

CLAIMS

[Claim 1]

An antibody or a fragment thereof, which specifically binds to a 6-sulfosialyl Lewis X glycan, where the binding requires fucose, a sulfate group, and a sialic acid that form the 6-sulfosialyl Lewis X glycan, wherein the antibody or the fragment thereof comprises at least one or more CDRs selected from the group consisting of the following CDRs:

- (a) CDRH1 comprising the amino acid sequence represented by SEQ ID NO: 1;
- (b) CDRH2 comprising the amino acid sequence represented by SEQ ID NO: 2;
- (c) CDRH3 comprising the amino acid sequence represented by SEQ ID NO: 3;
- (d) CDRL1 comprising the amino acid sequence represented by SEQ ID NO: 4;
- (e) CDRL2 comprising the amino acid sequence represented by SEQ ID NO: 5; and
- (f) CDRL3 comprising the amino acid sequence represented by SEQ ID NO: 6, or

comprises at least one or more CDRs, each comprising an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence of the corresponding CDR, or

comprises at least one or more CDRs, each comprising an amino acid sequence having 80% or more identity to the amino acid sequence of the corresponding CDR.

[Claim 2]

The antibody or the fragment thereof according to claim 1, which comprises a heavy chain variable region comprising the following CDRs:

- (a) CDRH1 comprising the amino acid sequence represented by SEQ ID NO: 1;
 - (b) CDRH2 comprising the amino acid sequence represented by SEQ ID NO: 2; and
 - (c) CDRH3 comprising the amino acid sequence represented by SEQ ID NO: 3, or
- comprises a heavy chain variable region comprising CDRH1, CDRH2, and

CDRH3, each comprising an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence of the corresponding CDR, or

comprises a heavy chain variable region comprising CDRH1, CDRH2, and CDRH3, each comprising an amino acid sequence having 80% or more identity to the amino acid sequence of the corresponding CDR.

[Claim 3]

The antibody or the fragment thereof according to claim 2, wherein the heavy chain variable region comprises at least 90 consecutive amino acids in the amino acid sequence

represented by any of SEQ ID NOS: 13, and 15 to 17.

[Claim 4]

The antibody or the fragment thereof according to claim 2 or 3, wherein the heavy chain variable region comprises the amino acid sequence represented by any of SEQ ID NOS: 13, and 15 to 17, an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence represented by any of SEQ ID NOS: 13, and 15 to 17, or an amino acid sequence having 80% or more identity to the amino acid sequence represented by any of SEQ ID NOS: 13, and 15 to 17.

[Claim 5]

The antibody or the fragment thereof according to any one of claims 2 to 4, wherein the heavy chain comprises the amino acid sequence represented by SEQ ID NO: 25, 27, or 28, an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence represented by SEQ ID NO: 25, 27, or 28, or an amino acid sequence having 80% or more identity to the amino acid sequence represented by SEQ ID NO: 25, 27, or 28.

[Claim 6]

The antibody or the fragment thereof according to any one of claims 1 to 5, which comprises a light chain variable region comprising the following CDRs:

(d) CDRL1 comprising the amino acid sequence represented by SEQ ID NO: 4;

(e) CDRL2 comprising the amino acid sequence represented by SEQ ID NO: 5; and

(f) CDRL3 comprising the amino acid sequence represented by SEQ ID NO: 6, or

comprises a light chain variable region comprising CDRL1, CDRL2, and CDRL3, each comprising an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence of the corresponding CDR, or

comprises a light chain variable region comprising CDRL1, CDRL2, and CDRL3, each comprising an amino acid sequence having 80% or more identity to the amino acid sequence of the corresponding CDR.

[Claim 7]

The antibody or the fragment thereof according to claim 6, wherein the light chain variable region comprises at least 80 consecutive amino acids in the amino acid sequence represented by any of SEQ ID NOS: 14, and 18 to 20.

[Claim 8]

The antibody or the fragment thereof according to claim 6 or 7, wherein the light chain variable region comprises the amino acid sequence represented by any of SEQ ID NOS: 14, and 18 to 20, an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence represented by any of SEQ ID NOS: 14, and 18 to 20, or an amino acid sequence having 80% or more identity to the amino acid sequence represented by any of SEQ ID NOS: 14, and 18 to 20.

