATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTT
CCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTG
CGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATG
GCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTA
CCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACA

AGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCC
AAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGAC
CAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGT
GGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTG
GACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCA
GGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACA
GAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGAT

Anti-DCIR_24A5.4A5_H-V-hIgG4H-C (SEQ ID NO: 47):

MDWLWNLLFLMAAAQSAQAQIQLVQSGPELKKPGETVKISCKASGYSFTNYGMNWVKQAP
GKGLKWMGWINTYTGESTYADDFKGRFAFSLETSASTAYLQISNLKNEDMATYFCARGDFR
YYYFDYWGQGTTLTGSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGA
LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPP
CPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTK
PREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPP
SQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKS
RWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_24A5.4A5_K-V-hIgGK-C (SEQ ID NO: 48):

ATGAGTGTGCTCACTCAGGTCCTGGCGTTGCTGCTGCTGTGGCTTACAGGTGCCAGATGT
GACATCCAGATGACTCAGTCTCCAGCCTCCCTATCTGCATCTGTGGGAGAAACTGTCACC
ATCACGTGTCGAGCAAGTGGGAATATTCACAATTATTTAGCATGGTATCAGCAGAAACA
GGGAAAATCTCCTCAGCTCCTGGTCTATAATGCAAAAACCTTGGCAGATGGTGTGCCATC
AAGGTTCAGTGGCAGTGGATCAGGAACACAATATTCTCTCAAGATCAACACCCTGCAGC
CTGAAGATTTTGGGAGTTATTACTGTCAACATTTTTGGGATTCTTGGACGTTCGGTGGAG
GCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCAT
CTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_24A5.4A5_K-V-hIgGK-C (SEQ ID NO: 49):

MSVLTQVLALLLLWLTGARCDIQMTQSPASLSASVGETVTITCRASGNIHNYLAWYQQKQG
KSPQLLVYNAKTLADGVPSRFSGSGSGTQYSLKINTLQPEDFGSYYCQHFWDSWTFGGGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_24E7.3H9_H-V-hIgG4H-C (SEQ ID NO: 50):

ATGGAATGGACCTGGGTCTTTCTCTTCCTCCTGTCAGTAACTGCAGGTGTCCACTCCCAG
GTTCAGCTGCAGCAGTCTGGAGCTGAGCTGATGAAGCCTGGGGCCTCAGTGAAGATATC
CTGCAAGGCTACTGGCTACACATTCAGTAGCTACTGGATAGAGTGGGTAAAGCAGAGGC
CTGGACATGGCCTTGAGTGGATTGGAGAGATTTTACCTGGAAGTGGTAGGACTAACGAC
AATGAGAAGTTCAAGGGCAAGGCCACATTCACTGCAGATACATCCTCCAAGAAAGCCTA
CATGCAACTCAGCAGCCTGACATCTGAGGACTCTGCCGTCTATTATTGTGCAAGAAGGGG
TGGTTACTCCTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAAC
AAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGC
CGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTC
AGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTA
CTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTG
CAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATG
GTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGT
TCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGG
TGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTG
GAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGT
GGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCA
AGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGG
CAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAA
CCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTG
GGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCG
ACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGG
AATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGC
CTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_24E7.3H9_H-V-hIgG4H-C (SEQ ID NO: 51):

MEWTWVFLFLLSVTAGVHSQVQLQQSGAELMKPGASVKISCKATGYTFSSYWIEWVKQRP
GHGLEWIGEILPGSGRTNDNEKFKGKATFTADTSSKKAYMQLSSLTSEDSAVYYCARRGGYS
FAYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTS
GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPA
PEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPRE
EQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQ
EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRW
QEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_24E7.3H9_K-V-hIgGK-C (SEQ ID NO: 52):

ATGACCATGTTCTCACTAGCTCTTCTCCTCAGTCTTCTTCTCCTCTGTGTCTCTGATTCTAG
GGCAGAAACAACTGTGACCCAGTCTATGACCATGTTCTCACTAGCTCTTCTCCTCAGTCTT
CTTCTCCTCTGTGTCTCTGATTCTAGGGCAGAAACAACTGTGACCCAGTCTCCAGCATCCC
TGTCCATGGCTATAGGGGAAAAAGTCACCATCAGATGCGTAACCAGCACTGATATTGAT
GATGATGTGAACTGGTACCAGCAGAAGCCAGGGGAACCTCCTAAACTCCTTATTTCAGA
AGGCAATACTCTTCGTCCTGGAGTCCCATCCCGATTCTCCAGCAGTGGCTATGGTACAGA
TTTTGTTTTTACAATTGAGAACATGCTCTCAGAAGATGTTGCAGATTACTACTGTTTGCAA
AGTGGTAACTTGCCGTACACGTTCGGAGGGGGGACCAAGCTCGAGATCAAACGAACTGT
GGCTGCACCATCTGTCTTCATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGC
CTCTGTTGTGTGCCTGCTGAATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGT
GGATAACGCCCTCCAATCGGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGG
ACAGCACCTACAGCCTCAGCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACAC
AAAGTCTATGCCTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTC
AACAGGGGAGAGTGTTAGCCAGCATCCCTGTCCATGGCTATAGGGGAAAAAGTCACCAT
CAGATGCGTAACCAGCACTGATATTGATGATGATGTGAACTGGTACCAGCAGAAGCCAG
GGGAACCTCCTAAACTCCTTATTTCAGAAGGCAATACTCTTCGTCCTGGAGTCCCATCCC
GATTCTCCAGCAGTGGCTATGGTACAGATTTTGTTTTTACAATTGAGAACATGCTCTCAG
AAGATGTTGCAGATTACTACTGTTTGCAAAGTGGTAACTTGCCGTACACGTTCGGAGGGG
GGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCAT
CTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_24E7.3H9_K-V-hIgGK-C (SEQ ID NO: 53):

MTMFSLALLLSLLLLCVSDSRAETTVTQSPASLSMAIGEKVTIRCVTSTDIDDDVNWYQQKPG
EPPKLLISEGNTLRPGVPSRFSSSGYGTDFVFTIENMLSEDVADYYCLQSGNLPYTFGGGTKLE
IKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQD
SKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_29E9.2E2_H-VhIgG4H-C (SEQ ID NO: 54):

ATGGCTTGGGTGTGGACCTTGCTATTCCTGATGGCAGCTGCCCAAAGTGCCCAAGCACAG
ATCCAGTTGGTGCAGTCTGGACCTGAGCTGAAGAAGCCTGGAGAGACAGTCAAGATCTC
CTGCAAGGCTTCTGGGTATACCTTCACAAACTATGGAATGAACTGGGTGAAGCAGGCTCC
AGGAAAGGGTTTAAAGTGGGTGGGCTGGATAAACACCTTCACTGGAGAGCCAACATATG
TTGATGACTTCAAGGGACGGTTTGCCTTCTCTTTGGAAACCTCTGCCAGCACTGCCTATTT

GCAGATCAACAACCTCAAAAATGAGGACACGGCTACATATTTCTGTGCAAGAGGGAATT
TTAGGTACTACTACTTTGACTACTGGGGCCAAGGCACCACTCTCACAGTCTCCTCAGCCA
AAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGC
ACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGG
AACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGA
CTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTAC
ACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAA
ATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTT
CCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTG
CGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATG
GCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTA
CCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACA
AGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCC
AAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGAC
CAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGT
GGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTG
GACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCA
GGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACA
GAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_29E9.2E2_H-VhIgG4H-C (SEQ ID NO: 55):

MAWVWTLLFLMAAAQSAQAQIQLVQSGPELKKPGETVKISCKASGYTFTNYGMNWVKQAP
GKGLKWVGWINTFTGEPTYVDDFKGRFAFSLETSASTAYLQINNLKNEDTATYFCARGNFRY
YYFDYWGQGTTLTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGAL
TSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPC
PAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKP
REEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_29E9.2E2_K-V-hIgGK-C (SEQ ID NO: 56):

ATGAGTGTGCTCACTCAGGTCCTGGCGTTGCTGCTGCTGTGGCTTACAGGTGCCAGATGT
GACATCCAGATGACTCAGTCCCCAGCCTCCCTATCTGCATCTGTGGGAGAAACTGTCACC
ATCACATGTCGAACAAGTGGGAATATTCGCAATTATTTAGCATGGTATCAGCAGAAACA
GGGAAAATCTCCTCAACTCCTGGTCTATAATGCAAAAACCTTAGCAGATGGTGTGCCATC
AAGGTTCGGTGGCAGTGGATCAGGAACACAATATTCTCTCAAGATCAACAGCCTGCAGC
CTGAAGATTTTGGGAATTATTACTGTCAACATTTTTGGAGTAGTCCGTACACGTTCGGAG

GGGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_29E9.2E2_K-V-hIgGK-C (SEQ ID NO: 57):

MSVLTQVLALLLLWLTGARCDIQMTQSPASLSASVGETVTITCRTSGNIRNYLAWYQQKQG
KSPQLLVYNAKTLADGVPSRFGGSGSGTQYSLKINSLQPEDFGNYYCQHFWSSPYTFGGGTK
LEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_29G10.3D9_H-V-hIgG4H-C (SEQ ID NO: 58):

ATGATGGGATGGAGCTATATCATCCTCTTTTTGGTAGCAACAGCTACAGATGTCCACTCC
CAGGTCCAACTGCAGCAGCCTGGGGCTGAACTGGTGAAGCCTGGGGCTTCAGTGAAGCT
GTCCTGCAAGGCTTCTGGCTACACCTTCACCAGCTACTGGATGCACTGGGTGAAGCAGAG
GCCTGGAGAAGGCCTTGAGTGGATTGGAGAGATTAATCCTAGCTACGGTCGTACTGACT
ACAATGAGAAGTTCAAGAACAAGGCCACACTGACTGTAGCCAAATCCTCCAGCACAGCC
TACATGCAACTCAGCAGCCTGACATCTGAGGACTCTGCGGTCTATTACTGTGCAAGAGGA
GATTACTACGGTAGTAGCTCGTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCT
GCAGCCAAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCC
GAGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGT
GTCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTC
CTCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAA
GACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTG
AGTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCAT
CAGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGG
TCACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTAC
GTGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACA
GCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAG
GAGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTC
CAAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGG
AGATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGAC
ATCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCC
CGTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAG
GTGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTA

CACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCGGATGGAGCTATATCATCCT
CTTTTTGGTAGCAACAGCTACAGATGTCCACTCCCAGGTCCAACTGCAGCAGCCTGGGGC
TGAACTGGTGAAGCCTGGGGCTTCAGTGAAGCTGTCCTGCAAGGCTTCTGGCTACACCTT
CACCAGCTACTGGATGCACTGGGTGAAGCAGAGGCCTGGAGAAGGCCTTGAGTGGATTG
GAGAGATTAATCCTAGCTACGGTCGTACTGACTACAATGGGAAGTTCAAGAACAAGGCC
ACACTGACTGTAGCCAAATCCTCCAGCACAGCCTACATGCAACTCAGCAGCCTGACATCT
GAGGACTCTGCGGTCTATTACTGTGCAAGAGGAGATTACTACGGTAGTAGCTCGTTTGCT
TACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAACAAAGGGCCCATCCGT
CTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCCTGGGCTGCCT
GGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGCGCCCTGACCA
GCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCCCTCAGCAGCG
TGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAACGTAGATCAC
AAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTCCCCCATGCCC
ACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCCCCCCAAAACC
CAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGGTGGACGTGA
GCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAGGTGCATAAT
GCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGTCAGCGTCCT
CACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGGTCTCCAACA
AAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCCCCGAGAG
CCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCAGGTCAGCCT
GACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGGAGAGCAATG
GGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGGCTCCTTC
TTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAATGTCTTCTC
ATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCTCTCCCTGTC
TCTGGGTAAAGCTAGCTGA

Anti-DCIR_29G10.3D9_H-V-hIgG4H-C (SEQ ID NO: 59):

MMGWSYIILFLVATATDVHSQVQLQQPGAELVKPGASVKLSCKASGYTFTSYWMHWVKQR
PGEGLEWIGEINPSYGRTDYNEKFKNKATLTVAKSSSTAYMQLSSLTSEDSAVYYCARGDYY
GSSSFAYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSG
ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCP
PCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKT
KPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTL
PPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVD
KSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_29G10.3D9_K-Var1-V-hIgGK-C (SEQ ID NO: 60):

ATGGATTTTCAAGTGCAGATTTTCAGCTTCCTGCTAATGAGTGCCTCAGTCATAATGTCCA
GGGGACAAATTGTTCTCACCCAGTCTCCAGCACTCATGTCTGCATCTCCAGGGGAGAAGG
TCACCATGACCTGCAGTGCCAGCTCAAATATAAGTTACATGTACTGGTACCAGCAGAAGC
CAAGATCCTCCCCCAAACCCTGGATTTATCTCACATCCAACCTGGCTTCTGGAGTCCCTG
CTCGCTTCAGTGGCAGTGGGTCTGGGACCTCTTACTCTCTCACAACCAGCAGCATGGAGG
CTGAAGATGCTGCCACTTATTGCTGCCAGCAGTGGAGTAGTAACCCACCCACGTTCGGTG
CTGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_29G10.3D9_K-Var1-V-hIgGK-C (SEQ ID NO: 61):

MDFQVQIFSFLLMSASVIMSRGQIVLTQSPALMSASPGEKVTMTCSASSNISYMYWYQQKPR
SSPKPWIYLTSNLASGVPARFSGSGSGTSYSLTTSSMEAEDAATYCCQQWSSNPPTFGAGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_29G10.3D9_K-Var2-V-hIgGK-C (SEQ ID NO: 62):

ATGGATTTTCGAGTGCAGATTTTCAGCTTCCTGCTAATGAGTGCCTCAGTCATAATGTCCA
GGGGACAAATTGTTCTCACCCAGTCTCCAGCACTCATGTCTGCATCTCCAGGGGAGAAGG
TCACCATGACCTGCAGTGCCAGCTCAAATATAAGTTACATGTACTGGTACCAGCAGAAGC
CAAGATCCTCCCCCAAACCCTGGATTTATCTCACATCCAACCTGGCTTCTGGAGTCCCTG
CTCGCTTCAGTGGCAGTGGGTCTGGGACCTCTTACTCTCTCACAATCAGCAGCATGGAGG
CTGAAGATGCTGCCACTTATTACTGCCAGCAGTGGAGTAGTAACCCACCCACGTTCGGTG
CTGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_29G10.3D9_K-Var2-V-hIgGK-C (SEQ ID NO: 63):

MDFRVQIFSFLLMSASVIMSRGQIVLTQSPALMSASPGEKVTMTCSASSNISYMYWYQQKPR
SSPKPWIYLTSNLASGVPARFSGSGSGTSYSLTISSMEAEDAATYYCQQWSSNPPTFGAGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_2C9K-V-hIgGK-C (SEQ ID NO: 64):

ATGGAGACAGACACACTCCTGCTATGGGTGCTGCTGCTCTGGGTTCCAGGTTCCACAGGT
GACATTGTGCTGATCCAATCTCCAGCTTCTTTGGCTGTGTCTCTAGGGCAGAGGGCCACC
ATATCCTGCAGAGCCAGTGAAAGTGTTGATAGTTATGTCAATAGTTTTATGCACTGGTAC
CAGCAGAAACCAGGACAGCCACCCAAACTCCTCATCTATCGTGTATCCAACCTAGAATCT
GGGATCCCTGCCAGGTTCAGTGGCAGTGGGTCTAGGACAGACTTCACCCTCACCATTAAT
CCTGTGGAGGCTGATGATGTTGCAACCTATTACTGTCAGCAAAGTAATGAGGATCCATTC
ACGTTCGGCTCGGGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTC
ATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-DCIR_2C9K-V-hIgGK-C (SEQ ID NO: 65):

METDTLLLWVLLLWVPGSTGDIVLIQSPASLAVSLGQRATISCRASESVDSYVNSFMHWYQQ
KPGQPPKLLIYRVSNLESGIPARFSGSGSRTDFTLTINPVEADDVATYYCQQSNEDPFTFGSGT
KLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC.

