



HU000028830T2

(19) **HU****MAGYARORSZÁG**
Szellemi Tulajdon Nemzeti Hivatala(11) Lajstromszám: **E 028 830**(13) **T2****EURÓPAI SZABADALOM**
SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: E 06 787719	(51) Int. Cl.: C07K 16/28	(2006.01)
(22) A bejelentés napja: 2006. 07. 18.	A61K 393/95	(2006.01)
	A61P 11/06	(2006.01)
(96) Az európai bejelentés bejelentési száma:	C12N 5/10	(2006.01)
EP 20060787719	G01N 335/77	(2006.01)
(97) Az európai bejelentés közzétételi adatai:	G01N 33/68	(2006.01)
EP 1915398 A2	C12N 15/13	(2006.01)
2007. 01. 25.	A61P 37/00	(2006.01)
(97) Az európai szabadalom megadásának meghirdetési adatai:	C07K 16/18	(2006.01)
EP 1915398 B1		
2016. 04. 20.		

(86) A nemzetközi (PCT) bejelentési szám:
PCT/US 06/027862(87) A nemzetközi közzétételi szám:
WO 07011941

(30) Elsőbbségi adatok: 700265 P 2005. 07. 18. US	(73) Jogosult(ak): AMGEN INC., Thousand Oaks, CA 91320-1799 (US) E. R. Squibb & Sons, L.L.C., Princeton, NJ 08540 (US)
(72) Feltaláló(k): SIU, Gerald, Santa Monica, CA 90403 (US) Shen, Wenyan, Palo Alto, CA 94306 (US) YOSHINAGA, Steven, Kiyoshi, Thousand Oaks, CA 91360 (US) HUANG, Haichun, Fremont, CA 94539 (US)	(74) Képviselő: Danubia Szabadalmi és Jogi Iroda Kft., Budapest

(54) **Humán anti-B7RP1 semlegesítő ellenanyagok**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.



(11) **EP 1 915 398 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
20.04.2016 Bulletin 2016/16

(21) Application number: **06787719.1**

(22) Date of filing: **18.07.2006**

(51) Int Cl.:
C07K 16/28 ^(2006.01) **A61P 37/00** ^(2006.01)
A61P 11/06 ^(2006.01) **A61K 39/395** ^(2006.01)
G01N 33/68 ^(2006.01) **G01N 33/577** ^(2006.01)
C12N 15/13 ^(2006.01) **C12N 5/10** ^(2006.01)
C07K 16/18 ^(2006.01)

(86) International application number:
PCT/US2006/027862

(87) International publication number:
WO 2007/011941 (25.01.2007 Gazette 2007/04)

(54) **HUMAN ANTI-B7RP1 NEUTRALIZING ANTIBODIES**

HUMANE ANTI-B7RP1-NEUTRALISIERENDE ANTIKÖRPER

ANTICORPS NEUTRALISANTS ANTI-B7RP1 HUMAINS

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

Designated Extension States:
AL BA HR MK RS

(30) Priority: **18.07.2005 US 700265 P**

(43) Date of publication of application:
30.04.2008 Bulletin 2008/18

(60) Divisional application:
11004885.7 / 2 397 496
11004890.7 / 2 388 276
11004891.5 / 2 388 277
11004892.3 / 2 397 497
11004893.1 / 2 397 498
11004894.9 / 2 397 499

(73) Proprietors:
• **AMGEN INC.**
Thousand Oaks, CA 91320-1799 (US)
• **E. R. Squibb & Sons, L.L.C.**
Princeton, NJ 08540 (US)

(72) Inventors:
• **SIU, Gerald**
Santa Monica, CA 90403 (US)
• **SHEN, Wenyan**
Palo Alto, CA 94306 (US)

• **YOSHINAGA, Steven, Kiyoshi**
Thousand Oaks, CA 91360 (US)
• **HUANG, Haichun**
Fremont, CA 94539 (US)

(74) Representative: **Grünecker Patent- und
Rechtsanwälte
PartG mbB
Leopoldstraße 4
80802 München (DE)**

(56) References cited:
EP-A1- 1 374 902 WO-A-2006/003999
WO-A2-00/46240 WO-A2-02/44364

• **S. KHAYYAMIAN ET AL: "ICOS-ligand, expressed
on human endothelial cells, costimulates h1 and
Th2 cytokine secretion by memory CD4+ T cells"**
PNAS, vol. 99, no. 9, 2002, pages 6198-6203,
XP002414707
• **IWAH ET AL: "Amelioration of collagen-induced
arthritis by blockade of inducible costimulator-B7
homologous protein costimulation" 15 October
2002 (2002-10-15), JOURNAL OF IMMUNOLOGY,**
THE WILLIAMS AND WILKINS CO. BALTIMORE,
US, PAGE(S) 4332-4339 , XP002336753 ISSN:
0022-1767 See Materials and methods

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

- TOTSUKA TERUJI ET AL: "Ameliorating effect of anti-inducible costimulator monoclonal antibody in a murine model of chronic colitis" February 2003 (2003-02), GASTROENTEROLOGY, ELSEVIER, PHILADELPHIA, PA, US, PAGE(S) 410-421 , XP002297200 ISSN: 0016-5085 see Materials and methods
- G. RICHTER ET AL: "Tumor Necrosis Factor-alpha regulates the expression of inducible costimulator receptor ligand on CD34+ progenitor cells during differentiation into antigen presenting cells" THE JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 276, no. 49, 2001, pages 45686-45693, XP002414708
- P. WAHL ET AL: "Renal tubular epithelial expression of the costimulatory molecule b7rp1 (inducible costimulator ligand)" J AM SOC NEPHROL, vol. 13, 2002, pages 1517-1526, XP002414709
- P. WAHL ET AL: "Interaction of b7rp1 with ICOS negatively regulates antigen presentation by B cells" INFLAMMATION, vol. 27, no. 4, 2003, pages 191-200, XP002414710
- DATABASE MEDLINE [Online] US NATIONAL LIBRARY OF MEDICINE (NLM), BETHESDA, MD, US 01 February 2009 HU YI-LING ET AL: 'B7RP-1 blockade ameliorates autoimmunity through regulation of follicular helper T cells.' Database accession no. NLM19155489 & JOURNAL OF IMMUNOLOGY (BALTIMORE, MD. : 1950) 1 FEB 2009 LNKD- PUBMED:19155489, vol. 182, no. 3, 1 February 2009 (2009-02-01), pages 1421-1428, ISSN: 1550-6606

Description**FIELD OF THE INVENTION**

5 **[0001]** The invention relates to human monoclonal antibodies that bind B7 related protein-1 (B7RP1). Compositions and methods for treating diseases and disorders related to immunosuppression and immune activation are also described.

BACKGROUND OF THE INVENTION

10 **[0002]** T-cells initiate the immune response, mediate antigen-specific effector functions, and regulate the activity of other leukocytes by secreting cytokines. For the generation of a proper T-lymphocyte (T-cell) immune response, two signals must be provided to the T-cell by antigen presenting cells (APC). Antigen must be presented to the T-cell receptor (TCR) via a major histocompatibility complex (MHC), in an event that determines specificity. T-cells can only recognize antigen presented on an APC. In addition to the antigen receptor, proper T-cell activation also requires the interaction
 15 of other cell-surface molecules on both the T-cell and the APC. These molecules, referred to as co-stimulatory molecules, consist of a receptor on the responding cell and a ligand present on the inducer cell. This antigen independent, co-stimulatory signal must be delivered by engagement of members of the B7 family on the APC with their receptors on T-cells. A productive immune response leads to proliferation, differentiation, clonal expansion, and effector function. In the absence of the second, co-stimulatory signal, T-cells undergo a state of long-lasting antigen-specific unresponsiveness, termed anergy. Phase II clinical experiments have demonstrated that blocking one co-stimulation pathway is efficacious
 20 in the treatment of psoriasis (Abrams et al., 2000, J Exp Med. 192:681-94; Abrams et al., 1999, J. Clin. Invest. 103:1243-52) and rheumatoid arthritis (Kremer et al., 2003, New England Journal of Medicine 349:1907-15), indicating that this general strategy is a good target for immunomodulatory therapy.

[0003] A particular co-stimulatory B7 molecule, B7 related protein-1 (B7RP1), is a type 1 transmembrane protein with
 25 a signal sequence and extracellular domain at the amino-terminus, an extracellular domain comprising two Ig loops, a transmembrane domain, and a carboxy terminal intracellular domain (PCT Application Publication No. WO 00/46240). B7RP1 preferentially binds to ICOS (which stands for "inducible costimulator"; Yoshinga et al., 2000, Int. Immun. 12:1439-1447) expressed on the cell surface of T-cells. ICOS plays an important role in the production of both type 1 and type 2 cytokines by activated T-cells (Coyle et al., 2000, Immunity 13:95-105).

30 **[0004]** B7RP1 is the sole ligand expressed constitutively on APCs (Yoshinaga et al., 1999, Nature. 402:827-32), while ICOS is expressed only on activated T-cells (McAdam et al., 2000, Journal of Immunology 165:5035-40). B7RP1-dependent signaling is required for the activation of the effector (*i.e.* fully activated) T-cell, as well as its maturation from its naive precursor (Dong et al., 2003, Journal of Autoimmunity. 21:255-60; Coyle et al., 2000, Immunity. 13:95-105). Consequently, the B7RP1/ICOS interaction is required for proper T-cell-dependent recall immune responses (Dong et
 35 al., 2003, Journal of Autoimmunity. 21:255-60).

WO 00/46240 and WO 02/44364 describe antibodies that bind to B7RP1. EP 1 374 902 describes antibodies that bind to ICOS.

Khayyamian et al., 2002, PNAS Vol. 99, No. 9, pp. 6198-6203, describe that ICOS-ligand, expressed on human endothelial cells, costimulates Th1 and Th2 cytokine secretion by memory CD4+ T cells.

40 Iwai et al., 2002, J. Immunol., Vol. 169, No. 8, pp. 4332-4339, report on the ICOS-B7h interaction in the pathogenesis of collagen-induced arthritis.

Totsuka et al., 2003, Gastroenterology, Vol. 124, No. 2, pp. 410-421, describe an ameliorating effect of an anti-ICOS monoclonal antibody in a murine model of chronic colitis.

45 Richter et al., 2001, J. Biol. Chem., Vol. 276, No. 49, pp. 45686-45693, describe that TNF-alpha regulates the expression of ICOSL on CD34(+) progenitor cells during differentiation into antigen presenting cells.

Wahl et al., 2002, J. Am. Soc. Nephrol., Vol. 13, No. 6, pp. 1517-1526, report on renal tubular epithelial expression of B7RP-1.

Wahl et al., 2003, Inflammation, Vol. 27, No. 4, pp. 191-200, describe that the B7RP-1/ICOS pathway is negatively regulating T cell activation by B cells.

50 **[0005]** Current attempts to interfere with the co-stimulatory T-cell pathway have focused primarily on co-stimulatory polypeptides that block T-cell activation only, but have not focused on activation and maturation. Consequently, these therapies provide general inhibition of T-cell function. In contrast, blocking the B7RP1/ICOS interaction provides a more specific inhibition of T-cell function by affecting only mature effector T-cells. Thus, blocking the B7RP1/ICOS interaction in a clinical setting is highly desirable because it would provide a more limited side-effect profile than co-stimulation
 55 therapies that block naive T-cell activation only.

SUMMARY OF THE INVENTION

[0006] The disclosure provides monoclonal antibodies that bind to B7 related protein-1 (B7RP1). In one aspect, the monoclonal antibodies are human monoclonal antibodies that neutralize biological activities of B7RP1 and are particularly useful for inhibiting partially or completely the immune co-stimulatory activity of B7RP1. Also provided by the disclosure are cells, particularly hybridoma cells that produce the monoclonal antibodies of the disclosure. In particular aspects, the antibodies of the disclosure bind specifically to the H or D region of B7RP1 as described herein.

[0007] The disclosure further provides fusion proteins comprising the sequence of an antibody Fc region and one or more sequences identified as SEQ ID NO: 1 through SEQ ID NO. 40. Such molecules can be prepared using methods as described, for example, in International Patent Application, Publication No. WO 00/24782. Such molecules can be expressed, for example, in mammalian cells (e.g. Chinese Hamster Ovary cells) or bacterial cells (e.g. *E. coli* cells).

[0008] In certain aspects, the disclosure provides antibodies comprising a heavy chain and a light chain, wherein the heavy chain comprises an heavy chain constant region selected from IgG1, IgG2, IgG3, IgG4, IgM, IgA and IgE heavy chain constant regions or any allelic variation thereof (as discussed in Kabat et al., 1991, SEQUENCES OF PROTEINS OF IMMUNOLOGICAL INTEREST, Fifth Edition, U.S. Department of Health and Human Services, NIH Publication No. 91-3242), and the variable region of the heavy chain comprises an amino acid sequence as set forth in any of SEQ ID NO: 7 through SEQ ID NO. 14, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. An antibody of the disclosure comprises either an amino acid sequence of the IgG2 heavy chain constant region as set forth in SEQ ID NO: 41 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, or an amino acid sequence of the IgG1 heavy chain constant region as set forth in SEQ ID NO: 42 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. In certain aspects, the antibodies are monoclonal antibodies, human antibodies, or preferably human monoclonal antibodies.

[0009] In certain aspects, the disclosure provides antibodies comprising a heavy chain and a light chain, wherein the light chain comprises a constant region having an amino acid sequence as set forth in SEQ ID NO: 43 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and the light chain variable region comprises an amino acid sequence as set forth in any of SEQ ID NO: 1 through SEQ ID NO. 6, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. In certain aspects, the antibodies are monoclonal antibodies, human antibodies, or preferably human monoclonal antibodies.

[0010] In certain aspects, antibodies of the disclosure comprise a heavy chain and a light chain, wherein the variable region of the heavy chain comprises an amino acid sequence as set forth in SEQ ID NO: 7 or SEQ ID NO: 8, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. In other aspects, the light chain variable region comprises an amino acid sequence as set forth in SEQ ID NO: 1, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0011] In other aspects, antibodies of the disclosure comprise a heavy chain and a light chain, wherein the variable region of the heavy chain comprises an amino acid sequence as set forth in SEQ ID NO: 9, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. In other aspects, the light chain variable region comprises an amino acid sequence as set forth in SEQ ID NO: 2, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0012] In additional aspects, the heavy chain comprises at least one complementarity determining region (CDR) having an amino acid sequence as set forth in any of SEQ ID NO: 27 through SEQ ID NO. 40, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof. In still further aspects, the light chain comprises at least one CDR having an amino acid sequence as set forth in any of SEQ ID NO: 15 through SEQ ID NO. 26, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0013] The disclosure also provides antibodies that bind specifically to B7RP1, wherein the heavy chain comprises a variable region comprising an amino acid sequence as set forth in SEQ ID NO: 7 or SEQ ID NO: 8, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and the light chain comprises a variable region comprising an amino acid sequence as set forth in SEQ ID NO: 1, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0014] In addition, the disclosure provides antibodies that bind specifically to B7RP1, wherein the heavy chain comprises a variable region comprising an amino acid sequence as set forth in SEQ ID NO: 9, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and the light chain comprises a variable region comprising an amino acid sequence as set forth in SEQ ID NO: 2, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0015] In certain aspects, the disclosure also provides antibodies, comprising a heavy chain and a light chain, wherein the heavy chain comprises a heavy chain variable region, and wherein the heavy chain variable region comprises a sequence that has at least about 75%, at least about 80%, at least about 85%, at least about 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or at least about 99% identity to the amino acid sequence as set forth in any of SEQ ID NO: 7 through SEQ ID NO. 14, and wherein the light chain comprises a light chain variable region, and wherein the light

chain variable region comprises a sequence that has at least about 80%, at least about 85%, at least about 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or at least about 99% identity to the amino acid sequence as set forth in any of SEQ ID NO: 1 through SEQ ID NO. 6, wherein the antibody binds specifically to B7RP1.

[0016] The disclosure also provides antibodies that bind specifically to B7RP1, wherein the heavy chain comprises an amino acid sequence as set forth in SEQ ID NO: 44 or SEQ ID NO: 46, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and the light chain comprises an amino acid sequence as set forth in SEQ ID NO: 45, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0017] The disclosure also provides antibodies that bind specifically to B7RP1, wherein the heavy chain comprises an amino acid sequence as set forth in SEQ ID NO: 47, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and the light chain comprises an amino acid sequence as set forth in SEQ ID NO: 48, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0018] In certain aspects, the disclosure provides antibodies, comprising a heavy chain and a light chain, wherein the heavy chain comprises a heavy chain variable region, and wherein the heavy chain variable region comprises at least one CDR having a sequence that has at least about 75%, at least about 80%, at least about 85%, at least about 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or at least about 99% identity to the amino acid sequence as set forth in any of SEQ ID NO: 27 through SEQ ID NO. 40, and wherein the light chain comprises a light chain variable region, and wherein the light chain variable region comprises at least one CDR having an amino acid sequence that has at least about 80%, at least about 85%, at least about 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or at least about 99% identity to the amino acid sequence as set forth in SEQ ID NO: 15 through SEQ ID NO. 26, wherein the antibody binds specifically to B7RP1.

[0019] The disclosure also provides single chain antibodies, single chain Fv antibodies, F(ab) antibodies, F(ab)' antibodies and (Fab')₂ antibodies.

[0020] In particular aspects, the disclosure provides a light chain comprising an amino acid sequence as set forth in SEQ ID NO: 15 through SEQ ID NO. 26, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0021] In addition, the disclosure provides a heavy chain comprising an amino acid sequence as set forth in any of SEQ ID NO: 27 through SEQ ID NO. 40, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.

[0022] The disclosure also relates to isolated human antibodies that specifically bind B7RP1, wherein the antibody comprises: (a) human heavy chain framework regions, a human heavy chain CDR1 region, a human heavy chain CDR2 region, and a human heavy chain CDR3 region; and (b) human light chain framework regions, a human light chain CDR1 region, a human light chain CDR2 region, and a human light chain CDR3 region. In certain aspects, the human heavy chain CDR1 region can be the heavy chain CDR1 region as shown in any of SEQ ID NO: 27, 30, or 35 and the human light chain CDR1 region can be the light chain CDR1 region shown in any of SEQ ID NO: 15, 18, or 24. In other aspects, the human heavy chain CDR2 region can be the heavy chain CDR2 region as shown in any of SEQ ID NO: 28, 31, 33, 36, or 39, and the human light chain CDR2 region can be the light chain CDR2 as shown in any of SEQ ID NO: 16, 19, or 21. In still other aspects, the human heavy chain CDR3 region is the heavy chain CDR3 region as shown in any of SEQ ID NO: 29, 32, 34, 37, 38 or 40, and the human light chain CDR3 region is the light chain CDR3 region as shown in any of SEQ ID NO: 17, 20, 22, 23, 25, or 26.

[0023] The antibodies of the disclosure are characterized by the ability to bind specifically to B7RP1. Furthermore, antibodies of the disclosure have the capacity to antagonize at least one *in vitro* and/or *in vivo* activity associated with B7RP1 polypeptides. The invention provides isolated anti-human B7RP1 human antibodies with high affinity binding to B7RP1 polypeptides, wherein the antibodies bind to a human B7RP1 polypeptide and dissociates from the human B7RP1 polypeptide with a dissociation constant (K_D) of about 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M, 10^{-12} M, or less, as determined using KinExA, or which inhibit B7RP1 induced survival in an *in vitro* neutralization assay with an EC_{50} of about 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M, 10^{-12} M, or less.

[0024] The disclosure also provides isolated human antibodies or an antigen-binding or immunologically functional immunoglobulin fragments thereof that bind specifically to B7RP1, wherein the antibodies or fragments comprise a heavy chain variable region comprising a heavy chain CDR1, CDR2, and CDR3, wherein:

a) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 27, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 28, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 29;

b) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 30, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 31, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 32;

c) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 27, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 33, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 34;

d) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 35, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 36, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 37;

e) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 27, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 33, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 38; or

f) the heavy chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 35, the heavy chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 39, and the heavy chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 40.

[0025] The disclosure also provides an isolated human antibody or an antigen-binding or an immunologically functional immunoglobulin fragment thereof that binds specifically to B7RP1, wherein the antibody or fragment comprises a light chain variable region comprising a light chain CDR1, CDR2, and CDR3, wherein:

a) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 15, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 16, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 17;

b) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 18, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 19, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 20;

c) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 15, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 21, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 22;

d) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 18, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 19, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 23;

e) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 24, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 16, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 25; or

f) the light chain CDR1 has an amino acid sequence as set forth in SEQ ID NO: 24, the light chain CDR2 has an amino acid sequence as set forth in SEQ ID NO: 16, and the light chain CDR 3 has an amino acid sequence as set forth in SEQ ID NO: 26.

[0026] The disclosure also provides antibodies that compete with binding of the antibodies described herein to B7RP1. In certain aspects, a competitive antibody of the disclosure competes with binding of an antibody that comprises any of SEQ ID NO: 1-40 to human B7RP1.

[0027] Also part of the disclosure are polynucleotide sequences that encode anti-human B7RP1 human antibodies, vectors comprising the polynucleotide sequences encoding anti-human B7RP1 human antibodies, host cells transformed with vectors incorporating polynucleotides that encode anti-human B7RP1 human antibodies, formulations comprising anti-human B7RP1 human antibodies and methods of making and using same.

[0028] The disclosure also provides methods for detecting B7RP1 in a biological sample, comprising the step of contacting the sample with an antibody of the disclosure or antigen-binding fragment thereof. An anti-B7RP1 antibody of the disclosure may be employed in any known assay method, such as competitive binding assays, direct and indirect sandwich assays, immunoprecipitation assays and enzyme-linked immunosorbent assays (ELISA) (See, Sola, 1987, Monoclonal Antibodies: A Manual of Techniques, pp. 147-158, CRC Press, Inc.) for the detection and quantitation of B7RP1. The antibodies can bind B7RP1 with an affinity that is appropriate for the assay method being employed.

[0029] In addition, the disclosure provides methods for use in treating a disease associated with increased production

of B7RP1, increased sensitivity to B7RP1, and/or diseases related to control of T-cell responses, comprising the step of administering a pharmaceutically effective amount of a pharmaceutical composition comprising at least one antibody of the disclosure or an antigen-binding or an immunologically functional immunoglobulin fragment thereof to an individual in need thereof.

[0030] Aspects of the disclosure will become evident from the following detailed description and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Figure 1A depicts the 16H antibody variable region sequence (SEQ ID NO: 7) and the corresponding 16H variable region germline (16Hg) sequence (SEQ ID NO: 8).

Figure 1B depicts results of co-stimulation assays using anti-CD3 and hB7RP1-Fc fusion protein demonstrating that 16Hg retains its biological activities compared with 16H.

Figure 2 shows the results of Biacore® binding assays with 16H, 16Hg, and 5D antibodies.

Figure 3 shows the results of KinExA binding assay with 5D antibody.

Figure 4 shows the results of KinExA binding assay with 2H antibody.

Figure 5 shows the results of KinExA binding assay with 2H germline (2Hg) antibody.

Figure 6 depicts the results of binding-competition assays showing that 16H antibody competes away binding of ICOS-Fc on B7RP-1, analyzed by flow cytometry.

Figure 7 depicts a summary of a B7RP-1 single nucleotide polymorphism (SNP) analysis.

Figure 8 depicts a summary of the analysis of a set of anti-human B7RP-1 monoclonal antibodies in ELISA competition assays. Values shown are IC₅₀s for inhibition of binding of an ICOS-Fc fusion protein.

Figure 9A shows fluorescent staining of B7RP1 extracellular domain (ECD) with labeled 16H, 5D, and ICOS antibodies.

Figure 9B shows similar binding efficacy of 16H and 5D antibodies to a B7RP1 SNP variant.

Figure 9C depicts the results of co-stimulation assays with 16H or 5D antibodies and SNP variants.

Figure 10A shows plate co-stimulation assay results with 1B7v2 monoclonal antibodies compared with a number of different anti-murine B7RP-1 monoclonal antibodies.

Figures 10B, 10C, and 10D show the results of antigen challenge experiments, analyzed for antigen-specific serum IgM (Figure 10B), IgG2a (Figure 10C), and IgG1 (Figure 10D).

Figure 11 depicts ELISA results demonstrating that serum IL-5 levels are repressed by 1B7v2 antibodies.

Figure 12A shows that 16H antibodies can bind to cynomolgus monkey B7RP1 (right panel) and human B7RP1 (left panel).

Figure 12B shows that 16H, 16Hg, and 5D antibodies can inhibit cynomolgus monkey B7RP1/ICOS-dependent T cell activation.

Figure 13A depicts individual cynomolgus monkey and group mean titer values at day 53 and day 57 after secondary challenge with tetanus toxoid on day 42 in animals treated with 16H antibodies.

Figure 13B depicts individual cynomolgus monkey and group mean titer values at day 53 and day 57 after secondary challenge with tetanus toxoid on day 42 in animals treated with 5D antibodies.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

[0032] The section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

Definitions

[0033] Conventional techniques may be used for recombinant DNA, oligonucleotide synthesis, and tissue culture and transformation (e.g., electroporation, lipofection). Enzymatic reactions and purification techniques may be performed according to manufacturer's specifications or as commonly accomplished in the art or as described herein. The foregoing techniques and procedures may be generally performed according to methods well known in the art and as described in various general and more specific references that are cited and discussed throughout the present specification. See e.g., Sambrook et al., 2001, MOLECULAR CLONING: A LABORATORY MANUAL, 3d ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. Unless specific definitions are provided, the nomenclature utilized in connection with, and the laboratory procedures and techniques of, analytical chemistry, synthetic organic chemistry, and medicinal and pharmaceutical chemistry described herein are those well known and commonly used in the art. Similarly, conventional techniques may be used for chemical syntheses, chemical analyses, pharmaceutical preparation, formulation, and delivery, and treatment of patients.

[0034] As utilized in accordance with the present disclosure, the following terms, unless otherwise indicated, shall be understood to have the following meanings. The phrases "biological property", "biological characteristic", and the term "activity" in reference to an antibody of the present invention are used interchangeably herein and include, but are not limited to, epitope affinity and specificity (e.g., anti-human B7RP1 human antibody binding to human B7RP1), ability to antagonize the activity of the targeted polypeptide (e.g., B7RP1 activity), the *in vivo* stability of the antibody, and the immunogenic properties of the antibody. Other identifiable biological properties or characteristics of an antibody recognized in the art include, for example, cross-reactivity, (*i.e.*, with non-human homologs of B7RP1, or with other proteins or tissues, generally), and ability to preserve high expression levels of protein in mammalian cells. The aforementioned properties or characteristics can be observed or measured using art-recognized techniques including, but not limited to ELISA, competitive ELISA, surface plasmon resonance analysis, *in vitro* and *in vivo* neutralization assays (e.g., Example 2), and immunohistochemistry with tissue sections from different sources including human, primate, or any other appropriate source. Particular activities and biological properties of anti-human B7RP1 human antibodies are described in further detail in the Examples below.

[0035] The term "isolated polynucleotide" as used herein shall mean a polynucleotide of genomic DNA, cDNA, RNA, or synthetic origin or some combination thereof, which by virtue of its origin the isolated polynucleotide (1) is not associated with all or a portion of a polynucleotide with which the isolated polynucleotide is found in nature, (2) is linked to a polynucleotide to which it is not linked in nature, or (3) does not occur in nature as part of a larger sequence.

[0036] The term "polynucleotide" as referred to herein means single-stranded or double-stranded nucleic acid polymers of at least 10 nucleotides in length. In certain aspects, the nucleotides comprising the polynucleotide can be ribonucleotides or deoxyribonucleotides or a modified form of either type of nucleotide. Said modifications include base modifications such as bromuridine, ribose modifications such as arabinoside and 2',3'-dideoxyribose and internucleotide linkage modifications such as phosphorothioate, phosphorodithioate, phosphoroselenoate, phosphorodiselenoate, phosphoroanilothioate, phosphoraniladate and phosphoroamidate. The term "polynucleotide" specifically includes single and double stranded forms of DNA or RNA.

[0037] The term "oligonucleotide" referred to herein includes naturally occurring, and modified nucleotides linked together by naturally occurring, and/or non-naturally occurring oligonucleotide linkages. Oligonucleotides are a polynucleotide subset comprising members that are generally single-stranded and have a length of 200 nucleotides or fewer. In certain aspects, oligonucleotides are 10 to 60 nucleotides in length. In certain aspects, oligonucleotides are 12, 13, 14, 15, 16, 17, 18, 19, or 20 to 40 nucleotides in length. Oligonucleotides may be single stranded or double stranded, e.g. for use in the construction of a genetic mutant. Oligonucleotides of the disclosure may be sense or antisense oligonucleotides with reference to a protein-coding sequence.

[0038] The term "naturally occurring nucleotides" includes deoxyribonucleotides and ribonucleotides. The term "modified nucleotides" includes nucleotides with modified or substituted sugar groups and the like. The term "oligonucleotide linkages" includes oligonucleotide linkages such as phosphorothioate, phosphorodithioate, phosphoroselenoate, phosphorodiselenoate, phosphoroanilothioate, phosphoraniladate, phosphoroamidate, and the like. See, e.g., LaPlanche et al., 1986, Nucl. Acids Res., 14:9081; Stec et al., 1984, J. Am. Chem. Soc., 106:6077; Stein et al., 1988, Nucl. Acids Res., 16:3209; Zon et al., 1991, Anti-Cancer Drug Design, 6:539; Zon et al., 1991, OLIGONUCLEOTIDES AND ANALOGUES: A PRACTICAL APPROACH, pp. 87-108 (F. Eckstein, Ed.), Oxford University Press, Oxford England; Stec et al., U.S. Pat. No. 5,151,510; Uhlmann and Peyman, 1990, Chemical Reviews, 90:543. An oligonucleotide can include a detectable label to enable detection of the oligonucleotide or hybridization thereof.

[0039] The term "isolated protein" referred to herein means that a subject protein (1) is free of at least some other proteins with which it would be found in nature, (2) is essentially free of other proteins from the same source, e.g., from the same species, (3) is expressed by a cell from a different species, (4) has been separated from at least about 50 percent of polynucleotides, lipids, carbohydrates, or other materials with which it is associated in nature, (5) is not associated (by covalent or noncovalent interaction) with portions of a protein with which the "isolated protein" is associated in nature, (6) is operably associated (by covalent or noncovalent interaction) with a polypeptide with which it is not associated in nature, or (7) does not occur in nature. Such an isolated protein can be encoded by genomic DNA, cDNA, mRNA or other RNA, of synthetic origin, or any combination thereof. In one aspect, the isolated protein is substantially free from proteins or polypeptides or other contaminants that are found in its natural environment that would interfere with its use (therapeutic, diagnostic, prophylactic, research or otherwise).

[0040] An "isolated" antibody is one that has been identified and separated and/or recovered from a component of its natural environment. Contaminant components of its natural environment are materials that would interfere with diagnostic or therapeutic uses for the antibody, and may include enzymes, hormones, and other proteinaceous or non-proteinaceous substances. In certain aspects, the antibody is purified (1) to greater than 95% or greater than 99% by weight of antibody as determined by the Lowry method, (2) to a degree sufficient to obtain at least 15 residues of N-terminal or internal amino acid sequence by use of a spinning cup sequenator, or (3) to homogeneity by SDS-PAGE under reducing or nonreducing conditions using Coomassie blue or silver stain. Isolated antibody includes the antibody *in situ* within recombinant cells since at least one component of the antibody's natural environment will not be present.

[0041] The terms "polypeptide" or "protein" means molecules having the sequence of native proteins, that is, proteins produced by naturally-occurring and specifically non-recombinant cells, or genetically-engineered or recombinant cells, and comprise molecules having the amino acid sequence of the native protein, or molecules having deletions from, additions to, and/or substitutions of one or more amino acids of the native sequence. The terms "polypeptide" and "protein" specifically encompass anti-B7RP1 antibodies, or sequences that have deletions from, additions to, and/or substitutions of one or more amino acid of an anti- B7RP1 antibody.

[0042] The term "polypeptide fragment" refers to a polypeptide that has an amino-terminal deletion, a carboxyl-terminal deletion, and/or an internal deletion. In certain embodiments, fragments are at least 5 to about 500 amino acids long. It will be appreciated that in certain embodiments, fragments are at least 5, 6, 8, 10, 14, 20, 50, 70, 100, 110, 150, 200, 250, 300, 350, 400, or 450 amino acids long. Particularly useful polypeptide fragments include functional domains, including binding domains particularly antigen-binding domains, especially wherein the antigen is an epitope of human B7RP1. In the case of an anti-B7RP1 antibody, useful fragments include but are not limited to a CDR region, a variable domain of a heavy or light chain, a portion of an antibody chain or just its variable region including two CDRs, and the like.

[0043] The term "specific binding agent" refers to a naturally occurring or non-naturally occurring molecule that specifically binds to a target. Examples of specific binding agents include, but are not limited to, proteins, peptides, nucleic acids, carbohydrates, and lipids. In certain aspects, a specific binding agent is an antibody.

[0044] The term "specific binding agent to B7RP1" refers to a specific binding agent that specifically binds any portion of B7RP1. In certain aspects, a specific binding agent to B7RP1 is an antibody that binds specifically to B7RP1.

[0045] By way of example, an antibody "binds specifically" to a target if the antibody, when labeled, can be competed away from its target by the corresponding non-labeled antibody.

[0046] The term "immunologically functional immunoglobulin fragment" as used herein refers to a polypeptide fragment that contains at least the CDRs of the immunoglobulin heavy and light chains. An immunologically functional immunoglobulin fragment of the disclosure is capable of binding to an antigen. In certain aspects, the antigen is a ligand that specifically binds to a receptor. In these aspects, binding of an immunologically functional immunoglobulin fragment of the invention prevents binding of the ligand to its receptor, interrupting the biological response resulting from ligand binding to the receptor. In one aspect, an immunologically functional immunoglobulin fragment of the disclosure binds specifically to B7RP1. Preferably, the fragment binds specifically to human B7RP1.

[0047] The term "naturally-occurring" or "native" as used herein and applied to an object refers to the fact that the object can be found in nature. For example, a polypeptide or polynucleotide sequence that is present in an organism (including viruses) that can be isolated from a source in nature and that has not been intentionally modified by man is naturally-occurring. The term "non-naturally occurring" or "non-native" as used herein refers to a material that is not found in nature or that has been structurally modified or synthesized by man. For example, "non-naturally occurring" can refer to a variant, such as a polynucleotide variant that can be produced using art-known mutagenesis techniques, or a polypeptide variant produced by such a polynucleotide variant. Such variants include, for example, those produced by nucleotide substitutions, deletions or additions that may involve one or more nucleotides. Polynucleotide variants can be altered in coding or non-coding regions or both. Alterations in the coding regions may produce conservative or non-conservative amino acid substitutions, deletions, or additions. Especially certain among these are silent substitutions, additions, deletions, and conservative substitutions, which do not alter the properties and activities of a B7RP1 antibody of the invention. One of skill in the art can readily determine how to generate such a variant using methods well known in the art.

[0048] The term "operably linked" means that the components to which the term is applied are in a relationship that allows them to carry out their inherent functions under suitable conditions. For example, a control sequence "operably linked" to a protein coding sequence is ligated thereto so that expression of the protein coding sequence is achieved under conditions compatible with the transcriptional activity of the control sequences.

[0049] The term "control sequence" as used herein refers to polynucleotide sequences that can effect expression, processing or intracellular localization of coding sequences to which they are operably linked. The nature of such control sequences may depend upon the host organism. In particular aspects, control sequences for prokaryotes may include a promoter, ribosomal binding site, and transcription termination sequence. In other particular aspects, control sequences for eukaryotes may include promoters comprising one or a plurality of recognition sites for transcription factors, transcription enhancer sequences, transcription termination sequences and polyadenylation sequences. In certain aspects, "control sequences" can include leader sequences and/or fusion partner sequences.

[0050] The term "vector" includes a nucleic acid molecule capable of carrying into a cell another nucleic acid to which it has been linked. One type of vector is a "plasmid", which refers to a circular double stranded DNA loop into which additional DNA segments may be ligated. Another type of vector is a viral vector, wherein additional DNA segments may be ligated into the viral genome. Certain vectors are capable of autonomous replication in a host cell into which they are introduced (*e.g.*, bacterial vectors having a bacterial origin of replication and episomal mammalian vectors). Other vectors (*e.g.*, non-episomal mammalian vectors) can be integrated into the genome of a host cell upon introduction into the host cell and thereby are replicated along with the host genome. Moreover, certain vectors are capable of directing the expression of genes to which they are operatively linked. Such vectors are referred to herein as "recombinant expression vectors" (or simply, "expression vectors"). In general, expression vectors useful in the practice of recombinant DNA techniques are often in the form of plasmids. In the present specification, "plasmid" and "vector" may be used interchangeably as the plasmid is the most commonly used form of vector. However, the disclosure is intended to include such other forms of expression vectors, such as viral vectors (*e.g.*, replication defective retroviruses, adenoviruses and adeno-associated viruses), which serve equivalent functions.