[Claim 9]

The antibody or the fragment thereof according to any one of claims 6 to 8, wherein the light chain comprises the amino acid sequence represented by SEQ ID NO: 26, an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence represented by SEQ ID NO: 26, or an amino acid sequence having 80% or more identity to the amino acid sequence represented by SEQ ID NO: 26.

[Claim 10]

The antibody or the fragment thereof according to any one of claims 1 to 9, which comprises a variable region comprising the following CDRs:

- (a) CDRH1 comprising the amino acid sequence represented by SEQ ID NO: 1;
- (b) CDRH2 comprising the amino acid sequence represented by SEQ ID NO: 2;
- (c) CDRH3 comprising the amino acid sequence represented by SEQ ID NO: 3;
- (d) CDRL1 comprising the amino acid sequence represented by SEQ ID NO: 4;
- (e) CDRL2 comprising the amino acid sequence represented by SEQ ID NO: 5; and
- (f) CDRL3 comprising the amino acid sequence represented by SEQ ID NO: 6, or

comprises a variable region comprising CDRH1, CDRH2, and CDRH3 and CDRL1, CDRL2, and CDRL3, each comprising an amino acid sequence having deletion, substitution, or addition of one or several amino acids in the amino acid sequence of the corresponding CDR, or

comprises a variable region comprising CDRH1, CDRH2, and CDRH3 and CDRL1, CDRL2, and CDRL3, each comprising an amino acid sequence having 80% or more identity to the amino acid sequence of the corresponding CDR.

[Claim 11]

The antibody or the fragment thereof according to any one of claims 1 to 10, which inhibits binding of a high endothelial venule expressing a 6-sulfosialyl Lewis X glycan to L-selectin.

[Claim 12]

The antibody or the fragment thereof according to any one of claims 1 to 11, wherein a constant region is derived from a human.

[Claim 13]

5 The antibody or the fragment thereof according to any one of claims 1 to 12, which is humanized.

[Claim 14]

The antibody or the fragment thereof according to any one of claims 1 to 13, which is selected from the group consisting of Fab, F(ab')₂, Fab', Fv, and a single-chain antibody.

10 [Claim 15]

The antibody or the fragment thereof according to claim 14, wherein the single-chain antibody comprises an amino acid sequence at positions 1 to 117 and 133 to 238 in the amino acid sequence represented by any of SEQ ID NOS: 21 to 24, an amino acid sequence having deletion, substitution, or addition of one or several amino acids in an amino acid
15 sequence at positions 1 to 117 and 133 to 238 in the amino acid sequence represented by any of SEQ ID NOS: 21 to 24, or an amino acid sequence having 80% or more identity to an amino acid sequence at positions 1 to 117 and 133 to 238 in the amino acid sequence represented by any of SEQ ID NOS: 21 to 24.

[Claim 16]

20 The antibody or the fragment thereof according to any one of claims 1 to 15, wherein the antibody or the fragment thereof exhibits a dissociation constant (K_D value) of 1×10^{-6} M or less for the 6-sulfosialyl Lewis X glycan.

[Claim 17]

25 A polynucleotide encoding the antibody or the fragment thereof according to any one of claims 1 to 16.

[Claim 18]

An expression vector, comprising the polynucleotide according to claim 17.

[Claim 19]

A host cell transfected with the expression vector according to claim 18.

30 [Claim 20]

The host cell according to claim 19, which is a eukaryotic cell.

[Claim 21]

A hybridoma producing the antibody according to any one of claims 1 to 16.

[Claim 22]

A lymphocyte homing inhibitor, comprising the antibody or the fragment thereof according to any one of claims 1 to 16, the polynucleotide according to claim 17, or the expression vector according to claim 18.

[Claim 23]

A pharmaceutical composition, comprising the antibody or the fragment thereof according to any one of claims 1 to 16, the polynucleotide according to claim 17, or the expression vector according to claim 18.

10 [Claim 24]

——— The pharmaceutical composition according to claim 23, for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing.

[Claim 25]

15 ——— The pharmaceutical composition according to claim 24, wherein the disease caused by an overactive immune response mediated by lymphocyte homing is an immune-related disease.

[Claim 26]

——— The pharmaceutical composition according to claim 25, wherein the immune-related disease is an allergic disease or an autoimmune disease.

20 [Claim 27]

——— The pharmaceutical composition according to claim 26, wherein the immune-related disease is an allergic disease selected from the group consisting of allergic rhinitis, atopic dermatitis, food allergy, oral allergy syndrome, drug allergy, pollen allergy, allergic conjunctivitis, eosinophilic pneumonia, allergic gastroenteritis, urticaria, photosensitive disorder, metal allergy, cat allergy, mite allergy, and asthma.