Anti-DCIR_31A6.1F5_H-var2-V-hIgG4H-C (SEQ ID NO: 66):

ATGGAATGTAACTGGATACTTCCTTTTATTCTGTCGGTAATTTCAGGGGTCTACTCAGAG
GTTCAGCTCCAGCAGTCTGGGACTGTGCTGGCAAGGCCTGGGGCTTCCGTGAATATGTCC
TGTAAGGCTGCTGGCTACAGCTTTACCAGTTACTGGGTGTACTGGGTCAAACAGAGGCCT
GGACAGGGTCTGGAATGGATTGGTGCTATTTACCCTAAAAATAGTAGAACTAGCTACAA
CCAGAAGTTCCAGGACAAGGCCACACTGACTGCAGTCACATCCGCCAGCACTGCCTACA
TGGAGCTCAGCAGCCTGACAAATGAGGACTCTGCGGTCTATTACTGTACAAGACCTCACT
ATGATTCGTTTGGTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAACAaa
gggcccATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCC
TGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGC
GCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCC
CTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAA
CGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTC
CCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCC
CCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGG
TGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAG

GTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGT
CAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGG
TCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAG
CCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCA
GGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGG
AGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGAC
GGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAA
TGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCT
CTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_31A6.1F5_H-var2-V-hIgG4H-C (SEQ ID NO: 67):

MECNWILPFILSVISGVYSEVQLQQSGTVLARPGASVNMSCKAAGYSFTSYWVYWVKQRPG
QGLEWIGAIYPKNSRTSYNQKFQDKATLTAVTSASTAYMELSSLTNEDSAVYYCTRPHYDSF
GYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSG
VHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAP
EFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREE
QFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQE
EMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQ
EGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_31A6.1F5_K-var2-V-hIgGK-C (SEQ ID NO: 68):

ATGGAGACAGACACACTCCTGCTATGGGTGCTGCTGCTCTGGGTTCCAGGTTCCACAGGT
GACATTGTGCTGACCCAATCTCCAGCTTCTTTGGCTGTGTCTCTAGGGCAGAGGGCCACC
ATATCCTGCAGAGCCAGTGAAAGTGTAGATAGTTATGGCATTAGTTTTATGCACTGGTAC
CAGCAGAAACCAGGACAGCCACCCAAACTCCTCATCTATCGTGCATCCAACCAAGAATC
TGGGATCCCTGCCAGGTTCAGTGGCAGTGGGTCTAGGACAGACTTCACCCTCACCATTAA
TCCTGTGGAGGCTGATGATGTTGCAACCTATTACTGTCAGCAAAGTAATGAGGATCCGCT
CACGTTCGGTGCTGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTT
CATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-DCIR_31A6.1F5_K-var2-V-hIgGK-C (SEQ ID NO: 69):

METDTLLLWVLLLWVPGSTGDIVLTQSPASLAVSLGQRATISCRASESVDSYGISFMHWYQQ
KPGQPPKLLIYRASNQESGIPARFSGSGSRTDFTLTINPVEADDVATYYCQQSNEDPLTFGAGT

KLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_3C2.2D9_H-LV-hIgG4H-C (SEQ ID NO: 70):

ATGAACAGGCTTACTTCCTCATTGCTGCTGCTGATTGTCCCTGCATATGTCCTGTCCCAGG
TTACTCTGAAAGAGTCTGGCCCTGGGATATTGCAGCCCTCCCAGACCCTCAGTCTGACTT
GTTCTTTCTCTGGGTTTTCACTGAGCACTTCTGGTATGGGTGTGAGCTGGATTCGTCAGCC
TTCAGGAAAGGGTCTGGAGTGGCTGGCACACATTTACTGGGATGATGACAAGCGCTATA
ATCCATCCCTGAAGAGCCGGCTCACAATCTTTAAGGATCCCTCCAGCAACCAGGTATTCC
TCAGGATCACCAGTGTGGACACTGCAGATACTGCCACATACTACTGTGCTCGAAACTCCC
ATTACTACGGTAGTACTTACGGGGGATACTTCGATGTCTGGGGCGCAGGGACCACGGTC
ACCGTCTCCTCAGCCAAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGG
AGCACCTCCGAGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACC
GGTGACGGTGTCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGT
CCTACAGTCCTCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTT
GGGCACGAAGACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACA
AGAGAGTTGAGTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAG
GGGGACCATCAGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGA
CCCCTGAGGTCACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTC
AACTGGTACGTGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGC
AGTTCAACAGCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGA
ACGGCAAGGAGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAA
ACCATCTCCAAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATC
CCAGGAGGAGATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACC
CCAGCGACATCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGAC
CACGCCTCCCGTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGA
CAAGAGCAGGTGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGC
ACAACCACTACACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_3C2.2D9_H-LV-hIgG4H-C (SEQ ID NO: 71):

NRLTSSLLLLIVPAYVLSQQVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMGVSWIRQPSGKG
LEWLAHIYWDDDKRYNPSLKSRLTIFKDPSSNQVFLRITSVDTADTATYYCARNSHYYGSTY
GGYFDVWGAGTTVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGA
LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPP
CPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTK
PREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPP

SQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKS
RWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS.

Anti-DCIR_3C2.2D9_K-LV-hIgGK-C (SEQ ID NO: 72):

ATGGAGACAGACACACTCCTGCTATGGGTGCTGCTGCTCGGGGTTCCAGGTTCCACAGGT
AACATTGTGCTGACCCAGTCTCCAACTTCTTTCACTGTGTCTCTTGGGCAGAGGGCCACC
ATATCCTGCAGAGCCAGTGAAAGTGTTCATAGTTATGGCAATAGTTTTATGCACTGGTAC
CAGCAGAAACCAGGGCAGCCACCCAAACTCCTCATCTATCTTGCATCCAACGTAGAATCT
GGGGTCCCTGCCAGGTTCAGTGGTAGTGGGTCCAGGACAGACTTCACCCTCACCATTGAT
CCTGTGGAGGCTGATGATGCTGCAACCTATTACTGTCAGCAAAATAGTGAGGATCCGTGG
ACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTC
ATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-DCIR_3C2.2D9_K-LV-hIgGK-C (SEQ ID NO: 73):

METDTLLLWVLLLGVPGSTGNIVLTQSPTSFTVSLGQRATISCRASESVHSYGNSFMHWYQQ
KPGQPPKLLIYLASNVESGVPARFSGSGSRTDFTLTIDPVEADDAATYYCQQNSEDPWTFGGG
TKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVT
EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_6C8.1G9_H-V-hIgG4H-C (SEQ ID NO: 74):

ATGGAATGGACCTGGGTCTTTCTCTTCCTCCTGTCAGTAACTGCAGGTGTCCACTCCCAG
GTTCAGCTGCAGCAGTCTGGAACTGAGCTGATGAAGCCTGGGGCCTCAGTGAAGATATC
CTGCAAGGCTACTGGCTACACATTCAGTACCTACTGGATAGAGTGGGTAAAGCAGAGGC
CTGGACATGGCCTTGAGTGGATTGGAGAGATTTTACCTGGAAGTGGTAGGACTAACGAC
AATGAGAAGTTCAAGGGCAAGGCCACAATCACTGCAGATACATCCTCCAAGAAAGCCTA
CATGCAACTCAGCAGCCTGACATCTGAGGACTCTGCCGTCTATTACTGTGCAAGAAGGGG
TGGTTACTCCTTTGCTTTCTGGGGCCAAGGGACTCTGGTCTCTGTCTCTGCAGCCAAAACA
AAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCC
GCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCA
GGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTAC
TCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGC
AACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGG
TCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTT

CCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGT
GGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGG
AGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTG
GTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAA
GGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGC
AGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAAC
CAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGG
GAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGA
CGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGA
ATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCC
TCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_6C8.1G9_H-V-hIgG4H-C (SEQ ID NO: 75):

MEWTWVFLFLLSVTAGVHSQVQLQQSGTELMKPGASVKISCKATGYTFSTYWIEWVKQRPG
HGLEWIGEILPGSGRTNDNEKFKGKATITADTSSKKAYMQLSSLTSEDSAVYYCARRGGYSF
AFWGQGTLVSVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSG
VHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAP
EFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREE
QFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQE
EMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQ
EGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_6C8.1G9_K-V-hIgGK-C (SEQ ID NO: 76):

ATGACCATGTTCTCACTAGCTCTTCTCCTCAGTCTTCTTCTCCTCTGTGTCTCTGATTCTAG
GGCAGAAACAACTGTGACCCAGTCTCCAGCATCCCTGTCCATGGCTATAGGAGAAAAAG
TCACCATCAGATGCGTAACCAGCACTGATATTGATGATGATGTGAACTGGTACCAGCAG
AAGCCAGGGGAACCTCCTAAGCTCCTTATTTCAGAAGGCAATACTCTTCGTGCTGGAGTC
CCATCCCGATTCTCCAGCAGTGGCTATGGTACAGATTTTGTTTTTACAATTGAGAACATG
CTCTCAGAAGATGTTGCAGATTACTACTGTTTGCAAAGTGGTAACTTGCCGTACACGTTC
GGAGGGGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTC
CCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAAC
TTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAA
CTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCA
CCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACC
CATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-DCIR_6C8.1G9_K-V-hIgGK-C (SEQ ID NO: 77):

MTMFSLALLLSLLLLCVSDSRAETTVTQSPASLSMAIGEKVTIRCVTSTDIDDDVNWYQQKPG
EPPKLLISEGNTLRAGVPSRFSSSGYGTDFVFTIENMLSEDVADYYCLQSGNLPYTFGGGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR_9E8.1E3_H-V-hIgG4H-C (SEQ ID NO: 78):

ATGAACAGGCTTACTTCCTCATTGCTGCTGCTGATTGTCCCTGCATATGTCCTGTCCCAGG
TTACTCTGAAAGAGTCTGGCCCTGGGATATTGCAGCCCTCCCAGACCCTCAGTCTGACTT
GTTCTTTCTCTGGGTTTTCACTGAGCACTTCTGGTATGGGTCTGAGCTGGATTCGTCAGCC
TTCAGGAAAGGGTCTGGAGTGGCTGGCACACATTTACTGGGATGATGACAAGCGCTATA
ACCCATCCCTGAAGAGCCGGCTCACAATCTCCAAGGATACCTCCAGCAACCAGGTTTTCC
TCAAGATCACCATTGTGGACACTGCAGATGCTGCCACATACTACTGTGCTCGAAGCTCCC
ATTACTACGGTTATGGCTACGGGGGATACTTCGATGTCTGGGGCGCAGGGACCACGGTC
ACCGTCTCCTCAGCCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGG
AGCACCTCCGAGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACC
GGTGACGGTGTCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGT
CCTACAGTCCTCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTT
GGGCACGAAGACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACA
AGAGAGTTGAGTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAG
GGGGACCATCAGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGA
CCCCTGAGGTCACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTC
AACTGGTACGTGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGC
AGTTCAACAGCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGA
ACGGCAAGGAGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAA
ACCATCTCCAAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATC
CCAGGAGGAGATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACC
CCAGCGACATCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGAC
CACGCCTCCCGTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGA
CAAGAGCAGGTGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGC
ACAACCACTACACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DCIR_9E8.1E3_H-V-hIgG4H-C (SEQ ID NO: 79):

MNRLTSSLLLLIVPAYVLSQVTLKESGPGILQPSQTLSLTCSFSGFSLSTSGMGLSWIRQPSGKG
LEWLAHIYWDDDKRYNPSLKSRLTISKDTSSNQVFLKITIVDTADAATYYCARSSHYYGYGY
GGYFDVWGAGTTVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGA
LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPP
CPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTK

PREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPP
SQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKS
RWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-DCIR_9E8.1E3_K-LV-hIgGK-C (SEQ ID NO: 80):

ATGGAGACAGACACACTCCTGCTATGGGTGCTGCTGCTCTGGGTTCCAGGTTCCACAGGT
AACATTGTGCTGACCCAATCTCCAGCTTCTTTGGCTGTGTCTCTAGGGCAGAGGGCCACC
ATATCCTGCAGAGCCAGTGAAAGTATTCATAGTTATGGCAATAGTTTTCTGCACTGGTAC
CAGCAGAAACCAGGACAGCCACCCAAACTCCTCATCTATCTTGCATCCAACCTAGAATCT
GGGGTCCCTGCCAGGTTCAGCGGCAGTGGGTCTAGGACAGACTTCACCCTCACCATTGAT
CCTGTGGAGGCTGATGATGCTGCAACCTATTACTGTCAGCAAAATAATGAGGATCCGTGG
ACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTC
ATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
GGCGGCCGCACTAGCGCGGGCCGCATTCGAAGAGCTCGGTACCCGGGGATCCTCTAGAG
TCGACCTGCAGGCATGCAAGCTGGCCGCGACTCTAGATCATAATCAGC

Anti-DCIR_9E8.1E3_K-LV-hIgGK-C (SEQ ID NO: 81):

METDTLLLWVLLLWVPGSTGNIVLTQSPASLAVSLGQRATISCRASESIHSYGNSFLHWYQQ
KPGQPPKLLIYLASNLESGVPARFSGSGSRTDFTLTIDPVEADDAATYYCQQNNEDPWTFGGG
TKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVT
EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-DCIR2C9H-LV-hIgG4H-V-hIgG4H-C (SEQ ID NO: 82):