[0051] The phrase "recombinant host cell" (or simply "host cell") includes a cell into which a recombinant expression vector has been introduced. It will be understood by those of skill in the art that such terms are intended to refer not only to the particular subject cell but to the progeny of such a cell. Because certain modifications may occur in succeeding generations due to either mutation or environmental influences, such progeny may not, in fact, be identical to the parent cell, but are still included within the scope of the term "host cell" as used herein. A wide variety of host expression systems can be used to express the antibodies of the present invention including bacterial, yeast, baculoviral and mammalian expression systems (as well as phage display expression systems). An example of a suitable bacterial expression vector is pUC19. To express an antibody recombinantly, a host cell is transfected with one or more recombinant expression vectors carrying DNA fragments encoding the immunoglobulin light and heavy chains of the antibody such that the light and heavy chains are expressed in the host cell and can be secreted into the medium in which the host cells are cultured, from which medium the antibodies can be recovered. Standard recombinant DNA methodologies are used to obtain antibody heavy and light chain genes, incorporate these genes into recombinant expression vectors and introduce the vectors into host cells, such as those described in Sambrook et al., 2001, MOLECULAR CLONING, A LABORATORY MANUAL, Cold Spring Harbor Laboratories, Ausubel, F.M. et al. (eds.), CURRENT PROTOCOLS IN MOLECULAR BIOLOGY, Greene Publishing Associates, (1989) and in U.S. Patent No. 4,816,397 to Boss et al.

[0052] The term "transduction" is used to refer to the transfer of genes from one bacterium to another, usually by a phage. "Transduction" also refers to the acquisition and transfer of eukaryotic cellular sequences by retroviruses.

[0053] The term "transfection" is used to refer to the uptake of foreign or exogenous DNA by a cell, and a cell has been "transfected" when the exogenous DNA has been introduced inside the cell membrane. A number of transfection techniques are well known in the art and are disclosed herein. See, *e.g.*, Graham et al., 1973, Virology 52: 456; Sambrook et al., 2001, MOLECULAR CLONING, A LABORATORY MANUAL, Cold Spring Harbor Laboratories; Davis et al., 1986, BASIC METHODS IN MOLECULAR BIOLOGY, Elsevier; and Chu et al., 1981, Gene 13: 197. Such techniques can be used to introduce one or more exogenous DNA moieties into suitable host cells.

[0054] The term "transformation" as used herein refers to a change in a cell's genetic characteristics, and a cell has been transformed when it has been modified to contain a new DNA. For example, a cell is transformed where it is genetically modified from its native state. Following transfection or transduction, the transforming DNA may recombine with DNA from the cell by physically integrating into a chromosome of the cell, or may be maintained transiently as an episomal element without being replicated, or may replicate independently as a plasmid. A cell is considered to have been stably transformed when the DNA is replicated with the division of the cell.

[0055] The term "antigen" refers to a molecule or a portion of a molecule capable of being bound by a selective binding agent, such as an antibody, and additionally capable of being used in an animal to produce antibodies capable of binding to an epitope of that antigen. An antigen may have one or more epitopes.

[0056] In certain aspects, antibody variants include glycosylation variants wherein the number and/or type of glycosylation site has been altered compared to the amino acid sequences of the parent polypeptide. In certain aspects,

protein variants comprise a greater or a lesser number of N-linked glycosylation sites than the native protein. An N-linked glycosylation site is characterized by the sequence: Asn-Xaa-Ser or Asn-Xaa-Thr, wherein the amino acid residue designated as Xaa may be any amino acid residue except proline. The substitution of amino acid residues to create this sequence provides a potential new site for the addition of an N-linked carbohydrate chain. Alternatively, substitutions that eliminate this sequence will remove an existing N-linked carbohydrate chain. Also provided is a rearrangement of N-linked carbohydrate chains wherein one or more N-linked glycosylation sites (typically those that are naturally occurring) are eliminated and one or more new N-linked sites are created. Additional antibody variants include cysteine variants wherein one or more cysteine residues are deleted from or substituted for another amino acid (e.g., serine) compared to the parent amino acid sequence. Cysteine variants may be useful when antibodies must be refolded into a biologically active conformation such as after the isolation of insoluble inclusion bodies. Cysteine variants generally have fewer cysteine residues than the native protein, and typically have an even number to minimize interactions resulting from unpaired cysteines.

[0057] In additional aspects, antibody variants can include antibodies comprising a modified Fc fragment or a modified heavy chain constant region. An Fc fragment, which stands for "fragment that crystallizes," or a heavy chain constant region can be modified by mutation to confer on an antibody altered binding characteristics. *See, for example*, Burton and Woof, 1992, *Advances in Immunology* 51: 1-84; Ravetch and Bolland, 2001, *Annu. Rev. Immunol.* 19: 275-90; Shields et al., 2001, *Journal of Biol. Chem* 276: 6591-6604; Telleman and Junghans, 2000, *Immunology* 100: 245-251; Medesan et al., 1998, *Eur. J. Immunol.* 28: 2092-2100. Such mutations can include substitutions, additions, deletions, or any combination thereof, and are typically produced by site-directed mutagenesis using one or more mutagenic oligonucleotide(s) according to methods described herein, as well as according to methods known in the art (see, *for example*, Sambrook et al., *MOLECULAR CLONING: A LABORATORY MANUAL*, 3rd Ed., 2001, Cold Spring Harbor, N.Y. and Berger and Kimmel, *METHODS IN ENZYMOLOGY*, Volume 152, Guide to Molecular Cloning Techniques, 1987, Academic Press, Inc., San Diego, CA.).

[0058] According to certain aspects, amino acid substitutions may (1) reduce susceptibility to proteolysis, (2) reduce susceptibility to oxidation, (3) alter binding affinity, and/or (4) confer or modify other physicochemical or functional properties on such polypeptides. According to certain aspects, single or multiple amino acid substitutions (in certain aspects, conservative amino acid substitutions) may be made in the naturally occurring sequence (in certain aspects, in the portion of the polypeptide outside the domain(s) forming intermolecular contacts). In certain aspects, a conservative amino acid substitution typically does not substantially change the structural characteristics of the parent sequence (e.g., a replacement amino acid should disrupt or tend to disrupt secondary structure that characterizes a parent sequence, such as a helix). Examples of art-recognized polypeptide secondary and tertiary structures are described in *PROTEINS, STRUCTURES AND MOLECULAR PRINCIPLES*, (Creighton, Ed.), 1984, W. H. Freeman and Company, New York; *INTRODUCTION TO PROTEIN STRUCTURE* (C. Branden and J. Tooze, eds.), 1991, Garland Publishing, New York, N.Y.; and Thornton et al., 1991, *Nature* 354:105.

[0059] "Antibody" or "antibody peptide(s)" refer to an intact antibody, or a binding fragment thereof that competes with the intact antibody for specific binding. In certain aspects, binding fragments are produced by recombinant DNA techniques. In additional aspects, binding fragments are produced by enzymatic or chemical cleavage of intact antibodies. Binding fragments include, but are not limited to, F(ab), F(ab'), F(ab')₂, Fv, and single-chain antibodies.

[0060] The disclosure provides antibodies that comprise a heavy chain and a light chain, wherein the heavy and light chains together form an antigen binding structure capable of specifically binding B7RP1. A full-length heavy chain includes a variable region domain, V_H, and three constant region domains, C_H1, C_H2, and C_H3. The V_H domain is at the amino-terminus of the polypeptide, and the C_H3 domain is at the carboxyl-terminus. The term "heavy chain", as used herein, encompasses a full-length heavy chain and fragments thereof. A full-length light chain includes a variable region domain, V_L, and a constant region domain, C_L. Like the heavy chain, the variable region domain of the light chain is at the amino-terminus of the polypeptide. The term "light chain", as used herein, encompasses a full-length light chain and fragments thereof. A F(ab) fragment is comprised of one light chain and the C_H1 and variable regions of one heavy chain. The heavy chain of a F(ab) molecule cannot form a disulfide bond with another heavy chain molecule. A F(ab') fragment contains one light chain and one heavy chain that contains more of the constant region, between the C_H1 and C_H2 domains, such that an interchain disulfide bond can be formed between two heavy chains to form a F(ab')₂ molecule. The Fv region comprises the variable regions from both the heavy and light chains, but lacks the constant regions. Single-chain antibodies are Fv molecules in which the heavy and light chain variable regions have been connected by a flexible linker to form a single polypeptide chain, which forms an antigen-binding region. Single chain antibodies are discussed in detail in International Patent Application Publication No. WO 88/01649 and U.S. Patent Nos. 4,946,778 and 5,260,203.

[0061] A bivalent antibody other than a "multispecific" or "multifunctional" antibody, in certain aspects, is understood to comprise binding sites having identical antigenic specificity.

[0062] In assessing antibody binding and specificity according to the disclosure, an antibody substantially inhibits adhesion of a ligand to a receptor when an excess of antibody reduces the quantity of ligand bound to receptor by at

least about 20%, 40%, 60%, 80%, 85%, or more (as measured, *inter alia*, using an *in vitro* competitive binding assay).

[0063] By "neutralizing antibody" is meant an antibody molecule that is able to block or substantially reduce an effector function of a target antigen to which it binds. Accordingly, a "neutralizing" anti-B7RP1 antibody is capable of blocking or substantially reducing an effector function, such as receptor binding and/or elicitation of a cellular response, of B7RP1.

"Substantially reduce" is intended to mean at least about 60%, at least about 70%, at least about 75%, at least about 80%, at least about 85%, or at least about 90% reduction of an effector function of the target antigen (e.g., human B7RP1).

[0064] The term "epitope" includes any site on an antigen that is capable of specific binding to an immunoglobulin or T-cell receptor. In certain aspects, epitope determinants include chemically active surface groupings of molecules such as amino acids, sugar side chains, phosphoryl groups, or sulfonyl groups, and, in certain embodiments, may have specific three-dimensional structural characteristics, and/or specific charge characteristics. An epitope is a region of an antigen that is bound by an antibody. In certain aspects, an antibody is said to specifically bind an antigen when it preferentially recognizes its target antigen in a complex mixture of proteins and/or macromolecules. In certain aspects, an antibody is said to specifically bind an antigen when the equilibrium dissociation constant is about 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M, 10^{-12} M, or less than about 10^{-12} M.

[0065] An antibody binds "essentially the same epitope" as a reference antibody, when the two antibodies recognize identical or sterically overlapping epitopes. The most widely used and rapid methods for determining whether two antibodies bind to identical or sterically overlapping epitopes are competition assays, which can be configured in all number of different formats, using either labeled antigen or labeled antibody. Usually, the antigen is immobilized on a substrate, and the ability of unlabeled antibodies to block the binding of labeled antibodies is measured using radioactive isotopes or enzyme labels.

[0066] The term "agent" is used herein to denote a chemical compound, a mixture of chemical compounds, a biological macromolecule, or an extract made from biological materials.

[0067] As used herein, the terms "label" or "labeled" refers to incorporation of a detectable marker, e.g., by incorporation of a radiolabeled amino acid or attachment to a polypeptide of biotin moieties that can be detected by labeled avidin (e.g., streptavidin comprising a detectable marker such as a fluorescent marker, a chemiluminescent marker or an enzymatic activity that can be detected by optical or colorimetric methods). In certain aspects, the label can also be therapeutic. Various methods of labeling polypeptides and glycoproteins are known in the art and may be used advantageously in the methods disclosed herein. Examples of labels for polypeptides include, but are not limited to radioisotopes or radionuclides such as ^3H , ^{14}C , ^{15}N , ^{35}S , ^{90}Y , $^{99\text{m}}\text{Tc}$, ^{111}In , ^{125}I , and ^{131}I , fluorescent labels (e.g., fluorescein isothiocyanate or FITC, rhodamine, or lanthanide phosphors), enzymatic labels (e.g., horseradish peroxidase, β -galactosidase, luciferase, alkaline phosphatase), chemiluminescent labels, hapten labels such as biotinyl groups, and predetermined polypeptide epitopes recognized by a secondary reporter (e.g., leucine zipper pair sequences, binding sites for secondary antibodies, metal binding domains, or epitope tags). In certain aspects, labels are attached by spacer arms (such as $(\text{CH}_2)_n$, where $n < \text{about } 20$) of various lengths to reduce potential steric hindrance.

[0068] The term "biological sample", as used herein, includes, but is not limited to, any quantity of a substance from a living thing or formerly living thing. Such living things include, but are not limited to, humans, mice, monkeys, rats, rabbits, and other animals. Such substances include, but are not limited to, blood, serum, urine, cells, organs, tissues, bone, bone marrow, lymph nodes, and skin.

[0069] The term "pharmaceutical agent or drug" as used herein refers to a chemical compound or composition capable of inducing a desired therapeutic effect when properly administered to a patient. The expression "pharmaceutically effective amount" in reference to a pharmaceutical composition comprising one or a plurality of the antibodies of the disclosure is understood to mean, according to the disclosure, an amount of the said pharmaceutical composition that is capable of abolishing, in a patient, the decrease in the sensitivity threshold to external stimuli with a return of this sensitivity threshold to a level comparable to that observed in healthy subjects.

[0070] A "disorder" is any condition that would benefit from treatment according to the present invention. "Disorder" and "condition" are used interchangeably herein and include chronic and acute immune system disorders or immune system diseases associated with inappropriate immune response, including those pathological conditions which predispose the mammal to the disorder in question. A number of conditions and disorders that would benefit from the treatment according to the present invention are described, for example, in International Patent Application No. PCT/US00/01871 (Publication No. WO 00/46240).

[0071] The terms "immune system disease" and "immune system condition" encompass any medical condition or disorder associated with increased levels of B7RP1, increased sensitivity to B7RP1, or T-cell mediated diseases, including, but not limited to, autoimmune disease, graft survival, bone marrow and organ transplantation, allosensitization due to blood transfusions, toxic shock syndrome, T-cell dependent B-cell mediated diseases, chronic inflammatory diseases associated with chronic immune cell dysfunction, lymphoproliferative disorders (such as multiple myeloma, Waldenström's macroglobulinemia, and crioglobulinemias), and cancer. Non-limiting examples of autoimmune diseases include systemic lupus erythematosus, rheumatoid arthritis, immune thrombocytopenic purpura (ITP), multiple sclerosis, diabetes, and psoriasis. Non-limiting examples of chronic inflammatory diseases include inflammatory bowel disease

(such as Crohn's disease and ulcerative colitis), Grave's disease, Hashimoto's thyroiditis, and diabetes mellitus.

[0072] The terms "immune system disease" and "immune system condition" also encompass any clinical condition that would be ameliorated by the inhibition of antibody production, such as hypersensitivity reactions. Hypersensitivity reactions can be caused, for example, by hay fever, allergies, asthma, atopy, and acute edema. Non-limiting examples of diseases that cause antibody-mediated hypersensitivity reactions include systemic lupus erythematosus, arthritis (such as rheumatoid arthritis, reactive arthritis, psoriatic arthritis), nephropathies (such as glomerulo-nephritis, membranous, mesangiocapillary, focal segmental, focal necrotizing, crescentic, and proliferative nephropathies such as tubulopathies), skin disorders (such as pemphigus and pemphigoid, erythema nodosum), endocrinopathies (such as thyroiditis, Grave's disease, Hashimoto's disease, insulin dependent diabetes mellitus), various pneumopathies (such as extrinsic alveolitis), various vasculopathies, coeliac disease, diseases with aberrant production of IgA, many anemias and thrombocytopenias, Guillain-Barre Syndrome, and myasthenia gravis.

[0073] As used herein, the terms "effective amount" and "therapeutically effective amount" when used with reference to a vehicle- or a pharmaceutical composition comprising one or more anti-human B7RP1 human antibodies refers to an amount or dosage sufficient to produce a desired result (i.e., where for therapy with the vehicle-or anti-human B7RP1 human antibodies of the present invention the desired result is the desired modulation of T-cell responses, for example) or to support an observable decrease in the level of one or more biological activities of B7RP1. More specifically, a therapeutically effective amount is an amount of the anti-human B7RP1 human antibody(ies) sufficient to inhibit, for some period of time, one or more of the clinically defined pathological processes associated with the condition at issue, e.g. immune disorders and diseases, in a subject treated *in vivo* with the agent. In the present disclosure, an "effective amount" of an anti-B7RP1 antibody may modulate T-cell responses in a patient. In the methods of the present disclosure, the term "control" and grammatical variants thereof, are used to refer to the prevention, partial or complete inhibition, reduction, delay or slowing down of an unwanted event, e.g. immune response. The effective amount may vary depending on the specific vehicle- or anti-human B7RP1 human antibody(ies) selected, and is also dependent on a variety of factors and conditions related to the subject to be treated and the severity of the disorder. For example, if the vehicle- or anti-human B7RP1 human antibody(ies) is to be administered *in vivo*, factors such as the age, weight and health of the patient as well as dose response curves and toxicity data obtained in preclinical animal work would be among those considered. If the agent is to be contacted with the cells *in vitro*, one would also design a variety of preclinical *in vitro* studies to assess such parameters as uptake, half-life, dose, toxicity, etc. The determination of an effective amount or a therapeutically effective amount for a given agent is well within the ability of those skilled in the art.

[0074] As used herein, the terms "B7 related protein-1" and "B7RP1" are defined as all mammalian species of native sequence B7RP1, which is described in International Patent Application Publication No. WO 00/46240.

[0075] As used herein, "substantially pure" or "substantially purified" means a compound or species that is the predominant species present (i.e., on a molar basis it is more abundant than any other individual species in the composition). In certain aspects, a substantially purified fraction is a composition wherein the species comprises at least about 50 percent (on a molar basis) of all macromolecular species present. In certain aspects, a substantially pure composition will comprise more than about 80%, 85%, 90%, 95%, or 99% of all macromolecular species present in the composition. In certain aspects, the species is purified to essential homogeneity (contaminant species cannot be detected in the composition by conventional detection methods) wherein the composition consists essentially of a single macromolecular species.

[0076] The term "patient" includes human and animal subjects.

[0077] "Treatment" or "treat" refers to both therapeutic treatment and prophylactic or preventative measures. Those in need of treatment include those already with the disorder as well as those prone to have the disorder or those in which the disorder is to be prevented.

[0078] Unless otherwise required by context, singular terms shall include pluralities and plural terms shall include the singular.

[0079] According to certain aspects of the disclosure, antibodies directed to B7RP1 may be used to treat immune system disorders and immune system diseases, including but not limited to, those mentioned above.

[0080] In one aspect of the disclosure are provided fully human monoclonal antibodies raised against and having biological and immunological specificity for binding to human B7RP1. In another aspect the disclosure provides nucleic acids comprising nucleotide sequences encoding amino acid sequences for heavy and light chain immunoglobulin molecules, particularly sequences corresponding to the variable regions thereof. Particular aspects of this aspect of the disclosure are sequences corresponding to complementarity determining regions (CDRs), specifically from CDR1 through CDR3, of the heavy and light chains provided by the disclosure. In yet another aspect the disclosure provides hybridoma cells and cell lines that express the immunoglobulin molecules and antibodies, such as monoclonal antibodies of the disclosure. The disclosure also provides biologically and immunologically purified preparations of antibodies, such as monoclonal antibodies raised against and having biological and immunological specificity for binding to human B7RP1.

[0081] The ability to clone and reconstruct megabase-sized human loci in yeast artificial chromosomes (YACs) and to introduce them into the mouse germline provides an advantageous approach to elucidating the functional components

of very large or crudely mapped loci as well as generating useful models of human disease. Furthermore, the utilization of such technology for substitution of mouse loci with their human equivalents provides unique insights into the expression and regulation of human gene products during development, their communication with other systems, and their involvement in disease induction and progression.

[0082] An important practical application of such a strategy is the "humanization" of the mouse humoral immune system. Introduction of human immunoglobulin (Ig) loci into mice in which the endogenous Ig genes have been inactivated offers the opportunity to study mechanisms underlying programmed expression and assembly of antibodies as well as their role in B-cell development. Furthermore, such a strategy provides a source for production of fully human monoclonal antibodies (MAbs).

[0083] The term "human antibody" includes antibodies having variable and constant regions substantially corresponding to human germline immunoglobulin sequences. In certain embodiments, human antibodies are produced in non-human mammals, including, but not limited to, rodents, such as mice and rats, and lagomorphs, such as rabbits. In certain aspects, human antibodies are produced in hybridoma cells. In certain aspects, human antibodies are produced recombinantly.

[0084] The term "recombinant" in reference to an antibody includes antibodies that are prepared, expressed, created or isolated by recombinant means. Representative examples include antibodies expressed using a recombinant expression vector transfected into a host cell, antibodies isolated from a recombinant, combinatorial human antibody library, antibodies isolated from an animal (e.g., a mouse) that is transgenic for human immunoglobulin genes (see e.g., Taylor, et al., 1992, Nucl. Acids Res. 20:6287-6295); or antibodies prepared, expressed, created or isolated by any means that involves splicing of human immunoglobulin gene sequences to other DNA sequences. Such recombinant human antibodies have variable and constant regions derived from human germline immunoglobulin sequences.

[0085] Human antibodies have at least three advantages over non-human and chimeric antibodies for use in human therapy:

1) because the effector portion of the antibody is human, it may interact better with the other parts of the human immune system (e.g., destroy the target cells more efficiently by complement-dependent cytotoxicity (CDC) or antibody-dependent cellular cytotoxicity (ADCC));

2) the human immune system should not recognize the human antibody as foreign, and, therefore the antibody response against such an injected antibody should be less than against a totally foreign non-human antibody or a partially foreign chimeric antibody;

3) injected non-human antibodies have been reported to have a half-life in the human circulation much shorter than the half-life of human antibodies. Injected human antibodies will have a half-life essentially identical to naturally occurring human antibodies, allowing smaller and less frequent doses to be given.

[0086] Thus, fully human antibodies are expected to minimize the immunogenic and allergic responses intrinsic to mouse or mouse-derivatized MAbs, and to thereby increase the efficacy and safety of the administered antibodies. Fully human antibodies of the disclosure, therefore, can be used in the treatment of diseases and disorders associated with inappropriate immune response, the treatment thereof requiring repeated antibody administration. Thus, one particular advantage of the anti-B7RP1 antibodies of the disclosure is that the antibodies are fully human and can be administered to patients in a non-acute manner while minimizing adverse reactions commonly associated with human anti-mouse antibodies or other previously described non-fully human antibodies from non-human species.

[0087] One skilled in the art can engineer mouse strains deficient in mouse antibody production with large fragments of the human Ig loci so that such mice produce human antibodies in the absence of mouse antibodies. Large human Ig fragments may preserve the large variable gene diversity as well as the proper regulation of antibody production and expression. By exploiting the mouse cellular machinery for antibody diversification and selection and the lack of immunological tolerance to human proteins, the reproduced human antibody repertoire in these mouse strains yields high affinity antibodies against any antigen of interest, including human antigens. Using the hybridoma technology, antigen-specific human MAbs with the desired specificity may be produced and selected.

[0088] Transgenic animals (e.g., mice) can also be used to produce human antibodies in the absence of endogenous immunoglobulin production. For example, transfer of the human germ-line immunoglobulin gene array in such germ-line mutant mice will result in the production of human antibodies upon antigen challenge (see, e.g., Jakobovits et al., 1993, Proc. Natl. Acad. Sci. USA 90:2551-2555; Jakobovits et al., 1993, Nature 362:255-258; Bruggemann et al., 1993, Year in Immun. 7:33, 1994, Nature 148:1547-1553) and, 1996, Nature Biotechnology 14:826; Gross et al., 2000, Nature 404:995-999; and U.S. Patents Nos. 5,877,397, 5,874,299, 5,814,318, 5,789,650, 5,770,429, 5,661,016, 5,633,425, 5,625,126, 5,569,825, and 5,545,806). Human antibodies can also be produced in phage display libraries (Hoogenboom and Winter, 1992, J. Mol. Biol. 227:381; Marks et al., 1991, J. Mol. Biol. 222:581). The techniques of Cole et al. and

Boerner *et al.* are also available for the preparation of human monoclonal antibodies (Cole *et al.*, 1985, MONOCLONAL ANTIBODIES AND CANCER THERAPY Alan R. Liss, p. 77; and Boerner *et al.*, 1991, J. Immunol. 147:86-95).

[0089] Recombinant human antibodies may also be subjected to *in vitro* mutagenesis (or, when an animal transgenic for human Ig sequences is used, *in vivo* somatic mutagenesis) and, thus, the amino acid sequences of the VH and VL regions of the recombinant antibodies are sequences that, while derived from those related to human germline VH and VL sequences, may not naturally exist within the human antibody germline repertoire *in vivo*.

[0090] In certain aspects, the skilled artisan can use constant regions from species other than human along with the human variable region(s) in such mice to produce chimeric antibodies.

[0091] A bispecific or bifunctional antibody typically is an artificial hybrid antibody having two different heavy chain/light chain pairs and two different binding sites. Bispecific antibodies may be produced by a variety of methods including, but not limited to, fusion of hybridomas or linking of F(ab') fragments. See, e.g., Songsivilai & Lachmann, 1990, Clin. Exp. Immunol. 79: 315-321; Kostelny *et al.*, 1992, J. Immunol. 148:1547-1553.

[0092] The disclosure provides antibodies that bind to human B7RP1. These antibodies can be produced by immunization with full-length B7RP1 or fragments thereof. The antibodies of the disclosure can be polyclonal or monoclonal, and/or may be recombinant antibodies. In preferred aspects, antibodies of the disclosure are human antibodies prepared, for example, by immunization of transgenic animals capable of producing human antibodies (see, for example, International Patent Application, Publication WO 93/12227).

[0093] The complementarity determining regions (CDRs) of the light chain and heavy chain variable regions of anti-B7RP1 antibodies of the invention can be grafted to framework regions (FRs) from the same, or another, species. In certain aspects, the CDRs of the light chain and heavy chain variable regions of anti-B7RP1 antibody may be grafted to consensus human FRs. To create consensus human FRs, FRs from several human heavy chain or light chain amino acid sequences are aligned to identify a consensus amino acid sequence. The FRs of the anti-B7RP1 antibody heavy chain or light chain can be replaced with the FRs from a different heavy chain or light chain. Rare amino acids in the FRs of the heavy and light chains of anti-B7RP1 antibody typically are not replaced, while the rest of the FR amino acids can be replaced. Rare amino acids are specific amino acids that are in positions in which they are not usually found in FRs. The grafted variable regions from anti-B7RP1 antibodies of the invention can be used with a constant region that is different from the constant region of anti-B7RP1 antibody. Alternatively, the grafted variable regions are part of a single chain Fv antibody. CDR grafting is described, e.g., in U.S. Patent Nos. 6,180,370, 5,693,762, 5,693,761, 5,585,089, and 5,530,101.

[0094] Antibodies of the disclosure can be prepared using transgenic mice that have a substantial portion of the human antibody producing locus inserted in antibody-producing cells of the mice, and that are further engineered to be deficient in producing endogenous, murine, antibodies. Such mice are capable of producing human immunoglobulin molecules and antibodies and do not produce or produce substantially reduced amounts of murine immunoglobulin molecules and antibodies. Technologies utilized for achieving this result are disclosed in the patents, applications, and references disclosed in the specification herein. In certain aspects, the skilled worker may employ methods as disclosed in International Patent Application Publication No. WO 98/24893. See also Mendez *et al.*, 1997, Nature Genetics 15: 146-156.

[0095] The monoclonal antibodies (mAbs) of the disclosure can be produced by a variety of techniques, including conventional monoclonal antibody methodology, e.g., the standard somatic cell hybridization technique of Kohler and Milstein (1975, Nature 256:495). Other techniques for producing monoclonal antibodies may be employed, e.g., viral or oncogenic transformation of B-lymphocytes.

[0096] An exemplary animal system for preparing hybridomas is the mouse. Hybridoma production in the mouse is known in the art and immunization protocols and techniques for isolation of immunized splenocytes for fusion are also known in the art. Fusion partners (e.g., murine myeloma cells) and fusion procedures are also known.

[0097] In a certain aspect, human monoclonal antibodies directed against B7RP1 can be generated using transgenic mice carrying parts of the human immune system rather than the mouse system. These transgenic mice, referred to herein as "HuMab" mice, contain a human immunoglobulin gene minilocus that encodes unrearranged human heavy (μ and γ) and κ light chain immunoglobulin sequences, together with targeted mutations that inactivate the endogenous μ and κ chain loci (Lonberg *et al.*, 1994, Nature 368:856-859). Accordingly, the mice exhibit reduced expression of mouse IgM or κ and in response to immunization, the introduced human heavy chain and light chain transgenes undergo class switching and somatic mutation to generate high affinity human IgG κ monoclonal antibodies (Lonberg *et al.*, *supra.*; Lonberg and Huszar, 1995, Intern. Rev. Immunol. 13:65-93; Harding and Lonberg, 1995, Ann.N.Y.Acad.Sci. 764:536-546). The preparation of HuMab mice is described in detail in Taylor *et al.*, 1992, Nucleic Acids Res. 20:6287-6295; Chen *et al.*, 1993, International Immunology 5:647-656; Tuailon *et al.*, 1994, J. Immunol. 152:2912-2920; Lonberg *et al.*, 1994, Nature 368:856-859; Lonberg, 1994, Handbook of Exp. Pharmacology 113:49-101; Taylor *et al.*, 1994, International Immunology 6:579-591; Lonberg & Huszar, 1995, Intern. Rev. Immunol. 13:65-93; Harding & Lonberg, 1995, Ann. N.Y. Acad. Sci 764:536-546; Fishwild *et al.*, 1996, Nature Biotechnology 14:845-851. See further U.S. Patent Nos. 5,545,806; 5,569,825; 5,625,126; 5,633,425; 5,789,650; 5,877,397; 5,661,016; 5,814,318; 5,874,299; and 5,770,429; all to Lonberg and Kay, as well as U.S. Patent No. 5,545,807 to Surani *et al.*; International Patent Application

Publication Nos. WO 93/1227, published June 24, 1993; WO 92/22646, published December 23, 1992; and WO 92/03918, published March 19, 1992. Alternatively, transgenic mice strains described in the Examples below can be used to generate human anti-B7RP1 antibodies.

[0098] The present disclosure provides human monoclonal antibodies that are specific for and neutralize bioactive human B7RP1 polypeptides. Also provided are antibody heavy and light chain amino acid sequences which are highly specific for and neutralize B7RP1 polypeptides when they are bound to them. This high specificity enables the anti-human B7RP1 human antibodies, and human monoclonal antibodies with like specificity, to be effective immunotherapy for B7RP1 associated diseases.

[0099] In one aspect, the disclosure provides isolated human antibodies that bind the same or essentially the same epitope as the 16H antibody provided herein.

[0100] In one aspect, the disclosure provides isolated human antibodies comprising at least one of the amino acid sequences shown in SEQ ID NOS: 1-40 or 44-58 that binds a B7RP1 polypeptide epitope with high affinity and has the capacity to antagonize B7RP1 polypeptide activity. These antibodies may bind the same or essentially the same epitope as the anti-B7RP1 antibodies shown in the Examples herein.

[0101] In certain aspects, the isolated antibodies bind to B7RP1 polypeptide with a dissociation constant (K_D) of about 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M or less and inhibits B7RP1 induced survival in an *in vitro* neutralization assay with an EC_{50} of about 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M or less. Examples of anti-human B7RP1 human antibodies that meet the aforementioned binding and neutralization criteria are provided herein.

[0102] In certain aspects, anti-human B7RP1 human antibodies of the invention are referred to herein as 16H, 16Hg (germline), 5D, 2H, 2Hg (germline), 15H, 41H, and 43H. Antibody 16H comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 7 and SEQ ID NO: 1, respectively. Antibody 16Hg comprises a variable light chain (V_L) and variable heavy chain (V_H) polypeptide sequences as shown in SEQ ID NO: 1 and SEQ ID NO: 8, respectively. Antibody 5D comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 2 and SEQ ID NO: 9, respectively. Antibody 2H comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 3 and SEQ ID NO: 10, respectively. Antibody 2Hg comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 3 and SEQ ID NO: 11, respectively. Antibody 15H comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 4 and SEQ ID NO: 12, respectively. Antibody 41H comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 5 and SEQ ID NO: 13, respectively. Antibody 43H comprises V_L and V_H polypeptide sequences as shown in SEQ ID NO: 6 and SEQ ID NO: 14, respectively. The properties of the anti-human B7RP1 human antibodies of the present disclosure are specifically disclosed in the Examples. Particularly notable is the high affinity for B7RP1 polypeptide and high capacity to antagonize B7RP1 polypeptide activity demonstrated herein.

[0103] The dissociation constant (K_D) of an anti-human B7RP1 human antibody can be determined by surface plasmon resonance as generally described in the Examples below. Generally, surface plasmon resonance analysis measures real-time binding interactions between ligand (recombinant B7RP1 polypeptide immobilized on a biosensor matrix) and analyte (antibodies in solution) by surface plasmon resonance (SPR) using the BIAcore® system (Pharmacia Biosensor, Piscataway, NJ). Surface plasmon analysis can also be performed by immobilizing the analyte (antibodies on a biosensor matrix) and presenting the ligand (recombinant V in solution). The dissociation constant (K_D) of an anti-human B7RP1 human antibody can also be determined by using KinExA methodology. In certain aspects of the disclosure, the antibodies bind to B7RP1 with a K_D of approximately 10^{-5} M, 10^{-6} M, 10^{-7} M, 10^{-8} M, 10^{-9} M, 10^{-10} M, 10^{-11} M, or 10^{-12} M. The term " K_D ", as used herein, is intended to refer to the dissociation constant of a particular antibody-antigen interaction. For purposes of the present disclosure K_D was determined as shown in the Examples below.

[0104] In certain aspects, the antibodies of the disclosure are of the IgG1, IgG2, IgG3, or IgG4 isotype. The antibodies may be of the IgG2 or IgG1 isotype. In other aspects, the antibodies of the disclosure may be of the IgM, IgA, IgE, or IgD isotype. In certain aspects of the disclosure, the antibodies comprise a human kappa light chain and a human IgG1, IgG2, IgG3, or IgG4 heavy chain. Expression of antibodies of the disclosure comprising an IgG1 or an IgG2 heavy chain constant region is described in the Examples below. In particular aspects, the variable regions of the antibodies are ligated to a constant region other than the constant region for the IgG1, IgG2, IgG3, or IgG4 isotype. In certain aspects, the antibodies of the disclosure have been cloned for expression in mammalian cells.

[0105] In certain aspects, conservative modifications to the heavy chains and light chains of anti-B7RP1 antibodies (and corresponding modifications to the encoding nucleotides) will produce anti-B7RP1 antibodies having functional and chemical characteristics similar to those of the anti-B7RP1 antibodies disclosed herein. In contrast, substantial modifications in the functional and/or chemical characteristics of anti-B7RP1 antibodies may be accomplished by selecting substitutions in the amino acid sequence of the heavy and light chains that differ significantly in their effect on maintaining (a) the structure of the molecular backbone in the area of the substitution, for example, as a sheet or helical conformation, (b) the charge or hydrophobicity of the molecule at the target site, or (c) the bulk of the side chain.

[0106] For example, a "conservative amino acid substitution" may involve a substitution of a native amino acid residue with a nonnative residue such that there is little or no effect on the polarity or charge of the amino acid residue at that position. Furthermore, any native residue in the polypeptide may also be substituted with alanine, as has been previously

described for "alanine scanning mutagenesis."

[0107] Amino acid substitutions (whether conservative or non-conservative) can be determined by those skilled in the art at the time such substitutions are desired. In certain aspects, amino acid substitutions can be used to identify those amino acid residues of an anti-B7RP1 antibody that are involved in binding specificity and/or affinity of the antibody for B7RP1 (e.g. residues that are involved in binding of the antibody to a particular epitope), such as amino acid residues in CDR1, CDR2, and/or CDR3 regions of the light or heavy chains as described herein. Such amino acid substitutions may increase or decrease the affinity of the anti-B7RP1 antibodies described herein.

[0108] Minor changes in an amino acid sequence such as deletion, addition or substitution of one, a few or even several amino acids may lead to an allelic form of the original protein which has substantially identical properties. Therefore, in addition to the antibodies specifically described herein, other "substantially homologous" antibodies can be readily designed and manufactured utilizing various recombinant DNA techniques well known to those skilled in the art. In general, modifications of the genes may be readily accomplished by a variety of well-known techniques, such as site-directed mutagenesis. Therefore, the present disclosure contemplates "variant" or "mutant" anti-B7RP1 human antibodies having substantially similar characteristics to the anti-B7RP1 human antibodies disclosed herein (See, for example, WO 00/56772). Thus, by the term "variant" or "mutant" in reference to an anti-B7RP1 human antibody is meant any binding molecule (molecule X) (i) in which the hypervariable regions CDR1, CDR2, and CDR3 of the heavy chain or the hypervariable regions CDR1, CDR2, and CDR3 of the light chain taken as a whole are at least about 80% homologous, at least about 90% homologous, or at least about 95% homologous to the hypervariable regions as shown in SEQ ID NO: 15 through SEQ ID NO: 26 or SEQ ID NO: 27 through SEQ ID NO: 40, respectively, and (ii) wherein the variant or mutant is capable of inhibiting the activity of human B7RP1 to the same extent as a reference anti-B7RP1 human antibody having framework regions identical to those of molecule X. Such antibodies may bind to human B7RP1 or to mouse B7RP1 or both. The mouse B7RP1 sequence is described in WO 00/46240.