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[Claim 28]

——— The pharmaceutical composition according to claim 26, wherein the immune-related disease is an autoimmune disease selected from the group consisting of multiple sclerosis including relapsing remitting multiple sclerosis, primary progressive multiple sclerosis, and secondary progressive multiple sclerosis; psoriasis; rheumatoid arthritis; psoriatic arthritis; systemic lupus erythematosus (SLE); ulcerative colitis; Crohn's disease; benign lymphocytic vasculitis; thrombocytopenic purpura; sudden thrombocytopenia;

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idiopathic autoimmune hemolytic anemia; pure red cell aplasia; Sjogren's syndrome; a
 rheumatic disease; a connective tissue disease; inflammatory rheumatism; degenerative
 rheumatism; nonarticular rheumatism; juvenile rheumatoid arthritis; muscle rheumatism;
 chronic polyarthritis; cryoglobulin vasculitis; ANCA associated vasculitis; antiphospholipid
 5 syndrome; myasthenia gravis; autoimmune hemolytic anemia; Guillain-Barre syndrome;
 chronic immune polyneuropathy; autoimmune thyroiditis; insulin dependent diabetes
 mellitus; type 1 diabetes mellitus; Addison's disease; membranous glomerulonephropathy;
 Goodpasture's disease; autoimmune gastritis; autoimmune atrophic gastritis; pernicious
 anemia; pemphigus; pemphigus vulgaris; hepatic cirrhosis; primary biliary cirrhosis;
 10 dermatomyositis; polymyositis; fibromyositis; muscle sclerosis; celiac disease;
 immunoglobulin A nephropathy; Henoch-Schonlein purpura; Evans' syndrome; psoriasis;
 psoriasis arthropathica; Graves' disease; Graves' ophthalmopathy; scleroderma; systemic
 scleroderma; progressive systemic scleroderma; primary biliary cirrhosis; Hashimoto's
 thyroiditis; primary myxedema; sympathetic ophthalmia; autoimmune uveitis; hepatitis;
 15 chronic active hepatitis; a collagen disease; ankylosing spondylitis; shoulder periartthritis;
 nodular panarteritis; chondrocalcinosis; Wegener's granulomatosis; microscopic polyangiitis;
 chronic urticaria; a bullous skin disease; pemphigoid; Devic's disease; pediatric autoimmune
 hemolytic anemia; refractory or chronic autoimmune cytopenia; acquired hemophilia A; cold
 agglutinin disease; neuromyelitis optica; stiff person syndrome; pancreatitis; myocarditis;
 20 vasculitis; gastritis; gout; gouty arthritis; psoriasis; normocomplementemic urticarial
 vasculitis; pericarditis; myositis; anti-synthetase syndrome; scleritis; macrophage activation
 syndrome; Behcet's syndrome; PAPA syndrome; Blau syndrome; adult and juvenile Still's
 disease; cryopyrin associated periodic syndrome; Muckle-Wells syndrome; familial cold
 autoinflammatory syndrome; neonatal onset multisystem inflammatory disease; familial
 25 Mediterranean fever; chronic infantile neurological cutaneous and articular syndrome;
 systemic onset juvenile idiopathic arthritis; hyper IgD syndrome; Schnitzler's syndrome;
 autoimmune retinopathy; atherosclerosis; chronic prostatitis; and TNF receptor associated
 periodic syndrome (TRAPS).

{Claim 29}

————— The pharmaceutical composition according to claim 28, wherein the autoimmune
 disease is multiple sclerosis or a collagen disease.

{Claim 30}

~~—————The pharmaceutical composition according to claim 28 or 29, wherein the collagen disease is one or multiple diseases selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, scleroderma, dermatomyositis, polyarteritis nodosa, a mixed connective tissue disease, Sjogren's syndrome, microscopic polyangiitis, eosinophilic granulomatosis with polyangiitis, hypersensitivity vasculitis, Behcet's disease, Cogan's syndrome, RS3PE, giant cell arteritis, adult-onset Still's disease, polymyalgia rheumatica, fibromyalgia, and SAPHO syndrome.~~

[Claim ~~34~~24]

The pharmaceutical composition according to ~~any one of claims 24 to 30~~23, further comprising an agent for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing.