ATGAAATGCAGCTGGGTCATCTTCTTCCTGATGGCAGTGGTTACAGGGGTCAATTCAGAG
GTTCAGCTGCAGCAGTCTGGGGCTGAGCTTGTGAGGCCAGGGGCCTTAGTCAAGTTGTCC
TGCAAAGCTTCTGGCTTCAACATTAATGACTACTATATCCACTGGGTGAAGCAGCGGCCT
GAACAGGGCCTGGAGCGGATTGGATGGATTGATCCTGACAATGGTAATACTATATATGA
CCCGAAGTTCCAGGGCAAGGCCAGTATAACAGCAGACACATCCCCCAACACAGCCTACC
TGCAGCTCAGCAGCCTGACATCTGAGGACACTGCCGTCTATTACTGTGCTAGAACCCGAT
CTCCTATGGTTACGACGGGGTTTGTTTACTGGGGCCAAGGGACTGTGGTCACTGTCTCTG
CAGCCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCG
AGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTG
TCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCC
TCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAG

ACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGA
GTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATC
AGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGT
CACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACG
TGGATGGCGTGGAGGTGCATAATGCCAAGACRAAGCCGCGGGAGGAGCAGTTCAACAGC
ACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGA
GTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCA
AAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAG
ATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACAT
CGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCC
GTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGG
TGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTAC
ACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAATGA

Anti-DCIR2C9H-LV-hIgG4H-V-hIgG4H-C (SEQ ID NO: 83):

MKCSWVIFFLMAVVTGVNSEVQLQQSGAELVRPGALVKLSCKASGFNINDYYIHWVKQRPE
QGLERIGWIDPDNGNTIYDPKFQGKASITADTSPNTAYLQLSSLTSEDTAVYYCARTRSPMVT
TGFVYWGQGTVVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGAL
TSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPC
PAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKXKP
REEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLSLSLGK

Anti-DC-SIGNL16E3H (SEQ ID NO: 84):

ATGGAAAGGCACTGGATCTTTCTCTTCCTGTTTTCAGTAACTGCAGGTGTCCACTCCCAG
GTCCAGCTTCAGCAGTCTGGGGCTGAGCTGGCAAAACCTGGGGCCTCAGTGAAGATGTC
CTGCAAGGCTTCTGGCTACACCTTTACTACCTACTGGATGCACTGGGTAAAACAGAGGCC
TGGACAGGGTCTGGAATGGATTGGATACATTAATCCTATCACTGGTTATACTGAGTACAA
TCAGAAGTTCAAGGACAAGGCCACCTTGACTGCAGACAAATCCTCCAGCACAGCCTACA
TGCAACTGAGCAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGAGAGGGTT
TAAGTGCTATGGACTATTGGGGTCAGGGAACCTCAGTCACCGTCACCTCAGCCAAAACA
ACAGCCCCATCGGTCTATCCACTGGCCCCTGTGTGTGGAGATACAACTGGCTCCTCGGTA
ACTCTAGGATGCCTGGTCAAGGGTTATTTCCCTGAGCCAGTGACCTTGACCTGGAACTCT
GGATCCCTGTCCAGTGGTGTGCACACCTTCCCAGCTGTCCTGCAGTCTGACCTCTACACC
CTCAGCAGCTCAGTGACTGTAACCTCGAGCACCTGGCCCAGCCAGACCGTCACCTGCAGC
GTTGCTCACCCAGCCAGCAGCACCACGGTGGACAAAAAACTTGAGCCCAGCGGGCCCAT

TTCAACAATCAACCCCTGTCCTCCATGCAAGGAGTGTCACAAATGCCCAGCTCCTAACCT
CGAGGGTGGACCATCCGTCTTCATCTTCCCTCCAAATATCAAGGATGTACTCATGATCTC
CCTGACACCCAAGGTCACGTGTGTGGTGGTGGATGTGAGCGAGGATGACCCAGACGTCC
AGATCAGCTGGTTTGTGAACAACGTGGAAGTACACACAGCTCAGACACAAACCCATAGA
GAGGATTACAACAGTACTATCCGGGTGGTCAGCACCCTCCCCATCCAGCACCAGGACTG
GATGAGTGGCAAGGAGTTCAAATGCAAGGTCAACAACAAAGACCTCCCATCACCCATCG
AGAGAACCATCTCAAAAATTAAAGGGCTAGTCAGAGCTCCACAAGTATACATCTTGCCG
CCACCAGCAGAGCAGTTGTCCAGGAAAGATGTCAGTCTCACTTGCCTGGTCGTGGGCTTC
AACCCTGGAGACATCAGTGTGGAGTGGACCAGCAATGGGCATACAGAGGAGAACTACA
AGGACACCGCACCAGTCCTGGACTCTGACGGTTCTTACTTCATATATAGCAAGCTCAATA
TGAAAACAAGCAAGTGGGAGAAAACAGATTCCTTCTCATGCAACGTGAGACACGAGGGT
CTGAAAAATTACTACCTGAAGAAGACCATCTCCCGGTCTCCGGGTAAAGCTAGCTGA

Anti-DC-SIGNL16E3H (SEQ ID NO: 85):

MERHWIFLFLFSVTAGVHSQVQLQQSGAELAKPGASVKMSCKASGYTFTTYWMHWVKQRP
GQGLEWIGYINPITGYTEYNQKFKDKATLTADKSSSTAYMQLSSLTSEDSAVYYCAREGLSA
MDYWGQGTSVTVTSAKTTAPSVYPLAPVCGDTTGSSVTLGCLVKGYFPEPVTLTWNSGSLSS
GVHTFPAVLQSDLYTLSSSVTVTSSTWPSQTVTCSVAHPASSTTVDKKLEPSGPISTINPCPPC
KECHKCPAPNLEGGPSVFIFPPNIKDVLMISLTPKVTCVVVDVSEDDPDVQISWFVNNVEVHT
AQTQTHREDYNSTIRVVSTLPIQHQDWMSGKEFKCKVNNKDLPSPIERTISKIKGLVRAPQVY
ILPPPAEQLSRKDVSLTCLVVGFNPGDISVEWTSNGHTEENYKDTAPVLDSDGSYFIYSKLNM
KTSKWEKTDSFSCNVRHEGLKNYYLKKTISRSPGKAS.

Anti-DC-SIGNL16E3K (SEQ ID NO: 86):

ATGGGCATCAAGATGGAGTCACGGATTCAGGCATTTGTATTCGTGTTTCTCTGGTTGTCT
GGTGTTGGCGGAGACATTGTGATGACCCAGTCTCACAAATTCATGTCCACATCAGTAGGA
GACAGGGTCAGCGTCACCTGCAAGGCCAGTCAGGATGTGACTTCTGCTGTAGCCTGGTAT
CAACAAAAACCAGGGCAATCTCCTAAACTACTGATTTACTGGGCATCCACCCGGCACACT
GGAGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTATACTCTCACCATCAGC
AGTGGGCAGGCTGAAGACCTGGCACTTTATTACTGTCACCAATATTATAGCGCTCCTCGG
ACGTTCGGTGGAGGCACCAAGCTGGAAGTCAAACGGGCTGATGCTGCACCAACTGTATC
CATCTTCCCACCATCCAGTGAGCAGTTAACATCTGGAGGTGCCTCAGTCGTGTGCTTCTT
GAACAACTTCTACCCCAAAGACATCAATGTCAAGTGGAAGATTGATGGCAGTGAACGAC
AAAATGGCGTCCTGAACAGTTGGACTGATCAGGACAGCAAAGACAGCACCTACAGCATG
AGCAGCACCCTCACGTTGACCAAGGACGAGTATGAACGACATAACAGCTATACCTGTGA
GGCCACTCACAAGACATCAACTTCACCCATCGTCAAGAGCTTCAATAGGAATGAGTGTTA
G

Anti-DC-SIGNL16E3K (SEQ ID NO: 87):

MESRIQAFVFVFLWLSGVGGDIVMTQSHKFMSTSVGDRVSVTCKASQDVTSAVAWYQQKP
GQSPKLLIYWASTRHTGVPDRFTGSGSGTDYTLTISSGQAEDLALYYCHQYYSAPRTFGGGT
KLEVKRADAAPTVSIFPPSSEQLTSGGASVVCFLNNFYPKDINVKWKIDGSERQNGVLNSWT
DQDSKDSTYSMSSTLTLTKDEYERHNSYTCEATHKTSTSPIVKSFNRNEC

Anti-DC-SIGNL16E7H-LV-hIgG4H-C (SEQ ID NO: 88):

ATGGAAAGGCACTGGATCTTTCTCTTCCTGTTTTCAGTAACTGCAGGTGTCCACTCCCAG
GTCCAGCTTCAGCAGTCTGGGGCTGAGCTGGCAAAACCTGGGGCCTCAGTGAAGATGTC
CTGCAAGGCTTCTGGCTACACCTTTACTACCTACTGGATGCACTGGGTAAAACAGAGGCC
TGGACAGGGTCTGGAATGGATTGGATACATTAATCCTATCACTGGTTATACTGAGTACAA
TCAGAAGTTCAAGGACAAGGCCACCTTGACTGCAGACAAATCCTCCAGCACAGCCTACA
TGCAACTGAGCAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGAGAGGGTT
TAAGTGCTATGGACTATTGGGGTCAGGGAACCTCAGTCACCGTCACCTCAGCCAAAACA
ACGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCC
GCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCA
GGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTAC
TCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGC
AACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGG
TCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTT
CCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGT
GGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGG
AGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTG
GTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAA
GGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGC
AGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAAC
CAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGG
GAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGA
CGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGA
ATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCC
TCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-DC-SIGNL16E7H-LV-hIgG4H-C (SEQ ID NO: 89):

MERHWIFLFLFSVTAGVHSQVQLQQSGAELAKPGASVKMSCKASGYTFTTYWMHWVKQRP
GQGLEWIGYINPITGYTEYNQKFKDKATLTADKSSSTAYMQLSSLTSEDSAVYYCAREGLSA
MDYWGQGTSVTVTSAKTTGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTS
GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPA

PEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPRE
EQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQ
EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRW
QEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS.

Anti-DC-SIGNL16E7K-LV-hIgGK-C (SEQ ID NO: 90):

ATGGGCATCAAGATGGAGTCACAGATTCAGGCATTTGTATTCGTGTTTCTCTGGTTGTCT
GGTGTTGGCGGAGACATTGTGATGACCCAGTCTCACAAATTCATGTCCACATCAGTAGGA
GACAGGGTCAGCGTCACCTGCAAGGCCAGTCAGGATGTGACTTCTGCTGTAGCCTGGTAT
CAACAAAAACCAGGGCAATCTCCTAAACTACTGATTTACTGGGCATCCACCCGGCACACT
GGAGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTATACTCTCACCATCAGC
AGTGGGCAGGCTGAAGACCTGGCACTTTATTACTGTCACCAATATTATAGCGCTCCTCGG
ACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTC
ATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-DC-SIGNL16E7K-LV-hIgGK-C (SEQ ID NO: 91):

MESQIQAFVFVFLWLSGVGGDIVMTQSHKFMSTSVGDRVSVTCKASQDVTSAVAWYQQKP
GQSPKLLIYWASTRHTGVPDRFTGSGSGTDYTLTISSGQAEDLALYYCHQYYSAPRTFGGGT
KLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Dectin_1_11B6.4_H-V-hIgG4H-C (SEQ ID NO: 92):

ATGGCTGTCCTGGCACTACTCCTCTGCCTGGTGGCTTTCCCAACTTGTACCCTGTCCCAGG
TGCAACTGAAGGAGTCAGGACCTGGCCTGGTGGCGCCCTCACAGAGCCTGTCCATTACCT
GCTCTGTCTCTGGGTTCTCATTAAGCAACTATGATATAAGCTGGATTCGCCAGCCACCAG
GAAAGGGTCTGGAGTGGCTTGGAGTAATGTGGACTGGTGGAGGCGCAAATTATAATTCA
GCTTTCATGTCCAGACTGAGCATCAACAAGGACAACTCCAAGAGCCAAGTTTTTTTAAAA
ATGAACAATCTGCAAACTGATGACACAGCCATTTATTACTGTGTCAGAGATGCGGTGAG
GTACTGGAACTTCGATGTCTGGGGCGCAGGGACCACGGTCACCGTCTCCTCAGCCAAAA
CGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAG
CCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACT
CAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCT
ACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCT

GCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATAT
GGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTG
TTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTG
GTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGT
GGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGT
GTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTG
CAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAG
GGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAG
AACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGA
GTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACT
CCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAG
GGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAG
AGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Dectin_1_11B6.4_H-V-hIgG4H-C (SEQ ID NO: 93):

MAVLALLLCLVAFPTCTLSQVQLKESGPGLVAPSQSLSITCSVSGFSLSNYDISWIRQPPGKGL
EWLGVMWTGGGANYNSAFMSRLSINKDNSKSQVFLKMNNLQTDDTAIYYCVRDAVRYWN
FDVWGAGTTVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTS
GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPA
PEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPRE
EQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQ
EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRW
QEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Dectin_1_11B6.4_K-LV-hIgGK-C (SEQ ID NO: 94):

ATGGATTTTCAAGCGCAGATTTTCAGCTTCCTGCTAATCAGTGCTTCAGTCATAATGTCCA
GAGGACAAATTGTTCTCTCCCAGTCACCAGCAATCCTGTCTGCATCTCCAGGGGAGAAGG
TCACAATGACTTGCAGGGCCAGCTCAAGTGTAAGTTACATACACTGGTACCAGCAGAAG
CCAGGATCCTCCCCCAAACCCTGGATTTATGCCACATCCCACCTGGCTTCTGGAGTCCCT
GCTCGCTTCAGTGGCAGTGGGTCTGGGACCTCTTACTCTCTCACAATCAGCAGAGTGGAG
GCTGAAGATACTGCCACTTATTACTGCCAGCAGTGGAGTAGTAACCCATTCACGTTCGGC
TCGGGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCG
CCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTC
TATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTC
CCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACC
CTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCA
TCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Dectin_1_11B6.4_K-LV-hIgGK-C (SEQ ID NO: 95):

MDFQAQIFSFLLISASVIMSRGQIVLSQSPAILSASPGEKVTMTCRASSSVSYIHWYQQKPGSSP
KPWIYATSHLASGVPARFSGSGSGTSYSLTISRVEAEDTATYYCQQWSSNPFTFGSGTKLEIKR
TVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKD
STYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Dectin_1_15E2.5_H-V-hIgG4H-C (SEQ ID NO: 96):

ATGGAAAGGCACTGGATCTTTCTACTCCTGTTGTCAGTAACTGCAGGTGTCCACTCCCAG
GTCCAGCTGCAGCAGTCTGGGGCTGAACTGGCAAGACCTGGGGCCTCAGTGAAGATGTC
CTGCAAGGCTTCTGGCTACACCTTTACTACCTACACTATGCACTGGGTAAAACAGAGGCC
TGGACAGGGTCTGGAATGGATTGGATACATTAATCCTAGCAGTGGTTATACTAATTACAA
TCAGAAGTTCAAGGACAAGGCCACATTGACTGCAGACAAATCCTCCAGCACAGCCTCCA
TGCAACTGAGCAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGAGAGAGG
GCGGTATTAGTCCCCTATGCTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCC
TCAGCCAAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCC
GAGAGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGT
GTCGTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTC
CTCAGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAA
GACCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTG
AGTCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCAT
CAGTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGG
TCACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTAC
GTGGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACA
GCACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAG
GAGTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTC
CAAAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGG
AGATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGAC
ATCGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCC
CGTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAG
GTGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTA
CACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Dectin_1_15E2.5_H-V-hIgG4H-C (SEQ ID NO: 97):