[0109] Ordinarily, an anti-B7RP1 human antibody variant will have light and/or heavy chain CDRs, when taken as a whole, that are at least about 80% amino acid sequence identity, at least about 85% sequence identity, at least about 90% sequence identity, at least about 91% sequence identity, at least about 92% sequence identity, at least about 93% sequence identity, at least about 94% sequence identity, at least about 95% sequence identity, at least about 96% sequence identity, at least about 97% sequence identity, at least about 98% sequence identity, or at least about 99% amino acid sequence identity to the amino acid sequence as shown in SEQ ID NOS: 15 through SEQ ID NO: 26 and/or SEQ ID NOS: 27 through SEQ ID NO: 40, respectively. Such antibodies may bind to human B7RP1 or to mouse B7RP1 or to both.

[0110] An anti-B7RP1 human antibody variant will have a light chain variable region, when taken as a whole, that has at least about 80% amino acid sequence identity, at least about 81% sequence identity, at least about 82% sequence identity, at least about 83% sequence identity, at least about 84% sequence identity, at least about 85% sequence identity, at least about 86% sequence identity, at least about 87% sequence identity, at least about 88% sequence identity, at least about 89% sequence identity, at least about 90% sequence identity, at least about 91% sequence identity, at least about 92% sequence identity, at least about 93% sequence identity, at least about 94% sequence identity, at least about 95% sequence identity, at least about 96% sequence identity, at least about 97% sequence identity, at least about 98% sequence identity, at least about 99% amino acid sequence identity to the amino acid sequence as shown in SEQ ID NOS: 1 through SEQ ID NO: 6, and/or a heavy chain variable region, when taken as a whole, that has at least about 70% amino acid sequence identity, at least about 75% sequence identity, at least about 80% sequence identity, at least about 81% sequence identity, at least about 82% sequence identity, at least about 83% sequence identity, at least about 84% sequence identity, at least about 85% sequence identity, at least about 86% sequence identity, at least about 87% sequence identity, at least about 88% sequence identity, at least about 89% sequence identity, at least about 90% sequence identity, at least about 91% sequence identity, at least about 92% sequence identity, at least about 93% sequence identity, at least about 94% sequence identity, at least about 95% sequence identity, at least about 96% sequence identity, at least about 97% sequence identity, at least about 98% sequence identity, or at least about 99% amino acid sequence identity to the amino acid sequence as shown in SEQ ID NOS: 7 through SEQ ID NO: 14. Such antibodies may bind to human B7RP1 and/or mouse B7RP1.

[0111] As will be appreciated by those of skill in the art, many of the potential CDR-contact residues are amenable to substitution by other amino acids and still allow the antibody to retain substantial affinity for the antigen. Likewise, many of the framework residues not in contact with the CDRs in the heavy and light chains can accommodate substitutions of amino acids from the corresponding positions from other human antibodies, by human consensus amino acids, or from other mouse antibodies, without significant loss of the affinity or non-immunogenicity of the human antibody. Selection of various alternative amino acids may be used to produce versions of the disclosed anti-B7RP1 antibodies and fragments thereof that have varying combinations of affinity, specificity, non-immunogenicity, ease of manufacture, and other desirable properties.

[0112] A "variant" in reference to a polynucleotide is intended to refer to a nucleic acid molecule having at least about 75% nucleic acid sequence identity with a polynucleotide sequence of the present invention. Ordinarily, a polynucleotide

variant will have at least about 75% nucleic acid sequence identity, at least about 80% nucleic acid sequence identity, at least about 81% nucleic acid sequence identity, at least about 82% nucleic acid sequence identity, at least about 83% nucleic acid sequence identity, at least about 84% nucleic acid sequence identity, at least about 85% nucleic acid sequence identity, at least about 86% nucleic acid sequence identity, at least about 87% nucleic acid sequence identity, at least about 88% nucleic acid sequence identity, at least about 89% nucleic acid sequence identity, at least about 90% nucleic acid sequence identity, at least about 91% nucleic acid sequence identity, at least about 92% nucleic acid sequence identity, at least about 93% nucleic acid sequence identity, at least about 94% nucleic acid sequence identity, at least about 95% nucleic acid sequence identity, at least about 96% nucleic acid sequence identity, at least about 97% nucleic acid sequence identity, at least about 98% nucleic acid sequence identity, or at least about 99% nucleic acid sequence identity with a novel nucleic acid sequence disclosed herein.

[0113] In alternative aspects, antibodies of the disclosure can be expressed in cell lines other than hybridoma cell lines. In these aspects, sequences encoding particular antibodies can be used for transformation of a suitable mammalian host cell. According to these aspects, transformation can be achieved using any known method for introducing polynucleotides into a host cell, including, for example packaging the polynucleotide in a virus (or into a viral vector) and transducing a host cell with the virus (or vector) or by transfection procedures known in the art, as exemplified by U.S. Pat. Nos. 4,399,216, 4,912,040, 4,740,461, and 4,959,455. Generally, the transformation procedure used may depend upon the host to be transformed. Methods for introducing heterologous polynucleotides into mammalian cells are well known in the art and include, but are not limited to, dextran-mediated transfection, calcium phosphate precipitation, polybrene mediated transfection, protoplast fusion, electroporation, encapsulation of the polynucleotide(s) in liposomes, and direct microinjection of the DNA into nuclei.

[0114] A nucleic acid molecule encoding the amino acid sequence of a heavy chain constant region, a heavy chain variable region, a light chain constant region, or a light chain variable region of an anti-B7RP1 antibody of the invention is inserted into an appropriate expression vector using standard ligation techniques. In one aspect, the anti-B7RP1 antibody heavy chain or light chain constant region is appended to the C-terminus of the appropriate variable region and is ligated into an expression vector. The vector is typically selected to be functional in the particular host cell employed (*i.e.*, the vector is compatible with the host cell machinery such that amplification of the gene and/or expression of the gene can occur). For a review of expression vectors, see METHODS IN. ENZYMOLOGY 185 (Goeddel, ed.), 1990, Academic Press.

[0115] Typically, expression vectors used in any of the host cells will contain sequences for plasmid maintenance and for cloning and expression of exogenous nucleotide sequences. Such sequences, collectively referred to as "flanking sequences" in certain aspects will typically include one or more of the following nucleotide sequences: a promoter, one or more enhancer sequences, an origin of replication, a transcriptional termination sequence, a complete intron sequence containing a donor and acceptor splice site, a sequence encoding a leader sequence for polypeptide secretion, a ribosome binding site, a polyadenylation sequence, a polylinker region for inserting the nucleic acid encoding the polypeptide to be expressed, and a selectable marker element. Each of these sequences is discussed below.

[0116] Optionally, the vector may contain a "tag"-encoding sequence, *i.e.*, an oligonucleotide molecule located at the 5' or 3' end of the anti-B7RP1 antibody polypeptide coding sequence; the oligonucleotide sequence encodes polyHis (such as hexaHis), or another "tag" such as FLAG, HA (hemagglutinin influenza virus), or *myc* for which commercially available antibodies exist. This tag is typically fused to the polypeptide upon expression of the polypeptide, and can serve as a means for affinity purification or detection of the anti-B7RP1 antibody from the host cell. Affinity purification can be accomplished, for example, by column chromatography using antibodies against the tag as an affinity matrix. Optionally, the tag can subsequently be removed from the purified anti-B7RP1 antibody polypeptide by various means such as using certain peptidases for cleavage.

[0117] Flanking sequences may be homologous (*i.e.*, from the same species and/or strain as the host cell), heterologous (*i.e.*, from a species other than the host cell species or strain), hybrid (*i.e.*, a combination of flanking sequences from more than one source), synthetic or native. As such, the source of a flanking sequence may be any prokaryotic or eukaryotic organism, any vertebrate or invertebrate organism, or any plant, provided that the flanking sequence is functional in, and can be activated by, the host cell machinery.

[0118] Flanking sequences useful in the vectors of this disclosure may be obtained by any of several methods well known in the art. Typically, flanking sequences useful herein will have been previously identified by mapping and/or by restriction endonuclease digestion and can thus be isolated from the proper tissue source using the appropriate restriction endonucleases. In some cases, the full nucleotide sequence of a flanking sequence may be known. Here, the flanking sequence may be synthesized using the methods described herein for nucleic acid synthesis or cloning.

[0119] Whether all or only a portion of the flanking sequence is known, it may be obtained using polymerase chain reaction (PCR) and/or by screening a genomic library with a suitable probe such as an oligonucleotide and/or flanking sequence fragment from the same or another species. Where the flanking sequence is not known, a fragment of DNA containing a flanking sequence may be isolated from a larger piece of DNA that may contain, for example, a coding sequence or even another gene or genes. Isolation may be accomplished by restriction endonuclease digestion to

produce the proper DNA fragment followed by isolation using agarose gel purification, Qiagen® column chromatography (Chatsworth, CA), or other methods known to the skilled artisan. The selection of suitable enzymes to accomplish this purpose will be readily apparent to one of ordinary skill in the art.

[0120] An origin of replication is typically a part of those prokaryotic expression vectors purchased commercially, and the origin aids in the amplification of the vector in a host cell. If the vector of choice does not contain an origin of replication site, one may be chemically synthesized based on a known sequence, and ligated into the vector. For example, the origin of replication from the plasmid pBR322 (New England Biolabs, Beverly, MA) is suitable for most gram-negative bacteria, and various viral origins (e.g., SV40, polyoma, adenovirus, vesicular stomatitis virus (VSV), or papillomaviruses such as HPV or BPV) are useful for cloning vectors in mammalian cells. Generally, the origin of replication component is not needed for mammalian expression vectors (*for example*, the SV40 origin is often used only because it also contains the virus early promoter).

[0121] A transcription termination sequence is typically located 3' to the end of a polypeptide coding region and serves to terminate transcription. Usually, a transcription termination sequence in prokaryotic cells is a G-C rich fragment followed by a poly-T sequence. While the sequence is easily cloned from a library or even purchased commercially as part of a vector, it can also be readily synthesized using methods for nucleic acid synthesis such as those described herein.

[0122] A selectable marker gene encodes a protein necessary for the survival and growth of a host cell grown in a selective culture medium. Typical selection marker genes encode proteins that (a) confer resistance to antibiotics or other toxins, e.g., ampicillin, tetracycline, or kanamycin for prokaryotic host cells; (b) complement auxotrophic deficiencies of the cell; or (c) supply critical nutrients not available from complex or defined media. Exemplary selectable markers are the kanamycin resistance gene, the ampicillin resistance gene, and the tetracycline resistance gene. Advantageously, a neomycin resistance gene may also be used for selection in both prokaryotic and eukaryotic host cells.

[0123] Other selectable genes may be used to amplify the gene that will be expressed. Amplification is the process wherein genes that are required for production of a protein critical for growth or cell survival are reiterated in tandem within the chromosomes of successive generations of recombinant cells. Examples of suitable selectable markers for mammalian cells include dihydrofolate reductase (DHFR) and promoterless thymidine kinase genes. Mammalian cell transformants are placed under selection pressure wherein only the transformants are uniquely adapted to survive by virtue of the selectable gene present in the vector. Selection pressure is imposed by culturing the transformed cells under conditions in which the concentration of selection agent in the medium is successively increased, thereby leading to the amplification of both the selectable gene and the DNA that encodes another gene, such as an antibody that binds to B7RP1 polypeptide. As a result, increased quantities of a polypeptide such as an anti-B7RP1 antibody are synthesized from the amplified DNA.

[0124] A ribosome-binding site is usually necessary for translation initiation of mRNA and is characterized by a Shine-Dalgarno sequence (prokaryotes) or a Kozak sequence (eukaryotes). The element is typically located 3' to the promoter and 5' to the coding sequence of the polypeptide to be expressed.

[0125] In some cases, such as where glycosylation is desired in a eukaryotic host cell expression system, one may manipulate the various pre- or prosequences to improve glycosylation or yield. For example, one may alter the peptidase cleavage site of a particular signal peptide, or add pro-sequences, which also may affect glycosylation. The final protein product may have, in the -1 position (relative to the first amino acid of the mature protein) one or more additional amino acids incident to expression, which may not have been totally removed. For example, the final protein product may have one or two amino acid residues found in the peptidase cleavage site, attached to the amino-terminus. Alternatively, use of some enzyme cleavage sites may result in a slightly truncated form of the desired polypeptide, if the enzyme cuts at such an area within the mature polypeptide.

[0126] Expression and cloning vectors of the disclosure will typically contain a promoter that is recognized by the host organism and operably linked to the molecule encoding the anti-B7RP1 antibody. Promoters are untranscribed sequences located upstream (*i.e.*, 5') to the start codon of a structural gene (generally within about 100 to 1000 bp) that control transcription of the structural gene. Promoters are conventionally grouped into one of two classes: inducible promoters and constitutive promoters. Inducible promoters initiate increased levels of transcription from DNA under their control in response to some change in culture conditions, such as the presence or absence of a nutrient or a change in temperature. Constitutive promoters, on the other hand, uniformly transcribe genes to which they are operably linked, that is, with little or no control over gene expression. A large number of promoters, recognized by a variety of potential host cells, are well known. A suitable promoter is operably linked to the DNA encoding heavy chain or light chain comprising an anti-B7RP1 antibody of the invention by removing the promoter from the source DNA by restriction enzyme digestion and inserting the desired promoter sequence into the vector.

[0127] Suitable promoters for use with yeast hosts are also well known in the art. Yeast enhancers are advantageously used with yeast promoters. Suitable promoters for use with mammalian host cells are well known and include, but are not limited to, those obtained from the genomes of viruses such as polyoma virus, fowlpox virus, adenovirus (such as Adenovirus 2), bovine papilloma virus, avian sarcoma virus, cytomegalovirus, retroviruses, hepatitis-B virus and Simian Virus 40 (SV40). Other suitable mammalian promoters include heterologous mammalian promoters, for example, heat-

shock promoters and the actin promoter.

[0128] Additional promoters which may be of interest include, but are not limited to: SV40 early promoter (Bernoist and Chambon, 1981, *Nature* 290:304-10); CMV promoter (Thomsen et al., 1984, *Proc. Natl. Acad. Sci. USA* 81:659-663); the promoter contained in the 3' long terminal repeat of Rous sarcoma virus (Yamamoto, et al., 1980, *Cell* 22:787-97); herpes thymidine kinase promoter (Wagner et al., 1981, *Proc. Natl. Acad. Sci. U.S.A.* 78:1444-45); promoter and regulatory sequences from the metallothionein gene (Brinster et al., 1982, *Nature* 296:39-42); and prokaryotic promoters such as the beta-lactamase promoter (Villa-Kamaroff et al., 1978, *Proc. Natl. Acad. Sci. U.S.A.*, 75:3727-31); or the tac promoter (DeBoer et al., 1983, *Proc. Natl. Acad. Sci. U.S.A.*, 80:21-25). Also of interest are the following animal transcriptional control regions, which exhibit tissue specificity and have been utilized in transgenic animals: the elastase I gene control region that is active in pancreatic acinar cells (Swift et al., 1984, *Cell* 38:639-46; Ornitz et al., 1986, *Cold Spring Harbor Symp. Quant Biol.* 50:399-409 (1986); MacDonald, 1987, *Hepatology* 7:425-515); the insulin gene control region that is active in pancreatic beta cells (Hanahan, 1985, *Nature* 315:115-22); the immunoglobulin gene control region that is active in lymphoid cells (Grosschedl et al., 1984, *Cell* 38:647-58; Adames et al., 1985, *Nature* 318:533-38; Alexander et al., 1987, *Mol. Cell. Biol.*, 7:1436-44); the mouse mammary tumor virus control region that is active in testicular, breast, lymphoid and mast cells (Leder et al., 1986, *Cell* 45:485-95); the albumin gene control region that is active in liver (Pinkert et al., 1987, *Genes and Devel.* 1:268-76); the alpha-feto-protein gene control region that is active in liver (Krumlauf et al., 1985, *Mol. Cell. Biol.*, 5:1639-48; Hammer et al., 1987, *Science* 235:53-58); the alpha 1-antitrypsin gene control region that is active in liver (Kelsey et al., 1987, *Genes and Devel.* 1:161-71); the beta-globin gene control region that is active in myeloid cells (Mogran et al., 1985, *Nature* 315:338-40; Kollias et al., 1986, *Cell* 46:89-94); the myelin basic protein gene control region that is active in oligodendrocyte cells in the brain (Readhead et al., 1987, *Cell* 48:703-12); the myosin light chain-2 gene control region that is active in skeletal muscle (Sani, 1985, *Nature* 314:283-86); and the gonadotropic releasing hormone gene control region that is active in the hypothalamus (Mason et al., 1986, *Science* 234:1372-78).

[0129] An enhancer sequence may be inserted into the vector to increase transcription of DNA encoding light chain or heavy chain comprising an anti-B7RP1 antibody of the invention by higher eukaryotes. Enhancers are *cis*-acting elements of DNA, usually about 10-300 bp in length, that act on the promoter to increase transcription. Enhancers are relatively orientation and position independent, having been found at positions both 5' and 3' to the transcription unit. Several enhancer sequences available from mammalian genes are known (e.g., globin, elastase, albumin, alpha-feto-protein and insulin). Typically, however, an enhancer from a virus is used. The SV40 enhancer, the cytomegalovirus early promoter enhancer, the polyoma enhancer, and adenovirus enhancers known in the art are exemplary enhancing elements for the activation of eukaryotic promoters. While an enhancer may be positioned in the vector either 5' or 3' to a coding sequence, it is typically located at a site 5' from the promoter.

[0130] Expression vectors of the disclosure may be constructed from a starting vector such as a commercially available vector. Such vectors may or may not contain all of the desired flanking sequences. Where one or more of the flanking sequences described herein are not already present in the vector, they may be individually obtained and ligated into the vector. Methods used for obtaining each of the flanking sequences are well known to one skilled in the art.

[0131] After the vector has been constructed and a nucleic acid molecule encoding light chain, a heavy chain, or a light chain and a heavy chain comprising an anti-B7RP1 antibody has been inserted into the proper site of the vector, the completed vector may be inserted into a suitable host cell for amplification and/or polypeptide expression. The transformation of an expression vector for an anti-B7RP1 antibody into a selected host cell may be accomplished by well known methods including transfection, infection, calcium phosphate co-precipitation, electroporation, microinjection, lipofection, DEAE-dextran mediated transfection, or other known techniques. The method selected will in part be a function of the type of host cell to be used. These methods and other suitable methods are well known to the skilled artisan, and are set forth, for example, in Sambrook *et al.*, *supra*.

[0132] A host cell, when cultured under appropriate conditions, synthesizes an anti-B7RP1 antibody that can subsequently be collected from the culture medium (if the host cell secretes it into the medium) or directly from the host cell producing it (if it is not secreted). The selection of an appropriate host cell will depend upon various factors, such as desired expression levels, polypeptide modifications that are desirable or necessary for activity (such as glycosylation or phosphorylation) and ease of folding into a biologically active molecule.

[0133] Mammalian cell lines available as hosts for expression are well known in the art and include, but are not limited to, immortalized cell lines available from the American Type Culture Collection (ATCC), including but not limited to Chinese hamster ovary (CHO) cells, HeLa cells, baby hamster kidney (BHK) cells, monkey kidney cells (COS), human hepatocellular carcinoma cells (e.g., Hep G2), and a number of other cell lines. In certain embodiments, cell lines may be selected through determining which cell lines have high expression levels and constitutively produce antibodies with B7RP1 binding properties. In another aspect, a cell line from the B cell lineage that does not make its own antibody but has a capacity to make and secrete a heterologous antibody can be selected.

[0134] Antibodies of the disclosure are useful for detecting B7RP1 in biological samples and identification of cells or tissues that produce B7RP1 protein. Antibodies of the disclosure that specifically bind to B7RP1 may be useful in

treatment of B7RP1 mediated diseases. Said antibodies can be used in binding assays to detect B7RP1 and to inhibit B7RP1 from forming a complex with B7RP1 receptors. Said antibodies that bind to B7RP1 and block interaction with other binding compounds may have therapeutic use in modulating B7RP1 mediated diseases. In certain aspects, antibodies to B7RP1 may block B7RP1 binding to its receptor, which may result in disruption of the B7RP1 induced signal transduction cascade.

[0135] The present disclosure also relates to the use of one or more of the antibodies of the present disclosure in the manufacture of a medicament for the treatment of a disorder or condition caused by increased expression of B7RP1 or increased sensitivity to B7RP1 in a patient such as any one of disorders or conditions disclosed herein.

[0136] In certain aspects, the disclosure provides pharmaceutical compositions comprising a therapeutically effective amount of one or a plurality of the antibodies of the disclosure together with a pharmaceutically acceptable diluent, carrier, solubilizer, emulsifier, preservative and/or adjuvant. Acceptable formulation materials are nontoxic to recipients at the dosages and concentrations employed. In preferred aspects, pharmaceutical compositions comprising a therapeutically effective amount of anti-B7RP1 antibodies are provided.

[0137] In certain aspects, acceptable formulation materials are nontoxic to recipients at the dosages and concentrations employed.

[0138] In certain aspects, the pharmaceutical composition may contain formulation materials for modifying, maintaining or preserving, for example, the pH, osmolarity, viscosity, clarity, color, isotonicity, odor, sterility, stability, rate of dissolution or release, adsorption or penetration of the composition. In such aspects, suitable formulation materials include, but are not limited to, amino acids (such as glycine, glutamine, asparagine, arginine or lysine); antimicrobials; antioxidants (such as ascorbic acid, sodium sulfite or sodium hydrogen-sulfite); buffers (such as borate, bicarbonate, Tris-HCl, citrates, phosphates or other organic acids); bulking agents (such as mannitol or glycine); chelating agents (such as ethylenediamine tetraacetic acid (EDTA)); complexing agents (such as caffeine, polyvinylpyrrolidone, beta-cyclodextrin or hydroxypropyl-beta-cyclodextrin); fillers; monosaccharides; disaccharides; and other carbohydrates (such as glucose, mannose or dextrans); proteins (such as serum albumin, gelatin or immunoglobulins); coloring, flavoring and diluting agents; emulsifying agents; hydrophilic polymers (such as polyvinylpyrrolidone); low molecular weight polypeptides; salt-forming counterions (such as sodium); preservatives (such as benzalkonium chloride, benzoic acid, salicylic acid, thimerosal, phenethyl alcohol, methylparaben, propylparaben, chlorhexidine, sorbic acid or hydrogen peroxide); solvents (such as glycerin, propylene glycol or polyethylene glycol); sugar alcohols (such as mannitol or sorbitol); suspending agents; surfactants or wetting agents (such as pluronics, PEG, sorbitan esters, polysorbates such as polysorbate 20, polysorbate 80, triton, tromethamine, lecithin, cholesterol, tyloxapal); stability enhancing agents (such as sucrose or sorbitol); tonicity enhancing agents (such as alkali metal halides, for example, sodium or potassium chloride, mannitol sorbitol); delivery vehicles; diluents; excipients and/or pharmaceutical adjuvants. See REMINGTON'S PHARMACEUTICAL SCIENCES, 18th Edition, (A.R. Gennaro, ed.), 1990, Mack Publishing Company.

[0139] In certain aspects, the optimal pharmaceutical composition will be determined by one skilled in the art depending upon, for example, the intended route of administration, delivery format and desired dosage. See, for example, REMINGTON'S PHARMACEUTICAL SCIENCES, *supra*. In certain aspects, such compositions may influence the physical state, stability, rate of *in vivo* release and rate of *in vivo* clearance of the antibodies of the invention.

[0140] In certain aspects, the primary vehicle or carrier in a pharmaceutical composition may be either aqueous or non-aqueous in nature. For example, a suitable vehicle or carrier may be water for injection, physiological saline solution or artificial cerebrospinal fluid, possibly supplemented with other materials common in compositions for parenteral administration. Neutral buffered saline or saline mixed with serum albumin are further exemplary vehicles. In certain aspects, pharmaceutical compositions of the present invention comprise Tris buffer of about pH 7.0-8.5, or acetate buffer of about pH 4.0-5.5, and may further include sorbitol, sucrose, Tween-20 and/or a suitable substitute therefor. In certain aspects of the disclosure, anti-B7RP1 antibody compositions may be prepared for storage by mixing the selected composition having the desired degree of purity with optional formulation agents (REMINGTON'S PHARMACEUTICAL SCIENCES, *supra*) in the form of a lyophilized cake or an aqueous solution. Further, in certain aspects, the anti-B7RP1 antibody product may be formulated as a lyophilizate using appropriate excipients such as sucrose.

[0141] The pharmaceutical compositions of the disclosure can be selected for parenteral delivery. Alternatively, the compositions may be selected for inhalation or for delivery through the digestive tract, such as orally. Preparation of such pharmaceutically acceptable compositions is within the skill of the art.

[0142] The formulation components are present in concentrations that are acceptable to the site of administration. In certain aspects, buffers are used to maintain the composition at physiological pH or at a slightly lower pH, typically within a pH range of from about 5 to about 8.

[0143] When parenteral administration is contemplated, the therapeutic compositions for use in this disclosure may be provided in the form of a pyrogen-free, parenterally acceptable aqueous solution comprising the desired anti-B7RP1 antibody in a pharmaceutically acceptable vehicle. A particularly suitable vehicle for parenteral injection is sterile distilled water in which the anti-B7RP1 antibody is formulated as a sterile, isotonic solution, properly preserved. In certain aspects, the preparation can involve the formulation of the desired molecule with an agent, such as injectable microspheres, bio-

erodible particles, polymeric compounds (such as polylactic acid or polyglycolic acid), beads or liposomes, that may provide controlled or sustained release of the product which can be delivered *via* depot injection. In certain aspects, hyaluronic acid may also be used, having the effect of promoting sustained duration in the circulation. In certain aspects, implantable drug delivery devices may be used to introduce the desired antibody molecule.

[0144] Pharmaceutical compositions of the disclosure can be formulated for inhalation. In these aspects, anti-B7RP1 antibodies are advantageously formulated as a dry, inhalable powder. In certain aspects, anti-B7RP1 antibody inhalation solutions may also be formulated with a propellant for aerosol delivery. In certain aspects, solutions may be nebulized. Pulmonary administration and formulation methods therefore are further described in International Patent Application No. PCT/US94/001875, which describes pulmonary delivery of chemically modified proteins.

[0145] It is also contemplated that formulations can be administered orally. Anti-B7RP1 antibodies that are administered in this fashion can be formulated with or without carriers customarily used in the compounding of solid dosage forms such as tablets and capsules. In certain aspects, a capsule may be designed to release the active portion of the formulation at the point in the gastrointestinal tract when bioavailability is maximized and pre-systemic degradation is minimized. Additional agents can be included to facilitate absorption of the anti-B7RP1 antibody. Diluents, flavorings, low melting point waxes, vegetable oils, lubricants, suspending agents, tablet disintegrating agents, and binders may also be employed.

[0146] A pharmaceutical composition of the disclosure is provided to comprise an effective quantity of one or a plurality of anti-B7RP1 antibodies in a mixture with non-toxic excipients that are suitable for the manufacture of tablets. By dissolving the tablets in sterile water, or another appropriate vehicle, solutions may be prepared in unit-dose form. Suitable excipients include, but are not limited to, inert diluents, such as calcium carbonate, sodium carbonate or bicarbonate, lactose, or calcium phosphate; or binding agents, such as starch, gelatin, or acacia; or lubricating agents such as magnesium stearate, stearic acid, or talc.

[0147] Additional pharmaceutical compositions will be evident to those skilled in the art, including formulations involving anti-B7RP1 antibodies in sustained- or controlled-delivery formulations. Techniques for formulating a variety of other sustained- or controlled-delivery means, such as liposome carriers, bio-erodible microparticles or porous beads and depot injections, are also known to those skilled in the art. See, *for example*, International Patent Application No. PCT/US93/00829, which describes controlled release of porous polymeric microparticles for delivery of pharmaceutical compositions. Sustained-release preparations may include semipermeable polymer matrices in the form of shaped articles, *e.g.* films, or microcapsules. Sustained release matrices may include polyesters, hydrogels, polylactides (as disclosed in U.S. Patent No. 3,773,919 and European Patent Application Publication No. EP 058481), copolymers of L-glutamic acid and gamma ethyl-L-glutamate (Sidman *et al.*, 1983, *Biopolymers* 22:547-556), poly (2-hydroxyethylmethacrylate) (Langer *et al.*, 1981, *J. Biomed. Mater. Res.* 15:167-277 and Langer, 1982, *Chem. Tech.* 12:98-105), ethylene vinyl acetate (Langer *et al.*, *supra*) or poly-D(-)-3-hydroxybutyric acid (European Patent Application Publication No. EP 133,988). Sustained release compositions may also include liposomes that can be prepared by any of several methods known in the art. See *e.g.*, Eppstein *et al.*, 1985, *Proc. Natl. Acad. Sci. USA* 82:3688-3692; European Patent Application Publication Nos. EP 036,676; EP 088,046 and EP 143,949.

[0148] Pharmaceutical compositions used for *in vivo* administration are typically provided as sterile preparations. Sterilization can be accomplished by filtration through sterile filtration membranes. When the composition is lyophilized, sterilization using this method may be conducted either prior to or following lyophilization and reconstitution. Compositions for parenteral administration can be stored in lyophilized form or in a solution. Parenteral compositions generally are placed into a container having a sterile access port, for example, an intravenous solution bag or vial having a stopper pierceable by a hypodermic injection needle.

[0149] Once the pharmaceutical composition has been formulated, it may be stored in sterile vials as a solution, suspension, gel, emulsion, solid, or as a dehydrated or lyophilized powder. Such formulations may be stored either in a ready-to-use form or in a form (*e.g.*, lyophilized) that is reconstituted prior to administration.

[0150] The disclosure also provides kits for producing a single-dose administration unit. The kits of the disclosure may each contain both a first container having a dried protein and a second container having an aqueous formulation. In certain aspects of this disclosure, kits containing single and multi-chambered pre-filled syringes (*e.g.*, liquid syringes and lyosyringes) are provided.

[0151] The effective amount of an anti-B7RP1 antibody-containing pharmaceutical composition to be employed therapeutically will depend, for example, upon the therapeutic context and objectives. One skilled in the art will appreciate that the appropriate dosage levels for treatment will vary depending, in part, upon the molecule delivered, the indication for which the anti-B7RP1 antibody is being used, the route of administration, and the size (body weight, body surface or organ size) and/or condition (the age and general health) of the patient. In certain aspects, the clinician may titer the dosage and modify the route of administration to obtain the optimal therapeutic effect. A typical dosage may range from about 0.1 μ g/kg to up to about 30 mg/kg or more, depending on the factors mentioned above. In certain aspects, the dosage may range from 0.1 μ g/kg up to about 30 mg/kg; from 1 μ g/kg up to about 30 mg/kg; or from 5 μ g/kg up to about 30 mg/kg.

[0152] Dosing frequency will depend upon the pharmacokinetic parameters of the particular anti-B7RP1 antibody in the formulation used. Typically, a clinician administers the composition until a dosage is reached that achieves the desired effect. The composition may therefore be administered as a single dose, or as two or more doses (which may or may not contain the same amount of the desired molecule) over time, or as a continuous infusion via an implantation device or catheter. Further refinement of the appropriate dosage is routinely made by those of ordinary skill in the art and is within the ambit of tasks routinely performed by them. Appropriate dosages may be ascertained through use of appropriate dose-response data. In certain aspects, the antibodies of the disclosure can be administered to patients throughout an extended time period. Chronic administration of an antibody of the invention minimizes the adverse immune or allergic response commonly associated with antibodies that are raised against a human antigen in a non-human animal, for example, a non-fully human antibody produced in a non-human species.

[0153] The route of administration of the pharmaceutical composition is in accord with known methods, e.g. orally, through injection by intravenous, intraperitoneal, intracerebral (intra-parenchymal), intracerebroventricular, intramuscular, intra-ocular, intraarterial, intraportal, or intralesional routes; by sustained release systems or by implantation devices. In certain aspects, the compositions may be administered by bolus injection or continuously by infusion, or by implantation device.

[0154] The composition also may be administered locally via implantation of a membrane, sponge or another appropriate material onto which the desired molecule has been absorbed or encapsulated. In certain aspects, where an implantation device is used, the device may be implanted into any suitable tissue or organ, and delivery of the desired molecule may be *via* diffusion, timed-release bolus, or continuous administration.

[0155] It also may be desirable to use anti-B7RP1 antibody pharmaceutical compositions according to the disclosure *ex vivo*. In such instances, cells, tissues or organs that have been removed from the patient are exposed to anti-B7RP1 antibody pharmaceutical compositions after which the cells, tissues and/or organs are subsequently implanted back into the patient.

[0156] In particular, anti-B7RP1 antibodies can be delivered by implanting certain cells that have been genetically engineered, using methods such as those described herein, to express and secrete the polypeptide. In certain aspects, such cells may be animal or human cells, and may be autologous, heterologous, or xenogeneic. In certain aspects, the cells may be immortalized. In other aspects, in order to decrease the chance of an immunological response, the cells may be encapsulated to avoid infiltration of surrounding tissues. In further aspects, the encapsulation materials are typically biocompatible, semipermeable polymeric enclosures or membranes that allow the release of the protein product(s) but prevent the destruction of the cells by the patient's immune system or by other detrimental factors from the surrounding tissues.

EXAMPLES

[0157] The following examples, including the experiments conducted and results achieved are provided for illustrative purposes only and are not to be construed as limiting the invention.

Example 1

Production of Human Monoclonal Antibodies Against B7 related protein-1 (B7RP1)

Antigen

[0158] Purified recombinant human B7RP-1 (hB7RP-1) prepared as described in International Patent Application Publication No. WO 00/46240, or CHO cells transfected to express hB7RP-1 were used as the antigen. Mature human B7RP-1 has the amino acid sequence of residues X to 302 in the sequence shown in WO 00/46240 as SEQ ID NO: 17, wherein X can be 19, 20, 21, 22, 24 or 28.

Transgenic HuMab Mice

[0159] Fully human monoclonal antibodies to B7RP-1 were prepared using HCo7 and HCo12 strains of HuMab transgenic mice, both of which express human antibody genes. In both of these mouse strains, the endogenous mouse kappa light chain gene has been homozygously disrupted as described in Chen et al. (1993) EMBO J. 12:811-820 and the endogenous mouse heavy chain gene has been homozygously disrupted as described in Example 1 of PCT Publication WO 01/09187. Each of these mouse strains carries a human kappa light chain transgene, KCo5, as described in Fishwild et al. (1996) Nature Biotechnology 14:845-851. The HCo7 strain carries the HCo7 human heavy chain transgene as described in U.S. Patent Nos. 5,545,806; 5,625,825; and 5,545,807. The HCo12 strain carries the HCo12 human heavy chain transgene as described in Example 2 of PCT Publication WO 01/09187.

HuMab Immunizations:

[0160] To generate fully human monoclonal antibodies to B7RP-1, HuMab mice of the HCo7 or HCo12 strain were immunized with purified recombinant B7RP-1 or CHO cells transfected to express B7RP-1. General immunization schemes for HuMab mice are described in Lonberg et al (1994) Nature 368(6474): 856-859; Fishwild et al. (1996) Nature Biotechnology 14: 845-851 and PCT Publication WO 98/24884. The mice were 6-16 weeks of age upon the first infusion of antigen. A purified recombinant preparation of B7RP-1 antigen (50 µg) or a preparation of transfected CHO cells (3.5×10^6 - 1×10^7 cells) was used to immunize the HuMab mice intraperitoneally.

[0161] Transgenic mice were immunized twice with purified antigen in complete Freund's adjuvant intraperitoneally, followed by 2-4 weeks of IP immunizations (up to a total of 8 immunizations) with the purified antigen in incomplete Freund's adjuvant. Immunization with CHO cells transfected to express B7RP-1 was the same except that complete Freund's adjuvant and incomplete Freund's adjuvant were not used with the cells. The immune response was monitored by retroorbital bleeds. The plasma was screened by ELISA (as described below), and mice with sufficient titers of anti-B7RP-1 human immunoglobulin were used for fusions. Mice were boosted intravenously with antigen 3 and 2 days before sacrifice and removal of the spleen. Typically, 10-20 fusions for each antigen were performed. Several dozen mice were immunized for each antigen. A total of 28 mice of the HCo7 and HCo12 mice strains were immunized with B7RP-1.