[Claim ~~32~~25]

A method for producing the antibody or the fragment thereof according to any one of claims 1 to 16, comprising a step of culturing the host cell according to claim 19 or 20, or the hybridoma according to claim 21.

[Claim ~~33~~26]

Use of a ~~A pharmaceutical composition for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing,~~ comprising an antibody or a fragment thereof, which specifically binds to a 6-sulfosialyl Lewis X glycan, where the binding requires fucose, a sulfate group, and a sialic acid that form the 6-sulfosialyl Lewis X glycan, a polynucleotide encoding the antibody or the fragment thereof, or an expression vector comprising the polynucleotide in the manufacture of a medicament for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing.

[Claim ~~34~~27]

~~The pharmaceutical composition~~use according to claim ~~33~~26, wherein the disease caused by an overactive immune response mediated by lymphocyte homing is an immune-related disease.

[Claim ~~35~~28]

~~The pharmaceutical composition~~use according to claim ~~34~~27, wherein the immune-related disease is an allergic disease or an autoimmune disease.

[Claim ~~36~~29]

The ~~pharmaceutical composition~~use according to claim ~~3528~~, wherein the immune-related disease is an allergic disease selected from the group consisting of allergic rhinitis, atopic dermatitis, food allergy, oral allergy syndrome, drug allergy, pollen allergy, allergic conjunctivitis, eosinophilic pneumonia, allergic gastroenteritis, urticaria, photosensitive disorder, metal allergy, cat allergy, mite allergy, and asthma.

[Claim ~~3730~~]

The ~~pharmaceutical composition~~according use to claim ~~3528~~, wherein the immune-related disease is any autoimmune disease selected from the group consisting of multiple sclerosis including relapsing-remitting multiple sclerosis, primary progressive multiple sclerosis, and secondary progressive multiple sclerosis; psoriasis; rheumatoid arthritis; psoriatic arthritis; systemic lupus erythematosus (SLE); ulcerative colitis; Crohn's disease; benign lymphocytic vasculitis; thrombocytopenic purpura; sudden thrombocytopenia; idiopathic autoimmune hemolytic anemia; pure red-cell aplasia; Sjogren's syndrome; a rheumatic disease; a connective tissue disease; inflammatory rheumatism; degenerative rheumatism; nonarticular rheumatism; juvenile rheumatoid arthritis; muscle rheumatism; chronic polyarthritis; cryoglobulin vasculitis; ANCA-associated vasculitis; antiphospholipid syndrome; myasthenia gravis; autoimmune hemolytic anemia; Guillain-Barre syndrome; chronic immune polyneuropathy; autoimmune thyroiditis; insulin-dependent diabetes mellitus; type 1 diabetes mellitus; Addison's disease; membranous glomerulonephropathy; Goodpasture's disease; autoimmune gastritis; autoimmune atrophic gastritis; pernicious anemia; pemphigus; pemphigus vulgaris; hepatic cirrhosis; primary biliary cirrhosis; dermatomyositis; polymyositis; fibromyositis; muscle sclerosis; celiac disease; immunoglobulin A nephropathy; Henoch-Schonlein purpura; Evans' syndrome; ~~psoriasis~~; psoriasis arthropathica; Graves' disease; Graves' ophthalmopathy; scleroderma; systemic scleroderma; progressive systemic scleroderma; primary biliary cirrhosis; Hashimoto's thyroiditis; primary myxedema; sympathetic ophthalmia; autoimmune uveitis; hepatitis; chronic active hepatitis; a collagen disease; ankylosing spondylitis; shoulder periartthritis; nodular panarteritis; chondrocalcinosis; Wegener's granulomatosis; microscopic polyangiitis; chronic urticaria; a bullous skin disease; pemphigoid; Devic's disease; pediatric autoimmune hemolytic anemia; refractory or chronic autoimmune cytopenia; acquired hemophilia A; cold agglutinin disease; neuromyelitis optica; stiff-person syndrome; pancreatitis; myocarditis; vasculitis; gastritis; gout; gouty arthritis; ~~psoriasis~~; normocomplementemic urticarial

vasculitis; pericarditis; myositis; anti-synthetase syndrome; scleritis; macrophage activation syndrome; Behcet's syndrome; PAPA syndrome; Blau syndrome; adult and juvenile Still's disease; cryopyrin-associated periodic syndrome; Muckle-Wells syndrome; familial cold autoinflammatory syndrome; neonatal-onset multisystem inflammatory disease; familial Mediterranean fever; chronic infantile neurological cutaneous and articular syndrome; systemic-onset juvenile idiopathic arthritis; hyper IgD syndrome; Schnitzler's syndrome; autoimmune retinopathy; atherosclerosis; chronic prostatitis; and TNF receptor-associated periodic syndrome (TRAPS).