MERHWIFLLLLSVTAGVHSQVQLQQSGAELARPGASVKMSCKASGYTFTTYTMHWVKQRP
GQGLEWIGYINPSSGYTNYNQKFKDKATLTADKSSSTASMQLSSLTSEDSAVYYCARERAVL
VPYAMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSG
ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCP

PCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKT
KPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTL
PPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVD
KSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Dectin_1_15E2.5_K-V-hIgGK-C (SEQ ID NO: 98):

ATGCATTTTCAAGTGCAGATTTTCAGCTTCCTGCTAATCAGTGCCTCAGTCATAATGTCCA
GAGGACAAATTGTTCTCACCCAGTCTCCAGCAGTCATGTCTGCATCTCCAGGGGAGAAGG
TCACCATAACCTGCACTGCCAGCTCAAGTTTAAGTTACATGCACTGGTTCCAGCAGAAGC
CAGGCACTTCTCCCAAACTCTGGCTTTATAGCACATCCATCCTGGCTTCTGGAGTCCCTAC
TCGCTTCAGTGGCAGTGGATCTGGGACCTCTTACTCTCTCACAATCAGCCGAATGGAGGC
TGAAGATGCTGCCACTTATTACTGCCAGCAAAGGAGTAGTTCCCCATTCACGTTCGGCTC
GGGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCC
ATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTA
TCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCC
AGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Dectin_1_15E2.5_K-V-hIgGK-C (SEQ ID NO: 99):

MHFQVQIFSFLLISASVIMSRGQIVLTQSPAVMSASPGEKVTITCTASSSLSYMHWFQQKPGTS
PKLWLYSTSILASGVPTRFSGSGSGTSYSLTISRMEAEDAATYYCQQRSSSPFTFGSGTKLEIK
RTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSK
DSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Dectin_1_2D8.2D4H-V-hIgG4H-C (SEQ ID NO: 100):

ATGGGATGGACCTGGATCTTTATTTTAATCCTGTCAGTTACTACAGGTGTCCACTCTGAG
GTCCAGCTGCAGCAGTCTGGACCTGAGCTGGAGAAGCCTGGCGCTTCAGTGAAGATATC
CTGCAAGGCTTCTGGTTACTCCTTCACTGGCTACAACATGAACTGGGTGAAACAGAGCAA
TGGAAAGAGCCTTGAGTGGATTGGAAATATTGATCCTTACTATGGTGATACTAACTACAA
CCAGAAGTTCAAGGGCAAGGCCACATTGACTGTAGACAAATCCTCCAGCACAGCCTACA
TGCACCTCAAGAGCCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGACCCTACG
GTAGTGAGGCCTACTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCA
AAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGC
ACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGG
AACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGA
CTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTAC
ACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAA

ATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTT
CCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTG
CGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATG
GCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTA
CCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACA
AGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCC
AAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGAC
CAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGT
GGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTG
GACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCA
GGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACA
GAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Dectin_1_2D8.2D4H-V-hIgG4H-C (SEQ ID NO: 101):

MGWTWIFILILSVTTGVHSEVQLQQSGPELEKPGASVKISCKASGYSFTGYNMNWVKQSNGK
SLEWIGNIDPYYGDTNYNQKFKGKATLTVDKSSSTAYMHLKSLTSEDSAVYYCARPYGSEA
YFAYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALT
SGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCP
APEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPR
EEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Dectin_1_2D8.2D4K-V-hIgGK-C (SEQ ID NO: 102):

ATGGTGTCCACTTCTCAGCTCCTTGGACTTTTGCTTTTCTGGACTTCAGCCTCCAGATGTG
ACATTGTGATGACTCAGTCTCCAGCCACCCTGTCTGTGACTCCAGGAGATAGAGTCTCTC
TTTCCTGCAGGGCCAGCCAGAGTATTAGCGACTACTTACACTGGTATCAACAAAAATCAC
ATGAGTCTCCAAGGCTTCTCATCAAATATGCTGCCCAATCCATCTCTGGGATCCCCTCCA
GGTTCAGTGGCAGTGGATCAGGGTCAGATTTCACTCTCAGTATCAACGGTGTGGAACCTG
AAGATGTTGGAGTGTATTACTGTCAAAATGGTCACAGCTTTCCGTACACGTTCGGAGGGG
GGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCCAT
CTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTATC
CCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCCAG
GAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCTGAC
GCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATCAGG
GCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Dectin_1_2D8.2D4K-V-hIgGK-C (SEQ ID NO: 103):

DIVMTQSPATLSVTPGDRVSLSCRASQSISDYLHWYQQKSHESPRLLIKYAAQSISGIPSRFSGS
GSGSDFTLSINGVEPEDVGVYYCQNGHSFPYTFGGGTKLEIKRTVAAPSVFIFPPSDEQLKSGT
ASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHK
VYACEVTHQGLSSPVTKSFNRGEC

Anti-Langerin15B10H-LV-hIgG4H-C (SEQ ID NO: 104):

ATGGAATGGAGGATCTTTCTCTTCATCCTGTCAGGAACTGCAGGTGTCCACTCCCAGGTT
CAGCTGCGGCAGTCTGGACCTGAGCTGGTGAAGCCTGGGGCTTCAGTGAAGATGTCCTG
CAAGGCTTCTGGATACACATTTACTGACTATGTTATAAGTTGGGTGAAGCAGAGAACTGG
ACAGGGCCTTGAGTGGATTGGAGATATTTATCCTGGAAGTGGTTATTCTTTCTACAATGA
GAACTTCAAGGGCAAGGCCACACTGACTGCAGACAAATCCTCCACCACAGCCTACATGC
AGCTCAGCAGCCTGACATCTGAGGACTCTGCGGTCTATTTCTGTGCAACCTACTATAACT
ACCCTTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAACAACGG
GCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCC
TGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGC
GCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCC
CTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAA
CGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTC
CCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCC
CCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGG
TGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAG
GTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGT
CAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGG
TCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAG
CCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCA
GGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGG
AGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGAC
GGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAA
TGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCT
CTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Langerin15B10H-LV-hIgG4H-C (SEQ ID NO: 105):

QVQLRQSGPELVKPGASVKMSCKASGYTFTDYVISWVKQRTGQGLEWIGDIYPGSGYSFYN
ENFKGKATLTADKSSTTAYMQLSSLTSEDSAVYFCATYYNYPFAYWGQGTLVTVSAAKTTG
PSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSV
VTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFEGGPSVFLFPPKPKDTL
MISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRVVSVLTVLHQD

WLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMTKNQVSLTCLVKGFYP
SDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEALHNH
YTQKSLSLSLGKAS.

Anti-Langerin15B10K-LV-hIgGK-C (SEQ ID NO: 106):

ATGAAGTTGCCTGTTAGGCTGTTGGTGCTGATGTTCTGGATTCCTGCTTCCAGCAGTGATG
TTGTGATGACCCAAACTCCACTCTCCCTGCCTGTCCGTCTTGGAGATCAAGCCTCCATCTC
TTGCAGATCTAGTCAGAGCCTTGTACACAGTAATGGAAACACCTATTTACATTGGTACCT
GCAGAAGCCAGGCCAGTCTCCAAAGCTCCTGATCTACAAAGTTTCCAACCGATTTTCTGG
GGTCCCAGACAGGTTCAGTGGCAGTGGATCAGGGACAAATTTCACACTCAAGATCAGCA
GAGTGGAGGCTGAGGATCTGGGACTTTATTTCTGCTCTCAAAGTACACATGTTCCGTACA
CGTTCGGAGGGGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTC
ATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-Langerin15B10K-LV-hIgGK-C (SEQ ID NO: 107):

DVVMTQTPLSLPVRLGDQASISCRSSQSLVHSNGNTYLHWYLQKPGQSPKLLIYKVSNRFSG
VPDRFSGSGSGTNFTLKISRVEAEDLGLYFCSQSTHVPYTFGGGTKLEIKRTVAAPSVFIFPPSD
EQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKA
DYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Langerin2G3H-LV-hIgG4H-C (SEQ ID NO: 108):

ATGACATTGAACATGCTGTTGGGGCTGAGGTGGGTTTTCTTTGTTGTTTTTTATCAAGGTG
TGCATTGTGAGGTGCAGCTTGTTGAGTCTGGTGGAGGATTGGTGCAGCCTAAAGGGTCAT
TGAAACTCTCATGTGCAGCCTCTGGATTAACCTTCAATATCTACGCCATGAACTGGGTCC
GCCAGGCTCCAGGAAAGGGTTTGGAATGGGTTGCTCGCATAAGAAATAAAAGTAATAAT
TATGCAACATATTATGCCGATTCAGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCA
CAAAGCTTGCTCTATCTGCAAATGAACAACTTGAAAACTGAGGACACAGCCATGTATTAC
TGTGTGGGACGGGACTGGTTTGATTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCA
GCCAAAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAG
AGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTC
GTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTC
AGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGA
CCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAG

TCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCA
GTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTC
ACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGT
GGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGC
ACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGA
GTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCA
AAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAG
ATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACAT
CGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCC
GTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGG
TGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTAC
ACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Langerin2G3H-LV-hIgG4H-C (SEQ ID NO: 109):

MTLNMLLGLRWVFFVVFYQGVHCEVQLVESGGGLVQPKGSLKLSCAASGLTFNIYAMNWV
RQAPGKGLEWVARIRNKSNNYATYYADSVKDRFTISRDDSQSLLYLQMNNLKTEDTAMYY
CVGRDWFDYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSW
NSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYG
PPCPPCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHN
AKTKPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQV
YTLPPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLT
VDKSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS.

Anti-Langerin2G3L-LV-hIgGK-C (SEQ ID NO: 110):

ATGGCCTGGATTTCACTTATACTCTCTCTCCTGGCTCTCAGCTCAGGGGCCATTTCCCAGG
CTGTTGTGACTCAGGAATCTGCACTCACCACATCACCTGGTGAAACAGTCACACTCACTT
GTCGCTCAAGTACTGGGGCTGTTACAACTAGTAACTATGCCAACTGGGTCCAAGAAAAA
CCAGATCATTTATTCACTGGTCTAATAGGTGGTACCAACAACCGAGTTTCAGGTGTTCCT
GCCAGATTCTCAGGCTCCCTGATTGGAGACAAGGCTGCCCTCACCATCACAGGGGCACA
GACTGAGGATGAGGCAATATATTTCTGTGCTCTATGGTACAGCAACCATTGGGTGTTCGG
TGGAGGAACCAAACTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCC
GCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTT
CTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACT
CCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCAC
CCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCC
ATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Langerin2G3L-LV-hIgGK-C (SEQ ID NO: 111):

MAWISLILSLLALSSGAISQAVVTQESALTTSPGETVTLTCRSSTGAVTTSNYANWVQEKPDH
LFTGLIGGTNNRVSGVPARFSGSLIGDKAALTITGAQTEDEAIYFCALWYSNHWVFGGGTKL
EIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQ
DSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Lox_1_10F9H-LV-hIgG4H-C (SEQ ID NO: 112):

ATGGAATGGACCTGGGTCTTTCTCTTCCTCCTGTCAGTAACTGCAGGTGTCCACTCCCAG
GTTCAGCTGCAGCAGTCTGGAGCTGAGCTGATGAAGCCTGGGGCCTCAGTGAAGATATC
CTGCAAGGCTACTGGCTACACATTCGGTAGCTACTGGATAGAGTGGGTAAAGCAGAGGC
CTGGACATGGCCTTGAGTGGATTGGAGAGATTTTACCTGGAAGTGGTAATACTAACTACA
ATGAGAACTTCAAGGGCAAGGCCACATTCACTGCAGATACATCCTCCAACACAGCCTAC
ATGCAACTCACCAGTCTGACATCTGAGGACTCTGCCGTCTATTACTGTGCTAGGGCGGGG
ATTTATTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCAGCCAAAACGAAGGGCCCATCC
GTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCCTGGGCTGC
CTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGCGCCCTGACC
AGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCCCTCAGCAGC
GTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAACGTAGATCA
CAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTCCCCCATGCC
CACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCCCCCCAAAAC
CCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGGTGGACGTGA
GCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAGGTGCATAAT
GCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGTCAGCGTCCT
CACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGGTCTCCAACA
AAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCCCCGAGAG
CCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCAGGTCAGCCT
GACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGGAGAGCAATG
GGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGGCTCCTTC
TTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAATGTCTTCTC
ATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCTCTCCCTGTC
TCTGGGTAAAGCTAGCTGA

Anti-Lox_1_10F9H-LV-hIgG4H-C (SEQ ID NO: 113):

MEWTWVFLFLLSVTAGVHSQVQLQQSGAELMKPGASVKISCKATGYTFGSYWIEWVKQRP
GHGLEWIGEILPGSGNTNYNENFKGKATFTADTSSNTAYMQLTSLTSEDSAVYYCARAGIYW
GQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVHT
FPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEFE
GGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFN

STYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEMT
KNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEGN
VFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Lox_1_10F9K-LV-hIgGK-C (SEQ ID NO: 114):

ATGGAGAAAGACACACTCCTGCTATGGGTCCTGCTTCTCTGGGTTCCAGGTTCCACAGGT
GACATTGTGCTGACCCAATCTCCAGCTTTTTTGGCTGTGTCTCTAGGGCAGAGGGCCACC
ATCTCCTGCAGAGCCAGCGAAAGTGTTGATAATTATGGCATTAGTTTTATGAACTGGTTC
CAACAGAAACCAGGACAGCCACCCAAACTCCTCATCTATGTTGCATCCAAGCAAGGATC
CGGGGTCCCTGCCAGGTTTAGTGGCAGTGGGTCTGGGACAGACTTCAGCCTCAACATCCA
TCCTATGGAGGAGGATGATACTGCAATGTATTTCTGTCAGCAAAGTAAGGAGGTTCCTCG
GACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTT
CATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-Lox_1_10F9K-LV-hIgGK-C (SEQ ID NO: 115):

MEKDTLLLWVLLLWVPGSTGDIVLTQSPAFLAVSLGQRATISCRASESVDNYGISFMNWFQQ
KPGQPPKLLIYVASKQGSGVPARFSGSGSGTDFSLNIHPMEEDDTAMYFCQQSKEVPRTFGG
GTKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQES
VTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-LOX-111C8H-LV-hIgG4H-C (SEQ ID NO: 116):