Selection of HuMab Mice Producing Anti-B7RP-1 Antibodies:

[0162] To select HuMab mice producing antibodies that bound B7RP-1, sera from immunized mice was tested by ELISA as described by Fishwild et al. (1996). Briefly, microtiter plates were coated with purified recombinant B7RP-1 at 1-2 µg/ml in PBS, 50 µl/wells incubated 4 °C overnight then blocked with 200 µl/well of 5% chicken serum in PBS/Tween (0.05%). Dilutions of plasma from B7RP-1-immunized mice were added to each well and incubated for 1-2 hours at ambient temperature. The plates were washed with PBS/Tween and then incubated with a goat-anti-human IgG Fc polyclonal antibody conjugated with horseradish peroxidase (HRP) for 1 hour at room temperature. After washing, the plates were developed with ABTS substrate (Sigma, A-1888, 0.22 mg/ml) and analyzed by spectrophotometer at OD 415-495. Mice that developed the highest titers of anti-B7RP-1 antibodies were used for fusions. Fusions were performed as described below and hybridoma supernatants were tested for anti-B7RP-1 activity by ELISA.

Generation of Hybridomas Producing Human Monoclonal Antibodies to B7RP-1:

[0163] The mouse splenocytes, isolated from the HuMab mice, were fused with PEG to a mouse myeloma cell line based upon standard protocols. The resulting hybridomas were then screened for the production of antigen-specific antibodies. Single cell suspensions of splenic lymphocytes from immunized mice were fused to one-fourth the number of SP2/0 nonsecreting mouse myeloma cells (ATCC, CRL 1581) with 50% PEG (Sigma). Cells were plated at approximately 1×10^5 /well in flat bottom microtiter plate, followed by about two week incubation in selective medium containing 10% fetal bovine serum, 10% P388D1 (ATCC, CRL TIB-63) conditioned medium, 3-5% origen (IGEN) in DMEM (Mediatech, CRL 10013, with high glucose, L-glutamine and sodium pyruvate) plus 5 mM HEPES, 0.055 mM 2-mercaptoethanol, 50 mg/ml gentamycin and 1x HAT (Sigma, CRL P-7185). After 1-2 weeks, cells were cultured in medium in which the HAT was replaced with HT. Individual wells were then screened by ELISA (described above) for human anti-B7RP-1 monoclonal IgG antibodies. Once extensive hybridoma growth occurred, medium was monitored usually after 10-14 days. The antibody secreting hybridomas were replated, screened again and, if still positive for human IgG, anti-B7RP-1 monoclonal antibodies were subcloned at least twice by limiting dilution. The stable subclones were then cultured *in vitro* to generate small amounts of antibody in tissue culture medium for further characterization.

Example 2*Cloning the anti-B7RP1 Antibody Heavy and Light Chains*

[0164] The hybridoma expressing the B7RP1 binding monoclonal antibody 16H was used as a source to isolate total RNA using TRIzol® reagent (Invitrogen). A 5' RACE (rapid amplification of cDNA ends) oligonucleotide (5'- CGA CUG GAG CAC GAG GAC ACU GAC AUG GAC UGA AGG AGU AGA AA-3'; SEQ ID NO: 69) was ligated to the RNA using the GeneRacer™ Kit (Invitrogen) components and protocol. First strand cDNA was synthesized using a random primer with an extension adapter (5'-_ GGC CGG ATA GGC CTC CAN NNN NNT-3') (SEQ ID NO: 59) and a 5' RACE (rapid amplification of cDNA ends) preparative assay was performed using the GeneRacer™ Kit (Invitrogen) according to instructions from the manufacturer. For preparing complete light chain encoding cDNA, the forward primer was the GeneRacer™ nested primer, and the reverse primer was (5'- GGG GTC AGG CTG GAA CTG AGG-3') (SEQ ID NO:

60). For preparing cDNA encoding the variable region of the heavy chain, the forward primer was the GeneRacer™ nested primer and the reverse primer was (5'- TGA GGA CGC TGA CCA CAC G-3') (SEQ ID NO: 61). RACE products were cloned into pCR4-TOPO (Invitrogen) and the sequences determined. Consensus sequences were used to design primers for full-length antibody chain PCR amplification.

[0165] For preparing cDNA encoding anti-B7RP1 16H kappa light chain, the 5' PCR primer encoded the amino terminus of the signal sequence, an *Xba*I restriction enzyme site, and an optimized Kozak sequence (5'-CAG CAG AAG CTT CTA GAC CAC CAT GGA CAT GAG GGT CCT CGC TCA GCT CCT GGG-3') (SEQ ID NO: 62). The 3' primer encoded the carboxyl terminus and termination codon, as well as a *Sa*I restriction site (5'-CTT GTC GAC TCA ACA CTC TCC CCT GTT GAA GCT C-3') (SEQ ID NO: 63). The resulting PCR product fragment was purified, digested with *Xba*I and *Sa*I, and then gel isolated and ligated into the mammalian expression vector pDSR α 20 (see International Application, Publication No. WO 90/14363, pDSR α 20 was produced by changing nucleotide 2563 in pDSRa19 from a "Guanosine" to an "Adenosine" by site directed mutagenesis.).

[0166] For preparing cDNA encoding anti-B7RP1 16H heavy chain the 5' PCR primer encoded the amino terminus of the signal sequence, an *Xba*I restriction enzyme site, and an optimized Kozak sequence (5'-ACA ACA AAG CTT CTA GAC CAC CAT GGA GTT GGG GCT GAA CTG G-3') (SEQ ID NO: 64). The 3' primer encoded the carboxyl end of the variable region, including a naturally occurring sense strand *Bsm*BI site (5'- GTG GAG GCA CTA GAG ACG GTG ACC AGG ATT CC - 3'; SEQ ID NO: 65). The resulting product was purified, digested with *Xba*I and *Bsm*BI, gel isolated and ligated into the pDSR α 20 vector containing the human IgG1 constant region and also into the pDSR α 20 vector containing the human IgG2 constant region. All of the hybridoma derived anti-B7RP1 heavy chain variable regions, regardless of the native constant region associated, were cloned as described above into both the pDSR α 20 vectors containing the human IgG1 and the human IgG2 constant regions.

Example 3

Expression of Anti-B7RP1 Antibodies in Chinese Hamster Ovary (CHO) Cells

[0167] Stable expression of the 16H anti-B7RP1 mAb was achieved by co-transfection of 16H-heavy chain/pDSR α 19 IgG2 B7RP1-kappa/pDSR α 19 plasmids into dihydrofolate reductase deficient (DHFR⁻) serum-free adapted Chinese hamster ovary (CHO) cells using a calcium phosphate method (the full length 16H heavy chain sequence is shown in SEQ ID NO: 44; the 16H kappa chain sequence is shown in SEQ ID NO: 45). Transfected cells were selected in medium containing dialyzed serum but not containing hypoxanthine-thymidine to ensure the growth of cells expressing the DHFR enzyme. Transfected clones were screened using assays such as ELISA in order to detect the expression of 16H anti-B7RP1 mAb in the conditioned medium. The highest expressing clones were subjected to increasing concentrations of methotrexate (MTX) for DHFR amplification. MTX amplified clones were screened using assays such as ELISA in order to detect higher expression of 16H anti-B7RP1 mAb in the conditioned medium. The highest expressing clones were subjected to subcloning to obtain a homogeneous population and creation of cell banks.

[0168] Other recombinant anti-B7RP1 antibodies of the invention can be generated in Chinese hamster ovary cells deficient in DHFR using the same protocol as described above for the anti-B7RP1 monoclonal antibody. The DNA sequences encoding the complete heavy chain or light chain of each anti-B7RP1 antibody of the invention are cloned into expression vectors. CHO cells are co-transfected with an expression vector capable of expressing a complete heavy chain and an expression vector expressing the complete light chain of the appropriate anti-B7RP1 antibody. For example, to generate a 5D anti-B7RP1 antibody, cells are co-transfected with a vector capable of expressing a complete heavy chain comprising the amino acid sequence as set forth in SEQ ID NO: 47 and a vector capable of expressing a complete light chain comprising the amino acid sequence set forth in SEQ ID NO: 48. Table 2 summarizes exemplary complete light chains and exemplary complete heavy chains for anti-B7RP1 antibodies having human IgG heavy chain constant regions. One of skill in the art will recognize that the IgG1 or IgG2 could be substituted for each other (*i.e.* where IgG1 is listed in the table, IgG2 could be present, and vice versa). Alternatively, any other immunoglobulin (*e.g.*, IgM, IgA, IgE or IgH) could be used to generate antibodies of the invention.

Table 2

Antibody	Heavy Chain Variable Region + Heavy Chain Constant Region	Complete Heavy Chain
16H(IgG2)	SEQ ID NO: 7 + SEQ ID NO: 41	SEQ ID NO: 44
16H(IgG1)	SEQ ID NO: 7 + SEQ ID NO: 42	SEQ ID NO: 70
16Hg(IgG2)	SEQ ID NO: 8 + SEQ ID NO: 41	SEQ ID NO: 46
16Hg(IgG1)	SEQ ID NO: 8 + SEQ ID NO: 42	SEQ ID NO: 71

(continued)

Antibody	Heavy Chain Variable Region + Heavy Chain Constant Region	Complete Heavy Chain
5D(IgG1)	SEQ ID NO: 9 + SEQ ID NO: 42	SEQ ID NO: 47
5D(IgG2)	SEQ ID NO: 9 + SEQ ID NO: 41	SEQ ID NO: 72
2H(IgG2)	SEQ ID NO: 10 + SEQ ID NO: 41	SEQ ID NO: 49
2H(IgG1)	SEQ ID NO: 10 + SEQ ID NO: 42	SEQ ID NO: 73
2Hg(IgG2)	SEQ ID NO: 11 + SEQ ID NO: 41	SEQ ID NO: 51
2Hg(IgG1)	SEQ ID NO: 11 + SEQ ID NO: 42	SEQ ID NO: 74
43H(IgG2)	SEQ ID NO: 14 + SEQ ID NO: 41	SEQ ID NO: 52
43H(IgG1)	SEQ ID NO: 14 + SEQ ID NO: 42	SEQ ID NO: 75
41H(IgG2)	SEQ ID NO: 13 + SEQ ID NO: 41	SEQ ID NO: 54
41H(IpG1)	SEQ ID NO: 13 + SEQ ID NO: 42	SEQ ID NO: 76
15H(IgG2)	SEQ ID NO: 12 + SEQ ID NO: 41	SEQ ID NO: 56
15H(IgG1)	SEQ ID NO: 12 + SEQ ID NO: 42	SEQ ID NO: 57
Antibody	Light Chain Variable Region + Light Chain Constant Region	Complete Light Chain
16H	SEQ ID NO: 1 + SEQ ID NO: 43	SEQ ID NO: 45
5D	SEQ ID NO: 2 + SEQ ID NO: 43	SEQ ID NO: 48
2H	SEQ ID NO: 3 + SEQ ID NO: 43	SEQ ID NO: 50
43H	SEQ ID NO: 6 + SEQ ID NO: 43	SEQ ID NO: 53
41H	SEQ ID NO: 5 + SEQ ID NO: 43	SEQ ID NO: 55
15H	SEQ ID NO: 4 + SEQ ID NO: 43	SEQ ID NO: 58

Example 4**Production of anti-B7RP1 Antibody**

[0169] Anti-B7RP1 antibody is produced by expression in a clonal line of CHO cells. For each production run, cells from a single vial are thawed into serum-free cell culture media. The cells are grown initially in a T-flask followed by spinner flasks and then grown in stainless steel reactors of increasing scale up to a 2000L bioreactor. Production is carried out in a 2000L bioreactor using a fed batch culture, in which a nutrient feed containing concentrated media components is added to maintain cell growth and culture viability. Production lasts for approximately two weeks during which time anti-B7RP1 antibody is constitutively produced by the cells and secreted into the cell culture medium.

[0170] The production reactor is controlled at a predetermined pH, temperature, and dissolved oxygen level: pH is controlled by carbon dioxide gas and sodium carbonate addition; dissolved oxygen is controlled by air, nitrogen, and oxygen gas flows.

[0171] At the end of production, the cell broth is fed into a disk stack centrifuge and the culture supernatant is separated from the cells. The concentrate is further clarified through a depth filter followed by a 0.2 μ m filter. The clarified conditioned media is then concentrated by tangential flow ultrafiltration. The conditioned media is concentrated 15- to 30- fold. The resulting concentrated conditioned medium is then either processed through purification or frozen for purification at a later date.

Example 5**Germlining the 16H mAb**

[0172] Sequence alignment of the 16H antibody with human germline sequences showed that the framework sequence

in the variable region of the 16H antibody was most identical to the V_H 3-07 and JH4 germline sequences, with only three amino acid differences (**Figure 1A**). The framework sequence for the VK region of the 16H antibody was found to be identical to the VK1-L15 germline sequence. It is theoretically possible that somatic hypermutations are recognized as foreign by the immune response of a patient; in which case the patient would generate an anti-idiotypic response that could neutralize the therapeutic. To reduce this possibility, the three amino acid changes in the V_H framework region were converted back to the V_H 3-07 and JH4 germline sequences (**Figure 1A**). Since the germline V_H and J_H gene segments are present in every human genome, the germline version of 16H is not likely to be recognized as foreign by the immune response of a dosed patient. Plate co-stimulation bioassays were conducted to determine if the germlined antibodies could induce T-cell proliferation with an IC₅₀ similar to the IC₅₀ of the non-germlined antibodies. The co-stimulation assays were conducted as described below using anti-CD3 and hB7RP-1-Fc fusion protein confirmed that this germlined antibody, referred to as 16Hgermline or 16Hg, retains its biological activities (**Figure 1B**).

Example 6

Affinity Measurement of Monoclonal Antibodies by Biacore® and KinExA

[0173] Three antibodies (5D and 16H, prepared as described in Example 1, and 16H germline, prepared as described in Example 5) were purified and submitted to binding affinity analysis. B7RP1-Fc was immobilized at a high density on a CM5 sensor chip using standard amine coupling chemistry. A fixed concentration of mAb was then incubated with varying concentrations of B7RP-1 or B7RP1-Fc for at least eight hours at room temperature to allow them to reach equilibrium. The samples were then injected over the B7RP1-Fc surface, and the binding signal observed represented free antibody remaining in solution at equilibrium. By using two different antibody concentration (0.2nM and 1nM), the K_D of the interaction between a particular mAb and ligand was calculated from nonlinear regression analysis of the competition curves using a dual-curve one-site homogeneous binding model (Adamczyk et al., 1999, Bioconjugate Chem. 10:1032-37; Adamczyk et al., 2000, Methods 20:319-28). As shown in Figure 2 and Table 3, the 16H, 16Hg, and 5D mAbs all bound both soluble B7RP-1 and B7RP-1-Fc proteins at high affinities. In addition, the results indicated that the 16H (non-germline) and the 16Hg (germline) reacted similarly, demonstrating that germlining did not significantly affect binding between antibody and ligand.

Table 3

Summary of K _D Values		
	B7RP-1	B7RP1-Fc
5D	37 pM	1.6 pM
16H	1.9 nM	27 pM
16H (germline)	2.7 nM	17 pM

[0174] Binding of 5D, 2H, and 2H germline antibodies was also tested using KinExA (kinetic exclusion assay) technology. In this assay, hB7RP-1 was coupled to agarose beads. The beads were used to create a bead column. Samples containing antibody at a fixed concentration, which were allowed to come to equilibrium with varying concentrations of hB7RP-1, were then passed over the bead column. Antibody not complexed with ligand bound to the coated beads.

[0175] A fluorescent tagged anti-human Fc secondary antibody was used to detect bound test antibody. The signal obtained was proportional to free antibody in solution at a given ligand concentration. Using two different antibody concentrations, the K_D of the interaction was calculated from nonlinear regression analysis of the competition curves using a dual-curve one-site homogeneous binding model (Adamczyk et al., 1999, Bioconjugate Chem. 10:1032-37; Adamczyk et al., 2000, Methods 20:319-28). Figures 3, 4, and 5 show the dual-curve fits for antibodies 5D, 2H and 2H(germline). Using this technique, an approximately 10-fold difference was seen in the K_Ds for antibodies 5D and 2H.

[0176] The results of the Biacore® and KinExA assays demonstrated that antibody 5D has a higher affinity for hB7RP-1 than do either 2H or 16H. Also, the germline version of antibody 2H does not show a significant difference from the non-germline construct.

Example 7

Functional Characteristics of anti-B7RP1 Antibodies

[0177] The functional characteristics of B7RP-1 antibodies of the invention were evaluated using binding-competition

assays, *in vitro* co-stimulation assays and *in vitro* tetanus toxoid assays.

Binding-competition studies

[0178] Binding-competition studies were conducted with the 16H mAbs to demonstrate that they can compete for ICOS binding for B7RP-1. CHO cells transfected with a gene encoding the full-length human B7RP-1 were first incubated with decreasing amounts of unlabeled 16H mAb and subsequently stained with a fluorescently-labeled ICOS-Fc fusion protein. The cells were then analyzed using flow cytometry. As shown in Figure 6, ICOS-Fc stained the B7RP-1-transfected CHO cells; 0.4 µg/ml of 16H mAb did not affect ICOS-Fc binding. However, 6 and 25 µg/ml of 16H efficiently competed away ICOS-Fc binding, indicating that the 16H mAb indeed competed for ICOS binding on B7RP-1.

Co-stimulation Assays

[0179] Cell culture plates (Falcon, Cat No.353077, U bottom) were coated with 1 µg/ml anti-human CD3 antibodies (PharMingen Cat No.555336) and 10 µg/ml anti-human IgG (Fc specific, Sigma Cat No.13391). The anti-CD3 antibodies and anti-human immunoglobulin in phosphate buffered saline (PBS) were added to each well (100 µl/well). The coated plates were incubated at 4°C overnight or at room temperature for 2 hours. The plates were then washed with PBS twice. After washing, 1 µg/ml human B7-2Fc (R&D System, Cat No.141-B2) or 5 µg/ml hB7RP1Fc, each diluted in PBS, were added to each well (100 µl per well). The plates were then incubated at room temperature for 3 hours and washed twice with PBS thereafter. Purified human T cells were added (1x10⁵ per well) in 200 µl volume of media (RPMI 1640 supplemented with 10% fetal calf serum (FCS), penicillin-streptomycin-L-glutamine (PSG), β-mercaptoethanol (2-ME), N-Acetyl aspartate (NAA) and Napyruvate) and incubated at 37°C, 5% CO₂ for 48 hours. ³H thymidine (ICN Cat No.2404205) was added at 1 µCi/well and the cells were incubated overnight at 37°C, 5% CO₂. The cells were then harvested and counted.

[0180] Cell culture plates (Falcon, Cat No.353077, U bottom) were coated with 0.1 µg/ml anti-human CD3 as above. hB7RP1 transfected CHO cells (5000RAD irradiated) were added at 2x10⁴ per well followed by purified human T cells at 1x10⁵ per well in 200 µl volume. Plates were incubated at 37°C, 5% CO₂ for 48 hours as above. ³H thymidine was added at 1 µCi/well. Cells were incubated overnight, harvested, and counted as above.

Tetanus Toxoid Assays

[0181] PBMC were purified from human blood using a Ficoll-Paque (Amersham Biosciences) gradient as follows. Blood was diluted 1:2 with PBS, diluted blood was layered on top of the Ficoll (1/3 room temp Ficoll + 2/3 diluted blood), centrifuged at 2500 rpm for 30 minutes at room temperature, the top layer (plasma & platelets) was aspirated off, and the mononuclear cell layer was transferred to a fresh 50 ml tube. The isolated PBMC were washed with PBS (3x the volume of the mononuclear cell layer) and centrifuged for 10 minutes at 1300 rpm at room temperature and washed as above. The PBMC were resuspended in media (RPMI 1640 + 10% heat-inactivated FBS + 1X PSG + 1X NEAA + 55 µM 2-ME) and the cells were counted.

[0182] PMBC were added to wells of a 96-well round bottom plate at 100 µl PBMC/well (3x10⁶/ml). Tetanus toxoid (20 µg/ml; University of Massachusetts) was added for a final concentration of 5 µg/ml. The cells were incubated for 3 days at 37°C; 100 µl supernatant were collected and incubated for an addition 6 to 8 hours in the presence of 1 µCi/well ³H-thymidine (MP Biomedicals). The cells were then harvested and counted.

[0183] Table 4 summarizes the functional characteristics of certain antibodies of the invention as determined using the assays described above.

Table 4

	Plate	Biacore Fc	Biacore mono	CHO	Tetanus Toxoid
2H	43	89		1445	15
15H	36				141
16H	53	27	1900	276	27
16Hg	32	17	2700	523	
41H	52				115
43H	46				35
5D	55	1.6	37	1456	15

(continued)

	Plate	Biacore Fc	Biacore mono	CHO	Tetanus Toxoid
ICOS-Fc	200-1000	1000			
α -CD86					40
*EC ₅₀ /KD values in pM					

Example 8**Epitope Mapping**

[0184] Experiments were conducted to identify the region on B7RP-1 to which the 16H/16Hg and 5D monoclonal antibodies bind. To do this, a novel Fluorescence-Activated Cell Sorter (FACS) binding assay was developed. The human extracellular domain (ECD) of B7RP1 (SEQ ID NO: 66) as well as truncated forms of B7RP-1 containing either the Ig1 (IgV-like; SEQ ID NO: 67) or the Ig2 (IgC-like; SEQ ID NO: 68) were expressed as N-terminal, in-frame fusions with chicken avidin.

SEQ ID NO: 66 (ECD):

DTQEKEVRAMVGSDVELSCACPEGSRFDLNDVYVYWQTSESKTVVITYHI PQNSSLENVDSRYNRALMS
PAGMLRGDFSLRLFNVTPQDEQKFHCLVLSQSLGFQEVLSVEVTLHVAANF SVPVVSAPHSPSQDELTF
TCTSINGYPRPNVYWINKTDNSLLDQALQNDTVFLNMRGLYDVVSVLRIARTPSVNIGCC IENVLLQQN
LTVGSQTGNDIGERDKITENP

SEQ ID NO: 67 (IgV-like):

DTQEKEVRAMVGSDVELSCACPEGSRFDLNDVYVYWQTSESKTVVITYHI PQNSSLENVDSRYNRALMS
PAGMLRGDFSLRLFNVTPQDEQKFHCLVLSQSLGFQEVLSVEVTLHVAANF SVPVVSAPHSPSQDELTF
T

SEQ ID NO: 68 (IgC-like):

LGFQEVLSVEVTLHVAANF SVPVVSAPHSPSQDELTF TCTSINGYPRPNVYWINKTDNSLLDQALQNDT
VFLNMRGLYDVVSVLRIARTPSVNIGCC IENVLLQQNLTVGSQTGNDIGERDKITENP

[0185] Expression vectors containing genes encoding these fusion proteins were individually transiently transfected into 293T cells and the conditioned media from these cell lines were used as the source of fusion protein. The avidin-tag was used to capture the B7RP1 fusion proteins from solution using a biotin-coated bead. Fusion proteins were incubated with either fluorescently-labeled 16H or 5D mAbs or a fluorescently-labeled ICOS-Fc fusion protein, and incubated with biotin-coated beads. The beads were recovered and analyzed using flow cytometry on a Becton-Dickinson Bioscience FACScan (BD, Franklin Lakes, NJ). As shown in **Figure 9A**, fluorescent staining of the beads was detected with the 16H, 5D, and the ICOS reagents when the full ECD of B7RP-1 was attached, indicating that all three of these reagents could bind to the ECD of B7RP-1. Similarly, all three reagents bound to the avidin fusion protein containing only the Ig1 domain, indicating that both ICOS and the blocking anti-B7RP-1 mAbs could bind to this region. In contrast, neither ICOS nor the anti-B7RP-1 mAbs could bind to the fusion protein containing only the membrane-proximal Ig2 domain. Thus, the ICOS, 16H, and 5D binding regions on B7RP-1 were located in the Ig1 domain.

[0186] The antibodies generated as described above in Example 1 and tested for binding using the avidin fusion binding assay, could be divided into two epitope classes, H and D, as shown in Table 5. Of the 100 antibodies initially selected based on their ability to bind B7RP1, 15 failed to bind in the avidin fusion binding assay, most likely because of degradation.

Table 5

Classification of mAbs by epitope	
Class	#
H epitope	75
D epitope	10
New epitope, ICOS blocker	0
New epitope, not an ICOS blocker	0
No detectable binding	15

Example 9**SNP identification and functional analysis**

[0187] One major single nucleotide polymorphism (SNP) variant was identified in B7RP-1 that is present in the population with an allele frequency of 28.4% (**Figure 7**). The variant was identified within the mature protein coding sequence. A search of the National Center for Biotechnology Information (NCBI) databank revealed a second potential SNP variant; the second variant was identified in a 1.5 individual (three chromosome) analysis. The first SNP variant (V128I) was located in the first IgV-like domain, whereas the NCBI SNP variant (L221F) was located in the second IgC-like domain.

[0188] As discussed above, both the 16H and 5D monoclonal antibodies bind to the first IgV-like domain, this it is unlikely that the latter L221F variant affects either 16H or 5D mAb binding or function. Nonetheless, to determine if either of these SNP variants affects 16H or 5D binding and/or function, two different experiments were conducted. In the first set of experiments, avidin fusion proteins were constructed with the two SNP variants and tested for binding to 16H or 5D antibodies in the flow cytometric assay as described above. These representative mAbs from the H and D epitope classes bound to the SNP variants with similar efficacy as the wild-type B7RP-1 (**Figure 9B**). These data suggested that antibodies from both the H and D epitope classes bind to the B7RP-1 SNP variants.

[0189] In the second approach, Fc fusion proteins were constructed using the B7RP-1 SNP variant sequences and compared for the ability of these proteins to stimulate T cells in the plate co-stimulation assay (**Figure 9C**). Both the 16H and 5D antibodies inhibited co-stimulation mediated by the SNP variant Fc fusion proteins with similar EC₅₀s as the wild-type fusion protein. Taken together these data indicated that the two potential B7RP-1 SNP variants were recognized by the antibodies of the invention. Thus, the antibodies of the invention can bind to target in patients containing these SNP variants.

Example 10**In vivo Animal Efficacy Models**

[0190] The ability of B7RP-1 antibodies to inhibit immune response was analyzed using a murinized rat anti-murine B7RP-1 monoclonal antibody (1B7v2) and challenging BALB/c mice with keyhole-limpet hemocyanin (KLH).

Generation of the murinized rat anti-murine B7RP-1 monoclonal antibody 1B7v2

[0191] A Chinese-Hamster-Ovary cell line that overexpressed a full-length murine B7RP-1 was injected into rats as a primary immunization, and subsequently with a murine B7RP-1-Fc fusion protein to boost the immune response. Spleens were harvested 3 or 4 days post-intravenous boost and the splenic B cells fused with the Y3-Ag1.2.3 rat myeloma line (ATCC CRL-1631). Cells were then selected in media supplemented with hypoxanthine-aminopterin-thymidine (HAT) for 2 weeks and subsequently single-cell subcloned by limiting dilution. These procedures are described in "Practical Immunology, 2nd ed." Leslie Hudson and Frank C. Hay; Blackwell Scientific Publications 1980.

[0192] Genes encoding the 1B7 immunoglobulin were cloned from the 1B7 cell line using standard procedures (Sambrook et al., 2001, MOLECULAR CLONING: A LABORATORY MANUAL, 3d ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y.). The isotype switch of the human anti-huB7RP1 MAbs was accomplished by cloning the variable region fragments containing *Xba*I and *Bsm*BI restriction site cohesive ends into the pDSRa vector with the human IgG1 or huIgG2 constant region which also had *Xba*I and *Bsm*BI ends. For the 1B7 rat anti-muB7RP1 the chimera was formed by a three step overlapping PCR process. The rat variable region was PCR amplified with a 3' primer that contained part, ~25-35 nucleotides, of the murine constant region. The murine constant region was amplified with a 5'

primer that contained part, ~25-35 nucleotides, of the rat variable region. The two fragments were then used as template and the 5' rat variable region (*Xba*I containing) and the murine 3' constant region (*Sa*I containing) primers were used to generate a complete light chain or heavy chain. The light chain and heavy chain PCR products were then digested with *Xba*I and *Sa*I and cloned into pDSRa19. A total of 25 µg of linearized DNA (12.5 µg pDC323B LC + 12.5 µg pDC324 HC) were transfected into CS-9 cells using electroporation and selected on DHFR-supplemented medium.

[0193] To test the efficacy of the 1B7v2 mAb, plate co-stimulation assays were conducted with this mAb. The results were compared with other anti-murine B7RP-1 mAbs (**Figure 10A**). As discussed above, 1B7 is the original hybridoma-produced mAb; two different preparations (labeled 1.33 and 7.4) were tested. 5E1 and 11G10 were other anti-mB7RP-1 monoclonals generated in the fusions described above. Finally, HK5.3 was a commercially-available anti-mB7RP-1 (ebiosciences # 16-5985-85).

[0194] The 1B7v2 mAb blocked T cell activation in this assay equal to or better than any of the other mAbs, and thus was selected as the surrogate therapeutic for further studies.

Antigen Challenge in Mice

[0195] Keyhole Limpet Hemocyanin (KLH) was purchased from Pierce Biotechnology (Rockford, Illinois). Dosing solution #1 (KLH 5mg/kg in 1mg/mouse ALUM) was prepared with equal parts of 2x ALUM (500mg of ALUM plus 50ml PBS (phosphate buffered saline)) and 2x KLH (2.0ml dH₂O (RNAse-Free) mixed with 20mg of lyophilized KLH, brought to 20ml with 1x PBS). Dosing solution #2 (KLH 1mg/kg in 1mg/mouse ALUM) was prepared with 1 part 2x KLH mixed with 4 parts 1x phosphate buffered saline.

[0196] Female BALB/c mice were primed either with 1 mg/kg of KLH/alum and re-immunized on day 21 with 5mg/kg KLH only, introduced by intraperitoneal injection. Mice were treated by intraperitoneal injection with 1B7v.2, the isotype control antibody (anti-AGP3 PB) or the vehicle (PBS) alone, starting on day 1 (one day prior to priming with KLH/alum) in a final volume of 200 µl every 5 days.

[0197] The mice were bled every 7 days retro-orbitally (approximately 200 µl) to obtain approximately 50-100 µl of serum for analysis of antigen-specific serum IgM (**Figure 10B**), IgG2a (**Figure 10C**), and IgG1 (**Figure 10D**). Both the isotype-control and vehicle-treated mice showed significant primary and secondary immune responses. The IgM response was not affected by treatment, whereas, blockade of B7RP-1/ICOS with 1B7v2 decreased both primary and secondary IgG2a and IgG1 responses in a statistically-significant manner.

[0198] IL-5 is a cytokine released by T cells in response to antigen stimulation that induces B cell differentiation and function. As the B7RP-1/ICOS interaction is believed to be critical for T-cell-dependent B cell function, measuring serum IL-5 levels was used to determine if interdiction of the B7RP-1/ICOS axis was indeed affecting T cell function. As expected, blockade of B7RP-1 also inhibited antigen-induced serum IL-5 levels. Sera were harvested from the mice from the antigen challenge experiment outlined above 24 hours after the antigen challenge on day 21, and serum IL-5 levels were determined by ELISA. As shown in **Figure 11**, elevated IL-5 levels were detected in the test mice as early as 9 hours after challenge; levels began to decline by 48 hours and returned to baseline by 72 hours. Treatment of the mice with 1B7v2 mAb lead to a statistically significant repression of IL-5 levels at the 24-hour time point.

Example 11

Binding to cynomolgus monkey B7RP-1

[0199] To determine if the anti-hB7RP-1 mAbs also bind to cynomolgus monkey B7RP-1, flow cytometric staining experiments were conducted with the 16H mAb and B cells purified from cynomolgus monkeys and humans. As shown in **Figure 12A**, addition of fluorescently-labeled 16H to cyno B cells lead to staining, indicating that 16H was indeed binding to cyno B7RP-1 (right panel). As expected, 16H also stained human B cells (left panel). In addition, 16H, 16Hg, and 5D were tested in plate co-stimulation assays using cyno T cells, cyno B7RP-1-Fc, and anti-CD3 mAb. As shown in **Figure 12B**, all three mAbs inhibited cyno B7RP-1-dependent cyno T cell activation, indicating that these mAbs functionally block the cyno ICOS-B7RP-1 interaction.

Example 12

T-Cell Dependent Antigen Responses in the Cynomolgus Monkey Following Administration of the Anti-B7RP-1 Antibodies

[0200] A cynomolgus monkey study was conducted with two anti-B7RP-1 monoclonal antibodies, 16H and 5D, to assess the ability of these antibodies to inhibit a T-cell dependent B cell antigen response as determined by serum levels of antigen-specific antibody. Briefly, the anti-keyhole limpet hemocyanin (KLH) and anti-tetanus toxoid antibody respons-

EP 1 915 398 B1

es were examined following antigen challenge in the presence of B7RP-1 antibodies in the cynomolgus monkey.

[0201] Test Article 1 was 16H and Test Article 2 was 5D. The Control Article was the vehicle for B7RP-1 antibody (0.01 sodium acetate, pH 5.0, 5% sorbitol, 0.004% Tween 20). Keyhole Limpet Hemocyanin (KLH) was purchased from Pierce Biotechnology (Rockford, Illinois).

[0202] The KLH was prepared by reconstitution with sterile water to yield a 10 mg/mL stock solution. The stock solution was diluted with sterile water to yield a 1 mg/mL dosing solution. Tetanus Toxoid used for these experiments was Super-Tet® Tetanus Toxoid w/Havlogen®, purchased from Intervet™ Inc. (Millsboro, Delaware). The dose level for these experiments was 75 IU (0.5 mL of 150 IU/mL).

[0203] Table 6 shows the treatment group distribution of 28 cynomolgus monkeys.

Table 6

Group No.	Number of Males/Females	Test Article	Route	Dose Level (mg/kg)	Dose Volume (mL/kg)	Dose Solution Cone. (mg/mL)
1	2/2	Control	IV	0	1	0
2	2/2	B7RP-1 5D	IV	0.1	1	0.1
3	2/2	B7RP-1 5D	IV	1.0	1	1.0
4	2/2	B7RP-1 5D	IV	8.0	1	10.0
5	2/2	B7RP-1 16H	IV	0.1	1	0.1
6	2/2	B7RP-1 16H	IV	1.0	1	1.0
7	2/2	B7RP-1 16H	IV	8.0	1	10.0

[0204] Test article doses were administered via intravenous injection to all animals on Days 1, 8, 15, 22, 29, 36, 43, and 50. Animals scheduled for necropsy in Groups 1-4 (1/sex/group) received an additional dose on Day 57. Evaluation of immune response was conducted on all animals via immunization with KLH and tetanus toxoid antigens followed by blood sampling for antigen-specific immunoglobulins (IgM and IgG).

[0205] Titer values were present following primary administration of both the KLH and tetanus antigens. For KLH, primary titer values ranged from 0 to 900 for both IgM and IgG. As the primary KLH challenge was administered prior to test article administration, no effect of the B7RP-1 antibodies was evaluated. For tetanus toxoid, primary titer values ranged from 0 to 50 for IgM and from 0 to 4050 for IgG. There were no differences in the primary response to tetanus toxoid between the B7RP-1 antibody groups and the control group.

[0206] As expected, titer values for IgG were increased following secondary administration of both the KLH and tetanus antigens, when compared to the primary titer values. For KLH, secondary titer values ranged from 0 to 300 for IgM and from 0 to 8100 for IgG. However, there was no evidence of inhibition of the KLH secondary response attributed to administration of the B7RP-1 antibodies.

[0207] For tetanus toxoid, secondary titer values were below 50 for IgM and ranged from 1350 to 36450 for IgG. Results for individual animal and group mean values are presented in the **Figure 13A** (16H antibody) and **Figure 13B** (5D antibody) for Days 53 and 57 following the secondary challenge with tetanus toxoid on Day 42.

[0208] On Day 53, the number of animals reaching peak response was 3/4, 1/4, and 1/4 at the 0.1, 1, and 8 mg/kg dose levels of 16H, respectively, and 1/4, 1/4, and 1/4 at the 0.1, 1, and 8 mg/kg dose levels of 5D respectively, compared to 2/4 control animals. Thus, in general, the number of animals reaching a high titer on Day 53 was reduced in the B7RP-1 antibody-treated groups. On Day 57, titer values were maintained in the control animals, while titer values for several of the B7RP-1 antibody-treated animals declined from the Day 53 values. The number of animals with high titers on Day 57 was 0/4, 0/4, and 1/4 at the 0.1, 1, and 8 mg/kg dose levels of 16H, respectively, and 0/4, 0/4, and 0/4 at the 0.1, 1, and 8 mg/kg dose levels of 5D respectively, compared to 2/4 control animals.