[Claim ~~38~~31]

10 The ~~pharmaceutical composition~~use according to claim ~~37~~30, wherein the autoimmune disease is multiple sclerosis or a collagen disease.

[Claim ~~39~~32]

15 The ~~pharmaceutical composition~~use according to claim ~~38~~31, wherein the collagen disease is one or multiple diseases selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, scleroderma, dermatomyositis, polyarteritis nodosa, a mixed connective tissue disease, Sjogren's syndrome, microscopic polyangiitis, eosinophilic granulomatosis with polyangiitis, hypersensitivity vasculitis, Behcet's disease, Cogan's syndrome, RS3PE, giant cell arteritis, adult-onset Still's disease, polymyalgia rheumatica, fibromyalgia, and SAPHO syndrome.

20 [Claim ~~40~~33]

The ~~pharmaceutical composition~~use according to any one of claims ~~33~~26 to ~~39~~32, wherein the antibody or the fragment thereof inhibits binding of a high endothelial venule expressing a 6-sulfosialyl Lewis X glycan to L-selectin.

[Claim ~~41~~34]

25 The ~~pharmaceutical composition~~use according to any one of claims ~~33~~26 to ~~40~~33, wherein the antibody or the fragment thereof is the antibody or the fragment thereof according to any one of claims 1 to 16.

[Claim ~~42~~35]

30 A pharmaceutical composition comprising an antibody or a fragment thereof, which specifically binds to a 6-sulfosialyl Lewis X glycan, where the binding requires fucose, a sulfate group, and a sialic acid that form the 6-sulfosialyl Lewis X glycan, a polynucleotide encoding the antibody or the fragment thereof, or an expression vector comprising the

polynucleotide for use in treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing.

————— A method for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing in a subject, comprising a step of administering an effective amount of an antibody or a fragment thereof, which specifically binds to a 6-sulfosialyl Lewis X glycan, where the binding requires fucose, a sulfate group, and a sialic acid that form the 6-sulfosialyl Lewis X glycan, a polynucleotide encoding the antibody or the fragment thereof, or an expression vector comprising the polynucleotide to the subject.

{Claim 43}

————— The method according to claim 42, wherein the disease caused by an overactive immune response mediated by lymphocyte homing is an immune-related disease.

{Claim 44}

————— The method according to claim 43, wherein the immune-related disease is an allergic disease or an autoimmune disease.

{Claim 45}

————— The method according to claim 44, wherein the immune-related disease is an allergic disease selected from the group consisting of allergic rhinitis, atopic dermatitis, food allergy, oral allergy syndrome, drug allergy, pollen allergy, allergic conjunctivitis, eosinophilic pneumonia, allergic gastroenteritis, urticaria, photosensitive disorder, metal allergy, cat allergy, mite allergy, and asthma.

{Claim 46}

————— The method according to claim 44, wherein the immune-related disease is any autoimmune disease selected from the group consisting of multiple sclerosis including relapsing remitting multiple sclerosis, primary progressive multiple sclerosis, and secondary progressive multiple sclerosis; psoriasis; rheumatoid arthritis; psoriatic arthritis; systemic lupus erythematosus (SLE); ulcerative colitis; Crohn's disease; benign lymphocytic vasculitis; thrombocytopenic purpura; sudden thrombocytopenia; idiopathic autoimmune hemolytic anemia; pure red cell aplasia; Sjogren's syndrome; a rheumatic disease; a connective tissue disease; inflammatory rheumatism; degenerative rheumatism; nonarticular rheumatism; juvenile rheumatoid arthritis; muscle rheumatism; chronic polyarthritis; cryoglobulin vasculitis; ANCA-associated vasculitis; antiphospholipid syndrome; myasthenia gravis; autoimmune hemolytic anemia; Guillain-Barre syndrome; chronic immune polyneuropathy;