ATGGAATGTAACTGGATACTTCCTTTTATTCTGTCGGTAACTTCAGGGGTCTACTCAGAG
GTTCAGCTCCAGCAGTCTGGGACTGTGCTGGCAAGGCCTGGGGCTTCAGTGAAGATGTCC
TGCAAGGCTTCTGGCTACACCTTTACCAGCTACTGGATGCACTGGGTAAAACAGAGGCCT
GGACAGGGTCTGGAATGGATTGGCGCTATTTATCCTGGAAATAGTGATACTACCTACAAC
CAGAAGTTCAAGGGCAAGGCCAAACTGACTGCAGTCACATCCACCAGCACTGCCTACAT
GGAGCTCAGCAGCCTGACAAATGAGGACTCTGCGGTCTATTACTGTACACCTACTTACTA
CTTTGACTACTGGGGCCAAGGCACCTCTCTCACAGTCTCCTCAGCCAAAACGAAGGGCCC
ATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCACAGCCGCCCTGGG
CTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGAACTCAGGCGCCCT
GACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGACTCTACTCCCTCAG
CAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACACCTGCAACGTAG
ATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAATATGGTCCCCCA

TGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTCCTGTTCCCCCCA
AAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGCGTGGTGGTGGA
CGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGGCGTGGAGGTGC
ATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACCGTGTGGTCAGC
GTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAGTGCAAGGTCTC
CAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAAAGGGCAGCCCC
GAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCAAGAACCAGGTC
AGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTGGAGTGGGAGAG
CAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGGACTCCGACGGCT
CCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAGGAGGGGAATGTC
TTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAGAAGAGCCTCTCC
CTGTCTCTGGGTAAAGCTAGCTGA

Anti-LOX-111C8H-LV-hIgG4H-C (SEQ ID NO: 117):

MECNWILPFILSVTSGVYSEVQLQQSGTVLARPGASVKMSCKASGYTFTSYWMHWVKQRPG
QGLEWIGAIYPGNSDTTYNQKFKGKAKLTAVTSTSTAYMELSSLTNEDSAVYYCTPTYYFDY
WGQGTSLTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTSGVH
TFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPAPEF
EGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQF
NSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQEEM
TKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRWQEG
NVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-LOX-111C8K-LV-hIgGK-C (SEQ ID NO: 118):

ATGAGTCCTGCCCAATTCCTGTTTCTGTTAGTGCTCTGGATTCGGGAAACCAACGGTGAT
GTTGTGATGACCCAGACTCCACTCACTTTGTCGGTTACCATTGGACAACCAGCCTCCATC
TCTTGCAAGTCAAGTCAGAGCCTCTTAGATAGTGATGGAAAGACATATTTGAATTGGTTC
TTACAGAGGCCAGGCCAGTCTCCAAAGCGCCTAATCTATCTGGTGTCTAAACTGGACTCT
GGAGTCCCTGACAGGTTCACTGGCAGTGGATCAGGGACAGATTTCACACTGAAAATCAG
CAGAGTGGAGGCTGAGGATTTGGGAGTTTATTATTGCTGGCAAGGTACACATTTTCCGTG
GACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTT
CATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-LOX-111C8K-LV-hIgGK-C (SEQ ID NO: 119):

MSPAQFLFLLVLWIRETNGDVVMTQTPLTLSVTIGQPASISCKSSQSLLDSDGKTYLNWFLQR
PGQSPKRLIYLVSKLDSGVPDRFTGSGSGTDFTLKISRVEAEDLGVYYCWQGTHFPWTFGGG
TKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVT
EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-LOX-115C4H-LV-hIgG4H-C (SEQ ID NO: 120):

ATGGGAGGGATCTGGATCTTTCTCTTCCTCCTGTCAGGAACTGCAGGTGCCCACTCTGAG
ATCCAGCTGCAGCAGACTGGACCTGAGCTGGTGAAGCCTGGGGCTTCAGTGAAGATATC
CTGCAAGGCTTCTGGTTATCCATTCACTGACTACATCATGGTCTGGGTGAAGCAGAGCCA
TGGAAAGAGCCTTGAGTGGATTGGAAATATTAGTCCTTACTATGGTACTACTAACTACAA
TCTGAAGTTCAAGGGCAAGGCCACATTGACTGTAGACAAATCTTCCAGCACAGCCTACAT
GCAGCTCAACAGTCTGACATCTGAGGACTCTGCAGTCTATTACTGTGCAAGATCCCCTAA
CTGGGACGGGGCCTGGTTTGCTCACTGGGGCCAAGGGGCTCTGGTCACTGTCTCTGCAGC
CAAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGA
GCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGT
GGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAG
GACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCT
ACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCC
AAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTC
TTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACG
TGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGA
TGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGT
ACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTAC
AAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGC
CAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGA
CCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCC
GTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCT
GGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGC
AGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACAC
AGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGATTAATTAA

Anti-LOX-115C4H-LV-hIgG4H-C (SEQ ID NO: 121):

MGGIWIFLFLLSGTAGAHSEIQLQQTGPELVKPGASVKISCKASGYPFTDYIMVWVKQSHGKS
LEWIGNISPYYGTTNYNLKFKGKATLTVDKSSSTAYMQLNSLTSEDSAVYYCARSPNWDGA
WFAHWGQGALVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGAL
TSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPC

PAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKP
REEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-LOX-115C4K-LV-hIgGK-C (SEQ ID NO: 122):

ATGGAGACAGACACAATCCTGCTATGGGTGCTGCTGCTCTGGGTTCCAGGCTCCACTGGT
GACATTGTGCTGACCCAATCTCCAGCTTCTTTGGCTGTGTCTCTAGGGCAGAGGGCCACC
ATCTCCTGCAAGGCCAGCCAAAGTGTTGATTATGATGGTGATAGTTATATGAACTGGTTC
CAACAGAAACCAGGACAGCCACCCAAACTCCTCATCTATGCTGCATCCAATCTAGAATCT
GGGATCCCAGCCAGGTTTAGTGGCAGTGGGTCTGGGACAGACTTCACCCTCAACATCCAT
CCTGTGGAGGAGGAGGATGCTGCAACCTATTACTGTCAGCAAAGTAATGAGGATCCATT
CACGTTCGGCTCGGGGACAAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTT
CATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTG
AATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATC
GGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCA
GCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAA
GTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTA
G

Anti-LOX-115C4K-LV-hIgGK-C (SEQ ID NO: 123):

METDTILLWVLLLWVPGSTGDIVLTQSPASLAVSLGQRATISCKASQSVDYDGDSYMNWFQ
QKPGQPPKLLIYAASNLESGIPARFSGSGSGTDFTLNIHPVEEEDAATYYCQQSNEDPFTFGSG
TKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVT
EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Marco_10B7.3G4H-LV-hIgG4H-C (SEQ ID NO: 124):

ATGGCTGTCCTGGGGCTGCTTCTCTGCCTGGTGACGTTCCCAAGCTGTGTCCTGTCCCAGG
TGCAGCTGAAGGAGTCAGGACCTGGCCTGGTGGCACCCTCACAGAGCCTGTCCATCACA
TGCACTGTCTCTGGGTTCTCATTATCCAGATATAGTGTATTTTGGGTTCGCCAGCCTCCAG
GAAAGGGTCTGGAGTGGCTGGGATTGATATGGGGTGGTGGAAGCACAGACTATAATTCA
GCTCTCAAATCCAGACTGAGCATCAGCAAGGACAACTCCAAGAGCCAAGTTTTCTTAAA
AATGAACAGTCTGCAAACTGATGACACAGCCATGTACTACTGTGCCAGAATCTACTTTGA
TTACGACGGGGCTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCCTCAGCCAA
AACAACGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGCAC
AGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGGA
ACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGAC
TCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTACA

CCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAAA
TATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTTC
CTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTGC
GTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATGG
CGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTACC
GTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACAAG
TGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCCAA
AGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGACCA
AGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGTG
GAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTGG
ACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCAG
GAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACAG
AAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTG

Anti-Marco_10B7.3G4H-LV-hIgG4H-C (SEQ ID NO: 125):

MAVLGLLLCLVTFPSCVLSQVQLKESGPGLVAPSQSLSITCTVSGFSLSRYSVFWVRQPPGKG
LEWLGLIWGGGSTDYNSALKSRLSISKDNSKSQVFLKMNSLQTDDTAMYYCARIYFDYDGA
MDYWGQGTSVTVSSAKTTGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGALTS
GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPCPA
PEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPRE
EQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPSQ
EEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSRW
QEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

AntiMarco_10B7.3G4K_H-V-hIgGK-C (SEQ ID NO: 126):

ATGCATCGCACCAGCATGGGCATCAAGATGGAGTCACGGATTCAGGCATTTGTATTCGTG
TTTCTCTGGTTGTCTGGTGTTGGCGGAGACATTGTGATGACCCAGTCTCACAAATTCATGT
CCACATCAGTAGGAGACAGGGTCAGCGTCACCTGCAAGGCCAGTCAGGATGTGACTTCT
GCTGTAGCCTGGTATCAACAAAAACCAGGGCAATCTCCTAAACTACTGATTTACTGGGCA
TCCACCCGGCACACTGGAGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTAT
ACTCTCACCATCAGCAGTGGGCAGGCTGAAGACCTGGCACTTTATTACTGTCACCAATAT
TATAGCGCTCCTCGGACGTTCGGTGGAGGCACCAAGCTCGAGATCAAACGAACTGTGGC
TGCACCATCTGTCTTCATCTTCCCGCCATCTGATGAGCAGTTGAAATCTGGAACTGCCTCT
GTTGTGTGCCTGCTGAATAACTTCTATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGA
TAACGCCCTCCAATCGGGTAACTCCCAGGAGAGTGTCACAGAGCAGGACAGCAAGGACA
GCACCTACAGCCTCAGCAGCACCCTGACGCTGAGCAAAGCAGACTACGAGAAACACAAA

GTCTATGCCTGCGAAGTCACCCATCAGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAAC
AGGGGAGAGTGTTAG

AntiMarco_10B7.3G4K_H-V-hIgGK-C (SEQ ID NO: 127):

MHRTSMGIKMESRIQAFVFVFLWLSGVGGDIVMTQSHKFMSTSVGDRVSVTCKASQDVTSA
VAWYQQKPGQSPKLLIYWASTRHTGVPDRFTGSGSGTDYTLTISSGQAEDLALYYCHQYYS
APRTFGGGTKLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQ
SGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Marco_11A8.3C9_H-V-hIgG4H-C (SEQ ID NO: 128):

ATGGAATGGAACTGGGTCGTTCTCTTCCTCCTGTCATTAACTGCAGGTGTCTATGCCCAG
GGTCAGATGCAGCAGTCTGGAGCTGAGCTGGTGAAGCCTGGGGCTTCAGTGAAGCTGTC
CTGCAAGACTTCTGGCTTCACCTTCAGCAGTAACTATATAAGTTGGTTGAAGCAAAAGCC
TGGACAGAGTCTTGAGTGGATTGCATGGATTTATGCTGGAACTGGTGGTATTACCTATAA
TCAGAAGTTCAGAGGCAGGGCCCAACTGACTGTAGACACATCCTCCAGCACAGCCTACA
TGCAGTTCAGCAGCCTGACAACTGATGACTCTGCCATCTATTACTGTGCAAGACACGTGA
GGGGTTACCATCCTATGGACTACTGGGGTCAAGGAACCTCAGTCACCGTCTCCTCAGCCA
AAACGAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAGAGC
ACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTCGTGG
AACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTCAGGA
CTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGACCTAC
ACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAGTCCAA
ATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCAGTCTT
CCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTCACGTG
CGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGTGGATG
GCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGCACGTA
CCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGAGTACA
AGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCAAAGCC
AAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAGATGAC
CAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACATCGCCGT
GGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCCGTGCTG
GACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGGTGGCA
GGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTACACACA
GAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Marco_11A8.3C9_H-V-hIgG4H-C (SEQ ID NO: 129):

MEWNWVVLFLLSLTAGVYAQGQMQQSGAELVKPGASVKLSCKTSGFTFSSNYISWLKQKP
GQSLEWIAWIYAGTGGITYNQKFRGRAQLTVDTSSSTAYMQFSSLTTDDSAIYYCARHVRGY

HPMDYWGQGTSVTVSSAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGAL
TSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCPPC
PAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKP
REEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTLPPS
QEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVDKSR
WQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Marco_11A8.3C9_H-V-hIgGK-C (SEQ ID NO: 130):

ATGGAGTCACAGACTCAGGTCTTTGTATACATGTTGCTGTGGTTGTCTGGTGTTGATGGA
GACATTGTGATGACCCAGTCTCAAAAATTCATGTCCGCATCAGTAGGGGACAGGGTCAG
CGTCACCTGCAGGGCCAGTCAGAATGTGGTTACTAATGTAGGCTGGTATCAACAGAAAC
CAGGGCAATCTCCTAAAGTACTGATTTACTCGGCATCCTTCCGGTACAGTGGAGTCCCTG
ATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCACCAATGTGCAGT
CTGAAGACTTGGCAGAGTATTTCTGTCAGCAATATAACAACTATCCGTACACGTTCGGAG
GGGGGACCAAGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGC
CATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCT
ATCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCC
CAGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT
GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Marco_11A8.3C9_H-V-hIgGK-C (SEQ ID NO: 131):

MESQTQVFVYMLLWLSGVDGDIVMTQSQKFMSASVGDRVSVTCRASQNVVTNVGWYQQK
PGQSPKVLIYSASFRYSGVPDRFTGSGSGTDFTLTITNVQSEDLAEYFCQQYNNYPYTFGGGT
KLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Anti-Marco_3H10.1F3_H-V-hIgG4H-C (SEQ ID NO: 132):

ATGGGATGGAGCTATATCATCCTCTTTTTGGTAGCAACAGCTACAGATGTCCACTCCCAG
GTCCAACTGCAGCAGCCTGGGGCTGAACTGGTGAAGCCTGGGGCTTCAGTGAAGCTGTC
CTGCAAGGCTTCTGGCTACACCTTCACCAGCTACTGGATGCACTGGGTGAAGCAGAGGCC
TGGAGAAGGCCTTGAGTGGATTGGAGAGATTAATCCTAGCTACGGTCGTACTGACTACA
ATGGGAAGTTCAAGAACAAGGCCACACTGACTGTAGCCAAATCCTCCAGCACAGCCTAC
ATGCAACTCAGCAGCCTGACATCTGAGGACTCTGCGGTCTATTACTGTGCAAGAGGAGAT
TACTACGGTAGTAGCTCGTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCA
GCCAAAACAAAGGGCCCATCCGTCTTCCCCCTGGCGCCCTGCTCCAGGAGCACCTCCGAG
AGCACAGCCGCCCTGGGCTGCCTGGTCAAGGACTACTTCCCCGAACCGGTGACGGTGTC
GTGGAACTCAGGCGCCCTGACCAGCGGCGTGCACACCTTCCCGGCTGTCCTACAGTCCTC