[0209] These results demonstrated that the two B7RP-1 antibodies 16H and 5D inhibited a T-cell dependent B cell antigen response in cynomolgus monkeys, as determined by serum levels of tetanus toxoid-specific antibody. In addition, the presence of the B7RP-1 antibodies was important for blockage of the B7RP-1-ICOS interaction during the primary response in order to detect an effect following the secondary challenge.

EP 1 915 398 B1

[0210] These results and the results from Example 10 demonstrated that both the surrogate therapeutic and the therapeutic candidates blocked T and B cell- dependent immune responses in murine and monkey model systems, which indicated that blocking this co-stimulatory axis may be efficacious in the treatment of B-cell-mediated diseases such as Systemic Lupus Erythematosus (SLE), asthma, and Rheumatoid Arthritis (RA).

SEQUENCE LISTING

[0211]

<110> Siu, Jerry Shen, David Yoshinaga, Steve Huang, Haichun

<120> Human anti-B7RP1 Neutralizing Antibodies

<130> 04-833

<160> 76

<170> PatentIn version 3.3

<210> 1

<211> 107

<212> PRT

<213> Homo sapiens

<400> 1

```

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1      5      10      15
.
.
.
Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Asn Trp
20      25      30
.
.
.
Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35      40      45
.
.
.
Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50      55      60
.
.
.
Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65      70      75      80
.
.
.
Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asp Ser Tyr Pro Arg
85      90      95
.
.
.
Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100      105

```

<210> 2

<211> 107

<212> PRT

<213> Homo sapiens

<400> 2

EP 1 915 398 B1

Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
1 5 10 15

5 Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Ser Tyr
20 25 30

10 Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
35 40 45

15 Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
65 70 75 80

20 Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Asn Asn Trp Pro Trp
85 90 95

25 Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 3

<211> 107

30 <212> PRT

<213> Homo sapiens

<400> 3

35 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

40 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Asn Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

45 Tyr Thr Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

50 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

55 Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Arg
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

EP 1 915 398 B1

<210> 4
<211> 108
<212> PRT
<213> Homo sapiens

5
<400> 4

Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
10 1 5 10 15
Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Ser Tyr
15 20 25 30
Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
35 40 45
Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
20 50 55 60
Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
25 65 70 75 80
Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Ser Asn Trp Pro Ala
85 90 95
30 Leu Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys
100 105

<210> 5
<211> 107
<212> PRT
<213> Homo sapiens

35
<400> 5

40 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15
45 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30
Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
50 35 40 45
Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
55 50 55 60
Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

EP 1 915 398 B1

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Thr Tyr Pro Arg
85 90 95

5 Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

<210> 6

<211> 107

10 <212> PRT

<213> Homo sapiens

<400> 6

15 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

20 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30

Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

25 Phe Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

30 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

35 Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105

40 <210> 7

<211> 121

<212> PRT

<213> Homo sapiens

45 <400> 7

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

50 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

55 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

EP 1 915 398 B1

Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

5 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Lys Ser Leu Tyr
65 70 75 80

10 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly
100 105 110

15 Gln Gly Ile Leu Val Thr Val Ser Ser
115 120

<210> 8
20 <211> 121
<212> PRT
<213> Homo sapiens

<400> 8

25 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

30 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

35 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

40 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

45 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly
100 105 110

50 Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

55 <210> 9
<211> 121
<212> PRT
<213> Homo sapiens

EP 1 915 398 B1

<400> 9

5 Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30
10 Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45
15 Ala Val Ile Trp Tyr Asp Gly Ser Lys Lys Tyr Tyr Ala Asp Ser Val
50 55 60
20 Glu Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80
Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Phe Tyr Cys
85 90 95
25 Ala Arg Asp Leu Asn Ile Met Val Trp Gly Ile Phe Asp Tyr Trp Gly
100 105 110
30 Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 10

<211> 121

<212> PRT

35 <213> Homo sapiens

<400> 10

40 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15
Ser Leu Arg Leu Ser Cys Val Gly Ser Gly Phe Thr Phe Ser Ser Tyr
45 20 25 30
Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45
50 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

55

EP 1 915 398 B1

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80
 5 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95
 10 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Ile Pro Thr Tyr Trp Gly
 100 105 110
 Gln Gly Ile Leu Val Thr Val Ser Ser
 115 120
 15 <210> 11
 <211> 121
 <212> PRT
 <213> Homo sapiens
 20 <400> 11
 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15
 25 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30
 30 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45
 35 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80
 40 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95
 45 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Ile Pro Thr Tyr Trp Gly
 100 105 110
 Gln Gly Thr Leu Val Thr Val Ser Ser
 115 120
 50 <210> 12
 <211> 120
 <212> PRT
 <213> Homo sapiens
 55 <400> 12

EP 1 915 398 B1

1 Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
 5 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
 10 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 15 Ser Ala Ile Gly Thr Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys
 20 Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Met Tyr Tyr Cys Ala
 25 Lys Ser Gly Val Pro Leu Leu Trp Phe Gly Glu Phe Tyr Trp Gly Gln
 30 Gly Thr Leu Val Thr Val Ser Ser
 35

<210> 13
 <211> 121
 <212> PRT
 <213> Homo sapiens

35
 40 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 45 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 50 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 55 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
 60 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65

EP 1 915 398 B1

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

5 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Tyr Trp Gly
100 105 110

10 Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 14
<211> 118
<212> PRT
15 <213> Homo sapiens
<400> 14

20 Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
1 5 10 15

25 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

30 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

35 Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu
65 70 75 80

40 Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Val Tyr Tyr Cys Ala
85 90 95

45 Arg Val Val Val Val Val Gly Phe Phe Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Leu Val Thr Val Ser Ser
115

<210> 15
<211> 11
50 <212> PRT
<213> Homo sapiens
<400> 15

55 Arg Ala Ser Gln Gly Ile Ser Asn Trp Leu Ala
1 5 10

<210> 16

EP 1 915 398 B1

<211> 7
 <212> PRT
 <213> Homo sapiens
 5 <400> 16
 Ala Ala Ser Ser Leu Gln Ser
 1 5
 10 <210> 17
 <211> 9
 <212> PRT
 <213> Homo sapiens
 15 <400> 17
 Gln Gln Tyr Asp Ser Tyr Pro Arg Thr
 1 5
 20 <210> 18
 <211> 11
 <212> PRT
 <213> Homo sapiens
 25 <400> 18
 Arg Ala Ser Gln Ser Val Ser Ser Tyr Leu Ala
 1 5 10
 30 <210> 19
 <211> 7
 <212> PRT
 <213> Homo sapiens
 35 <400> 19
 Asp Ala Ser Asn Arg Ala Thr
 1 5
 40 <210> 20
 <211> 9
 <212> PRT
 <213> Homo sapiens
 45 <400> 20
 Gln Gln Arg Asn Asn Trp Pro Trp Thr
 1 5
 50 <210> 21
 <211> 7
 <212> PRT
 <213> Homo sapiens
 55 <400> 21

EP 1 915 398 B1

		Thr	Ala	Ser	Ser	Leu	Gln	Ser				
		1				5						
5												
	<210>	22										
	<211>	9										
	<212>	PRT										
	<213>	Homo sapiens										
10												
	<400>	22										
		Gln	Gln	Tyr	Asn	Ser	Tyr	Pro	Arg	Thr		
		1				5						
15												
	<210>	23										
	<211>	10										
	<212>	PRT										
	<213>	Homo sapiens										
20												
	<400>	23										
		Gln	Gln	Arg	Ser	Asn	Trp	Pro	Ala	Leu	Thr	
		1				5				10		
25												
	<210>	24										
	<211>	11										
	<212>	PRT										
	<213>	Homo sapiens										
30												
	<400>	24										
		Arg	Ala	Ser	Gln	Gly	Ile	Ser	Ser	Trp	Leu	Ala
		1				5					10	
35												
	<210>	25										
	<211>	9										
	<212>	PRT										
	<213>	Homo sapiens										
40												
	<400>	25										
		Gln	Gln	Tyr	Asn	Thr	Tyr	Pro	Arg	Thr		
		1				5						
45												
	<210>	26										
	<211>	9										
	<212>	PRT										
50		<213>	Homo sapiens									
	<400>	26										
		Gln	Gln	Tyr	Asn	Ser	Tyr	Pro	Tyr	Thr		
		1				5						
55												
	<210>	27										
	<211>	5										

EP 1 915 398 B1

<212> PRT
 <213> Homo sapiens
 <400> 27

5

Ser Tyr Trp Met Ser
 1 5

<210> 28
 <211> 17
 <212> PRT
 <213> Homo sapiens

<400> 28

Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val Lys
 1 5 10 15

20

Gly

<210> 29
 <211> 12
 <212> PRT
 <213> Homo sapiens

<400> 29

Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe
 1 5 10

<210> 30
 <211> 5
 <212> PRT
 <213> Homo sapiens

<400> 30

40

Ser Tyr Gly Met His
 1 5

<210> 31
 <211> 17
 <212> PRT
 <213> Homo sapiens

<400> 31

50

Val Ile Trp Tyr Asp Gly Ser Lys Lys Tyr Tyr Ala Asp Ser Val Glu
 1 5 10 15

55

Gly

<210> 32
 <211> 12

EP 1 915 398 B1

<212> PRT
<213> Homo sapiens

<400> 32

5

Asp Leu Asn Ile Met Val Trp Gly Ile Phe Asp Tyr
1 5 10

<210> 33

10

<211> 17
<212> PRT
<213> Homo sapiens

<400> 33

15

Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val Lys
1 5 10 15

20

Gly

<210> 34

<211> 12

<212> PRT

25

<213> Homo sapiens

<400> 34

30

Asp Gly Ile Leu Trp Phe Gly Asp Ile Pro Thr Tyr
1 5 10

<210> 35

<211> 5

35

<212> PRT
<213> Homo sapiens

<400> 35

40

Ser Tyr Ala Met His
1 5

<210> 36

<211> 16

45

<212> PRT
<213> Homo sapiens

<400> 36

50

Ala Ile Gly Thr Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys Gly
1 5 10 15

<210> 37

55

<211> 11
<212> PRT
<213> Homo sapiens

EP 1 915 398 B1

<400> 37

5 Gly Val Pro Leu Leu Trp Phe Gly Glu Phe Tyr
1 5 10

<210> 38

<211> 12

<212> PRT

10 <213> Homo sapiens

<400> 38

15 Asp Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Tyr
1 5 10

<210> 39

<211> 16

<212> PRT

20 <213> Homo sapiens

<400> 39

25 Ala Ile Gly Ala Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys Gly
1 5 10 15

<210> 40

<211> 10

30 <212> PRT

<213> Homo sapiens

<400> 40

35 Val Val Val Val Val Gly Phe Phe Asp Tyr
1 5 10

<210> 41

<211> 326

40 <212> PRT

<213> Homo sapiens

<400> 41

45 Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg
1 5 10 15

50 Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
20 25 30

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser
35 40 45

55

EP 1 915 398 B1

	Gly	Val	His	Thr	Phe	Pro	Ala	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	
	50						55					60					
5	Leu	Ser	Ser	Val	Val	Thr	Val	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	
	65					70					75					80	
	Tyr	Thr	Cys	Asn	Val	Asp	His	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	
10					85					90					95		
	Thr	Val	Glu	Arg	Lys	Cys	Cys	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	
				100					105					110			
15	Pro	Val	Ala	Gly	Pro	Ser	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	
			115					120					125				
	Thr	Leu	Met	Ile	Ser	Arg	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	
20			130				135					140					
	Val	Ser	His	Glu	Asp	Pro	Glu	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	
	145					150					155					160	
25	Val	Glu	Val	His	Asn	Ala	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	
					165					170					175		
	Ser	Thr	Phe	Arg	Val	Val	Ser	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	
30				180					185					190			
	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	
			195					200					205				
35	Ala	Pro	Ile	Glu	Lys	Thr	Ile	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	
		210					215					220					
	Pro	Gln	Val	Tyr	Thr	Leu	Pro	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	
40						230					235					240	
	Gln	Val	Ser	Leu	Thr	Cys	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	
45					245					250					255		
	Ala	Val	Glu	Trp	Glu	Ser	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	
				260					265					270			
50	Thr	Pro	Pro	Met	Leu	Asp	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	
			275					280					285				
55																	

EP 1 915 398 B1

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys
290 295 300

5 Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu
305 310 315 320

10 Ser Leu Ser Pro Gly Lys
325

<210> 42
<211> 330
<212> PRT
15 <213> Homo sapiens

<400> 42

20 Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu Ala Pro Ser Ser Lys
1 5 10 15

25 Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr
20 25 30

Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser
35 40 45

30 Gly Val His Thr Phe Pro Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser
50 55 60

35 Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser Leu Gly Thr Gln Thr
65 70 75 80

Tyr Ile Cys Asn Val Asn His Lys Pro Ser Asn Thr Lys Val Asp Lys
85 90 95

40 Lys Val Glu Pro Lys Ser Cys Asp Lys Thr His Thr Cys Pro Pro Cys
100 105 110

45 Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro
115 120 125

Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys
130 135 140

50 Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe Asn Trp
145 150 155 160

55 Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu

EP 1 915 398 B1

					165					170					175	
5	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr	Arg	Val	Val	Ser	Val	Leu	Thr	Val	Leu
				180					185					190		
10	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	Cys	Lys	Val	Ser	Asn
			195					200					205			
15	Lys	Ala	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	Ser	Lys	Ala	Lys	Gly
		210					215					220				
20	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	Pro	Ser	Arg	Asp	Glu
		225				230					235					240
25	Leu	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	Val	Lys	Gly	Phe	Tyr
				245						250					255	
30	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	Gly	Gln	Pro	Glu	Asn
				260					265					270		
35	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Val	Leu	Asp	Ser	Asp	Gly	Ser	Phe	Phe
			275					280					285			
40	Leu	Tyr	Ser	Lys	Leu	Thr	Val	Asp	Lys	Ser	Arg	Trp	Gln	Gln	Gly	Asn
		290					295					300				
45	Val	Phe	Ser	Cys	Ser	Val	Met	His	Glu	Ala	Leu	His	Asn	His	Tyr	Thr
		305				310					315					320
50	Gln	Lys	Ser	Leu	Ser	Leu	Ser	Pro	Gly	Lys						
				325						330						
55	Arg	Thr	Val	Ala	Ala	Pro	Ser	Val	Phe	Ile	Phe	Pro	Pro	Ser	Asp	Glu
	1				5					10					15	
60	Gln	Leu	Lys	Ser	Gly	Thr	Ala	Ser	Val	Val	Cys	Leu	Leu	Asn	Asn	Phe
				20					25					30		
65	Tyr	Pro	Arg	Glu	Ala	Lys	Val	Gln	Trp	Lys	Val	Asp	Asn	Ala	Leu	Gln
			35					40					45			

<210> 43
 <211> 107
 <212> PRT
 <213> Homo sapiens

<400> 43

EP 1 915 398 B1

Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser
50 55 60

5 Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu
65 70 75 80

10 Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser
85 90 95

Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
100 105

15 <210> 44
<211> 447
<212> PRT
<213> Homo sapiens

20 <400> 44

Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

25 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

30 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

35 Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Lys Ser Leu Tyr
65 70 75 80

40 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

45 Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly
100 105 110

Gln Gly Ile Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
115 120 125

50 Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala
130 135 140

55 Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val

EP 1 915 398 B1

	145		150		155		160									
5	Ser	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala
					165					170					175	
10	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val
				180					185					190		
15	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His
			195					200					205			
20	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys
	210						215					220				
25	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val
	225					230					235					240
30	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr
					245					250					255	
35	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu
				260					265					270		
40	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys
			275					280					285			
45	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser
	290						295					300				
50	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys
	305					310					315					320
55	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile
					325					330					335	
60	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro
				340					345					350		
65	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu
			355					360					365			
70	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn
	370						375					380				
75	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser
	385					390					395					400

EP 1 915 398 B1

Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg
405 410 415

5 Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
420 425 430

10 His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
435 440 445

<210> 45
<211> 214
<212> PRT
15 <213> Homo sapiens

<400> 45

20 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

25 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Asn Trp
20 25 30

30 Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

35 Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

40 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

45 Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asp Ser Tyr Pro Arg
85 90 95

50 Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala
100 105 110

55 Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
115 120 125

Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
130 135 140

Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
145 150 155 160

EP 1 915 398 B1

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser
 165 170 175
 5 Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
 180 185 190
 10 Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
 195 200 205
 Phe Asn Arg Gly Glu Cys
 210
 15 <210> 46
 <211> 447
 <212> PRT
 <213> Homo sapiens
 20 <400> 46
 25 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15
 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30
 30 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45
 35 Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80
 40 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95
 45 Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly
 100 105 110
 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125
 50 Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala
 130 135 140
 55 Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
 145 150 155 160

EP 1 915 398 B1

	Ser	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala
					165					170					175	
5	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val
				180					185					190		
10	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His
			195					200					205			
15	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys
	210					215						220				
20	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val
	225					230					235					240
25	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr
					245					250					255	
30	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu
				260					265					270		
35	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys
			275					280					285			
40	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser
	290						295					300				
45	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys
	305					310					315					320
50	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile
					325					330					335	
55	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro
				340					345					350		
60	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu
			355					360					365			
65	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn
	370						375					380				
70	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser
	385					390					395					400

EP 1 915 398 B1

Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg
405 410 415

5 Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
420 425 430

10 His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
435 440 445

<210> 47
<211> 451
<212> PRT
15 <213> Homo sapiens

<400> 47

20 Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
1 5 10 15

25 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

30 Ala Val Ile Trp Tyr Asp Gly Ser Lys Lys Tyr Tyr Ala Asp Ser Val
50 55 60

35 Glu Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

40 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Phe Tyr Cys
85 90 95

Ala Arg Asp Leu Asn Ile Met Val Trp Gly Ile Phe Asp Tyr Trp Gly
100 105 110

45 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
115 120 125

50 Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala
130 135 140

Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
145 150 155 160

55 Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala

EP 1 915 398 B1

	165	170	175
5	Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val		
	180	185	190
10	Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His		
	195	200	205
15	Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys		
	210	215	220
20	Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly		
	225	230	235
25	Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met		
	245	250	255
30	Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His		
	260	265	270
35	Glu Asp Pro Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val		
	275	280	285
40	His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr		
	290	295	300
45	Arg Val Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly		
	305	310	315
50	Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile		
	325	330	335
55	Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val		
	340	345	350
60	Tyr Thr Leu Pro Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser		
	355	360	365
65	Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu		
	370	375	380
70	Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro		
	385	390	395
75	Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val		

EP 1 915 398 B1

	405	410	415
5	Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met		
	420	425	430
10	His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser		
	435	440	445
15	Pro Gly Lys		
	450		
	<210> 48		
	<211> 214		
	<212> PRT		
	<213> Homo sapiens		
20	<400> 48		
	Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly		
	1 5 10 15		
25	Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Ser Tyr		
	20 25 30		
30	Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile		
	35 40 45		
	Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly		
	50 55 60		
35	Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro		
	65 70 75 80		
40	Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Asn Asn Trp Pro Trp		
	85 90 95		
	Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala		
	100 105 110		
45	Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly		
	115 120 125		
50	Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala		
	130 135 140		
	Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln		
	145 150 155 160		
55			

EP 1 915 398 B1

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser
 165 170 175
 5 Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
 180 185 190
 10 Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
 195 200 205
 Phe Asn Arg Gly Glu Cys
 210
 15 <210> 49
 <211> 433
 <212> PRT
 <213> Homo sapiens
 20 <400> 49
 25 Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu
 1 5 10 15
 Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe
 20 25 30
 30 Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln
 35 40 45
 35 Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser
 50 55 60
 Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu
 65 70 75 80
 40 Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser
 85 90 95
 45 Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys Ala Ser Thr Lys Gly
 100 105 110
 Pro Ser Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser
 115 120 125
 50 Thr Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val
 130 135 140
 55 Thr Val Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe

EP 1 915 398 B1

	145		150		155		160									
5	Pro	Ala	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val
				165						170					175	
10	Thr	Val	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val
				180					185					190		
15	Asp	His	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys
			195					200					205			
20	Cys	Cys	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro
		210					215					220				
25	Ser	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser
	225					230					235					240
30	Arg	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp
					245					250					255	
35	Pro	Glu	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn
				260					265					270		
40	Ala	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val
			275					280					285			
45	Val	Ser	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu
		290					295					300				
50	Tyr	Lys	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys
	305					310					315				320	
55	Thr	Ile	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr
					325					330					335	
60	Leu	Pro	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr
				340					345					350		
65	Cys	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu
			355					360					365			
70	Ser	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu
		370					375					380				
75	Asp	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val	Asp	Lys
	385					390					395					400

EP 1 915 398 B1

Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu
405 410 415

5 Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly
420 425 430

Lys

10

<210> 50

<211> 214

<212> PRT

<213> Homo sapiens

15

<400> 50

20

Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Asn Trp
20 25 30

25

Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

30

Tyr Thr Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

35

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Arg
85 90 95

40

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala
100 105 110

45

Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
115 120 125

Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
130 135 140

50

Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
145 150 155 160

55

EP 1 915 398 B1

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser
 165 170 175
 5 Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
 180 185 190
 10 Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
 195 200 205
 Phe Asn Arg Gly Glu Cys
 210
 15 <210> 51
 <211> 447
 <212> PRT
 <213> Homo sapiens
 20 <400> 51
 25 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15
 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30
 30 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45
 35 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60
 40 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80
 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95
 45 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Ile Pro Thr Tyr Trp Gly
 100 105 110
 50 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125
 Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala
 130 135 140
 55

EP 1 915 398 B1

	Ala	Leu	Gly	Cys	Leu	Val	Lys	Asp	Tyr	Phe	Pro	Glu	Pro	Val	Thr	Val	
	145					150					155					160	
5	Ser	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala	
					165					170					175		
10	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	
				180					185					190			
15	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His	
			195					200					205				
20	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys	
	210						215					220					
25	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val	
	225					230					235					240	
30	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	
					245					250					255		
35	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	
				260					265					270			
40	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	
			275					280					285				
45	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser	
	290						295					300					
50	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	
	305					310					315					320	
55	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	
					325					330					335		
60	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	
				340					345					350			
65	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	
			355					360					365				
70	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	
	370						375					380					
75	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser	

EP 1 915 398 B1

	385		390		395		400
5	Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg	405	410	415			
10	Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu	420	425	430			
	His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys	435	440	445			
15	<210> 52						
	<211> 444						
	<212> PRT						
	<213> Homo sapiens						
20	<400> 52						
25	Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly	1	5	10	15		
30	Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr	20	25	30			
35	Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val	35	40	45			
40	Ser Ala Ile Gly Ala Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys	50	55	60			
45	Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu	65	70	75	80		
50	Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Val Tyr Tyr Cys Ala	85	90	95			
55	Arg Val Val Val Val Val Gly Phe Phe Asp Tyr Trp Gly Gln Gly Thr	100	105	110			
	Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro	115	120	125			
	Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly	130	135	140			
	Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn	145	150	155	160		

EP 1 915 398 B1

	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala	Val	Leu	Gln
					165					170					175	
5	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	Pro	Ser	Ser
				180					185					190		
10	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His	Lys	Pro	Ser
			195					200					205			
15	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys	Val	Glu	Cys
		210					215					220				
20	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val	Phe	Leu	Phe
						230					235					240
25	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	Pro	Glu	Val
					245					250					255	
30	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	Val	Gln	Phe
					260				265					270		
35	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	Thr	Lys	Pro
			275					280					285			
40	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser	Val	Leu	Thr
		290					295					300				
45	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	Cys	Lys	Val
		305				310					315					320
50	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	Ser	Lys	Thr
					325					330					335	
55	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	Pro	Ser	Arg
				340					345					350		
60	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	Val	Lys	Gly
			355					360					365			
65	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	Gly	Gln	Pro
		370					375					380				
70	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser	Asp	Gly	Ser
						390					395					400

EP 1 915 398 B1

Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln
 405 410 415
 5 Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His
 420 425 430
 10 Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
 435 440
 <210> 53
 <211> 214
 <212> PRT
 15 <213> Homo sapiens
 <400> 53
 20 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
 1 5 10 15
 25 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
 20 25 30
 30 Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
 35 40 45
 35 Phe Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
 50 55 60
 40 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
 65 70 75 80
 45 Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Ser Tyr Pro Tyr
 85 90 95
 50 Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg Thr Val Ala Ala
 100 105 110
 55 Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
 115 120 125
 60 Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
 130 135 140
 65 Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
 145 150 155 160
 70 Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser

EP 1 915 398 B1

165 170 175

5 Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
180 185 190

Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
195 200 205

10 Phe Asn Arg Gly Glu Cys
210

<210> 54
 15 <211> 447
 <212> PRT
 <213> Homo sapiens

<400> 54

20 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

25 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

30 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
50 55 60

35 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

40 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Tyr Trp Gly
100 105 110

45 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
115 120 125

50 Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala
130 135 140

Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
145 150 155 160

55

EP 1 915 398 B1

	Ser	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala	
					165					170					175		
5	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	
				180					185					190			
10	Pro	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His	
			195					200					205				
15	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys	
	210						215					220					
20	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val	
	225					230					235					240	
25	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	
					245					250					255		
30	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	
				260					265					270			
35	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	
			275					280					285				
40	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser	
	290						295					300					
45	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	
	305					310					315					320	
50	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	
					325					330					335		
55	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	
				340					345					350			
60	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	
			355					360					365				
65	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	
	370						375					380					
70	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser	
	385					390					395					400	

EP 1 915 398 B1

Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg
405 410 415

5 Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
420 425 430

10 His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
435 440 445

<210> 55
<211> 214
<212> PRT
15 <213> Homo sapiens

<400> 55

20 Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
1 5 10 15

25 Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Gln Gly Ile Ser Ser Trp
20 25 30

30 Leu Ala Trp Tyr Gln Gln Lys Pro Glu Lys Ala Pro Lys Ser Leu Ile
35 40 45

35 Tyr Ala Ala Ser Ser Leu Gln Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

35 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Gln Pro
65 70 75 80

40 Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Tyr Asn Thr Tyr Pro Arg
85 90 95

45 Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala Ala
100 105 110

45 Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly
115 120 125

50 Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala
130 135 140

55 Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln
145 150 155 160

Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser

EP 1 915 398 B1

```

165
170
175
5
Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr
180 185 190
10
Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser
195 200 205
15
Phe Asn Arg Gly Glu Cys
210
15
<210> 56
<211> 446
<212> PRT
<213> Homo sapiens
20
<400> 56
25
Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
1 5 10 15
25
Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30
30
Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45
35
Ser Ala Ile Gly Thr Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys
50 55 60
35
Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu
65 70 75 80
40
Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Met Tyr Tyr Cys Ala
85 90 95
45
Lys Ser Gly Val Pro Leu Leu Trp Phe Gly Glu Phe Tyr Trp Gly Gln
100 105 110
45
Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val
115 120 125
50
Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala
130 135 140
55
Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser
145 150 155 160

```

EP 1 915 398 B1

	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala	Val
					165					170					175	
5	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	Pro
				180					185					190		
10	Ser	Ser	Asn	Phe	Gly	Thr	Gln	Thr	Tyr	Thr	Cys	Asn	Val	Asp	His	Lys
			195					200					205			
	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys	Val
		210					215					220				
15	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val	Phe
	225					230					235					240
20	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	Pro
					245					250					255	
25	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	Val
				260					265					270		
	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	Thr
			275					280					285			
30	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser	Val
		290					295					300				
35	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	Cys
	305					310					315					320
	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	Ser
					325					330					335	
40	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	Pro
				340					345					350		
45	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	Val
			355					360					365			
	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	Gly
		370					375					380				
50	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser	Asp
	385					390					395					400

55

EP 1 915 398 B1

Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp
405 410 415

5 Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His
420 425 430

Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
435 440 445

10 <210> 57
<211> 450
<212> PRT
<213> Homo sapiens

15 <400> 57

Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
1 5 10 15

20 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

25 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

30 Ser Ala Ile Gly Thr Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys
50 55 60

Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu
65 70 75 80

35 Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Met Tyr Tyr Cys Ala
85 90 95

40 Lys Ser Gly Val Pro Leu Leu Trp Phe Gly Glu Phe Tyr Trp Gly Gln
100 105 110

Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val
115 120 125

45 Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala
130 135 140

50 Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser
145 150 155 160

Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val
165 170 175

55

EP 1 915 398 B1

	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	Pro	
				180					185					190			
5	Ser	Ser	Ser	Leu	Gly	Thr	Gln	Thr	Tyr	Ile	Cys	Asn	Val	Asn	His	Lys	
			195					200					205				
10	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Lys	Val	Glu	Pro	Lys	Ser	Cys	Asp	
			210				215					220					
15	Lys	Thr	His	Thr	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Glu	Leu	Leu	Gly	Gly	
	225					230					235					240	
20	Pro	Ser	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	
				245						250					255		
25	Ser	Arg	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	
				260					265					270			
30	Asp	Pro	Glu	Val	Lys	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	
			275					280					285				
35	Asn	Ala	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr	Arg	
		290					295					300					
40	Val	Val	Ser	Val	Leu	Thr	Val	Leu	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	
	305				310						315					320	
45	Glu	Tyr	Lys	Cys	Lys	Val	Ser	Asn	Lys	Ala	Leu	Pro	Ala	Pro	Ile	Glu	
				325						330					335		
50	Lys	Thr	Ile	Ser	Lys	Ala	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	
			340						345					350			
55	Thr	Leu	Pro	Pro	Ser	Arg	Asp	Glu	Leu	Thr	Lys	Asn	Gln	Val	Ser	Leu	
		355						360					365				
60	Thr	Cys	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	
		370					375					380					
65	Glu	Ser	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Val	
	385					390					395					400	
70	Leu	Asp	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val	Asp	
				405						410					415		

EP 1 915 398 B1

Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His
 420 425 430
 5 Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro
 435 440 445
 10 Gly Lys
 450
 <210> 58
 <211> 215
 <212> PRT
 15 <213> Homo sapiens
 <400> 58
 20 Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
 1 5 10 15
 25 Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Ser Val Ser Ser Tyr
 20 25 30
 30 Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile
 35 40 45
 35 Tyr Asp Ala Ser Asn Arg Ala Thr Gly Ile Pro Ala Arg Phe Ser Gly
 50 55 60
 40 Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Leu Glu Pro
 65 70 75 80
 45 Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Arg Ser Asn Trp Pro Ala
 85 90 95
 50 Leu Thr Phe Gly Gly Gly Thr Lys Val Glu Ile Lys Arg Thr Val Ala
 100 105 110
 55 Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser
 115 120 125
 Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu
 130 135 140
 Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser
 145 150 155 160

EP 1 915 398 B1

Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu
165 170 175

5 Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val
180 185 190

10 Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys
195 200 205

Ser Phe Asn Arg Gly Glu Cys
210 215

15 <210> 59
<211> 24
<212> DNA
<213> Homo sapiens

20 <220>
<221> misc_feature
<222> (18)..(23)
<223> n is a, c, g, or t

25 <400> 59
ggccggatag gcctccannn nnnt 24

30 <210> 60
<211> 21
<212> DNA
<213> Homo sapiens

35 <400> 60
ggggtcaggc tggaactgag g 21

40 <210> 61
<211> 19
<212> DNA
<213> Homo sapiens

45 <400> 61
tgaggacgct gaccacacg 19

50 <210> 62
<211> 54
<212> DNA
<213> Homo sapiens

55 <400> 62
cagcagaagc ttctagacca ccatggacat gagggctctc gctcagctcc tggg 54

<210> 63
<211> 34
<212> DNA
<213> Homo sapiens

<400> 63
cttgtgact caacactctc cctgttgaa gctc 34

EP 1 915 398 B1

<210> 64
<211> 43
<212> DNA
<213> Homo sapiens

5

<400> 64
acaacaaagc ttctagacca ccatggagtt ggggctgaac tgg 43

10

<210> 65
<211> 32 DNA
<213> Homo sapiens

15

<400> 65
gtggaggcac tagagacggt gaccaggatt cc 32

20

<210> 66
<211> 228
<212> PRT
<213> Homo sapiens

<400> 66

25

Asp Thr Gln Glu Lys Glu Val Arg Ala Met Val Gly Ser Asp Val Glu
1 5 10 15

30

Leu Ser Cys Ala Cys Pro Glu Gly Ser Arg Phe Asp Leu Asn Asp Val
20 25 30

Tyr Val Tyr Trp Gln Thr Ser Glu Ser Lys Thr Val Val Thr Tyr His
35 40 45

35

Ile Pro Gln Asn Ser Ser Leu Glu Asn Val Asp Ser Arg Tyr Arg Asn
50 55 60

40

Arg Ala Leu Met Ser Pro Ala Gly Met Leu Arg Gly Asp Phe Ser Leu
65 70 75 80

Arg Leu Phe Asn Val Thr Pro Gln Asp Glu Gln Lys Phe His Cys Leu
85 90 95

45

Val Leu Ser Gln Ser Leu Gly Phe Gln Glu Val Leu Ser Val Glu Val
100 105 110

Thr Leu His Val Ala Ala Asn Phe Ser Val Pro Val Val Ser Ala Pro

50

55

EP 1 915 398 B1

115 120 125

5 His Ser Pro Ser Gln Asp Glu Leu Thr Phe Thr Cys Thr Ser Ile Asn
130 135 140

10 Gly Tyr Pro Arg Pro Asn Val Tyr Trp Ile Asn Lys Thr Asp Asn Ser
145 150 155 160

15 Leu Leu Asp Gln Ala Leu Gln Asn Asp Thr Val Phe Leu Asn Met Arg
165 170 175

20 Gly Leu Tyr Asp Val Val Ser Val Leu Arg Ile Ala Arg Thr Pro Ser
180 185 190

25 Val Asn Ile Gly Cys Cys Ile Glu Asn Val Leu Leu Gln Gln Asn Leu
195 200 205

30 Thr Val Gly Ser Gln Thr Gly Asn Asp Ile Gly Glu Arg Asp Lys Ile
210 215 220

35 Thr Glu Asn Pro
225

<210> 67
<211> 139
<212> PRT
<213> Homo sapiens
<400> 67

35 Asp Thr Gln Glu Lys Glu Val Arg Ala Met Val Gly Ser Asp Val Glu
1 5 10 15

40 Leu Ser Cys Ala Cys Pro Glu Gly Ser Arg Phe Asp Leu Asn Asp Val
20 25 30

45 Tyr Val Tyr Trp Gln Thr Ser Glu Ser Lys Thr Val Val Thr Tyr His
35 40 45

50 Ile Pro Gln Asn Ser Ser Leu Glu Asn Val Asp Ser Arg Tyr Arg Asn
50 55 60

55 Arg Ala Leu Met Ser Pro Ala Gly Met Leu Arg Gly Asp Phe Ser Leu
65 70 75 80

60 Arg Leu Phe Asn Val Thr Pro Gln Asp Glu Gln Lys Phe His Cys Leu
85 90 95

EP 1 915 398 B1

Val Leu Ser Gln Ser Leu Gly Phe Gln Glu Val Leu Ser Val Glu Val
100 105 110

5 Thr Leu His Val Ala Ala Asn Phe Ser Val Pro Val Val Ser Ala Pro
115 120 125

10 His Ser Pro Ser Gln Asp Glu Leu Thr Phe Thr
130 135

<210> 68
<211> 127
<212> PRT
15 <213> Homo sapiens
<400> 68

20 Leu Gly Phe Gln Glu Val Leu Ser Val Glu Val Thr Leu His Val Ala
1 5 10 15

25 Ala Asn Phe Ser Val Pro Val Val Ser Ala Pro His Ser Pro Ser Gln
20 25 30

30 Asp Glu Leu Thr Phe Thr Cys Thr Ser Ile Asn Gly Tyr Pro Arg Pro
35 40 45

35 Asn Val Tyr Trp Ile Asn Lys Thr Asp Asn Ser Leu Leu Asp Gln Ala
50 55 60

40 Leu Gln Asn Asp Thr Val Phe Leu Asn Met Arg Gly Leu Tyr Asp Val
65 70 75 80

45 Val Ser Val Leu Arg Ile Ala Arg Thr Pro Ser Val Asn Ile Gly Cys
85 90 95

50 Cys Ile Glu Asn Val Leu Leu Gln Gln Asn Leu Thr Val Gly Ser Gln
100 105 110

55 Thr Gly Asn Asp Ile Gly Glu Arg Asp Lys Ile Thr Glu Asn Pro
115 120 125

<210> 69
<211> 39
50 <212> DNA
<213> Homo sapiens
<400> 69
cgacggagca cgaggacacg acaggacgaa ggagagaaa 39

<210> 70
<211> 451
<212> PRT

EP 1 915 398 B1

<213> Homo sapiens

<400> 70

5	Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly	1 5 10 15
10	Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr	20 25 30
15	Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val	35 40 45
20	Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val	50 55 60
25	Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Lys Ser Leu Tyr	65 70 75 80
30	Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys	85 90 95
35	Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly	100 105 110
40	Gln Gly Ile Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser	115 120 125
45	Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala	130 135 140
50	Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val	145 150 155 160
55	Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala	165 170 175
	Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val	180 185 190
	Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His	195 200 205
	Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys	210 215 220