autoimmune thyroiditis; insulin-dependent diabetes mellitus; type 1 diabetes mellitus; Addison's disease; membranous glomerulonephropathy; Goodpasture's disease; autoimmune gastritis; autoimmune atrophic gastritis; pernicious anemia; pemphigus; pemphigus vulgaris; hepatic cirrhosis; primary biliary cirrhosis; dermatomyositis; polymyositis; fibromyositis; muscle sclerosis; celiac disease; immunoglobulin A nephropathy; Henoch-Schönlein purpura; Evans' syndrome; psoriasis; psoriasis arthropathica; Graves' disease; Graves' ophthalmopathy; scleroderma; systemic scleroderma; progressive systemic scleroderma; primary biliary cirrhosis; Hashimoto's thyroiditis; primary myxedema; sympathetic ophthalmia; autoimmune uveitis; hepatitis; chronic active hepatitis; a collagen disease; ankylosing spondylitis; shoulder periarthritis; nodular panarteritis; chondrocalcinosis; Wegener's granulomatosis; microscopic polyangiitis; chronic urticaria; a bullous skin disease; pemphigoid; Devic's disease; pediatric autoimmune hemolytic anemia; refractory or chronic autoimmune cytopenia; acquired hemophilia A; cold agglutinin disease; neuromyelitis optica; stiff person syndrome; pancreatitis; myocarditis; vasculitis; gastritis; gout; gouty arthritis; psoriasis; normocomplementemic urticarial vasculitis; pericarditis; myositis; anti-synthetase syndrome; scleritis; macrophage activation syndrome; Behcet's syndrome; PAPA syndrome; Blau syndrome; adult and juvenile Still's disease; cryopyrin-associated periodic syndrome; Muckle-Wells syndrome; familial cold autoinflammatory syndrome; neonatal-onset multisystem inflammatory disease; familial Mediterranean fever; chronic infantile neurological cutaneous and articular syndrome; systemic-onset juvenile idiopathic arthritis; hyper IgD syndrome; Schnitzler's syndrome; autoimmune retinopathy; atherosclerosis; chronic prostatitis; and TNF receptor-associated periodic syndrome (TRAPS).

[Claim 47]

— The method according to claim 46, wherein the autoimmune disease is multiple sclerosis or a collagen disease.

[Claim 48]

— The method according to claim 46 or 47, wherein the collagen disease is one or multiple diseases selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, scleroderma, dermatomyositis, polyarteritis nodosa, a mixed connective tissue disease, Sjögren's syndrome, microscopic polyangiitis, eosinophilic granulomatosis with polyangiitis, hypersensitivity vasculitis, Behcet's disease, Cogan's syndrome, RS3PE, giant cell arteritis, adult-onset Still's disease, polymyalgia rheumatica, fibromyalgia, and SAPHO

syndrome.

{Claim 49}

_____ The method according to any one of claims 42 to 48, wherein the antibody or the fragment thereof is the antibody or the fragment thereof according to any one of claims 1 to 16.

{Claim 50}

_____ The method according to any one of claims 42 to 49, further comprising a step of administering an agent for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing.

[Claim 51]

The antibody or the fragment thereof according to any one of claims 1 to 16, for use in treatment or prevention of a disease caused by an overactive immune response mediated by lymphocyte homing.

{Claim 52}

_____ The antibody or the fragment thereof according to claim 51, wherein the disease caused by an overactive immune response mediated by lymphocyte homing is an immune-related disease.

{Claim 53}

_____ The antibody or the fragment thereof according to claim 52, wherein the immune-related disease is an allergic disease or an autoimmune disease.

{Claim 54}

_____ The antibody or the fragment thereof according to claim 53, wherein the immune-related disease is an allergic disease selected from the group consisting of allergic rhinitis, atopic dermatitis, food allergy, oral allergy syndrome, drug allergy, pollen allergy, allergic conjunctivitis, eosinophilic pneumonia, allergic gastroenteritis, urticaria, photosensitive disorder, metal allergy, cat allergy, mite allergy, and asthma.

{Claim 55}

_____ The antibody or the fragment thereof according to claim 53, wherein the immune-related disease is an autoimmune disease selected from the group consisting of multiple sclerosis including relapsing remitting multiple sclerosis, primary progressive multiple sclerosis, and secondary progressive multiple sclerosis; psoriasis; rheumatoid arthritis; psoriatic arthritis; systemic lupus erythematosus (SLE); ulcerative colitis; Crohn's disease;

benign lymphocytic vasculitis; thrombocytopenic purpura; sudden thrombocytopenia; idiopathic autoimmune hemolytic anemia; pure red cell aplasia; Sjogren's syndrome; a rheumatic disease; a connective tissue disease; inflammatory rheumatism; degenerative rheumatism; nonarticular rheumatism; juvenile rheumatoid arthritis; muscle rheumatism; chronic polyarthritis; cryoglobulin vasculitis; ANCA-associated vasculitis; antiphospholipid syndrome; myasthenia gravis; autoimmune hemolytic anemia; Guillain-Barre syndrome; chronic immune polyneuropathy; autoimmune thyroiditis; insulin-dependent diabetes mellitus; type 1 diabetes mellitus; Addison's disease; membranous glomerulonephropathy; Goodpasture's disease; autoimmune gastritis; autoimmune atrophic gastritis; pernicious anemia; pemphigus; pemphigus vulgaris; hepatic cirrhosis; primary biliary cirrhosis; dermatomyositis; polymyositis; fibromyositis; muscle sclerosis; celiac disease; immunoglobulin A nephropathy; Henoch-Schonlein purpura; Evans' syndrome; psoriasis; psoriasis arthropathica; Graves' disease; Graves' ophthalmopathy; scleroderma; systemic scleroderma; progressive systemic scleroderma; primary biliary cirrhosis; Hashimoto's thyroiditis; primary myxedema; sympathetic ophthalmia; autoimmune uveitis; hepatitis; chronic active hepatitis; a collagen disease; ankylosing spondylitis; shoulder periartthritis; nodular panarteritis; chondrocalcinosis; Wegener's granulomatosis; microscopic polyangiitis; chronic urticaria; a bullous skin disease; pemphigoid; Devic's disease; pediatric autoimmune hemolytic anemia; refractory or chronic autoimmune cytopenia; acquired hemophilia A; cold agglutinin disease; neuromyelitis optica; stiff person syndrome; pancreatitis; myocarditis; vasculitis; gastritis; gout; gouty arthritis; psoriasis; normocomplementemic urticarial vasculitis; pericarditis; myositis; anti-synthetase syndrome; scleritis; macrophage activation syndrome; Behcet's syndrome; PAPA syndrome; Blau syndrome; adult and juvenile Still's disease; cryopyrin-associated periodic syndrome; Muckle-Wells syndrome; familial cold autoinflammatory syndrome; neonatal-onset multisystem inflammatory disease; familial Mediterranean fever; chronic infantile neurological cutaneous and articular syndrome; systemic-onset juvenile idiopathic arthritis; hyper IgD syndrome; Schnitzler's syndrome; autoimmune retinopathy; atherosclerosis; chronic prostatitis; and TNF receptor-associated periodic syndrome (TRAPS).

[Claim 56]

——— The antibody or the fragment thereof according to claim 55, wherein the autoimmune disease is multiple sclerosis or a collagen disease.

[Claim 57]

~~The antibody or the fragment thereof according to claim 55 or 56, wherein the collagen disease is one or multiple diseases selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, scleroderma, dermatomyositis, polyarteritis nodosa, a mixed connective tissue disease, Sjogren's syndrome, microscopic polyangiitis, eosinophilic granulomatosis with polyangiitis, hypersensitivity vasculitis, Behcet's disease, Cogan's syndrome, RS3PE, giant cell arteritis, adult-onset Still's disease, polymyalgia rheumatica, fibromyalgia, and SAPHO syndrome.~~

[Claim 5837]

Use of the antibody or the fragment thereof according to any one of claims 1 to 16, a polynucleotide encoding the antibody or the fragment thereof, or an expression vector comprising the polynucleotide in the manufacture of a medicament for producing a medicine for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing, wherein an effective amount of the medicament is to be administered to a subject.

[Claim 5938]

The use according to claim ~~5837~~, wherein the disease caused by an overactive immune response mediated by lymphocyte homing is an immune-related disease.

[Claim ~~6039~~]

The use according to claim ~~5938~~, wherein the immune-related disease is an allergic disease or an autoimmune disease.

[Claim ~~6140~~]

The use according to claim ~~6039~~, wherein the immune-related disease is an allergic disease selected from the group consisting of allergic rhinitis, atopic dermatitis, food allergy, oral allergy syndrome, drug allergy, pollen allergy, allergic conjunctivitis, eosinophilic pneumonia, allergic gastroenteritis, urticaria, photosensitive disorder, metal allergy, cat allergy, mite allergy, and asthma.