AGGACTCTACTCCCTCAGCAGCGTGGTGACCGTGCCCTCCAGCAGCTTGGGCACGAAGA
CCTACACCTGCAACGTAGATCACAAGCCCAGCAACACCAAGGTGGACAAGAGAGTTGAG
TCCAAATATGGTCCCCCATGCCCACCCTGCCCAGCACCTGAGTTCGAAGGGGGACCATCA
GTCTTCCTGTTCCCCCCAAAACCCAAGGACACTCTCATGATCTCCCGGACCCCTGAGGTC
ACGTGCGTGGTGGTGGACGTGAGCCAGGAAGACCCCGAGGTCCAGTTCAACTGGTACGT
GGATGGCGTGGAGGTGCATAATGCCAAGACAAAGCCGCGGGAGGAGCAGTTCAACAGC
ACGTACCGTGTGGTCAGCGTCCTCACCGTCCTGCACCAGGACTGGCTGAACGGCAAGGA
GTACAAGTGCAAGGTCTCCAACAAAGGCCTCCCGTCCTCCATCGAGAAAACCATCTCCA
AAGCCAAAGGGCAGCCCCGAGAGCCACAGGTGTACACCCTGCCCCCATCCCAGGAGGAG
ATGACCAAGAACCAGGTCAGCCTGACCTGCCTGGTCAAAGGCTTCTACCCCAGCGACAT
CGCCGTGGAGTGGGAGAGCAATGGGCAGCCGGAGAACAACTACAAGACCACGCCTCCC
GTGCTGGACTCCGACGGCTCCTTCTTCCTCTACAGCAGGCTAACCGTGGACAAGAGCAGG
TGGCAGGAGGGGAATGTCTTCTCATGCTCCGTGATGCATGAGGCTCTGCACAACCACTAC
ACACAGAAGAGCCTCTCCCTGTCTCTGGGTAAAGCTAGCTGA

Anti-Marco_3H10.1F3_H-V-hIgG4H-C (SEQ ID NO: 133):

MGWSYIILFLVATATDVHSQVQLQQPGAELVKPGASVKLSCKASGYTFTSYWMHWVKQRP
GEGLEWIGEINPSYGRTDYNGKFKNKATLTVAKSSSTAYMQLSSLTSEDSAVYYCARGDYY
GSSSFAYWGQGTLVTVSAAKTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSG
ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNTKVDKRVESKYGPPCP
PCPAPEFEGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSQEDPEVQFNWYVDGVEVHNAKT
KPREEQFNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQVYTL
PPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSRLTVD
KSRWQEGNVFSCSVMHEALHNHYTQKSLSLSLGKAS

Anti-Marco_3H10.1F3_K-V-hIgGK-C (SEQ ID NO: 134):

ATGGAGTCACAGACTCAGGTCTTTGTATACATGTTGCTGTGGTTGTCTGGTGTTGATGGA
GACATTGTGATGACCCAGTCTCAAAAATTCATGTCCACATCATTAGGAGACAGGGTCAGC
GTCACCTGCAAGGCCAGTCAGAATGTGGGTACTAATGTAGCCTGGTATCAACAGAAACC
AGGGCACTCTCCTAAAGCACTGATTTACTCGGCATCCTACCGGTACAGTGGAGTCCCTGA
TCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACCATCAGCAATGTGCAGTC
TGAAGACTTGGCAGAGTTTTTCTGTCAGCAATATAACAACTATCCGTACACGTTCGGAGG
GGGGACCACGCTCGAGATCAAACGAACTGTGGCTGCACCATCTGTCTTCATCTTCCCGCC
ATCTGATGAGCAGTTGAAATCTGGAACTGCCTCTGTTGTGTGCCTGCTGAATAACTTCTA
TCCCAGAGAGGCCAAAGTACAGTGGAAGGTGGATAACGCCCTCCAATCGGGTAACTCCC
AGGAGAGTGTCACAGAGCAGGACAGCAAGGACAGCACCTACAGCCTCAGCAGCACCCT

GACGCTGAGCAAAGCAGACTACGAGAAACACAAAGTCTATGCCTGCGAAGTCACCCATC
AGGGCCTGAGCTCGCCCGTCACAAAGAGCTTCAACAGGGGAGAGTGTTAG

Anti-Marco_3H10.1F3_K-V-hIgGK-C (SEQ ID NO: 135):

MESQTQVFVYMLLWLSGVDGDIVMTQSQKFMSTSLGDRVSVTCKASQNVGTNVAWYQQK
PGHSPKALIYSASYRYSGVPDRFTGSGSGTDFTLTISNVQSEDLAEFFCQQYNNYPYTFGGGT
TLEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTE
QDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

The antigens of the present invention comprises one or more viral antigens or peptides from adenovirus, retrovirus, picornavirus, herpesvirus, rotaviruses, hantaviruses, coronavirus, togavirus, flavirvirus, rhabdovirus, paramyxovirus, orthomyxovirus, bunyavirus, arenavirus, reovirus, papilomavirus, parvovirus, poxvirus, hepadnavirus, or spongiform virus, HIV, CMV, hepatitis A, B, and C, influenza; measles, polio, smallpox, rubella; respiratory syncytial, herpes simplex, varicella zoster, Epstein-Barr, Japanese encephalitis, rabies, flu, or cold viruses. The antigen is selected from: Nef (66-97): VGFPVTPQVPLRPMTYKAAVDLSHFLKEKGGL (SEQ ID NO: 136); Nef (116-145): HTQGYFPDWQNYTPGPGVRYPLTFGWLYKL (SEQ ID NO: 137); Gag p17 (17-35): EKIRLRPGGKKKYKLKHIV (SEQ ID NO: 138); Gag p17-p24 (253-284): NPPIPVGEIYKRWIILGLNKIVRMYSPTSILD (SEQ ID NO: 139); and/or Pol 325-355 (RT 158-188) is: AIFQSSMTKILEPFRKQNPDIVIYQYMDDLY (SEQ ID NO: 140). In one aspect the said antigen is 19 to 32 residues and is selected from a cytotoxic T lymphocyte (CTL) epitope identified in the HIV-1 Nef, Gag and Env proteins presented in the context of MHC-class I molecules. In another aspect, the Ag is selected from HIV gp120, gp41, Gag, p17, p24, p2, p7, p1, p6, Tat, Rev, PR, RT, IN, Vif, Vpr, Vpx, Vpu and Nef.

In another aspect the antigen is selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC-related protein (Mucin) (MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67. In another aspect, the Ag is selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile

cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia.

The Ag is selected from at least one of: MWVPVVFLTLSVTWIGAAPLILSRIVGGWECEKHSQPWQVLVASRGRAVCGGVLVHPQWV (SEQ ID NO: 141);

LTAAHCIRNKSVILLGRHSLFHPEDTGQVFQVSHSFPHPLYDMSLLKNRFLRPGDDSSHD (SEQ ID NO: 142);

LMLLRLSEPAELTDAVKVMDLPTQEPALGTTCYASGWGSIEPEEFLTPKKLQCVDLHVIS (SEQ ID NO: 143);

NDVCAQVHPQKVTKFMLCAGRWTGGKSTCSGDSGGPLVCNGVLQGITSWGSEPCALPERP (SEQ ID NO: 144); or

SLYTKVVHYRKWIKDTIVANP (SEQ ID NO.:145).

In another aspect, the Ag is selected from at least one of:

IMDQVPFSV (SEQ ID NO: 146);

ITDQVPFSV (SEQ ID NO: 147);

YLEPGPVTV (SEQ ID NO: 148);

YLEPGPVTA (SEQ ID NO: 149);

KTWGQYWQV (SEQ ID NO: 150);

DTTEPATPTTPVTTPTTTKVPRNQDWLGVSRQLRTKAWNRQLYPEWTEAQRLDCWRGGQV SLKVSNDGPTLIGANASFSIALNFPGSQKVLPDGQVIWVNNTIINGSQVWGGQPVYPQETDDA CIFPDGGPCPSGSWSQKRSFVYVWKTWGQYWQVLGGPVSGLSIGTGRAMLGTHTMEVTVY HRRGSQSYVPLAHSSSAFTITDQVPFSVSVSQLRALDGGNKHFLRNQ (SEQ ID NO: 151);

PLTFALQLHDPSGYLAEADLSYTWDFGDSSGTLISRAXVVTHTYLEPGPVTAQVVLQAAIPLT SCGSSPVPAS (SEQ ID NO: 152);

GTTDGHRPTAEAPNTTAGQVPTTEVVGTTPGQAPTAEPSGTTSVQVPTTEVISTAPVQMPTAE STGMTPEKVPVSEVMGTTLAEMSTPEATGMTPAEVSIVVLSGTTAA (SEQ ID NO: 153);

QVTTTEWVETTARELPIPEPEGPDASSIMSTESITGSLGPLLDGTATLRLVKRQVPLDCVLYRY GSFSVTLDIVQ (SEQ ID NO: 154); and

GIESAEILQAVPSGEGDAFELTVSCQGGLPKEACMEISSPGCQPPAQRLCQPVLPSPACQLVLH QILKGGSGTYCLNVSLADTNSLAVVSTQLIVPGILLTGQEAGLGQ (SEQ ID NO: 155), and fragments thereof.

In yet another aspect, the Ag is selected from at least one of: MEMKILRALNFGLGRPLPLHFLRRASKIGEVDVEQHTLAKYLMELTMLDY (SEQ ID NO: 156); and DWLVQVQMKFRLLQETMYMTVSIIDRFMQNNCVPKK (SEQ ID NO: 157).

In another aspect, the Ag is selected from at least one of: MEHQLLCCEVETIRRAYPDANLLNDRVLRAMLKAEETCAPSVSYFKCV (SEQ ID NO: 158);

QKEVLPSMRKIVATWMLEVCEEQKCEEEVFPLAMNYLDRFLSLEPVKKSRLQLLGATCMFV ASKMKETIPLTAEKLCIYTDNSIRPEELLQMELL (SEQ ID NO: 159); LVNKLKWNLAAMTPHDFIEHFLSKMPEAEENKQIIRKHAQTFVALCATDVKFISNPPSMV (SEQ ID NO: 160);and

AGSVVAAVQGLNLRSPNNFLSYYRLTRFLSRVIKCDPDCLRACQEQIEALLESSLRQAQQNM DPKAAEEEEEEEEEVDLACTPTDVRDVDI (SEQ ID NO: 161), and fragments thereof.

In another aspect, the Ag is 19 to 32 amino acids long. In another aspect, the Ag is 17 to 60 amino acids long and is selected from a cytotoxic T lymphocyte (CTL) epitope identified in PSA or cyclin 1

In another aspect, the cancer peptides are selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC-related protein (Mucin) (MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

Preparation of cells: Apheresis procedures were performed on healthy individuals after informed consent was collected. This protocol was reviewed and approved by the Baylor Research Institute Institutional Review Board. PBMCs were purified from apheresis blood samples and used after cryopreservation. Monocyte-derived IFNa-DCs were prepared from frozen human monocytes (elutriation fraction 5, Lemarie et al, J. Immunological Methods, 2007) cultured with GM-CSF (100 ng/ml) and IFNa (500 U/ml)) (Salluto et al, J. Exp. Med) for 3 days in Cellgenix.

Extracellular cytokine secretion assay. PBMCs or monocyte-derived IFNa-DCs (2 x 106 cells/ml, 200 µl/well) were cultured in cRPMI containing 10 % human AB serum, 2 mM L-glutamine, 50 U penicillin, 50 µg/ml streptomycin, 1 X essential amino acids, 25 mM hepes, 55 µM 2-mercapto-

ethanol with DC-targeting vaccines and TLR ligands of interest or left unstimulated (negative control) for 24 h, at 37 °C and 5 % CO2. Then culture supernatants were harvested and then the secreted cytokines were measured in the culture supernatants using BioPlex200 Luminex (BioRad).

FIGS. 1A to 1D shows flagellin and the several antibody-flagellin contructs of the present invention.

FIG. 2 shows the design of the studies used to test the activity of the antibody-flagellin constructs of the present invention.

FIGS. 3A to 3C show the secretion of IL-6 when various types of cells were activated with the construction of the present invention. The addition of the flexible linker (flex) between the 2 flagellin domains (flgn1 and flgn2) abolishes the activity. The various cells were IFNalpha activated DCs and Peripheral Blood Mononuclear Cells (PBMCs).

FIGS. 4A to 4B show the dose titration of the various constructs as measured by the secretion of IL-6 and IL-1 beta. The flagellin activity is dependent on the targeting antibody and is effective even at the lowest 0.1 nM dose, while the isotype control gives only a response at 25 nM dose. FIG. 4C and 4D show the dose titration of the various constructs as measured by the secretion of IL-6 and IL-1 beta. The flagellin activity is dependent on the targeting antibody and is effective even at the lowest 0.1 nM dose, while the isotype control gives only a response at 25 nM dose. Moreover, the addition of free antibody to the isotype control does not restore the flagellin activity.

FIG. 5 shows heat maps of gene expression for the listed genes using an anti-LOX-1 antibody with or without flagellin. Of the heat maps obtained from IFNα -DCs cultured with α-LOX-1.flgn, it was found that 17 transcripts are overexpressed in response to the αLOX-1.flgn stimuli.

It is contemplated that any embodiment discussed in this specification can be implemented with respect to any method, kit, reagent, or composition of the invention, and vice versa. Furthermore, compositions of the invention can be used to achieve methods of the invention.

It may be understood that particular embodiments described herein are shown by way of illustration and not as limitations of the invention. The principal features of this invention can be employed in various embodiments without departing from the scope of the invention. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, numerous equivalents to the specific procedures described herein. Such equivalents are considered to be within the scope of this invention and are covered by the claims.

All publications and patent applications mentioned in the specification are indicative of the level of skill of those skilled in the art to which this invention pertains. All publications and patent applications are herein incorporated by reference to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

The use of the word "a" or "an" when used in conjunction with the term "comprising" in the claims and/or the specification may mean "one," but it is also consistent with the meaning of "one or more," "at least one," and "one or more than one." The use of the term "or" in the claims is used to mean "and/or" unless explicitly indicated to refer to alternatives only or the alternatives are mutually exclusive, although the disclosure supports a definition that refers to only alternatives and "and/or." Throughout this application, the term "about" is used to indicate that a value includes the inherent variation of error for the device, the method being employed to determine the value, or the variation that exists among the study subjects.

As used in this specification and claim(s), the words "comprising" (and any form of comprising, such as "comprise" and "comprises"), "having" (and any form of having, such as "have" and "has"), "including" (and any form of including, such as "includes" and "include") or "containing" (and any form of containing, such as "contains" and "contain") are inclusive or open-ended and do not exclude additional, unrecited elements or method steps.

The term "or combinations thereof" as used herein refers to all permutations and combinations of the listed items preceding the term. For example, "A, B, C, or combinations thereof" is intended to include at least one of: A, B, C, AB, AC, BC, or ABC, and if order is important in a particular context, also BA, CA, CB, CBA, BCA, ACB, BAC, or CAB. Continuing with this example, expressly included are combinations that contain repeats of one or more item or term, such as BB, AAA, MB, BBC, AAABCCCC, CBBAAA, CABABB, and so forth. The skilled artisan will understand that typically there is no limit on the number of items or terms in any combination, unless otherwise apparent from the context.