EP 1 915 398 B1

	Asp	Lys	Thr	His	Thr	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Glu	Leu	Leu	Gly	225	230	235									240
5	Gly	Pro	Ser	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met		245	250								255	
10	Ile	Ser	Arg	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His		260	265							270		
	Glu	Asp	Pro	Glu	Val	Lys	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val		275	280						285			
15	His	Asn	Ala	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr		290	295				300					
20	Arg	Val	Val	Ser	Val	Leu	Thr	Val	Leu	His	Gln	Asp	Trp	Leu	Asn	Gly		305	310			315					320	
	Lys	Glu	Tyr	Lys	Cys	Lys	Val	Ser	Asn	Lys	Ala	Leu	Pro	Ala	Pro	Ile			325			330				335		
25	Glu	Lys	Thr	Ile	Ser	Lys	Ala	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val		340	345					350				
30	Tyr	Thr	Leu	Pro	Pro	Ser	Arg	Asp	Glu	Leu	Thr	Lys	Asn	Gln	Val	Ser		355	360					365				
35	Leu	Thr	Cys	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu		370	375				380					
	Trp	Glu	Ser	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro		385	390			395					400	
40	Val	Leu	Asp	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val			405			410				415		
45	Asp	Lys	Ser	Arg	Trp	Gln	Gln	Gly	Asn	Val	Phe	Ser	Cys	Ser	Val	Met		420	425					430				
	His	Glu	Ala	Leu	His	Asn	His	Tyr	Thr	Gln	Lys	Ser	Leu	Ser	Leu	Ser		435	440					445				
50	Pro	Gly	Lys															450										

<210> 71

55 <211> 451

<212> PRT

<213> Homo sapiens

EP 1 915 398 B1

<400> 71

5 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15

 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30

 10 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45

 Ala Tyr Ile Lys Gln Asp Gly Asn Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60

 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80

 20 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95

 Ala Arg Glu Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Phe Trp Gly
 100 105 110

 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125

 30 Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala
 130 135 140

 Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
 145 150 155 160

 Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala
 165 170 175

 Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val
 180 185 190

 45 Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His
 195 200 205

 Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys

 50

 55

EP 1 915 398 B1

	210	215	220
5	Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly 225 230 235 240		
10	Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met 245 250 255		
15	Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His 260 265 270		
20	Glu Asp Pro Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val 275 280 285		
25	His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr 290 295 300		
30	Arg Val Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly 305 310 315 320		
35	Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile 325 330 335		
40	Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val 340 345 350		
45	Tyr Thr Leu Pro Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser 355 360 365		
50	Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu 370 375 380		
55	Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro 385 390 395 400		
	Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val 405 410 415		
	Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met 420 425 430		
	His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser 435 440 445		
	Pro Gly Lys		

450

5

<210> 72
 <211> 447
 <212> PRT
 <213> Homo sapiens

10

<400> 72

15

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
 1 5 10 15

20

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45

25

Ala Val Ile Trp Tyr Asp Gly Ser Lys Lys Tyr Tyr Ala Asp Ser Val
 50 55 60

30

Glu Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
 65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Phe Tyr Cys
 85 90 95

35

Ala Arg Asp Leu Asn Ile Met Val Trp Gly Ile Phe Asp Tyr Trp Gly
 100 105 110

40

Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125

Val Phe Pro Leu Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala
 130 135 140

45

Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
 145 150 155 160

50

Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala
 165 170 175

Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val
 180 185 190

55

Pro Ser Ser Asn Phe Gly Thr Gln Thr Tyr Thr Cys Asn Val Asp His
 195 200 205

EP 1 915 398 B1

	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Thr	Val	Glu	Arg	Lys	Cys	Cys	
	210						215					220					
5	Val	Glu	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Pro	Val	Ala	Gly	Pro	Ser	Val	
	225					230					235					240	
	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	
10					245					250					255		
	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	
				260					265					270			
15	Val	Gln	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	
			275					280					285				
	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Phe	Asn	Ser	Thr	Phe	Arg	Val	Val	Ser	
20		290					295					300					
	Val	Leu	Thr	Val	Val	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	Lys	
25	305					310					315					320	
	Cys	Lys	Val	Ser	Asn	Lys	Gly	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	Ile	
					325					330					335		
30	Ser	Lys	Thr	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	Pro	
				340					345					350			
	Pro	Ser	Arg	Glu	Glu	Met	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	Leu	
35			355					360					365				
	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	Asn	
	370						375					380					
40	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Met	Leu	Asp	Ser	
	385					390					395					400	
	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val	Asp	Lys	Ser	Arg	
45					405					410					415		
	Trp	Gln	Gln	Gly	Asn	Val	Phe	Ser	Cys	Ser	Val	Met	His	Glu	Ala	Leu	
				420					425					430			
50	His	Asn	His	Tyr	Thr	Gln	Lys	Ser	Leu	Ser	Leu	Ser	Pro	Gly	Lys		
			435					440					445				
55	<210> 73																
	<211> 451																
	<212> PRT																
	<213> Homo sapiens																

<400> 73

5 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15

 10 Ser Leu Arg Leu Ser Cys Val Gly Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30

 15 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45

 20 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60

 25 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80

 30 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95

 35 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Ile Pro Thr Tyr Trp Gly
 100 105 110

 40 Gln Gly Ile Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125

 45 Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala
 130 135 140

 50 Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
 145 150 155 160

 55 Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala
 165 170 175

 60 Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val
 180 185 190

 65 Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His
 195 200 205

 70 Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys

EP 1 915 398 B1

	210	215	220
5	Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly 225 230 235 240		
10	Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met 245 250 255		
15	Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His 260 265 270		
20	Glu Asp Pro Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val 275 280 285		
25	His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr 290 295 300		
30	Arg Val Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly 305 310 315 320		
35	Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile 325 330 335		
40	Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val 340 345 350		
45	Tyr Thr Leu Pro Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser 355 360 365		
50	Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu 370 375 380		
55	Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro 385 390 395 400		
60	Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val 405 410 415		
65	Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met 420 425 430		
70	His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser 435 440 445		
75	Pro Gly Lys 450		

<210> 74

EP 1 915 398 B1

<211> 451
<212> PRT
<213> Homo sapiens

5 <400> 74

	Glu	Val	Gln	Leu	Val	Glu	Ser	Gly	Gly	Gly	Leu	Val	Gln	Pro	Gly	Gly	
	1				5					10					15		
10																	
	Ser	Leu	Arg	Leu	Ser	Cys	Ala	Ala	Ser	Gly	Phe	Thr	Phe	Ser	Ser	Tyr	
				20					25					30			
15	Trp	Met	Ser	Trp	Val	Arg	Gln	Ala	Pro	Gly	Lys	Gly	Leu	Glu	Trp	Val	
			35					40					45				
	Ala	Tyr	Ile	Lys	Gln	Asp	Gly	Ser	Glu	Lys	Tyr	Tyr	Val	Asp	Ser	Val	
20		50					55					60					
	Lys	Gly	Arg	Phe	Thr	Ile	Ser	Arg	Asp	Asn	Ala	Lys	Asn	Ser	Leu	Tyr	
	65					70					75					80	
25	Leu	Gln	Met	Asn	Ser	Leu	Arg	Ala	Glu	Asp	Thr	Ala	Val	Tyr	Tyr	Cys	
				85						90					95		
	Ala	Arg	Asp	Gly	Ile	Leu	Trp	Phe	Gly	Asp	Ile	Pro	Thr	Tyr	Trp	Gly	
30				100					105					110			
	Gln	Gly	Thr	Leu	Val	Thr	Val	Ser	Ser	Ala	Ser	Thr	Lys	Gly	Pro	Ser	
			115					120					125				
35																	
	Val	Phe	Pro	Leu	Ala	Pro	Ser	Ser	Lys	Ser	Thr	Ser	Gly	Gly	Thr	Ala	
		130					135					140					
40	Ala	Leu	Gly	Cys	Leu	Val	Lys	Asp	Tyr	Phe	Pro	Glu	Pro	Val	Thr	Val	
	145					150					155					160	
	Ser	Trp	Asn	Ser	Gly	Ala	Leu	Thr	Ser	Gly	Val	His	Thr	Phe	Pro	Ala	
45					165					170					175		
	Val	Leu	Gln	Ser	Ser	Gly	Leu	Tyr	Ser	Leu	Ser	Ser	Val	Val	Thr	Val	
				180					185					190			
50	Pro	Ser	Ser	Ser	Leu	Gly	Thr	Gln	Thr	Tyr	Ile	Cys	Asn	Val	Asn	His	
			195					200					205				
55																	

EP 1 915 398 B1

	Lys	Pro	Ser	Asn	Thr	Lys	Val	Asp	Lys	Lys	Val	Glu	Pro	Lys	Ser	Cys	
	210						215					220					
5	Asp	Lys	Thr	His	Thr	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Glu	Leu	Leu	Gly	
	225					230					235					240	
10	Gly	Pro	Ser	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	
					245					250					255		
15	Ile	Ser	Arg	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	
				260					265					270			
20	Glu	Asp	Pro	Glu	Val	Lys	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	
			275					280					285				
25	His	Asn	Ala	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr	
	290						295					300					
30	Arg	Val	Val	Ser	Val	Leu	Thr	Val	Leu	His	Gln	Asp	Trp	Leu	Asn	Gly	
	305					310					315					320	
35	Lys	Glu	Tyr	Lys	Cys	Lys	Val	Ser	Asn	Lys	Ala	Leu	Pro	Ala	Pro	Ile	
					325					330					335		
40	Glu	Lys	Thr	Ile	Ser	Lys	Ala	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	
				340					345					350			
45	Tyr	Thr	Leu	Pro	Pro	Ser	Arg	Asp	Glu	Leu	Thr	Lys	Asn	Gln	Val	Ser	
			355					360					365				
50	Leu	Thr	Cys	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	
	370						375					380					
55	Trp	Glu	Ser	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	
	385					390					395					400	
60	Val	Leu	Asp	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val	
					405					410					415		
65	Asp	Lys	Ser	Arg	Trp	Gln	Gln	Gly	Asn	Val	Phe	Ser	Cys	Ser	Val	Met	
				420					425					430			
70	His	Glu	Ala	Leu	His	Asn	His	Tyr	Thr	Gln	Lys	Ser	Leu	Ser	Leu	Ser	
			435					440					445				
75	Pro	Gly	Lys														

450

5 <210> 75
 <211> 448
 <212> PRT
 <213> Homo sapiens

10 <400> 75

1 Glu Val Gln Leu Val Gln Ser Gly Gly Gly Leu Val His Pro Gly Gly
 1 5 10 15

15 Ser Leu Arg Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30

20 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45

25 Ser Ala Ile Gly Ala Gly Gly Gly Thr Tyr Tyr Ala Asp Ser Val Lys
 50 55 60

30 Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr Leu
 65 70 75 80

35 Gln Met Asn Ser Leu Arg Ala Glu Asp Met Ala Val Tyr Tyr Cys Ala
 85 90 95

40 Arg Val Val Val Val Val Gly Phe Phe Asp Tyr Trp Gly Gln Gly Thr
 100 105 110

45 Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro
 115 120 125

50 Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly
 130 135 140

55 Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn
 145 150 155 160

Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln
 165 170 175

Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser
 180 185 190

Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser
 195 200 205

EP 1 915 398 B1

	Asn	Thr	Lys	Val	Asp	Lys	Lys	Val	Glu	Pro	Lys	Ser	Cys	Asp	Lys	Thr	
	210						215					220					
5	His	Thr	Cys	Pro	Pro	Cys	Pro	Ala	Pro	Glu	Leu	Leu	Gly	Gly	Pro	Ser	
	225					230					235					240	
10	Val	Phe	Leu	Phe	Pro	Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	
					245					250					255		
15	Thr	Pro	Glu	Val	Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	
				260					265					270			
20	Glu	Val	Lys	Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	
			275					280					285				
25	Lys	Thr	Lys	Pro	Arg	Glu	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr	Arg	Val	Val	
		290				295						300					
30	Ser	Val	Leu	Thr	Val	Leu	His	Gln	Asp	Trp	Leu	Asn	Gly	Lys	Glu	Tyr	
	305					310					315					320	
35	Lys	Cys	Lys	Val	Ser	Asn	Lys	Ala	Leu	Pro	Ala	Pro	Ile	Glu	Lys	Thr	
				325						330					335		
40	Ile	Ser	Lys	Ala	Lys	Gly	Gln	Pro	Arg	Glu	Pro	Gln	Val	Tyr	Thr	Leu	
				340					345					350			
45	Pro	Pro	Ser	Arg	Asp	Glu	Leu	Thr	Lys	Asn	Gln	Val	Ser	Leu	Thr	Cys	
			355					360					365				
50	Leu	Val	Lys	Gly	Phe	Tyr	Pro	Ser	Asp	Ile	Ala	Val	Glu	Trp	Glu	Ser	
	370						375					380					
55	Asn	Gly	Gln	Pro	Glu	Asn	Asn	Tyr	Lys	Thr	Thr	Pro	Pro	Val	Leu	Asp	
	385					390					395					400	
60	Ser	Asp	Gly	Ser	Phe	Phe	Leu	Tyr	Ser	Lys	Leu	Thr	Val	Asp	Lys	Ser	
				405						410					415		
65	Arg	Trp	Gln	Gln	Gly	Asn	Val	Phe	Ser	Cys	Ser	Val	Met	His	Glu	Ala	
			420					425						430			
70	Leu	His	Asn	His	Tyr	Thr	Gln	Lys	Ser	Leu	Ser	Leu	Ser	Pro	Gly	Lys	
		435						440					445				
75	<210> 76																
	<211> 451																
	<212> PRT																
	<213> Homo sapiens																

EP 1 915 398 B1

<400> 76

5 Glu Val Gln Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15

 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30

 10 Trp Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45

 Ala Tyr Ile Lys Gln Asp Gly Ser Glu Lys Tyr Tyr Val Asp Ser Val
 50 55 60

 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
 65 70 75 80

 20 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95

 Ala Arg Asp Gly Ile Leu Trp Phe Gly Asp Leu Pro Thr Tyr Trp Gly
 100 105 110

 Gln Gly Thr Leu Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
 115 120 125

 30 Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala
 130 135 140

 Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
 145 150 155 160

 Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala
 165 170 175

 Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val
 180 185 190

 45 Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His
 195 200 205

 Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys

 50

 55

EP 1 915 398 B1

	210	215	220
5	Asp Lys Thr His Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly 225 230 235 240		
10	Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met 245 250 255		
15	Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His 260 265 270		
20	Glu Asp Pro Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val 275 280 285		
25	His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr 290 295 300		
30	Arg Val Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly 305 310 315 320		
35	Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile 325 330 335		
40	Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val 340 345 350		
45	Tyr Thr Leu Pro Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser 355 360 365		
50	Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu 370 375 380		
55	Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro 385 390 395 400		
	Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val 405 410 415		
	Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met 420 425 430		
	His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser 435 440 445		
	Pro Gly Lys 450		

Claims

1. An isolated antibody that binds specifically to B7RP1, wherein the antibody comprises a heavy chain comprising CDR1 having an amino acid sequence as set forth in SEQ ID NO: 27, a CDR2 having an amino acid sequence as set forth in SEQ ID NO: 28, and a CDR3 having an amino acid sequence as set forth in SEQ ID NO: 29, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and a light chain comprising a CDR1 having an amino acid sequence as set forth in SEQ ID NO: 15, a CDR2 having an amino acid sequence as set forth in SEQ ID NO: 16, and a CDR3 having an amino acid sequence as set forth in SEQ ID NO: 17, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, and wherein the antibody inhibits B7RP1 activity.
2. The antibody of claim 1, wherein the heavy chain comprises a heavy chain variable region comprising an amino acid sequence as set forth in SEQ ID NO: 7 or 8, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.
3. The antibody of claim 1, wherein the light chain comprises a light chain variable region comprising an amino acid sequence as set forth in SEQ ID NO: 1, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.
4. A polypeptide comprising the amino acid sequences of SEQ ID NO: 15, 16, 17, 27, 28 and 29, wherein the polypeptide binds specifically to B7RP1 and inhibits B7RP1 activity.
5. The isolated antibody or fragment of claim 1 that binds specifically to B7RP1, wherein the antibody binds to SEQ ID NO: 67 but not to SEQ ID NO: 68 of the extracellular domain of B7RP1 and inhibits B7RP1 activity.
6. An isolated antibody that binds specifically to B7RP1 and is competitive with an antibody that comprises a light chain variable region comprising the amino acid sequence of SEQ ID NO: 1 and a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 7 or 8 for binding to B7RP1, wherein the antibody inhibits B7RP1 activity.
7. The antibody of claim 1, which comprises an amino acid sequence as set forth in any of SEQ ID NO: 45 or 46, or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.
8. The antibody of claim 1, 5 or 6, wherein the heavy chain and light chain comprise a single-chain antibody.
9. The antibody of claim 8, which is a single-chain Fv antibody.
10. The antibody of claim 1, 5 or 6, which is a Fab antibody.
11. The antibody of claim 1, 5 or 6, which is a Fab' antibody.
12. The antibody of claim 1, 5 or 6, which is a (Fab')₂ antibody.
13. The antibody of claim 1, 5 or 6, wherein the antibody is a fully human antibody.
14. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a therapeutically effective amount of the antibody of any of claims 1, 6 or 7 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof.
15. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and a therapeutically effective amount of the polypeptide of claim 4.
16. The antibody or fragment of any of claims 1, 5 or 6 for use as a medicament.
17. The polypeptide of claim 4 for use as a medicament.
18. The antibody of any of claims 1, 5 or 6 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof for use in treating an autoimmune disease or inflammatory response in a patient.

19. The polypeptide of claim 4 for use in treating an autoimmune disease or inflammatory response in a patient.
20. Use of a pharmaceutically effective amount of the antibody of any of claims 1, 5 or 6 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof, for the preparation of a composition for treating a B7RP1-mediated autoimmune disease or inflammatory response in a patient.
21. Use of a pharmaceutically effective amount of the polypeptide of claim 4 for the preparation of a composition for treating a B7RP1-mediated autoimmune disease or inflammatory response in a patient.
22. The use of claim 20 or 21, wherein the autoimmune disease or the inflammatory response is rheumatoid arthritis, asthma, immune thrombocytopenic purpura, multiple sclerosis, diabetes, psoriasis, inflammatory bowel disease, Crohn's disease, ulcerative colitis, Grave's disease, Hashimoto's thyroiditis or systemic Lupus erythematosus.
23. Use of a pharmaceutically effective amount of the antibody of any of claims 1, 5 or 6 or an antigen-binding or an immunologically functional immunoglobulin fragment thereof for the preparation of a composition for inhibiting co-stimulatory signal T-cell activation in a patient.
24. A method for detecting B7RP1 in a biological sample comprising:
 - a) contacting the sample with the antibody of any of claims 1, 5 or 6 or the polypeptide of claim 4 under conditions that allow for binding of the antibody or polypeptide to B7RP1; and
 - b) measuring the level of bound antibody or polypeptide in the sample.
25. A nucleic acid molecule that encodes the antibody of any of claims 1, 5 or 6 or the polypeptide of claim 4.
26. An isolated nucleic acid molecule that encodes a polypeptide comprising an amino acid sequence selected from the group consisting of
 - (a) SEQ ID NOs: 1 and 7,
 - (b) SEQ ID NOs: 1 and 8,
 - (c) SEQ ID NOs: 15, 16, 17, 27, 28, and 29,
 - (d) SEQ ID NOs: 45 and 7,
 - (e) SEQ ID NOs: 45 and 8, and
 - (f) SEQ ID NOs: 1 and 46.
27. A host cell comprising the nucleic acid molecule of claim 25 or 26.
28. An isolated cell line that produces an antibody according to any of claims 1, 5 or 6, or the polypeptide of claim 4.
29. An expression vector comprising the nucleic acid molecule of claim 25 or 26.
30. A method of making an antibody or polypeptide comprising culturing the host cell of claim 27 or the cell line of claim 28 and collecting the antibody or polypeptide from the culture medium or from the host cell.
31. An antibody comprising a light chain variable region comprising the amino acid sequence of SEQ ID NO: 1 and a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 8.
32. An antibody comprising a light chain and a heavy chain, wherein the light chain comprises a light chain variable region comprising the amino acid sequence of SEQ ID NO: 1 and a light chain constant region comprising the amino acid sequence of SEQ ID NO: 43; and wherein the heavy chain comprises a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 8 and a heavy chain constant region comprising the amino acid sequence of SEQ ID NO: 41.
33. An antibody comprising a light chain consisting of the amino acid sequence of SEQ ID NO: 45 and a heavy chain consisting of the amino acid sequence of SEQ ID NO: 46.

Patentansprüche

1. Isolierter Antikörper, welcher spezifisch an B7RP1 bindet, wobei der Antikörper eine schwere Kette umfassend eine CDR1 mit einer Aminosäuresequenz wie in SEQ ID NO: 27 gezeigt, eine CDR2 mit einer Aminosäuresequenz wie in SEQ ID NO: 28 gezeigt, und eine CDR3 mit einer Aminosäuresequenz wie in SEQ ID NO: 29 gezeigt, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon, und eine leichte Kette umfassend eine CDR1 mit einer Aminosäuresequenz wie in SEQ ID NO: 15 gezeigt, eine CDR2 mit einer Aminosäuresequenz wie in SEQ ID NO: 16 gezeigt, und eine CDR3 mit einer Aminosäuresequenz wie in SEQ ID NO: 17 gezeigt, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon, umfasst, und wobei der Antikörper die Aktivität von B7RP1 inhibiert.
2. Antikörper nach Anspruch 1, wobei die schwere Kette die variable Region einer schweren Kette umfassend eine Aminosäuresequenz wie in SEQ ID NO: 7 oder 8 gezeigt umfasst, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon.
3. Antikörper nach Anspruch 1, wobei die leichte Kette die variable Region einer leichten Kette umfassend eine Aminosäuresequenz wie in SEQ ID NO: 1 gezeigt umfasst, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon.
4. Polypeptid umfassend die Aminosäuresequenzen von SEQ ID NO: 15, 16, 17, 27, 28 und 29, wobei das Polypeptid spezifisch an B7RP1 bindet und die Aktivität von B7RP1 inhibiert.
5. Isolierter Antikörper oder Fragment davon nach Anspruch 1, welcher spezifisch an B7RP1 bindet, wobei der Antikörper an SEQ ID NO: 67, nicht jedoch an SEQ ID NO: 68 der extrazellulären Domäne von B7RP1 bindet und die Aktivität von B7RP1 inhibiert.
6. Isolierter Antikörper, welcher spezifisch an B7RP1 bindet, und welcher gegenüber der Bindung an B7RP1 kompetitiv ist mit einem Antikörper, welcher die variable Region einer leichten Kette umfassend die Aminosäuresequenz von SEQ ID NO: 1 und die variable Region einer schweren Kette umfassend die Aminosäuresequenz von SEQ ID NO: 7 oder 8 umfasst, wobei der Antikörper die Aktivität von B7RP1 inhibiert.
7. Antikörper nach Anspruch 1, welcher eine Aminosäuresequenz wie in SEQ ID NO: 45 oder 46 gezeigt umfasst, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon.
8. Antikörper nach Anspruch 1, 5 oder 6, wobei die schwere Kette und die leichte Kette einen Einzelketten-Antikörper umfassen.
9. Antikörper nach Anspruch 8, welcher ein Einzelketten-Fv-Antikörper ist.
10. Antikörper nach Anspruch 1, 5 oder 6, welcher ein Fab-Antikörper ist.
11. Antikörper nach Anspruch 1, 5 oder 6, welcher ein Fab'-Antikörper ist.
12. Antikörper nach Anspruch 1, 5 oder 6, welcher ein (Fab')₂-Antikörper ist.
13. Antikörper nach Anspruch 1, 5 oder 6, wobei der Antikörper ein vollständig menschlicher Antikörper ist.
14. Pharmazeutische Zusammensetzung umfassend einen pharmazeutisch verträglichen Träger und eine therapeutisch wirksame Menge des Antikörpers nach einem der Ansprüche 1, 6 oder 7, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon.
15. Pharmazeutische Zusammensetzung umfassend einen pharmazeutisch verträglichen Träger und eine therapeutisch wirksame Menge des Polypeptids nach Anspruch 4.
16. Antikörper oder Fragment davon nach einem der Ansprüche 1, 5 oder 6 für die Verwendung als Medikament.
17. Polypeptid nach Anspruch 4 für die Verwendung als Medikament.

18. Antikörper nach einem der Ansprüche 1, 5 oder 6, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon, für die Verwendung bei der Behandlung einer Autoimmunerkrankung oder einer Entzündungsreaktion in einem Patienten.
- 5 19. Polypeptid nach Anspruch 4 für die Verwendung bei der Behandlung einer Autoimmunerkrankung oder einer Entzündungsreaktion in einem Patienten.
- 10 20. Verwendung einer pharmazeutisch wirksamen Menge des Antikörpers nach einem der Ansprüche 1, 5 oder 6, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon, für die Herstellung einer Zusammensetzung zur Behandlung einer B7RP1-vermittelten Autoimmunerkrankung oder Entzündungsreaktion in einem Patienten.
- 15 21. Verwendung einer pharmazeutisch wirksamen Menge des Polypeptids nach Anspruch 4 für die Herstellung einer Zusammensetzung zur Behandlung einer B7RP1-vermittelten Autoimmunerkrankung oder Entzündungsreaktion in einem Patienten.
- 20 22. Die Verwendung nach Anspruch 20 oder 21, wobei die Autoimmunerkrankung oder Entzündungsreaktion rheumatoide Arthritis, Asthma, Immunthrombozytopenische Purpura, Multiple Sklerose, Diabetes, Psoriasis, entzündliche Darmerkrankung, Morbus Crohn, Colitis ulcerosa, Morbus Basedow, Hashimoto Thyreoiditis oder systemischer Lupus erythematodes ist.
- 25 23. Verwendung einer pharmazeutisch wirksamen Menge des Antikörpers nach einem der Ansprüche 1, 5 oder 6, oder ein Antigen-bindendes Fragment oder immunologisch funktionelles Immunglobulin-Fragment davon, für die Herstellung einer Zusammensetzung zur Hemmung der T-Zell-Aktivierung durch ein co-stimulatorisches Signal in einem Patienten.
- 30 24. Verfahren zur Detektion von B7RP1 in einer biologischen Probe umfassend:
- (a) Inkontaktbringen der Probe mit dem Antikörper nach einem der Ansprüche 1, 5 oder 6, oder dem Polypeptid nach Anspruch 4, unter Bedingungen, welche die Bindung des Antikörpers oder des Polypeptids an B7RP1 erlauben; und
- (b) Messen des Niveaus an gebundenem Antikörper oder Polypeptid in der Probe.
- 35 25. Nukleinsäuremolekül, welches den Antikörper nach einem der Ansprüche 1, 5 oder 6, oder das Polypeptid nach Anspruch 4 kodiert.
- 40 26. Isoliertes Nukleinsäuremolekül, welches ein Polypeptid kodiert, welches eine Aminosäuresequenz umfasst ausgewählt aus der Gruppe bestehend aus:
- (a) SEQ ID NOs: 1 und 7,
- (b) SEQ ID NOs: 1 und 8,
- (c) SEQ ID NOs: 15, 16, 17, 27, 28 und 29,
- (d) SEQ ID NOs: 45 und 7,
- (e) SEQ ID NOs: 45 und 8; und
- 45 (f) SEQ ID NOs: 1 und 46.
27. Wirtszelle umfassend das Nukleinsäuremolekül nach Anspruch 25 oder 26.
- 50 28. Isolierte Zelllinie, welche einen Antikörper nach einem der Ansprüche 1, 5 oder 6, oder das Polypeptid nach Anspruch 4 herstellt.
29. Expressionsvektor umfassend das Nukleinsäuremolekül nach Anspruch 25 oder 26.
- 55 30. Verfahren zur Herstellung eines Antikörpers oder Polypeptids umfassend das Züchten der Wirtszelle nach Anspruch 27, oder der Zelllinie nach Anspruch 28, und Sammeln des Antikörpers oder des Polypeptids aus dem Kulturmedium oder aus der Wirtszelle.
31. Antikörper umfassend die variable Region einer leichten Kette umfassend die Aminosäuresequenz von SEQ ID

NO: 1, und die variable Region einer schweren Kette umfassend die Aminosäuresequenz von SEQ ID NO: 8.

32. Antikörper umfassend eine leichte Kette und eine schwere Kette, wobei die leichte Kette die variable Region einer leichten Kette umfassend die Aminosäuresequenz von SEQ ID NO: 1 und die konstante Region einer leichten Kette umfassend die Aminosäuresequenz von SEQ ID NO: 43 umfasst, und wobei die schwere Kette die variable Region einer schweren Kette umfassend die Aminosäuresequenz von SEQ ID NO: 8 und die konstante Region einer schweren Kette umfassend die Aminosäuresequenz von SEQ ID NO: 41 umfasst.

33. Antikörper umfassend eine leichte Kette bestehend aus der Aminosäuresequenz von SEQ ID NO: 45 und eine schwere Kette bestehend aus der Aminosäuresequenz von SEQ ID NO: 46.

Revendications

1. Anticorps isolé qui se lie spécifiquement à B7RP1, l'anticorps comprenant une chaîne lourde comprenant CDR1 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 27, une CDR2 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 28, et une CDR3 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 29, ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline, et une chaîne légère comprenant une CDR1 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 15, une CDR2 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 16, et une CDR3 ayant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 17, ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline, et l'anticorps inhibant l'activité B7RP1.

2. Anticorps selon la revendication 1, la chaîne lourde comprenant une région variable de chaîne lourde comprenant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 7 ou 8, ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline.

3. Anticorps selon la revendication 1, la chaîne légère comprenant une région variable de chaîne légère comprenant une séquence d'acides aminés telle qu'exposée dans SEQ ID n° : 1, ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline.

4. Polypeptide comprenant les séquences d'acides aminés de SEQ ID n° : 15, 16, 17, 27, 28 et 29, le polypeptide se liant spécifiquement à B7RP1 et inhibant l'activité B7RP1.

5. Anticorps isolé ou fragment selon la revendication 1 qui se lie spécifiquement à B7RP1, l'anticorps se liant à SEQ ID n° : 67 mais non à SEQ ID n° : 68 du domaine extracellulaire de B7RP1 et inhibant l'activité B7RP1.

6. Anticorps isolé qui se lie spécifiquement à B7RP1 et qui est compétitif par rapport à un anticorps qui comprend une région variable de chaîne légère comprenant la séquence d'acides aminés de SEQ ID n° : 1 et une région variable de chaîne lourde comprenant la séquence d'acides aminés de SEQ ID n° : 7 ou 8 pour la liaison à B7RP1, l'anticorps inhibant l'activité B7RP1.

7. Anticorps selon la revendication 1, qui comprend une séquence d'acides aminés telle qu'exposée selon l'une quelconque des SEQ ID n° : 45 ou 46, ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline.

8. Anticorps selon la revendication 1, 5 ou 6, la chaîne lourde et la chaîne légère comprenant un anticorps monocaténaire.

9. Anticorps selon la revendication 8, qui est un anticorps monocaténaire Fv.

10. Anticorps selon la revendication 1, 5 ou 6, qui est un anticorps Fab.

11. Anticorps selon la revendication 1, 5 ou 6, qui est un anticorps Fab'.

12. Anticorps selon la revendication 1, 5 ou 6, qui est un anticorps (Fab')₂.

13. Anticorps selon la revendication 1, 5 ou 6, l'anticorps étant un anticorps pleinement humain.

14. Composition pharmaceutique comprenant un support pharmaceutiquement acceptable et une quantité thérapeutiquement efficace de l'anticorps selon l'une quelconque des revendications 1, 6 ou 7 ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline.
- 5 15. Composition pharmaceutique comprenant un support pharmaceutiquement acceptable et une quantité thérapeutiquement efficace du polypeptide selon la revendication 4.
16. Anticorps ou fragment selon l'une quelconque des revendications 1, 5 ou 6 à utiliser comme médicament.
- 10 17. Polypeptide selon la revendication 4 à utiliser comme médicament.
18. Anticorps selon l'une quelconque des revendications 1, 5 ou 6 ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline à utiliser dans le traitement d'une maladie auto-immune ou d'une réponse inflammatoire chez un patient.
- 15 19. Polypeptide selon la revendication 4 à utiliser dans le traitement d'une maladie auto-immune ou d'une réponse inflammatoire chez un patient.
- 20 20. Utilisation d'une quantité pharmaceutiquement efficace de l'anticorps selon l'une quelconque des revendications 1, 5 ou 6 ou son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline, pour la préparation d'une composition de traitement d'une maladie auto-immune ou d'une réponse inflammatoire médiée par B7RP1 chez un patient.
- 25 21. Utilisation d'une quantité pharmaceutiquement efficace du polypeptide selon la revendication 4 pour la préparation d'une composition pour le traitement d'une maladie auto-immune ou d'une réponse inflammatoire médiée par B7RP1 chez un patient.
- 30 22. Utilisation selon la revendication 20 ou 21, la maladie auto-immune ou la réponse inflammatoire étant l'arthrite rhumatoïde, l'asthme, le purpura thrombopénique immunologique, la sclérose en plaques, le diabète, le psoriasis, la maladie du côlon inflammatoire, la maladie de Crohn, la rétrocolite hémorragique, la maladie de Grave, la thyroïdite de Hashimoto ou le lupus érythémateux systémique.
- 35 23. Utilisation d'une quantité pharmaceutiquement efficace de l'anticorps selon l'une quelconque des revendications 1, 5 ou 6 ou de son fragment de liaison à l'antigène ou immunologiquement fonctionnel d'immunoglobuline pour la préparation d'une composition d'inhibition de l'activation des cellules T par signal de co-stimulation chez un patient.
24. Procédé de détection de B7RP1 dans un échantillon biologique comprenant:
 - a) la mise en contact de l'échantillon avec l'anticorps selon l'une quelconque des revendications 1, 5 ou 6 ou le polypeptide selon la revendication 4 sous des conditions qui permettent la liaison de l'anticorps ou du polypeptide à B7RP1 ; et
 - b) la mesure du taux d'anticorps ou de polypeptide lié dans l'échantillon.
- 40 25. Molécule d'acide nucléique qui code pour l'anticorps selon l'une quelconque des revendications 1, 5 ou 6 ou le polypeptide selon la revendication 4.
- 45 26. Molécule d'acide nucléique isolé qui code pour un polypeptide comprenant une séquence d'acides aminés sélectionnée dans le groupe constitué de
 - (a) SEQ ID n^{os} : 1 et 7,
 - (b) SEQ ID n^{os} : 1 et 8,
 - (c) SEQ ID n^{os} : 15, 16, 17, 27, 28, et 29,
 - (d) SEQ ID n^{os} : 45 et 7,
 - (e) SEQ ID n^{os} : 45 et 8, et
 - 50 (f) SEQ ID n^{os} : 1 et 46.
- 55 27. Cellule hôte comprenant la molécule d'acide nucléique selon la revendication 25 ou 26.

28. Lignée cellulaire isolée qui produit un anticorps selon l'une quelconque des revendications 1, 5 ou 6, ou le polypeptide selon la revendication 4.

29. Vecteur d'expression comprenant la molécule d'acide nucléique selon la revendication 25 ou 26.

30. Procédé de fabrication d'un anticorps ou d'un polypeptide comprenant la culture de la cellule hôte selon la revendication 27 ou de la lignée cellulaire selon la revendication 28 et le recueil de l'anticorps ou du polypeptide du milieu de culture ou de la cellule hôte.

31. Anticorps comprenant une région variable de chaîne légère comprenant la séquence d'acides aminés de SEQ ID n° : 1 et une région variable de chaîne lourde comprenant la séquence d'acides aminés de SEQ ID n° : 8.

32. Anticorps comprenant une chaîne légère et une chaîne lourde, la chaîne légère comprenant une région variable de chaîne légère comprenant la séquence d'acides aminés de SEQ ID n° : 1 et une région constante de chaîne légère comprenant la séquence d'acides aminés de SEQ ID n° : 43 ; et la chaîne lourde comprenant une région variable de chaîne lourde comprenant la séquence d'acides aminés de SEQ ID n° : 8 et une région constante de chaîne lourde comprenant la séquence d'acides aminés de SEQ ID n° : 41.

33. Anticorps comprenant une chaîne légère constituée de la séquence d'acides aminés de SEQ ID n° : 45 et une chaîne lourde constituée de la séquence d'acides aminés de SEQ ID n° : 46.

Figure 1

- A)
- | | | |
|-------------------|------|--|
| 16H-VH-G.L. | (1) | EVQLVESGGGLVQPGGSLRLSCA A SGFTFSSYMSWVRQAPGKGLEWVAY |
| 16H.VH | (1) | EVQLVESGGGLVQPGGSLRLSCA G SGFTFSSYMSWVRQAPGKGLEWVAY |
| 16H-VH-G.L. | (51) | IKQDGN E KYYVDSVKGRFTISRDN A K N SLYLQMN S LRAEDTAVYYCAREG |
| 16H.VH | (51) | IKQDGN E KYYVDSVKGRFTISRDN A K K SLYLQMN S LRAEDTAVYYCAREG |
| 16H-VH-G.L. (101) | | ILWFGDLPTFWGQ T LVTVSS |
| 16H.VH (101) | | ILWFGDLPTFWGQ I LVTVSS |

B)

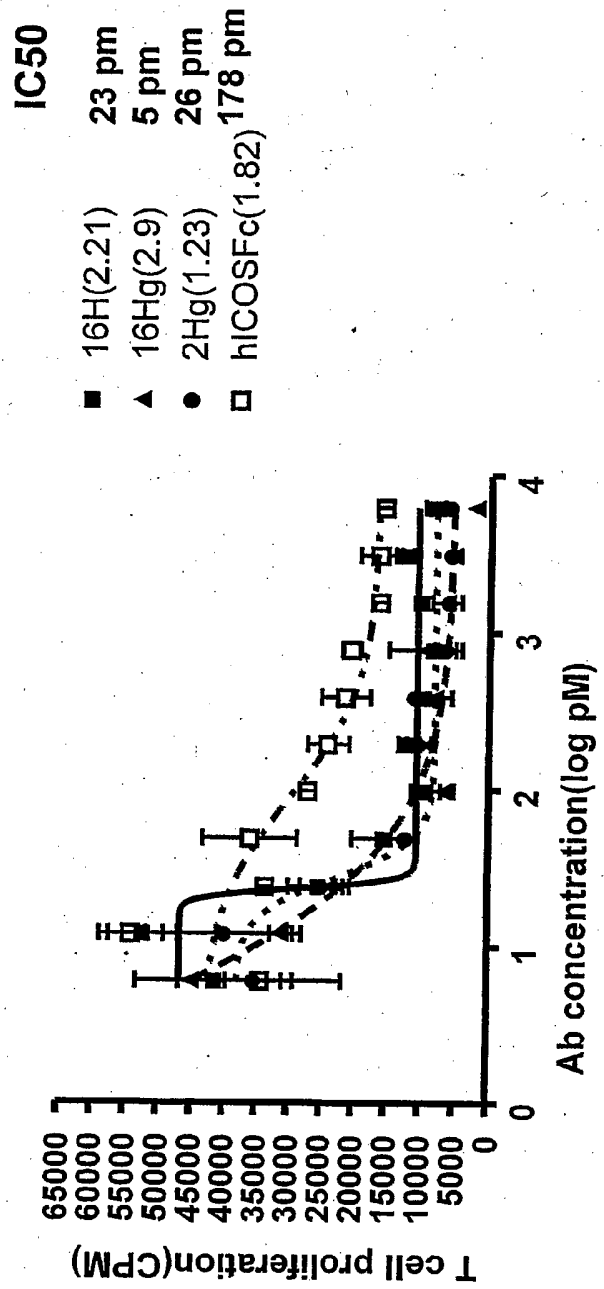
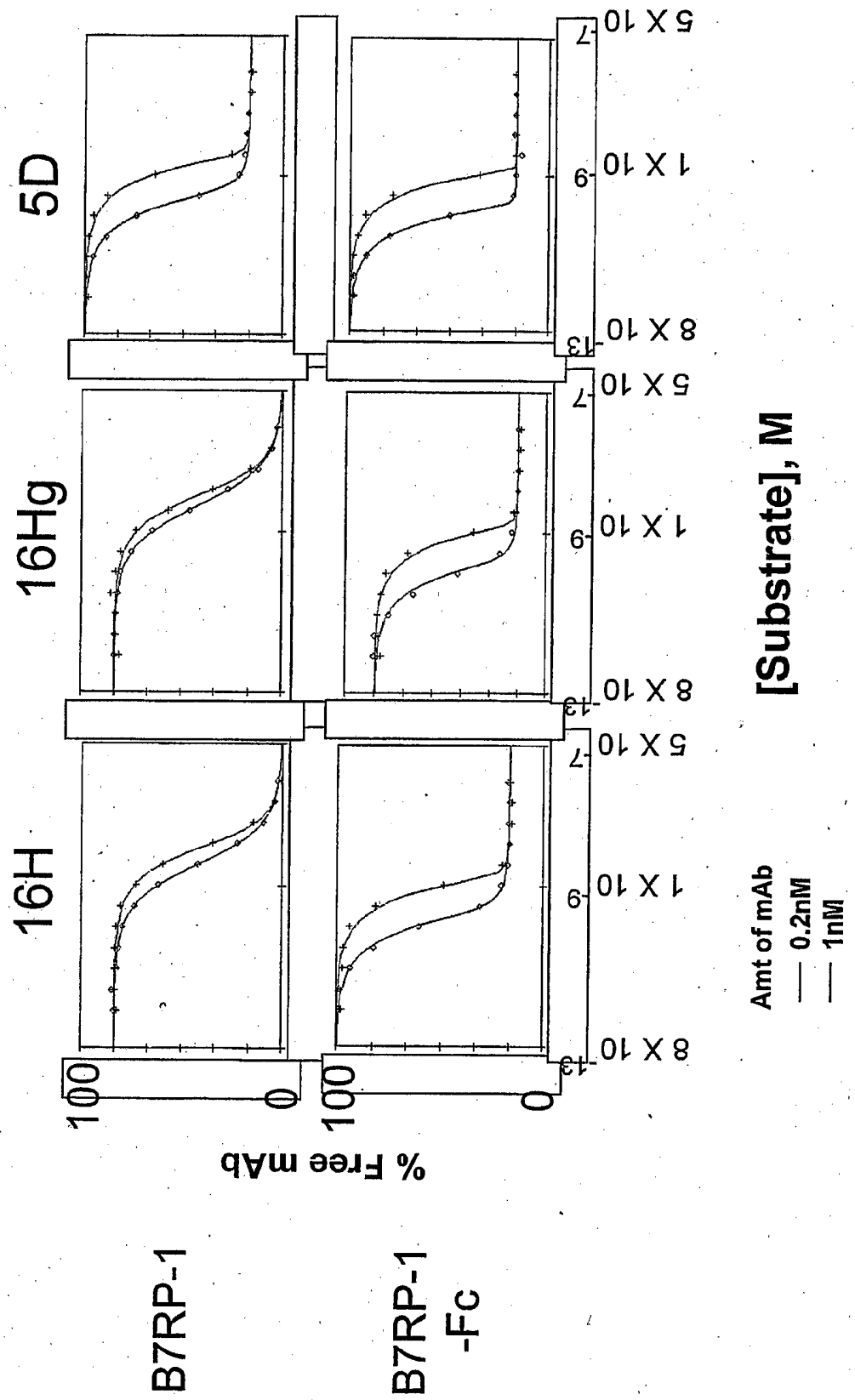
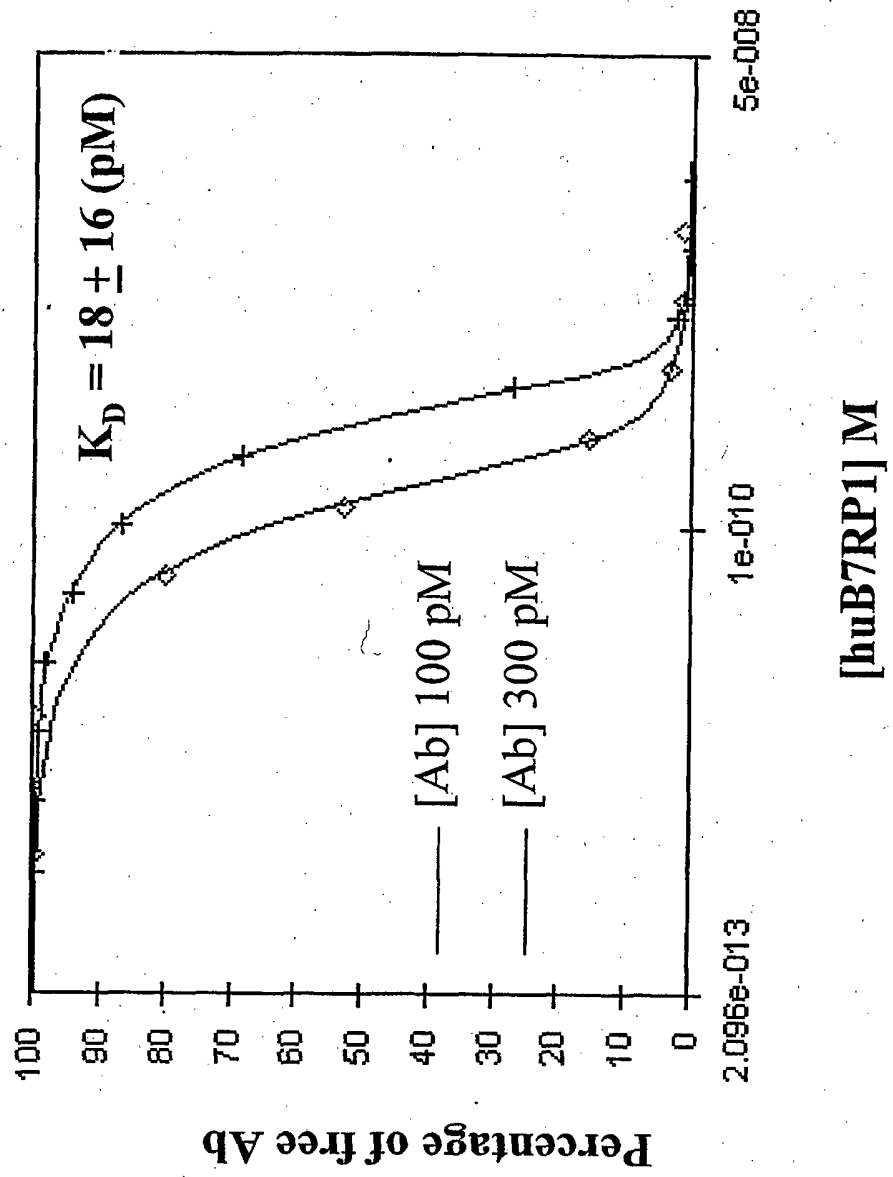


Figure 2



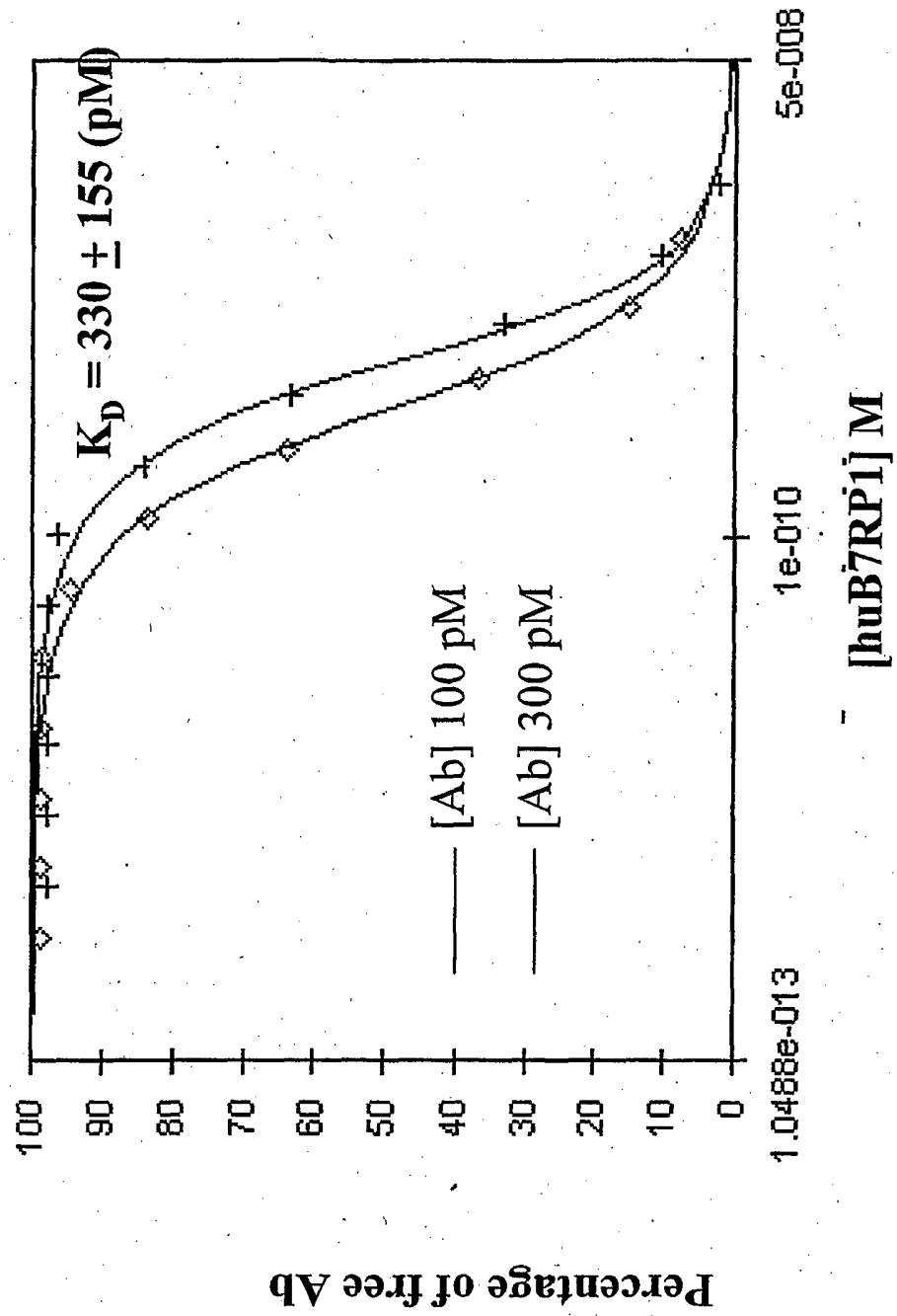
Anti-huB7RP1 5D to HuB7RP1

Figure 3



Anti-huB7RP1 2H to HuB7RP1

Figure 4



Anti-huB7RP1 2H(germline) to HuB7RP1

Figure 5

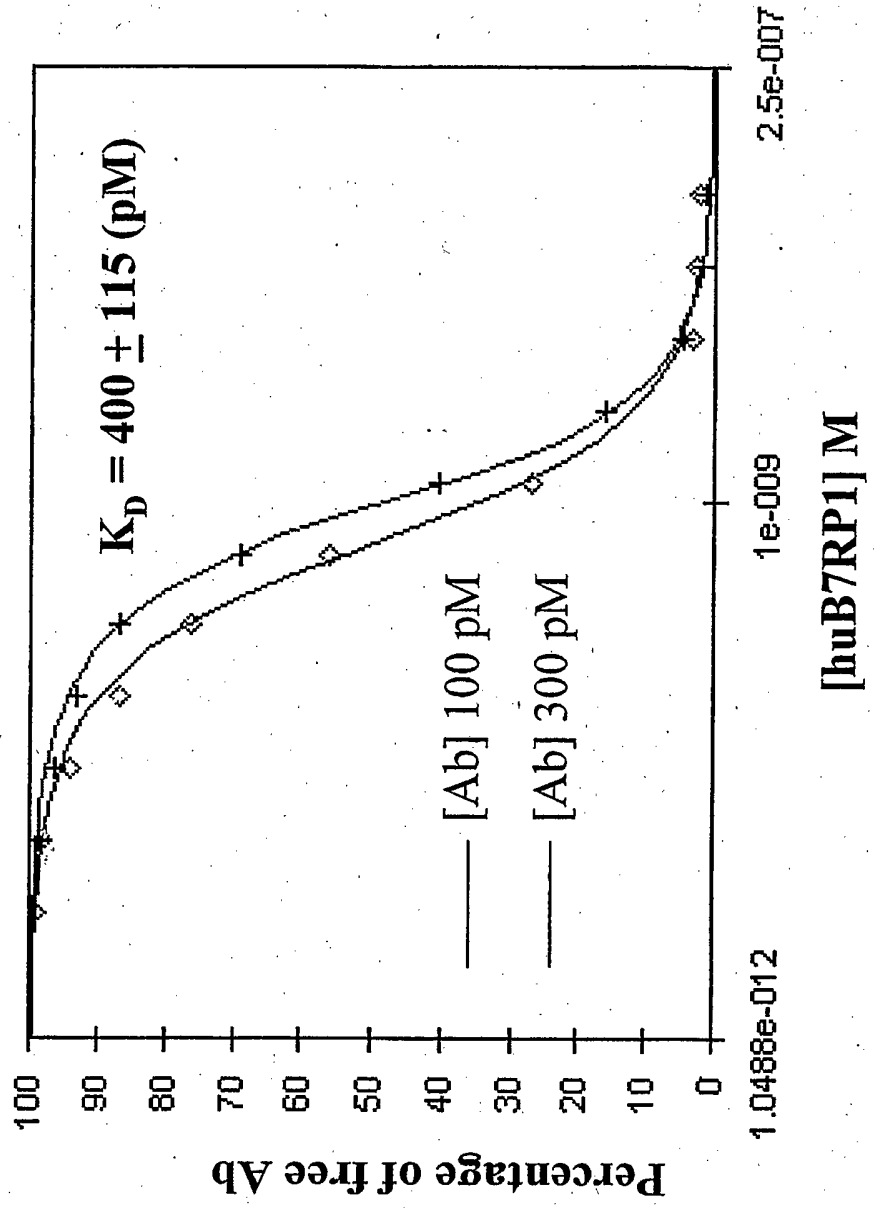


Figure 6

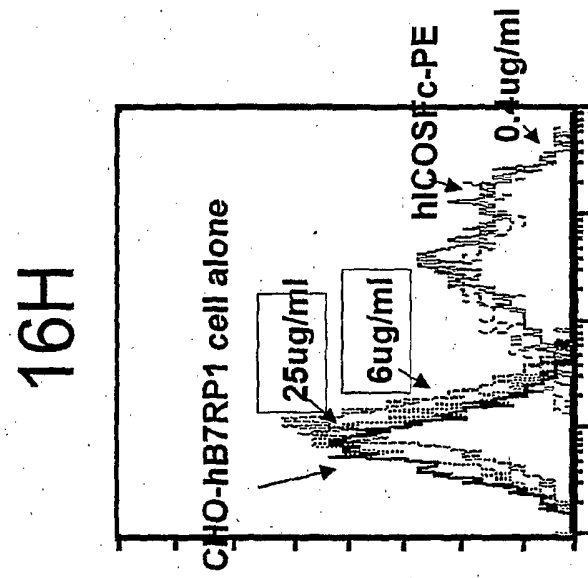


Figure 7

# of samples seq'd*	Location in cDNA	Base Change	# of Homozygotes	# of Heterozygotes	Alternate allele frequency	AA change	Location in peptide sequence
70	22	G→C	4	31	27.9%	L→V	8 (sig pep)
70	31	G→T	6	48	42.9%	L→M	11 (sig pep)
88	382	G→A	5	40	28.4%	V→I	128 (lgV-like)
1.5	661	T→C	?	?	?	L→F	221 (lgC-like)

* Number of individuals. The number of chromosomes is twice this amount.

Figure 8

mAb	IC50
2H	6.6
4H	9.3
6H	11.2
8H	8.8
10H	11.1
15H	8.2
16H	6.3
18H	12.7
21H	8.7
25H	12.6
31H	10.0
32H	11.6
ICOS	9.5

mAb	IC50
33H	8.3
34H	14.4
38H	8.6
39H	12.6
41H	5.9
43H	8.0
44H	9.2
45H	10.5
2K	17.0
3K	10.0
4K	15.1
5K	18.9
ICOS	9.5

Figure 9

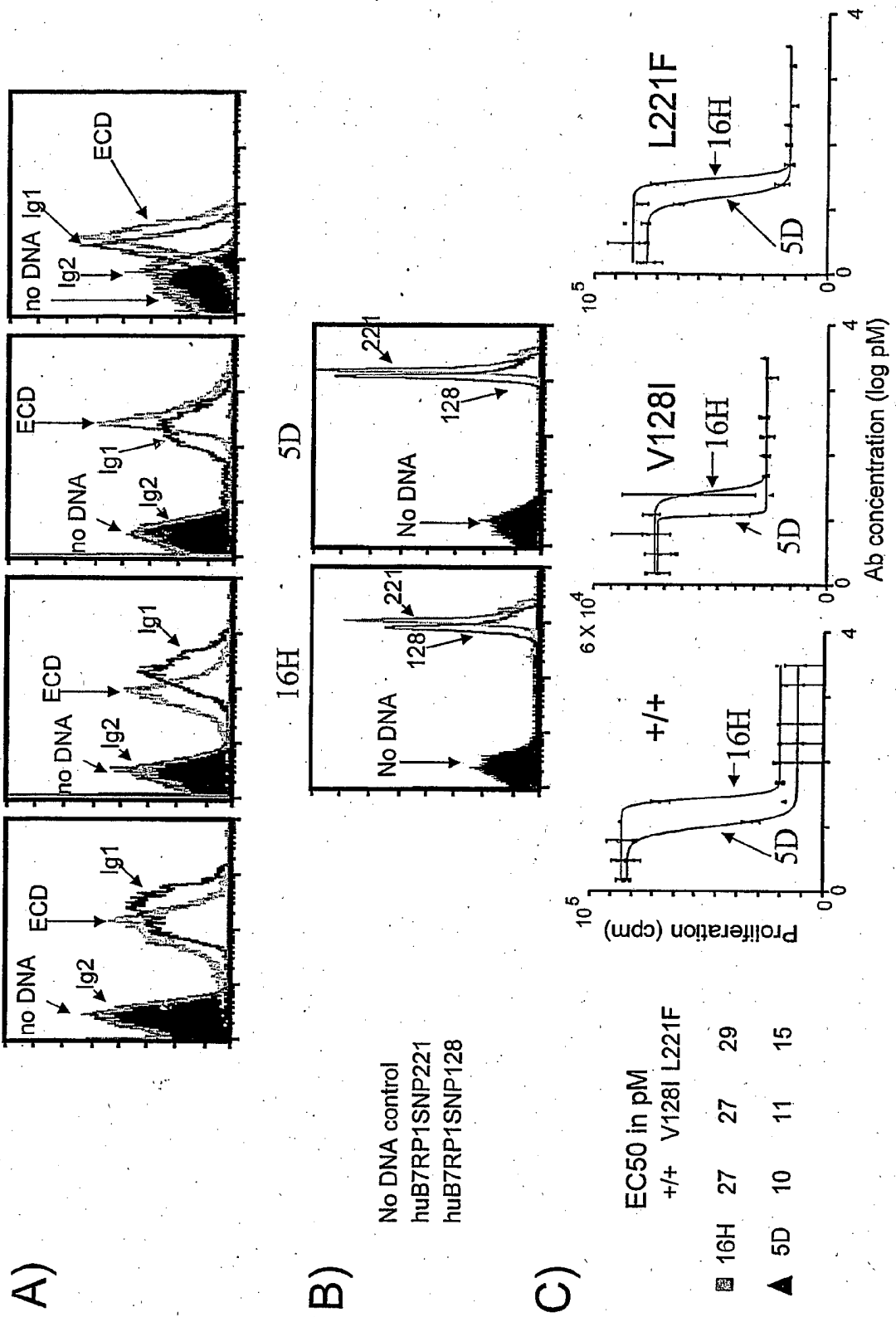


Figure 10A

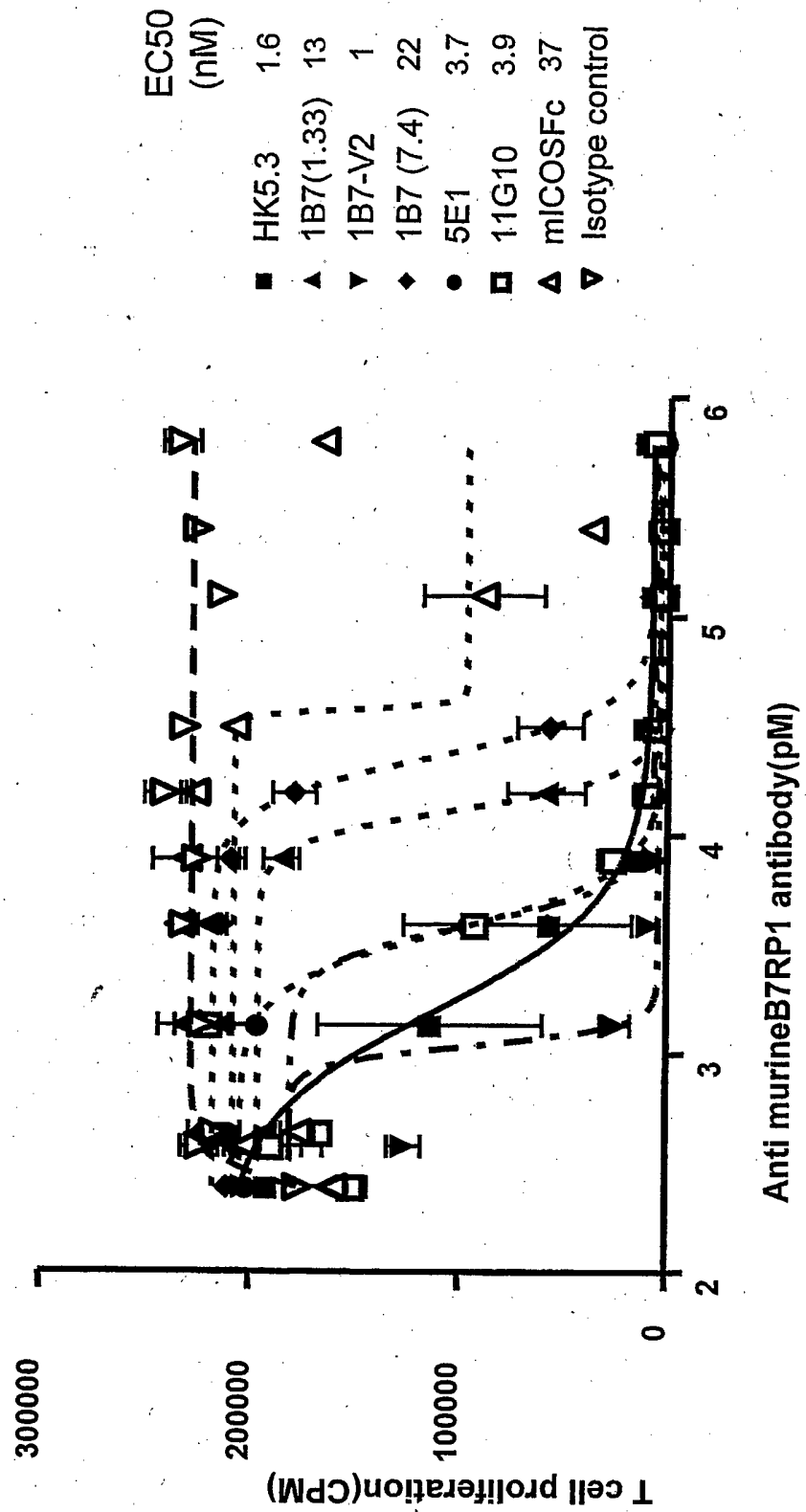


Figure 10B: IgM

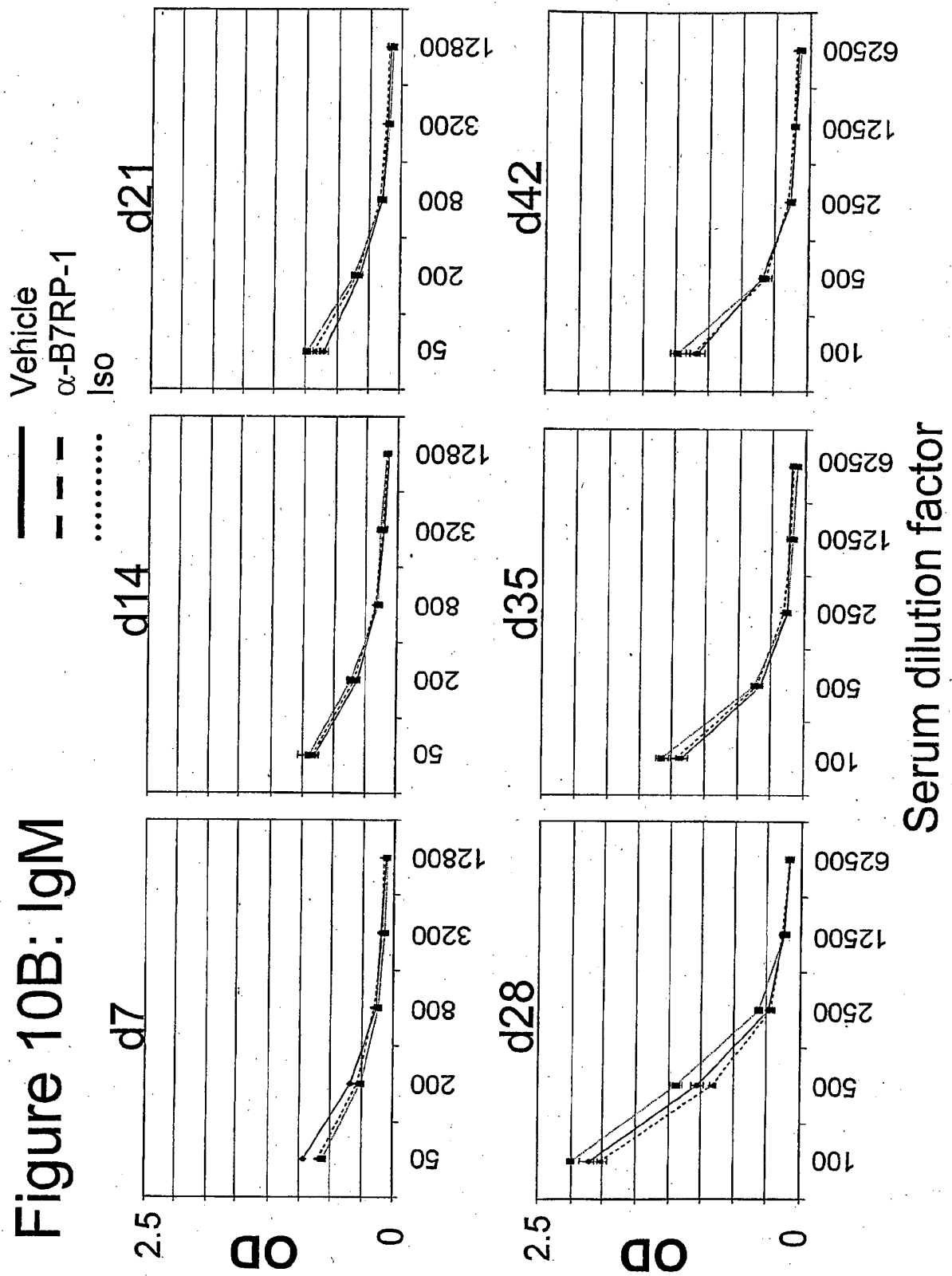


Figure 10C: IgG2A

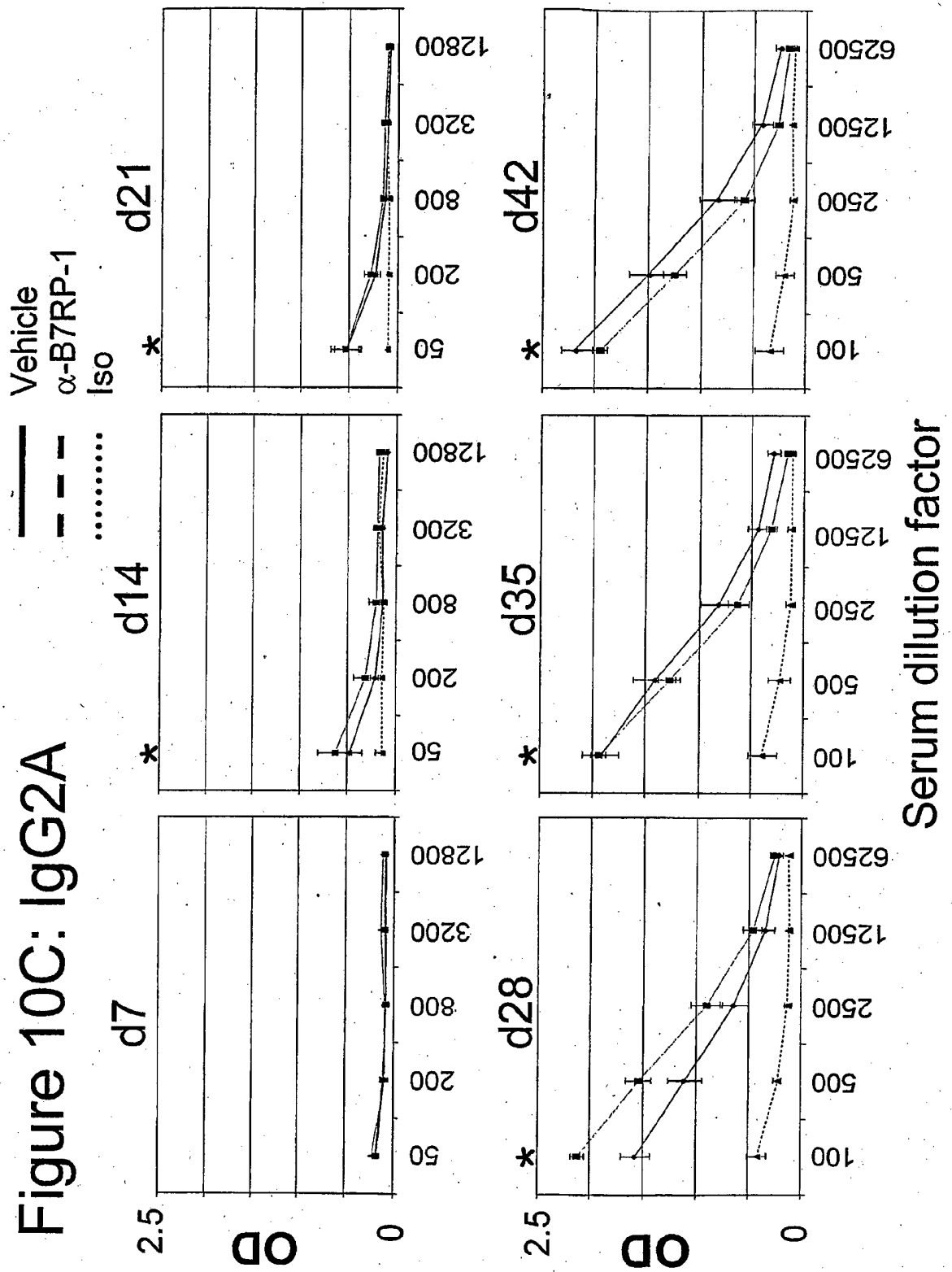


Figure 10D: IgG1

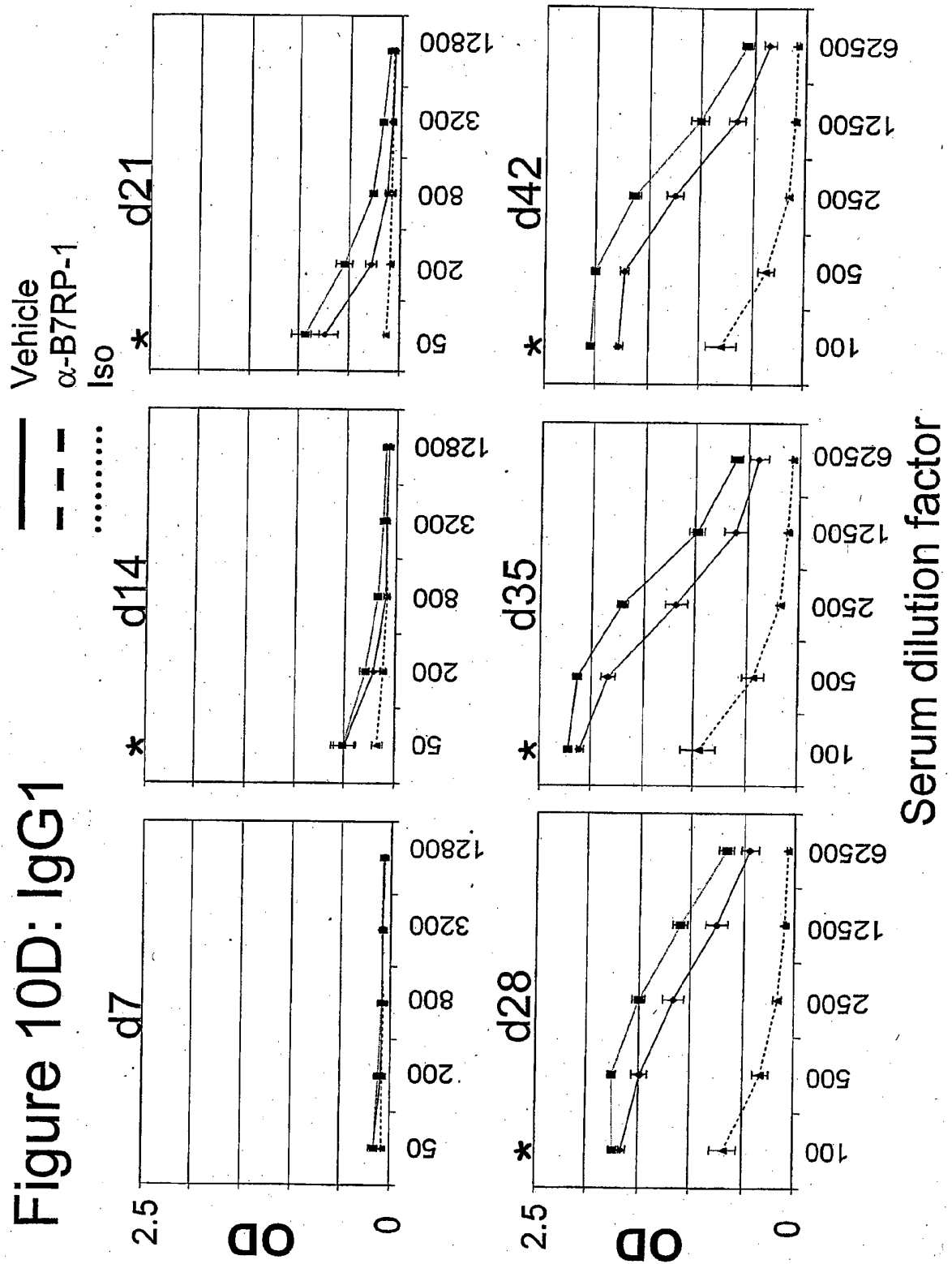


Figure 11

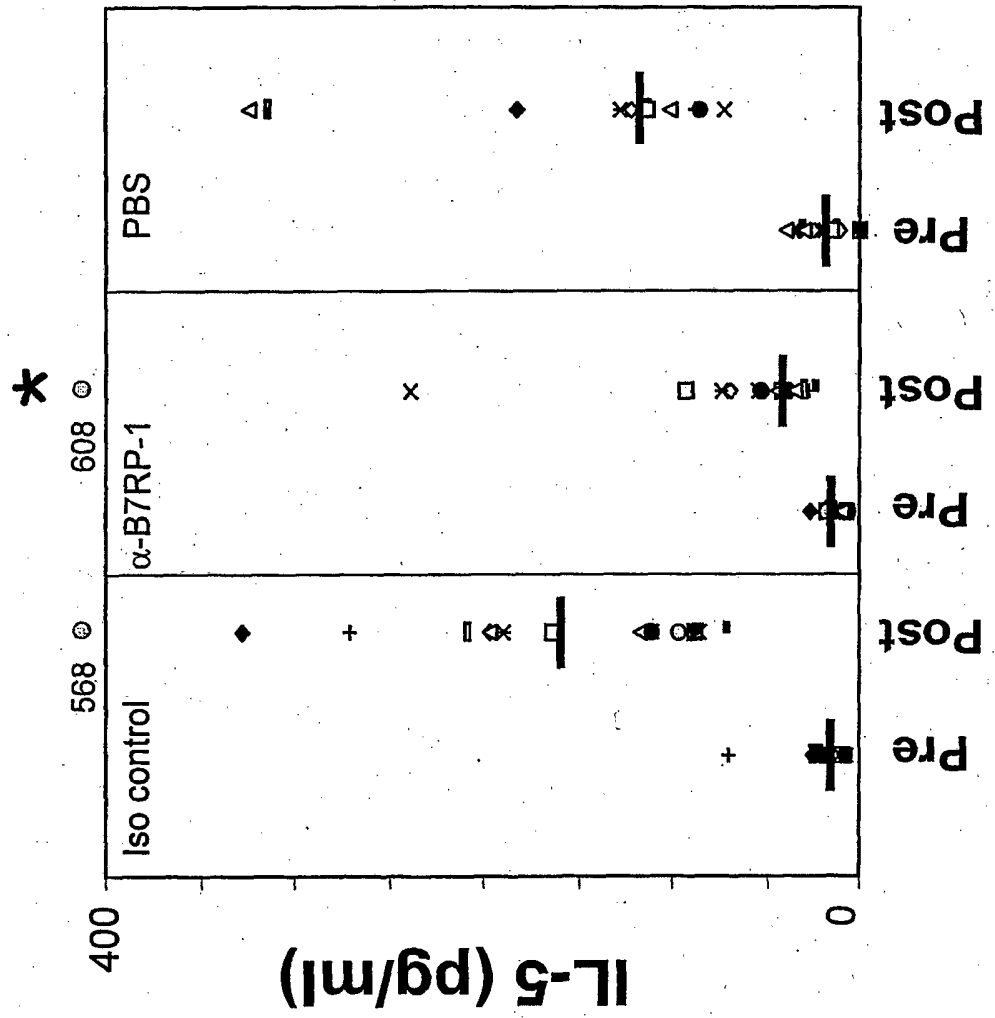


Figure 12

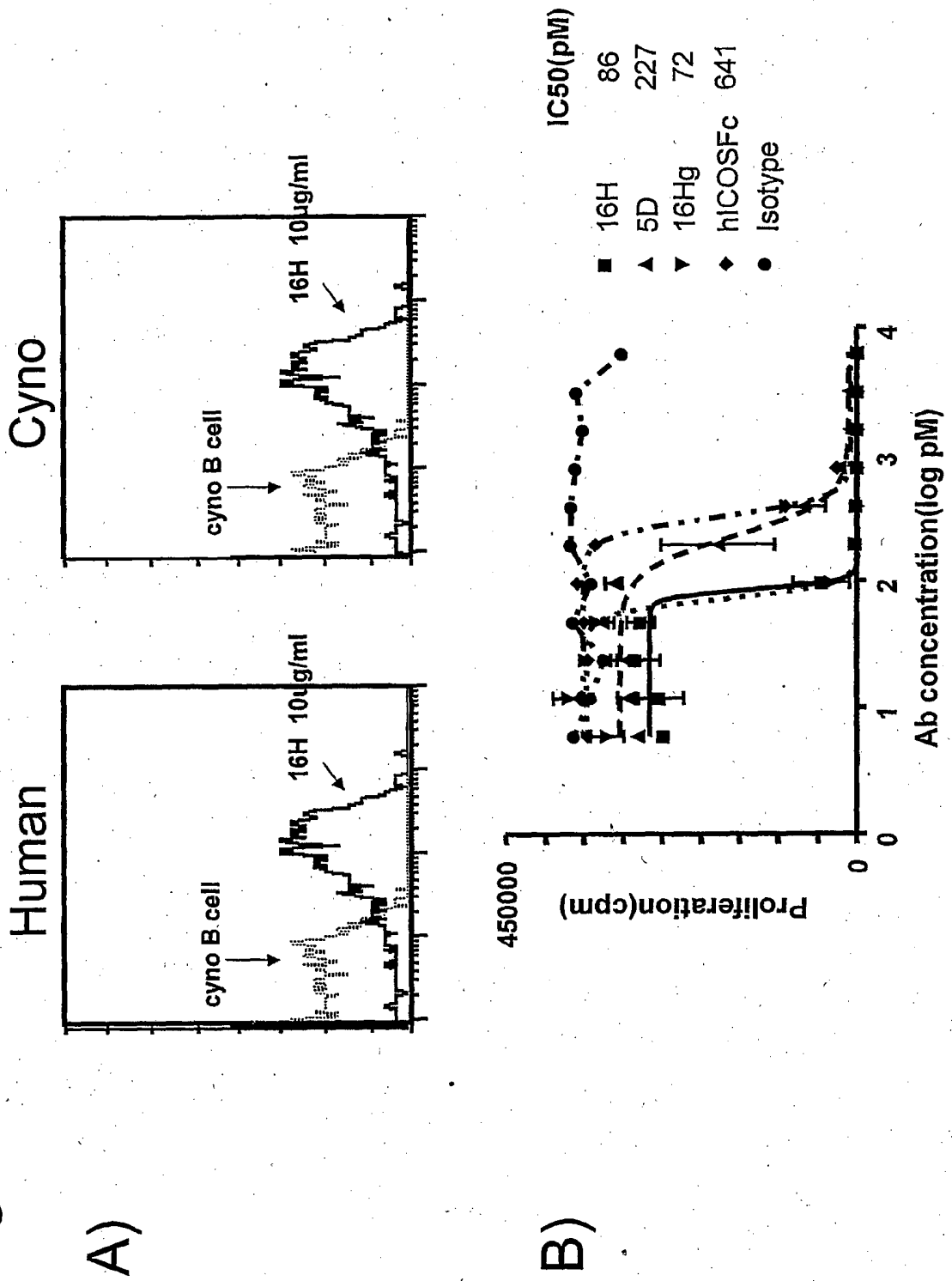


Figure 13A: 16H

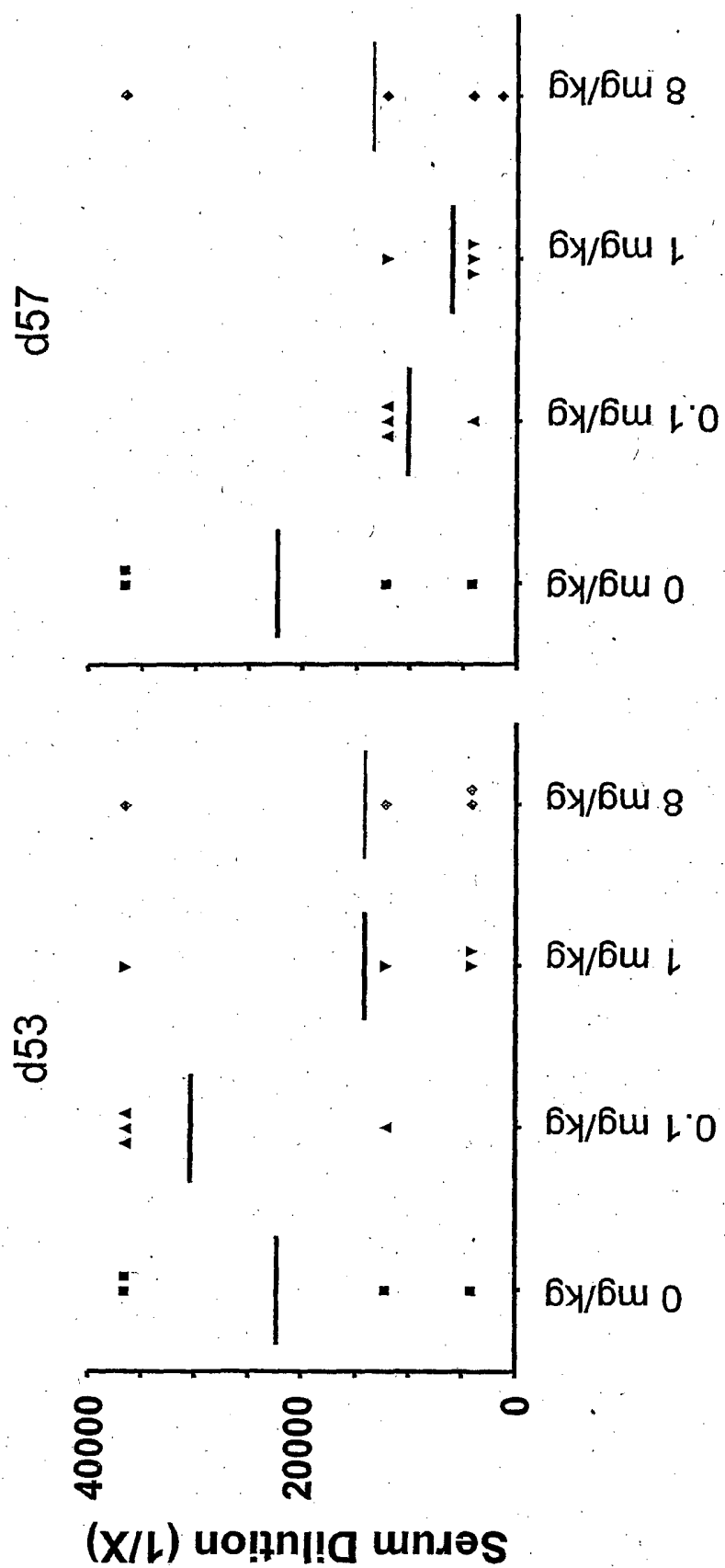
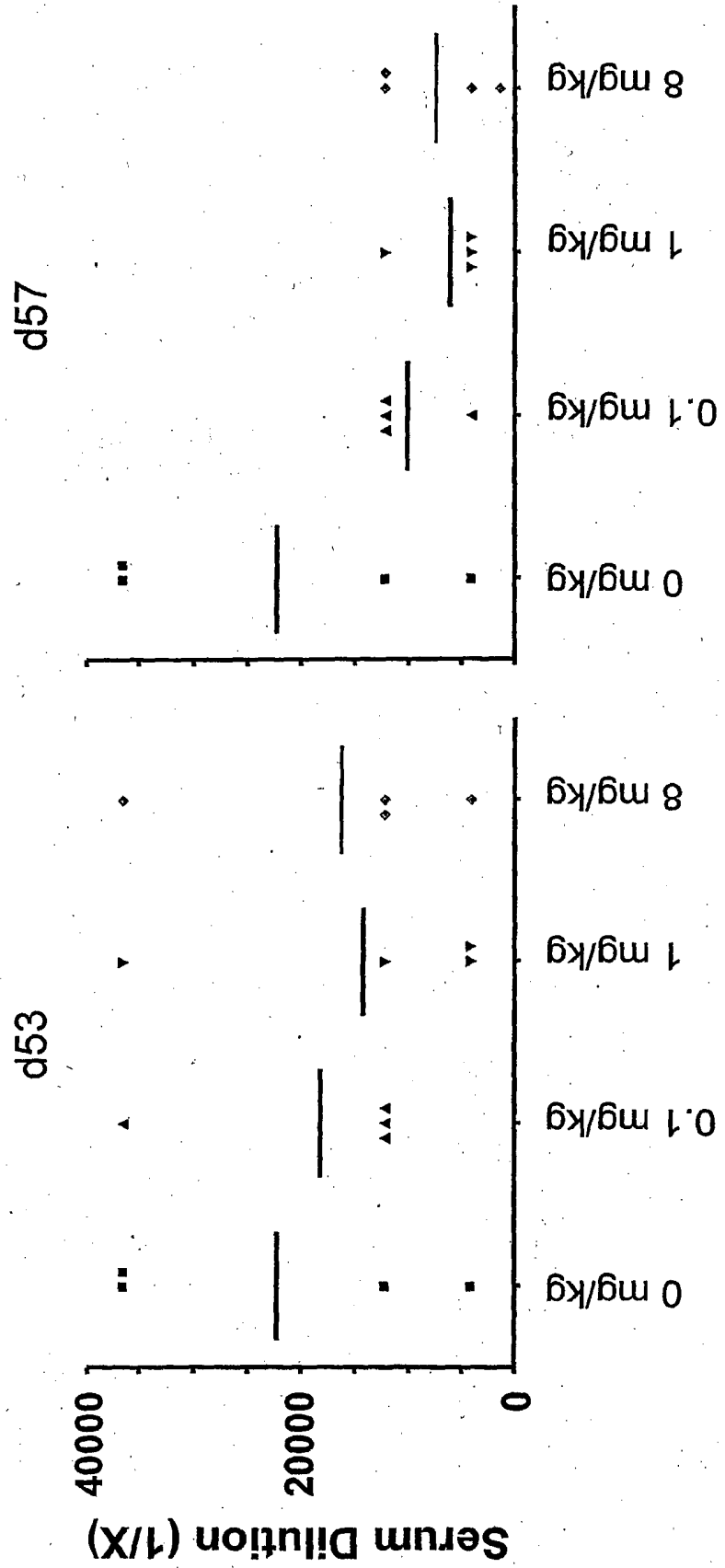


Figure 13B: 5D



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 0046240 A [0003] [0004] [0070] [0074] [0108] [0158]
- WO 0244364 A [0004]
- EP 1374902 A [0004]
- WO 0024782 A [0007]
- US 5151510 A, Stec [0038]
- US 4816397 A, Boss [0051]
- WO 8801649 A [0060]
- US 4946778 A [0060]
- US 5260203 A [0060]
- US 0001871 W [0070]
- US 5877397 A [0088] [0097]
- US 5874299 A [0088] [0097]
- US 5814318 A [0088] [0097]
- US 5789650 A [0088] [0097]
- US 5770429 A [0088] [0097]
- US 5661016 A [0088] [0097]
- US 5633425 A [0088] [0097]
- US 5625126 A [0088] [0097]
- US 5569825 A [0088] [0097]
- US 5545806 A [0088] [0097] [0159]
- WO 9312227 A [0092]
- US 6180370 B [0093]
- US 5693762 A [0093]
- US 5693761 A [0093]
- US 5585089 A [0093]
- US 5530101 A [0093]
- WO 9824893 A [0094]
- US 5545807 A, Surani [0097] [0159]
- WO 931227 A [0097]
- WO 9222646 A [0097]
- WO 9203918 A [0097]
- WO 0056772 A [0108]
- US 4399216 A [0113]
- US 4912040 A [0113]
- US 4740461 A [0113]
- US 4959455 A [0113]
- US 94001875 W [0144]
- US 9300829 W [0147]
- US 3773919 A [0147]
- EP 058481 A [0147]
- EP 133988 A [0147]
- EP 036676 A [0147]
- EP 088046 A [0147]
- EP 143949 A [0147]
- WO 0109187 A [0159]
- US 5625825 A [0159]
- WO 9824884 A [0160]
- WO 9014363 A [0165]

Non-patent literature cited in the description

- **ABRAMS et al.** *J Exp Med.*, 2000, vol. 192, 681-94 [0002]
- **ABRAMS et al.** *J. Clin. Invest.*, 1999, vol. 103, 1243-52 [0002]
- **KREMER et al.** *New England Journal of Medicine*, 2003, vol. 349, 1907-15 [0002]
- **YOSHINGA et al.** *Int. Immun.*, 2000, vol. 12, 1439-1447 [0003]
- **COYLE et al.** *Immunity*, 2000, vol. 13, 95-105 [0003] [0004]
- **YOSHINAGA et al.** *Nature*, 1999, vol. 402, 827-32 [0004]
- **MCADAM et al.** *Journal of Immunology*, 2000, vol. 165, 5035-40 [0004]
- **DONG et al.** *Journal of Autoimmunity*, 2003, vol. 21, 255-60 [0004]
- **DONG et al.** *Journal of Autoimmunity.*, 2003, vol. 21, 255-60 [0004]
- **KHAYYAMIAN et al.** *PNAS*, 2002, vol. 99 (9), 6198-6203 [0004]
- **IWAII et al.** *J. Immunol.*, 2002, vol. 169 (8), 4332-4339 [0004]
- **TOTSUKA et al.** *Gastroenterology*, 2003, vol. 124 (2), 410-421 [0004]
- **RICHTER et al.** *J. Biol. Chem.*, 2001, vol. 276 (49), 45686-45693 [0004]
- **WAHL et al.** *J. Am. Soc. Nephrol.*, 2002, vol. 13 (6), 1517-1526 [0004]
- **WAHL et al.** *Inflammation*, 2003, vol. 27 (4), 191-200 [0004]
- **KABAT et al.** SEQUENCES OF PROTEINS OF IMMUNOLOGICAL INTEREST. NIH Publication No. 91-3242, 1991 [0008]
- **Monoclonal Antibodies: A Manual of Techniques.** CRC Press, Inc, 1987, 147-158 [0028]
- **SAMBROOK et al.** MOLECULAR CLONING: A LABORATORY MANUAL. Cold Spring Harbor Laboratory Press, 2001 [0033] [0192]
- **LAPLANCHE et al.** *Nucl. Acids Res.*, 1986, vol. 14, 9081 [0038]

- **STEC et al.** *J. Am. Chem. Soc.*, 1984, vol. 106, 6077 [0038]
- **STEIN et al.** *Nucl. Acids Res.*, 1988, vol. 16, 3209 [0038]
- **ZON et al.** *Anti-Cancer Drug Design*, 1991, vol. 6, 539 [0038]
- **ZON et al.** OLIGONUCLEOTIDES AND ANALOGUES: A PRACTICAL APPROACH. Oxford University Press, 1991, 87-108 [0038]
- **UHLMANN ; PEYMAN.** *Chemical Reviews*, 1990, vol. 90, 543 [0038]
- **SAMBROOK et al.** MOLECULAR CLONING, A LABORATORY MANUAL. Cold Spring Harbor Laboratories, 2001 [0051] [0053]
- CURRENT PROTOCOLS IN MOLECULAR BIOLOGY. Greene Publishing Associates, 1989 [0051]
- **GRAHAM et al.** *Virology*, 1973, vol. 52, 456 [0053]
- **DAVIS et al.** BASIC METHODS IN MOLECULAR BIOLOGY. Elsevier, 1986 [0053]
- **CHU et al.** *Gene*, 1981, vol. 13, 197 [0053]
- **BURTON ; WOOF.** *Advances in Immunology*, 1992, vol. 51, 1-84 [0057]
- **RAVETCH ; BOLLAND.** *Annu. Rev. Immunol.*, 2001, vol. 19, 275-90 [0057]
- **SHIELDS et al.** *Journal of Biol. Chem.*, 2001, vol. 276, 6591-6604 [0057]
- **TELLEMAN ; JUNGHANS.** *Immunology*, 2000, vol. 100, 245-251 [0057]
- **MEDESAN et al.** *Eur. J. Immunol.*, 1998, vol. 28, 2092-2100 [0057]
- **SAMBROOK et al.** MOLECULAR CLONING: A LABORATORY MANUAL. Cold Spring Harbor, 2001 [0057]
- Guide to Molecular Cloning Techniques. **BERGER ; KIMMEL.** METHODS IN ENZYMOLOGY. Academic Press, Inc, 1987, vol. 152 [0057]
- PROTEINS, STRUCTURES AND MOLECULAR PRINCIPLES. W. H. Freeman and Company, 1984 [0058]
- INTRODUCTION TO PROTEIN STRUCTURE. Garland Publishing, 1991 [0058]
- **THORNTON et al.** *Nature*, 1991, vol. 354, 105 [0058]
- **TAYLOR et al.** *Nucl. Acids Res.*, 1992, vol. 20, 6287-6295 [0084]
- **JAKOBOVITS et al.** *Proc. Natl. Acad. Sci. USA*, 1993, vol. 90, 2551-2555 [0088]
- **JAKOBOVITS et al.** *Nature*, 1993, vol. 362, 255-258 [0088]
- **BRUGGEMANN et al.** *Year in Immun.*, 1993, vol. 7, 33 [0088]
- *Nature*, 1994, vol. 148, 1547-1553 [0088]
- *Nature Biotechnology*, 1996, vol. 14, 826 [0088]
- **GROSS et al.** *Nature*, 2000, vol. 404, 995-999 [0088]
- **HOOGENBOOM ; WINTER.** *J. Mol. Biol.*, 1992, vol. 227, 381 [0088]
- **MARKS et al.** *J. Mol. Biol.*, 1991, vol. 222, 581 [0088]
- **COLE et al.** MONOCLONAL ANTIBODIES AND CANCER THERAPY. Alan R. Liss, 1985, 77 [0088]
- **BOERNER et al.** *J. Immunol.*, 1991, vol. 147, 86-95 [0088]
- **SONGSIVILAI ; LACHMANN.** *Clin. Exp Immunol.*, 1990, vol. 79, 315-321 [0091]
- **KOSTELNY et al.** *J. Immunol.*, 1992, vol. 148, 1547-1553 [0091]
- **MENDEZ et al.** *Nature Genetics*, 1997, vol. 15, 146-156 [0094]
- **KOHLER ; MILSTEIN.** *Nature*, 1975, vol. 256, 495 [0095]
- **LONBERG et al.** *Nature*, 1994, vol. 368, 856-859 [0097]
- **LONBERG ; HUSZAR.** *Intern. Rev. Immunol.*, 1995, vol. 13, 65-93 [0097]
- **HARDING ; LONBERG.** *Ann.N.Y.Acad.Sci.*, 1995, vol. 764, 536-546 [0097]
- **TAYLOR et al.** *Nucleic Acids Res.*, 1992, vol. 20, 6287-6295 [0097]
- **CHEN et al.** *International Immunology*, 1993, vol. 5, 647-656 [0097]
- **TUAILLON et al.** *J. Immunol.*, 1994, vol. 152, 2912-2920 [0097]
- **LONBERG.** Handbook of Exp. Pharmacology. 1994, vol. 113, 49-101 [0097]
- **TAYLOR et al.** *International Immunology*, 1994, vol. 6, 579-591 [0097]
- **HARDING ; LONBERG.** *Ann. N.Y. Acad. Sci.*, 1995, vol. 764, 536-546 [0097]
- **FISHWILD et al.** *Nature Biotechnology*, 1996, vol. 14, 845-851 [0097] [0159] [0160]
- METHODS IN. ENZYMOLOGY. Academic Press, 1990, vol. 185 [0114]
- **BERNOIST ; CHAMBON.** *Nature*, 1981, vol. 290, 304-10 [0128]
- **THOMSEN et al.** *Proc. Natl. Acad. Sci. USA*, 1984, vol. 81, 659-663 [0128]
- **YAMAMOTO et al.** *Cell*, 1980, vol. 22, 787-97 [0128]
- **WAGNER et al.** *Proc. Natl. Acad. Sci. U.S.A.*, vol. 78, 1444-45 [0128]
- **BRINSTER et al.** *Nature*, vol. 296, 39-42 [0128]
- **VILLA-KAMAROFF et al.** *Proc. Natl. Acad. Sci. U.S.A.*, 1978, vol. 75, 3727-31 [0128]
- **DEBOER et al.** *Proc. Natl. Acad. Sci. U.S.A.*, 1983, vol. 80, 21-25 [0128]
- **SWIFT et al.** *Cell*, 1984, vol. 38, 639-46 [0128]
- **ORNITZ et al.** *Cold Spring Harbor Symp. Quant Biol.*, 1986, vol. 50, 399-409 [0128]
- **MACDONALD.** *Hepatology*, 1987, vol. 7, 425-515 [0128]
- **HANAHAN.** *Nature*, 1985, vol. 315, 115-22 [0128]
- **GROSSCHEDL et al.** *Cell*, 1984, vol. 38, 647-58 [0128]
- **ADAMES et al.** *Nature*, 1985, vol. 318, 533-38 [0128]
- **ALEXANDER et al.** *Mol. Cell. Biol.*, 1987, vol. 7, 1436-44 [0128]
- **LEDER et al.** *Cell*, 1986, vol. 45, 485-95 [0128]
- **PINKERT et al.** *Genes and Devel.*, 1987, vol. 1, 268-76 [0128]

EP 1 915 398 B1

- **KRUMLAUF et al.** *Mol. Cell. Biol.*, 1985, vol. 5, 1639-48 [0128]
- **HAMMER et al.** *Science*, 1987, vol. 235, 53-58 [0128]
- **KELSEY et al.** *Genes and Devel.*, 1987, vol. 1, 161-71 [0128]
- **MOGRAM et al.** *Nature*, 1985, vol. 315, 338-40 [0128]
- **KOLLIAS et al.** *Cell*, 1986, vol. 46, 89-94 [0128]
- **READHEAD et al.** *Cell*, 1987, vol. 48, 703-12 [0128]
- **SANI.** *Nature*, 1985, vol. 314, 283-86 [0128]
- **MASON et al.** *Science*, 1986, vol. 234, 1372-78 [0128]
- REMINGTON'S PHARMACEUTICAL SCIENCES. Mack Publishing Company, 1990 [0138]
- **SIDMAN et al.** *Biopolymers*, 1983, vol. 22, 547-556 [0147]
- **LANGER et al.** *J. Biomed. Mater. Res.*, 1981, vol. 15, 167-277 [0147]
- **LANGER.** *Chem. Tech.*, 1982, vol. 12, 98-105 [0147]
- **EPPSTEIN et al.** *Proc. Natl. Acad. Sci. USA*, 1985, vol. 82, 3688-3692 [0147]
- **CHEN et al.** *EMBO J.*, 1993, vol. 12, 811-820 [0159]
- **LONBERG et al.** *Nature*, 1994, vol. 368 (6474), 856-859 [0160]
- **ADAMCZYK et al.** *Bioconjugate Chem.*, 1999, vol. 10, 1032-37 [0173] [0175]
- **ADAMCZYK et al.** *Methods*, 2000, vol. 20, 319-28 [0173] [0175]
- **LESLIE HUDSON ; FRANK C. HAY.** *Practical Immunology.* Blackwell Scientific Publications, 1980 [0191]

Szabadalmi igénypontok

1. Izolált ellenanyag, amely specifikusan kötődik B7RP1-hez, ahol az ellenanyag olyan nehézláncot tartalmaz, amely SEQ ID NO: 27 szerinti szekvenciájú CDR1-et, SEQ ID NO: 28 szerinti szekvenciájú CDR2-t, és SEQ ID NO: 29 szerinti szekvenciájú CDR1-et tartalmaz, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmensét, és olyan könnyűláncot, amely SEQ ID NO: 15 szerinti szekvenciájú CDR1-et, SEQ ID NO: 16 szerinti szekvenciájú CDR1-et, és SEQ ID NO: 17 szerinti szekvenciájú CDR1-et tartalmaz, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmensét, és ahol az ellenanyag gátolja a B7RP1 aktivitást.

2. Az 1. igénypont szerinti ellenanyag, ahol a nehézlánc a SEQ ID NO: 7 vagy 8 szerinti aminosav-szekvenciát tartalmazó nehézlánc variábilis régiót tartalmaz, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmensét.

3. Az 1. igénypont szerinti ellenanyag, ahol a könnyűlánc a SEQ ID NO: 1 szerinti aminosav-szekvenciát tartalmazó könnyűlánc variábilis régiót tartalmaz, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmensét.

4. Polipeptid, amely tartalmazza a SEQ ID NO: 15, 16, 17, 27, 28 és 29 szerinti aminosav-szekvenciákat, ahol a polipeptid specifikusan kötődik a B7RP1-hez és gátolja a B7RP1 aktivitást.

5. Az 1. igénypont szerinti izolált ellenanyag vagy fragmens, amely specifikusan kötődik a B7RP1-hz, ahol az ellenanyag kötődik a SEQ ID NO: 67 szerinti szekvenciához, de nem kötődik a B7RP1 extracelluláris doménjében lévő SEQ ID NO: 68 szerinti szekvenciához, és gátolja a B7RP1 aktivitást.

6. Izolált ellenanyag, amely specifikusan kötődik a B7RP1-hez és verseng a B7RP1 kötéséért a SEQ ID NO: 1 szerinti aminosav-szekvenciát tartalmazó könnyűlánc variábilis régiót és SEQ ID NO: 7 vagy 8 szerinti aminosav-szekvenciát tartalmazó nehézlánc variábilis régiót tartalmazó ellenanyaggal, ahol az ellenanyag gátolja a B7RP1 aktivitást.

7. Az 1. igénypont szerinti ellenanyag, amely a SEQ ID NO: 45 vagy 46 szerinti aminosav-szekvencia, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmense bármelyikét tartalmazza.

8. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, ahol a nehézlánc és könnyűlánc egyláncú ellenanyag.

9. A 8. igénypont szerinti ellenanyag, amely egyláncú Fv ellenanyag.

10. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, amely Fab ellenanyag.

11. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, amely Fab' ellenanyag.

11. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, amely (Fab')₂ ellenanyag.

11. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, ahol az ellenanyag teljesen humán ellenanyag.

14. Gyógyászati készítmény, amely gyógyászatilag elfogadható hordozót és az 1., 5. vagy 6. igénypont szerinti ellenanyag, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmense terápiásan hatásos mennyiségét tartalmazza.

15. Gyógyászati készítmény, amely gyógyászatilag elfogadható hordozót és a 4. igénypont szerinti polipeptid terápiásan hatásos mennyiségét tartalmazza.

16. Az 1., 5. vagy 6. igénypont szerinti ellenanyag vagy fragmense, gyógyszerként történő alkalmazásra.

17. A 4. igénypont szerinti polipeptid, gyógyszerként történő alkalmazásra.

18. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmense, autoimmun betegség vagy gyulladásos válasz pácienstben történő kezelésében történő alkalmazásra.

19. A 4. igénypont szerinti ellenanyag, autoimmun betegség vagy gyulladásos válasz pácienstben történő kezelésében történő alkalmazásra.

20. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmense gyógyászatiilag hatásos mennyiségének alkalmazása B7RP1 által közvetített autoimmun betegség vagy gyulladásos válasz pácienstben történő kezelésére szolgáló gyógyszer előállítására.

21. A 4. igénypont szerinti polipeptid gyógyászatiilag hatásos mennyiségének alkalmazása B7RP1 által közvetített autoimmun betegség vagy gyulladásos válasz pácienstben történő kezelésére szolgáló gyógyszer előállítására.

22. A 20. vagy 21. igénypont szerinti alkalmazás, ahol az autoimmun betegség vagy gyulladásos válasz reumatoid arthritisz, asztma, immun trombocitopénia purpura, szklerózis multiplex, cukorbetegség, psoriasis, gyulladásos bélbetegség, Crohn-betegség, fekélyes vastagbélgyulladás, Grave-betegség, Hashimoto-féle pajzsmirigygyulladás, vagy szisztémás lupus erythematosus.

23. Az 1., 5. vagy 6. igénypont szerinti ellenanyag, vagy annak antigénkötő vagy immunológiailag működőképes immunglobulin fragmense gyógyászatiilag hatásos mennyiségének alkalmazása kostimulációs szignál T-sejt aktiválást pácienstben gátló készítmény előállítására.

24. Eljárás B7RP1 detektálására biológiai mintában, amely eljárás magában foglalja:

a) a minta érintkeztetését az 1., 5. vagy 6. igénypontok bármelyike szerinti ellenanyaggal vagy a 4. igénypont szerinti polipeptiddel olyan körülmények között, amelyek lehetővé teszik az ellenanyag vagy polipeptid kötődését a B7RP1-hez; és

b) a megkötődött ellenanyag vagy polipeptid mennyiségének mérését a mintában.

25. Nukleinsav-molekula, amely 1., 5. vagy 6. igénypontok bármelyike szerinti ellenanyagot vagy 4. igénypont szerinti polipeptidet kódol.

26. Izolált nukleinsav-molekula, amely a következők által alkotott csoportból kiválasztott aminosav-szekvenciát tartalmazó polipeptidet kódol

(a) SEQ ID NO: 1 és 7,

(b) SEQ ID NO: 1 és 8,

(c) SEQ ID NO: 15, 16, 17, 27, 28, és 29,

(d) SEQ ID NO: 45 és 7,

(e) SEQ ID NO: 45 és 8, és

(f) SEQ ID NO: 1 és 46.

27. Gazdasejt, amely 25. vagy 26. igénypont szerinti nukleinsav-molekulát tartalmaz.

28. Izolált sejtvonal, amely az 1., 5. vagy 6. igénypontok bármelyike szerinti ellenanyagot vagy 4. igénypont szerinti polipeptidet termel.

29. Expressziós vektor, amely 25. vagy 26. igénypont szerinti nukleinsav-molekulát tartalmaz.

30. Eljárás ellenanyag vagy polipeptid előállítására, amely eljárás magában foglalja a 27. igénypont szerinti gazdasejt vagy a 28. igénypont szerinti sejtvonal tenyésztését és az ellenanyag vagy polipeptid begyűjtését a tenyésztő tápközegből vagy a gazdasejtből.

31. Ellenanyag, amely SEQ ID NO: 1 szerinti aminosav-szekvenciát tartalmazó könnyűlánc variábilis régiót és SEQ ID NO: 8 szerinti aminosav-szekvenciát tartalmazó nehézlánc variábilis régiót tartalmaz.

32. Ellenanyag, amely könnyűláncot és nehézláncot tartalmaz, ahol a könnyűlánc SEQ ID NO: 1 szerinti aminosav-szekvenciát tartalmazó könnyűlánc variábilis régiót és SEQ ID NO: 43 szerinti aminosav-szekvenciát tartalmazó könnyűlánc konstans régiót tartalmaz, és ahol a nehézlánc SEQ ID NO: 8 szerinti aminosav-szekvenciát tartalmazó nehézlánc variábilis régiót és SEQ ID NO: 41 szerinti aminosav-szekvenciát tartalmazó nehézlánc konstans régiót tartalmaz.

33. Ellenanyag, amely a SEQ ID NO: 45 szerint aminosav-szekvenciából álló könnyűláncot és SEQ ID NO: 46 szerinti aminosav-szekvenciából álló nehézláncot tartalmaz.