[Claim ~~6241~~]

The use according to claim ~~6039~~, wherein the immune-related disease is an autoimmune disease selected from the group consisting of multiple sclerosis including relapsing-remitting multiple sclerosis, primary progressive multiple sclerosis, and secondary progressive multiple sclerosis; psoriasis; rheumatoid arthritis; psoriatic arthritis; systemic

lupus erythematosus (SLE); ulcerative colitis; Crohn's disease; benign lymphocytic vasculitis;
 thrombocytopenic purpura; sudden thrombocytopenia; idiopathic autoimmune hemolytic
 anemia; pure red-cell aplasia; Sjogren's syndrome; a rheumatic disease; a connective tissue
 disease; inflammatory rheumatism; degenerative rheumatism; nonarticular rheumatism;
 5 juvenile rheumatoid arthritis; muscle rheumatism; chronic polyarthritis; cryoglobulin
 vasculitis; ANCA-associated vasculitis; antiphospholipid syndrome; myasthenia gravis;
 autoimmune hemolytic anemia; Guillain-Barre syndrome; chronic immune polyneuropathy;
 autoimmune thyroiditis; insulin-dependent diabetes mellitus; type 1 diabetes mellitus;
 Addison's disease; membranous glomerulonephropathy; Goodpasture's disease; autoimmune
 10 gastritis; autoimmune atrophic gastritis; pernicious anemia; pemphigus; pemphigus vulgaris;
 hepatic cirrhosis; primary biliary cirrhosis; dermatomyositis; polymyositis; fibromyositis;
 muscle sclerosis; celiac disease; immunoglobulin A nephropathy; Henoch-Schonlein purpura;
 Evans' syndrome; ~~psoriasis~~; psoriasis arthropathica; Graves' disease; Graves' ophthalmopathy;
 scleroderma; systemic scleroderma; progressive systemic scleroderma; primary biliary
 15 cirrhosis; Hashimoto's thyroiditis; primary myxedema; sympathetic ophthalmia; autoimmune
 uveitis; hepatitis; chronic active hepatitis; a collagen disease; ankylosing spondylitis; shoulder
 periartthritis; nodular panarteritis; chondrocalcinosis; Wegener's granulomatosis; microscopic
 polyangiitis; chronic urticaria; a bullous skin disease; pemphigoid; Devic's disease; pediatric
 autoimmune hemolytic anemia; refractory or chronic autoimmune cytopenia; acquired
 20 hemophilia A; cold agglutinin disease; neuromyelitis optica; stiff-person syndrome;
 pancreatitis; myocarditis; vasculitis; gastritis; gout; gouty arthritis; ~~psoriasis~~;
 normocomplementemic urticarial vasculitis; pericarditis; myositis; anti-synthetase syndrome;
 scleritis; macrophage activation syndrome; Behcet's syndrome; PAPA syndrome; Blau
 syndrome; adult and juvenile Still's disease; cryopyrin-associated periodic syndrome; Muckle-
 25 Wells syndrome; familial cold autoinflammatory syndrome; neonatal-onset multisystem
 inflammatory disease; familial Mediterranean fever; chronic infantile neurological cutaneous
 and articular syndrome; systemic-onset juvenile idiopathic arthritis; hyper IgD syndrome;
 Schnitzler's syndrome; autoimmune retinopathy; atherosclerosis; chronic prostatitis; and TNF
 receptor-associated periodic syndrome (TRAPS).

30 [Claim ~~6342~~]

The use according to claim ~~6241~~, wherein the autoimmune disease is multiple
 sclerosis or a collagen disease.

[Claim ~~64~~43]

The use according to claim ~~62~~41 or ~~63~~42, wherein the collagen disease is one or multiple diseases selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, scleroderma, dermatomyositis, polyarteritis nodosa, a mixed connective tissue disease, Sjogren's syndrome, microscopic polyangiitis, eosinophilic granulomatosis with polyangiitis, hypersensitivity vasculitis, Behcet's disease, Cogan's syndrome, RS3PE, giant cell arteritis, adult-onset Still's disease, polymyalgia rheumatica, fibromyalgia, and SAPHO syndrome.

[Claim 44]

The use according to any one of claims 37 to 43, further comprising an agent for treating or preventing a disease caused by an overactive immune response mediated by lymphocyte homing to be administered to the subject.