All of the compositions and/or methods disclosed and claimed herein can be made and executed without undue experimentation in light of the present disclosure. While the compositions and methods of this invention have been described in terms of preferred embodiments, it may be apparent to those of skill in the art that variations may be applied to the compositions and/or methods and in the steps or in the sequence of steps of the method described herein without departing from the concept, spirit and scope of the invention. All such similar substitutes and modifications apparent to those skilled in the art are deemed to be within the spirit, scope and concept of the invention as defined by the appended claims.

References

U.S. Patent Application Publication No. 20090004194: TLR Agonist (Flagellin)/CD40 Agonist/Antigen Protein and DNA Conjugates and use Thereof for Inducing Synergistic Enhancement in Immunity.

U.S. Patent Application Publication No. 20080220011: *Use of Flagellin in Tumor Immunotherapy*.

U.S. Patent Application Publication No. 20080248068: *Use of Flagellin as an Adjuvant for Vaccine.*

U.S. Patent No. 7,404,963: Flagellin-Based Adjuvants and Vaccines.

CLAIMS

1. A composition comprising:

an anti-dendritic cell (DC)-specific antibody or binding fragment thereof conjugated to a TLR agonist; and at least one antigen, wherein the antigen and the agonist are effective to produce an immune response in a human or animal subject in need of immunostimulation.

2. The composition of claim 1, wherein the DC-specific antibody or fragment is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR.

3. The composition of claim 1, wherein the composition further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof.

4. The composition of claim 1, wherein the composition further comprises antigenic peptides selected from one or more bacterial antigens, wherein the bacterial antigens comprise antigens derived from *Bacillus*, *Escherichia*, *Listeria*, *Neisseria*, *Nocardia*, *Salmonella*, *Staphylococcus*, *Streptococcus*, or combinations and modifications thereof.

5. The composition of claim 1, wherein the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia.

6. The composition of claim 1, wherein the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

7. The composition of claim 1, wherein the DC-specific antibody is humanized.

8. The composition of claim 1, wherein the TLR agonist comprises at least one of a flagellin from *Salmonella enterica*, a flagellin from *Vibrio cholerae*, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof.

9. The composition of claim 1, wherein the antigen is conjugated to the antibody and TLR agonist.

10. The composition of claim 1, wherein the antigen and the antibody are a single fusion protein.

11. The composition of claim 1, wherein the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

12. A vaccine composition comprising:

an antigen; and

an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to at least a portion of a TLR agonist in an amount effective to produce an immune response in a human or animal subject in need of immunostimulation.

13. The composition of claim 12, wherein the DC-specific antibody or fragment is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR.

14. The composition of claim 12, wherein the composition further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-

1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof.

15. The composition of claim 12, wherein the composition further comprises antigenic peptides selected from one or more bacterial antigens, wherein the bacterial antigens comprise antigens derived from *Bacillus*, *Escherichia*, *Listeria*, *Neisseria*, *Nocardia*, *Salmonella*, *Staphylococcus*, *Streptococcus*, or combinations and modifications thereof.

16. The composition of claim 12, wherein the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia.

17. The composition of claim 12, wherein the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

18. The composition of claim 12, wherein the DC-specific antibody is humanized.

19. The composition of claim 12, wherein the TLR agonist comprises at least one of a flagellin from *Salmonella enterica*, a flagellin from *Vibrio cholerae*, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof.

20. The composition of claim 12, wherein the antigen is conjugated to the antibody and TLR agonist.

21. The composition of claim 12, wherein the antigen and the antibody are a single fusion protein.

22. The composition of claim 12, wherein the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

23. A method for increasing effectiveness of antigen presentation by an antigen presenting cell comprising:

contacting the antigen presenting cell with a composition comprising:

an antigen; and

an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or binding fragment thereof conjugated to a TLR agonist, wherein the antigen and adjuvant are provided in an amount effective to produce an immune response in a human or animal subject in need of immunostimulation.

24. The method of claim 23, wherein the DC-specific antibody or fragment is selected from an anti-DCIR, MHC class I, MHC class II, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF-44, CMRF-56, DCIR, DC-ASPGR, CLEC-6, CD40, BDCA-2, MARCO, DEC-205, mannose receptor, Langerin, DECTIN-1, B7-1, B7-2, IFN-γ receptor and IL-2 receptor, ICAM-1, Fcγ receptor, LOX-1, or ASPGR.

25. The method of claim 23, wherein the anti-DC-specific antibody is selected from pairs of SEQ ID NOS.: 7 and 9, 11 and 13, 15 and 17, 19 and 21, 23 and 25, 27 and 29, 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53, 55 and 57, 59 and 61, 63 and 65, 67 and 69, 71 and 73, 75 and 77, 79 and 81, 83 and 85, 87 and 89, 91 and 93, 95 and 97, 99 and 101, 1-3 and 105, 107 and 109, 111 and 113, 115 and 117, 119 and 121, 123 and 125, 127 and 129, 131 and 132, 133 and 134.

26. The method of claim 23, wherein the composition further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof.

27. The method of claim 23, wherein the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of

the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia.

28. The method of claim 23, wherein the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

29. The method of claim 23, wherein the DC-specific antibody is humanized.

30. The method of claim 23, wherein the composition is administered to the human or animal subject by an oral route, a nasal route, topically or as an injection.

31. The method of claim 23, wherein the injection is selected from the group consisting of intradermal, intramucosal, subcutaneous, intravenous, intraperitoneal, intramuscular, and intravenous.

32. The method of claim 23, wherein the TLR agonist comprises at least one of a flagellin from *Salmonella enterica*, a flagellin from *Vibrio cholerae*, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof.

33. The method of claim 23, wherein the antigen is conjugated to the antibody and TLR agonist.

34. The method of claim 23, wherein the antigen and the antibody are a single fusion protein.

35. The method of claim 23, wherein the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

36. A method for a treatment, a prophylaxis or a combination thereof against one or more cancers in a human subject comprising the steps of:

identifying the human subject in need of the treatment, the prophylaxis or a combination thereof against the one or more cancers; and

administering a vaccine composition comprising:

an antigen; and

an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to a TLR agonist; and a pharmaceutically acceptable carrier, wherein the antigen and adjuvant are provided in an amount effective to produce an immune response for the treatment, the prophylaxis or a combination thereof against the one or more cancers.

37. The method of claim 36, wherein the composition is administered to the human or animal subject by an oral route, a nasal route, topically or as an injection.

38. The method of claim 37, wherein the injection is selected from the group consisting of intradermal, intramucosal, subcutaneous, intravenous, intraperitoneal, intramuscular, and intravenous.

39. A method of providing immunostimulation by activation of one or more dendritic cells (DCs) to a human subject for a prophylaxis, a therapy or a combination thereof against one or more viral, bacterial, fungal, parasitic, protozoal, and parasitic diseases, and allergic disorders comprising the steps of:

identifying the human subject in need of immunostimulation for the prophylaxis, the therapy or a combination thereof against the one or more viral, bacterial, fungal, parasitic, protozoal, and parasitic diseases, and allergic disorders;

isolating one or more DCs from the human subject;

activating the isolated DCs with an amount of a composition effective for forming activated DCs comprising:

an antigen; and

an adjuvant, wherein the adjuvant comprises an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to a TLR agonist; and a pharmaceutically acceptable carrier, in an amount effective to produce an immune response in a human or animal subject in need of immunostimulation; and

reintroducing the activated DCs into the human subject.

40. An adjuvant composition comprising:

an anti-dendritic cell (DC)-specific antibody or fragment thereof conjugated to at least a portion of a TLR agonist wherein the anti-DC-specific antibody is selected from pairs of SEQ ID NOS.: 7 and 9, 11 and 13, 15 and 17, 19 and 21, 23 and 25, 27 and 29, 31 and 33, 35 and 37, 39 and 41, 43 and 45, 47 and 49, 51 and 53, 55 and 57, 59 and 61, 63 and 65, 67 and 69, 71 and 73, 75 and 77, 79 and 81, 83 and 85, 87 and 89, 91 and 93, 95 and 97, 99 and 101, 1-3 and 105, 107 and 109, 111 and 113, 115 and 117, 119 and 121, 123 and 125, 127 and 129, 131 and 132, 133 and 134.

41. The composition of claim 40, wherein the composition further comprises antigenic peptides selected from human immunodeficiency virus (HIV) antigens and gene products selected from the group consisting of gag, pol, and env genes, the Nef protein, reverse transcriptase, string of HIV peptides (Hipo5), PSA (KLQCVDLHV)-tetramer, a HIVgag-derived p24-PLA HIV gag p24 (gag), and other HIV components, hepatitis viral antigens, influenza viral antigens and peptides selected from the group consisting of hemagglutinin, neuraminidase, Influenza A Hemagglutinin HA-1 from a H1N1 Flu strain, HLA-A201-FluMP (58-66) peptide (GILGFVFTL) tetramer, and Avian Flu (HA5-1), dockerin domain from C. thermocellum, measles viral antigens, rubella viral antigens, rotaviral antigens, cytomegaloviral antigens, respiratory syncytial viral antigens, herpes simplex viral antigens, varicella zoster viral antigens, Japanese encephalitis viral antigens, rabies viral antigens or combinations and modifications thereof.

42. The composition of claim 40, wherein the composition further comprises antigenic peptides selected from cancer peptides selected from tumor associated antigens comprising antigens from leukemias and lymphomas, neurological tumors such as astrocytomas or glioblastomas, melanoma, breast cancer, lung cancer, head and neck cancer, gastrointestinal tumors, gastric cancer, colon cancer, liver cancer, pancreatic cancer, genitourinary tumors such cervix, uterus, ovarian cancer, vaginal cancer, testicular cancer, prostate cancer or penile cancer, bone tumors, vascular tumors, or cancers of the lip, nasopharynx, pharynx and oral cavity, esophagus, rectum, gall bladder, biliary tree, larynx, lung and bronchus, bladder, kidney, brain and other parts of the nervous system, thyroid, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma and leukemia.

43. The composition of claim 40, wherein the composition further comprises antigenic peptides selected from tumor associated antigens selected from CEA, prostate specific antigen (PSA), HER-2/neu, BAGE, GAGE, MAGE 1-4, 6 and 12, MUC (Mucin) (e.g., MUC-1, MUC-2, etc.), GM2 and GD2 gangliosides, ras, myc, tyrosinase, MART (melanoma antigen), MARCO-MART, cyclin B1, cyclin D, Pmel 17(gp100), GnT-V intron V sequence (N-acetylglucoaminyltransferase V intron V sequence), Prostate Ca psm, prostate serum antigen (PSA), PRAME (melanoma antigen), β-catenin, MUM-1-B (melanoma ubiquitous mutated gene product), GAGE (melanoma antigen) 1, BAGE (melanoma antigen) 2-10, c-ERB2 (Her2/neu), EBNA (Epstein-Barr Virus nuclear antigen) 1-6, gp75, human papilloma virus (HPV) E6 and E7, p53, lung resistance protein (LRP), Bcl-2, and Ki-67.

44. The composition of claim 40, wherein the DC-specific antibody is humanized.

45. The composition of claim 40, wherein the TLR agonist comprises at least one of a flagellin from *Salmonella enterica*, a flagellin from *Vibrio cholerae*, any other TLR5 agonist, a TLR7 agonist, a TLR9 agonist, or any combinations or modifications thereof.

46. The composition of claim 40, wherein the antigen and the antibody are a single fusion protein.

47. The composition of claim 40, wherein the antibody comprises at least one of a light chain, a heavy chain, or a heavy and a light chain.

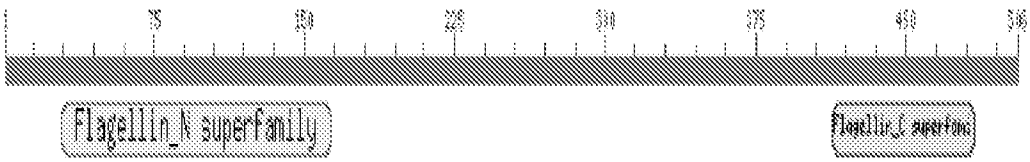


FIG. 1A

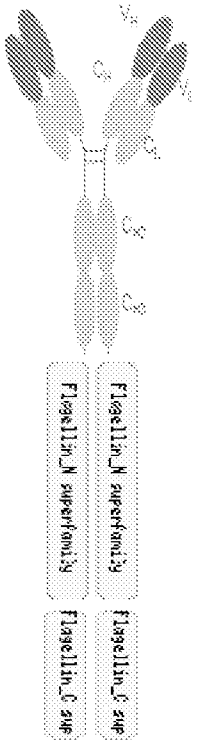


FIG. 1B

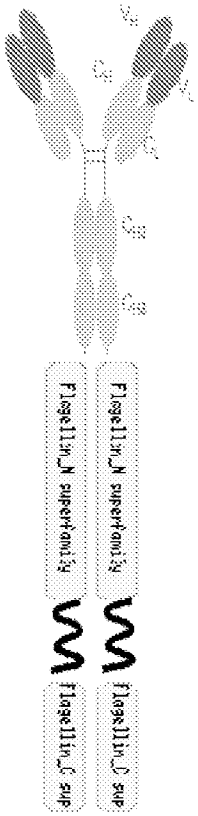


FIG. 1C

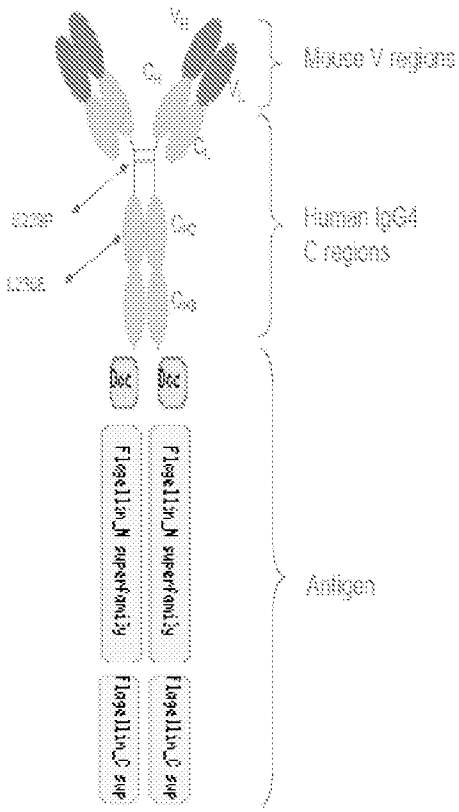


FIG. 1D

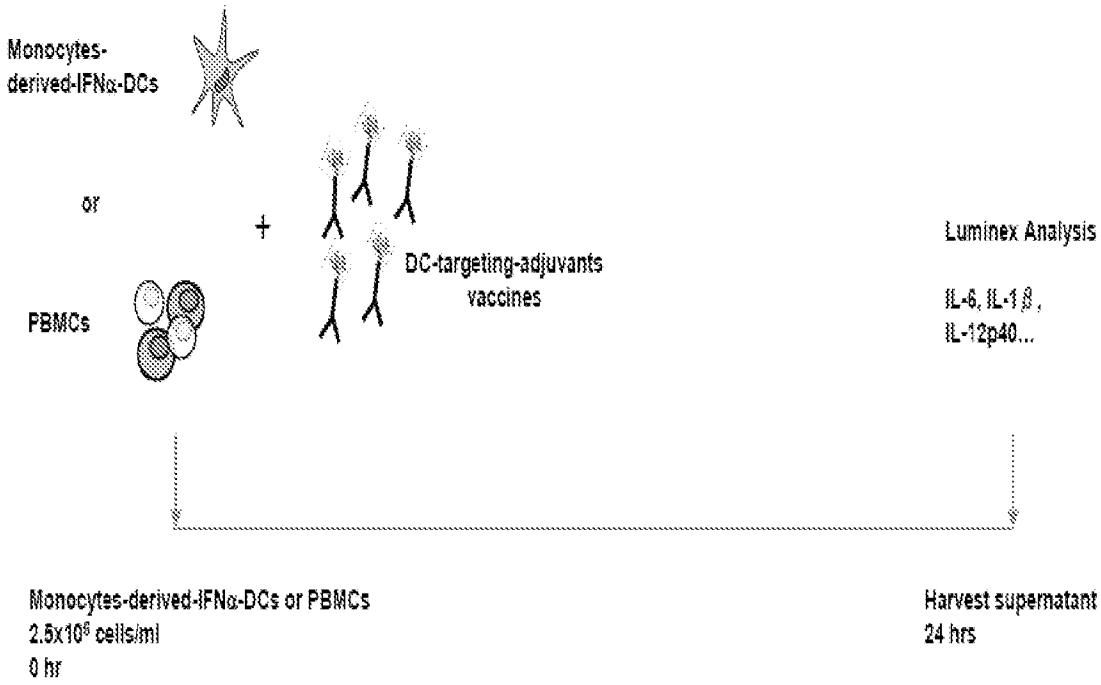

Monocytes-derived-IFNα-DCs
or
PBMCs
+
DC-targeting-adjuvants vaccines
Luminex Analysis
IL-6, IL-1β, IL-12p40...
Monocytes-derived-IFNα-DCs or PBMCs
2.5x10^6 cells/ml
0 hr
Harvest supernatant
24 hrs

FIG. 2

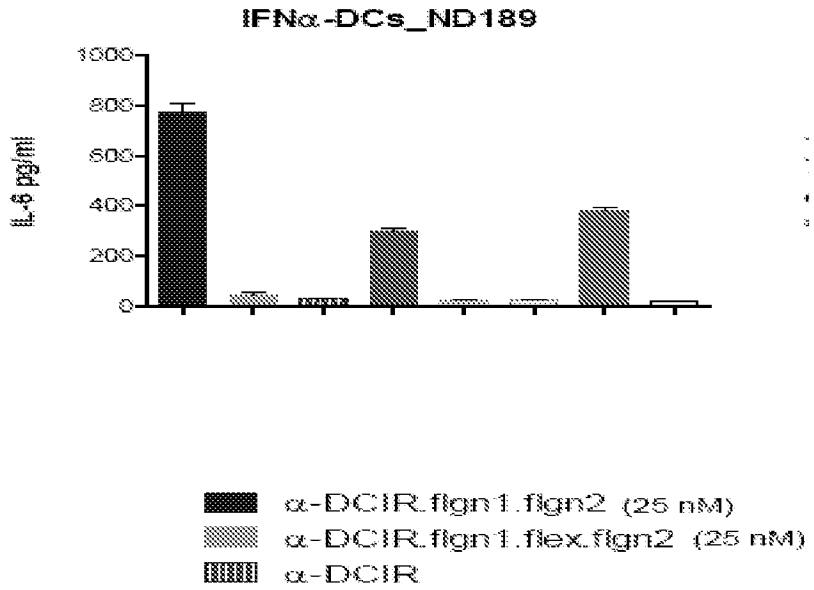
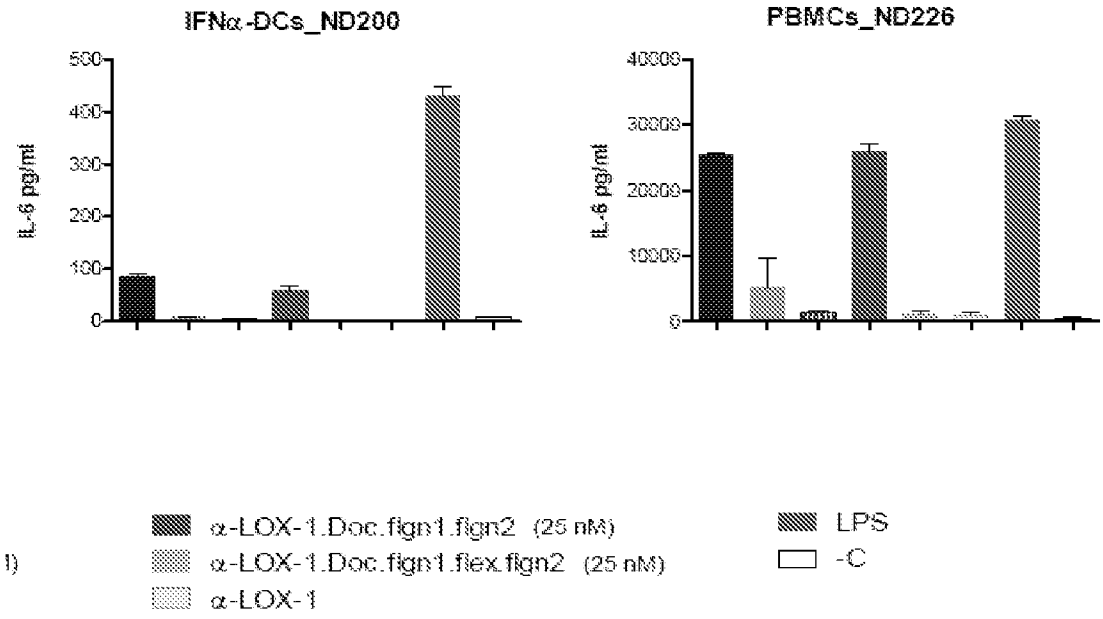

IFNα-DCs_ND189
IL-6 pg/ml
1000
800
600
400
200
0
α-DCIR.fign1.fign2 (25 nM)
α-DCIR.fign1.flex.fign2 (25 nM)
α-DCIR

FIG. 3A



I)

FIG. 3B

FIG. 3C

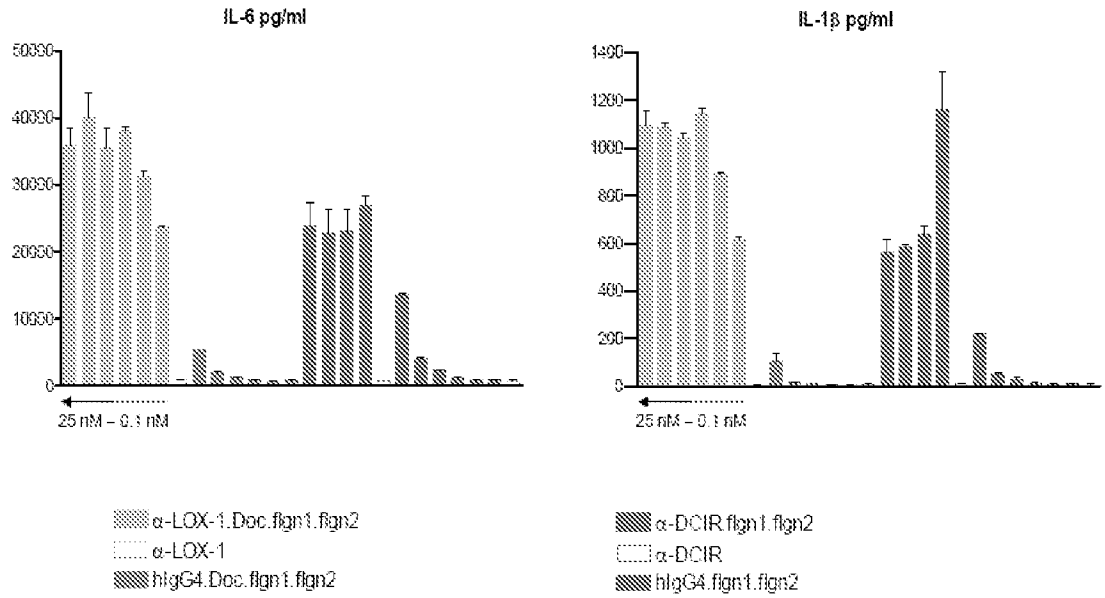


FIG. 4A

FIG. 4B

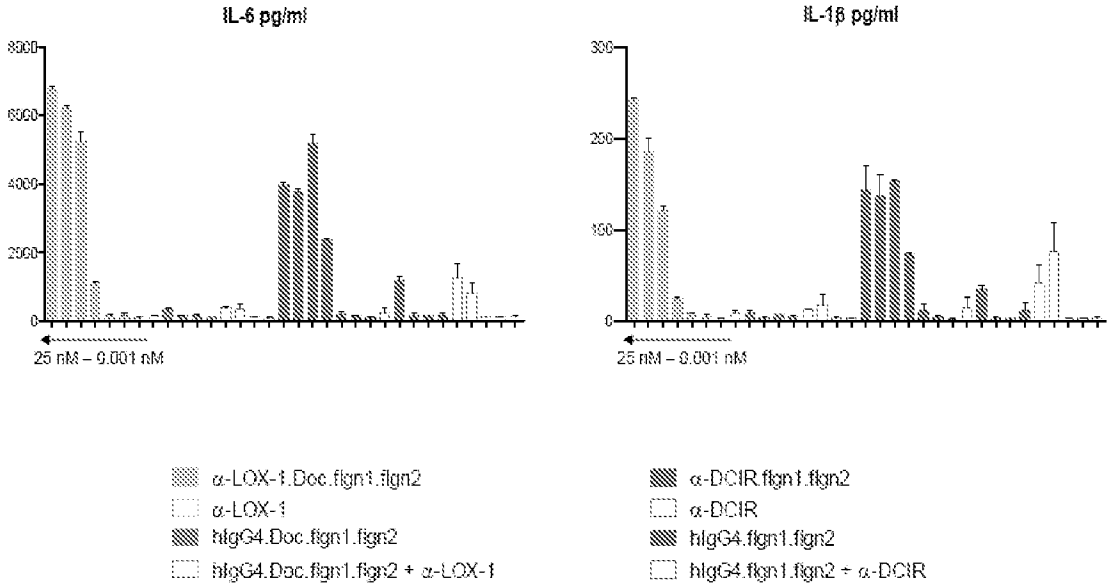


FIG. 4C FIG. 4D

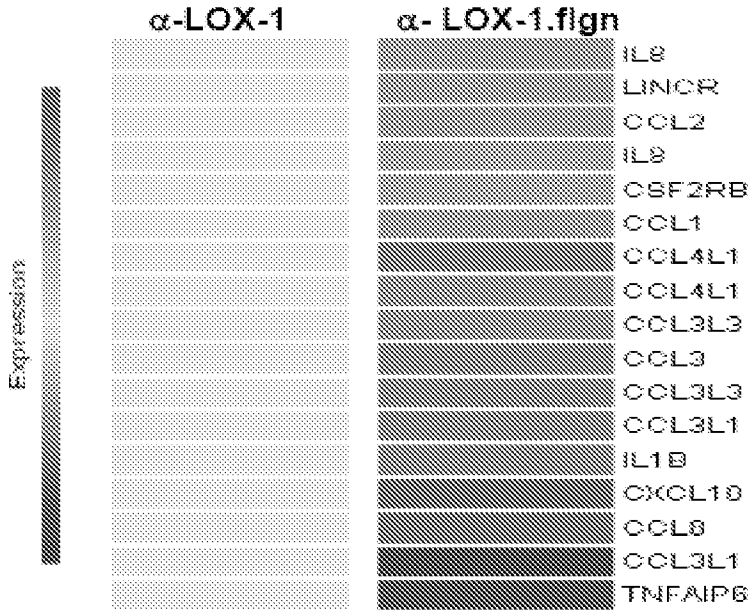


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/047633

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

A61K 39/39 (2006.01) ***A61K 39/106*** (2006.01) ***A61K 39/395*** (2006.01)
A61K 39/00 (2006.01) ***A61K 39/112*** (2006.01) ***A61K 39/02*** (2006.01)
A61K 39/12 (2006.01)

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)

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, EPODOC, MEDLINE (keywords: +dendritic_cell, dc, anti+ or immunoglob+, toll_like_receptor, TLR?, agoni+, ligand+, flagellin, conjugate+, link+, covalent+, fuse[e,i]+, DCIR, MHC+, CD1, CD2, CD3, CD4, CD8, CD11b, CD14, CD15, CD16, CD19, CD20, CD29, CD31, CD40, CD43, CD44, CD45, CD54, CD56, CD57, CD58, CD83, CD86, CMRF?44, CMRF?56, DC?ASPGR, CLEC?6, BDCA?2, MARCO, DEC?205, MANNOSE_RECEPTOR, LANGERIN, DECTIN?1, B7?[1,2], IFN?? RECEPTOR, IL?2 RECEPTOR, ICAM?1, Fc?? RECEPTOR, LOX?1, ASPGR)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/103048 A2 (REGENTS OF THE UNIVERSITY OF COLORADO) 13 September 2007 See, in particular: Abstract; [0008]; [0011]; [0013]; [0027]; [0029]; [0030]; [0033]; [0094]; [0096]; [00102]; [00103]; [00109]; [00119]; [00125]; Figures 6, 8, and 9; and Claim 7.	1-5, 7-16, 18-27, 29-42, 44-47
Y	See, in particular: Abstract; [0027]; [0029]; [0033]; [0094]; [0096]; [00102]; [00103]; [00109]; and Figures 6, and 8.	6, 17, 28, 43
Y	WO 2008/118587 A2 (BAYLOR RESEARCH INSTITUTE) 2 October 2008 See in particular: pg 3, lines 20-23; pg 16-17, bridging paragraph; and pg 37, lines 7-11.	6, 17, 28, 43

☐ 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
"E" earlier application or patent but published on or after the international filing date
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"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
30 September 2011	24 OCTOBER 2011
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **MICHAEL AMON** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2083

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2011/047633

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	2007103048	US	2009004194	US	2010291109		
WO	2008118587	AU	2008231242	CA	2717659	CN	101679949
		EP	2129773	JP	2010519316	KR	20090114466
		MX	2009008926	US	2008233140	ZA	200906619

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX