CLAIMS

[Claim 1]

An antibody or an antigen binding fragment of the antibody, characterized in that:

the heavy chain sequence contains a variable region having CDRH1, CDRH2, and CDRH3, and the CDRH1 comprises an amino acid sequence represented by SEQ ID NO: 7, the CDRH2 comprises an amino acid sequence represented by SEQ ID NO: 9, and the CDRH3 comprises an amino acid sequence represented by SEQ ID NO: 11; and

the light chain sequence contains a variable region having CDRL1, CDRL2, and CDRL3, and the CDRL1 comprises an amino acid sequence represented by SEQ ID NO: 12, the CDRL2 comprises an amino acid sequence represented by SEQ ID NO: 13, and the CDRL3 comprises an amino acid sequence represented by SEQ ID NO: 14.

[Claim 2]

The antibody or an antigen binding fragment of the antibody according to claim 1, characterized by comprising a heavy chain variable region sequence comprising amino acid residues 20 to 140 of an amino acid sequence represented by SEQ ID NO: 6 and a light chain variable region sequence comprising amino acid residues 21 to 133 of an amino acid sequence represented by SEQ ID NO: 4.

[Claim 3]

The antibody or an antigen binding fragment of the antibody according to claim 1, characterized by comprising a heavy chain sequence comprising amino acid residues 20 to 466 of an amino acid sequence represented by SEQ ID NO: 6 and a light chain sequence comprising amino acid residues 21 to 238 of an amino acid sequence represented by SEQ ID NO: 4.

[Claim 4]

The antibody or an antigen binding fragment of the antibody according to claim 1, characterized by comprising a heavy chain sequence comprising amino acid residues 20 to 465 of an amino acid sequence represented by SEQ ID NO: 6 and a light chain sequence comprising amino acid residues 21 to 238 of an amino acid sequence represented by SEQ ID NO: 4.

[Claim 5]

The antigen binding fragment of the antibody according to claim 1 or 2, which is selected from the group consisting of Fab, F(ab')2, Fab' and Fv.

[Claim 6]

The antibody according to claim 1 or 2, characterized by being an scFv.

[Claim 7]

A pharmaceutical composition, characterized by comprising at least one of the antibodies or antigen binding fragments of the antibodies according to claims 1 to 6.

[Claim 8]

The pharmaceutical composition according to claim 7, characterized by being a therapeutic and/or prophylactic agent for abnormal bone metabolism.

[Claim 9]

A pharmaceutical composition for the treatment and/or prophylaxis of abnormal bone metabolism, characterized by comprising at least one of the antibodies or antigen binding fragments of the antibodies according to claims 1 to 6 and at least one selected from the group consisting of bisphosphonates, active vitamin D_3, calcitonin and derivatives thereof, hormones such as estradiol, SERMs (selective estrogen receptor modulators), ipriflavone, vitamin K_2 (menatetrenone), calcium preparations, PTH (parathyroid hormone), nonsteroidal anti-inflammatory agents, soluble TNF receptors, anti-TNF-α antibodies or antigen binding fragments of the antibodies, anti-PTHrP (parathyroid hormone-related protein) antibodies or antigen binding fragments of the antibodies, IL-1 receptor antagonists, anti-IL-6 receptor antibodies or antigen binding fragments of the antibodies, anti-RANKL antibodies or antigen binding fragments of the antibodies, and OCIF (osteoclastogenesis inhibitory factor).

[Claim 10]

The pharmaceutical composition according to claim 8 or 9, wherein the abnormal bone metabolism is selected from the group consisting of osteoporosis, bone destruction

accompanying rheumatoid arthritis, cancerous hypercalcemia, bone destruction accompanying multiple myeloma or cancer metastasis to bone, giant cell tumor, osteopenia, tooth loss due to periodontitis, osteolysis around a prosthetic joint, bone destruction in chronic osteomyelitis, bone Paget's disease, renal osteodystrophy, and osteogenesis imperfecta.

[Claim 11]

The pharmaceutical composition according to claim 10, characterized in that the abnormal bone metabolism is osteoporosis, bone destruction accompanying rheumatoid arthritis, or bone destruction accompanying cancer metastasis to bone.

[Claim 12]

The pharmaceutical composition according to claim 11, characterized in that the abnormal bone metabolism is osteoporosis.

[Claim 13]

The pharmaceutical composition according to claim 12, characterized in that the osteoporosis is postmenopausal osteoporosis, senile osteoporosis, secondary osteoporosis due to the use of a therapeutic agent such as a steroid or an immunosuppressant, or osteoporosis accompanying rheumatoid arthritis.

[Claim 14]

A method for the treatment and/or prophylaxis of abnormal

bone metabolism, characterized by administering at least one of the antibodies or antigen binding fragments of the antibodies according to claims 1 to 6 or the pharmaceutical composition according to claim 8 or 9.

[Claim 15]

A method for the treatment and/or prophylaxis of abnormal bone metabolism, characterized by simultaneously or successively administering at least one of the antibodies or antigen binding fragments of the antibodies according to claims 1 to 6 or the pharmaceutical composition according to claim 8 and at least one selected from the group consisting of bisphosphonates, active vitamin D_3, calcitonin and derivatives thereof, hormones such as estradiol, SERMs (selective estrogen receptor modulators), ipriflavone, vitamin K_2 (menatetrenone), calcium preparations, PTH (parathyroid hormone), nonsteroidal anti-inflammatory agents, soluble TNF receptors, anti-TNF-α antibodies or antigen binding fragments of the antibodies, anti-PTHrP (parathyroid hormone-related protein) antibodies or antigen binding fragments of the antibodies, IL-1 receptor antagonists, anti-IL-6 receptor antibodies or antigen binding fragments of the antibodies, anti-RANKL antibodies or antigen binding fragments of the antibodies, and OCIF (osteoclastogenesis inhibitory factor).

[Claim 16]

The method for the treatment and/or prophylaxis

according to claim 14 or 15, characterized in that the abnormal bone metabolism is osteoporosis, bone destruction accompanying rheumatoid arthritis, or bone destruction accompanying cancer metastasis to bone.

[Claim 17]

The method for the treatment and/or prophylaxis according to claim 16, characterized in that the abnormal bone metabolism is osteoporosis.

[Claim 18]

The method for the treatment and/or prophylaxis according to claim 17, characterized in that the osteoporosis is postmenopausal osteoporosis, senile osteoporosis, secondary osteoporosis due to the use of a therapeutic agent such as a steroid or an immunosuppressant, or osteoporosis accompanying rheumatoid arthritis.

[Claim 19]

A polynucleotide encoding the antibody according to any one of claims 1 to 6.

[Claim 20]

The polynucleotide according to claim 19, characterized by comprising a polynucleotide comprising a nucleotide sequence comprising nucleotides 58 to 420 of a nucleotide sequence represented by SEQ ID NO: 5 and a polynucleotide comprising a nucleotide sequence comprising nucleotides 61 to 399 of a nucleotide sequence represented by SEQ ID NO: 3.

[Claim 21]

The polynucleotide according to claim 19, characterized by comprising a polynucleotide comprising a nucleotide sequence comprising nucleotides 58 to 1398 of a nucleotide sequence represented by SEQ ID NO: 5 and a polynucleotide comprising a nucleotide sequence comprising nucleotides 61 to 714 of a nucleotide sequence represented by SEQ ID NO: 3.

[Claim 22]

A vector, comprising any one of the polynucleotides according to claims 19 to 21.

[Claim 23]

A transformed host cell, comprising any one of the polynucleotides according to claims 19 to 21.

[Claim 24]

A transformed host cell, comprising the vector according to claim 22.

[Claim 25]

A method of producing the antibody according to any one of claims 1 to 6, comprising culturing the host cell according to claim 23 or 24, and purifying an antibody from the resulting culture product.

CLAIMS

1. An antibody or an antigen binding fragment, comprising:

a heavy chain sequence that comprises a variable region having CDRH1, CDRH2, and CDRH3, wherein CDRH1 comprises SEQ ID NO: 7, CDRH2 comprises SEQ ID NO: 9, and CDRH3 comprises SEQ ID NO: 11; and

a light chain sequence that comprises a variable region having CDRL1, CDRL2, and CDRL3, wherein CDRL1 comprises SEQ ID NO: 12, CDRL2 comprises SEQ ID NO: 13, and CDRL3 comprises SEQ ID NO: 14,

wherein the antibody or antigen binding fragment binds Siglec-15.

2. The antibody or an antigen binding fragment according to claim 1, comprising a heavy chain variable region sequence that comprises amino acid residues 20 to 140 of SEQ ID NO: 6 and a light chain variable region sequence that comprises amino acid residues 21 to 133 of SEQ NO: 4.

3. The antibody or an antigen binding fragment according to claim 1, comprising a heavy chain sequence that comprises amino acid residues 20 to 466 of SEQ ID NO: 6 and a light chain sequence that comprises amino acid residues 21 to 238 of SEQ ID NO: 4.

4. The antibody or an antigen binding fragment according to claim 1, comprising a heavy chain sequence that comprises amino acid residues 20 to 465 of SEQ ID NO: 6 and

a light chain sequence that comprises amino acid residues 21 to 238 of SEQ ID NO: 4.

5. The antigen binding fragment according to claim 1, which is selected from the group consisting of Fab, F(ab')2, Fab' and Fv.

6. The antibody according to claim 1, wherein the antibody is an scFv.

7. A pharmaceutical composition, characterized by comprising at least one antibody or antigen binding fragment according to claim 1, wherein said antibody or antigen binding fragment inhibits osteoclast formation and/or osteoclastic bone resorption.

8. The pharmaceutical composition according to claim 7, wherein the composition is a therapeutic and/or prophylactic agent for abnormal bone metabolism, wherein said abnormal bone metabolism is characterized by insufficient bone mass or density.

9. A pharmaceutical composition for the treatment and/or prophylaxis of abnormal bone metabolism, comprising at least one antibody or antigen binding fragment according to claim 1, wherein said antibody or antigen binding fragment inhibits osteoclast formation and/or osteoclastic bone resorption, and wherein said abnormal

bone metabolism is characterized by insufficient bone mass or density, and at least one therapeutic agent selected from the group consisting of bisphosphonates, active vitamin D_3, calcitonin and derivatives thereof, hormones, estradiol, SERMs (selective estrogen receptor modulators), ipriflavone, vitamin K_2 (menatetrenone), calcium preparations, PTH (parathyroid hormone), nonsteroidal anti-inflammatory agents, soluble TNF receptors, anti-TNF-α antibodies or antigen binding fragments of the antibodies, anti-PTHrP (parathyroid hormone-related protein) antibodies or antigen binding fragments of the antibodies, IL-1 receptor antagonists, anti-IL-6 receptor antibodies or antigen binding fragments of the antibodies, anti-RANKL antibodies or antigen binding fragments of the antibodies, and OCIF (osteoclastogenesis inhibitory factor).

10. The pharmaceutical composition according to claim 8, wherein the abnormal bone metabolism is selected from the group consisting of osteoporosis, bone destruction accompanying rheumatoid arthritis, cancerous hypercalcemia, bone destruction accompanying multiple myeloma or cancer metastasis to bone, giant cell tumor, osteopenia, tooth loss due to periodontitis, osteolysis around a prosthetic joint, bone destruction in chronic osteomyelitis, bone Paget's disease, renal osteodystrophy, and osteogenesis imperfecta.

11. The pharmaceutical composition according to claim 10, wherein the abnormal bone metabolism is osteoporosis, bone destruction accompanying rheumatoid arthritis, or bone destruction accompanying cancer metastasis to bone.

12. The pharmaceutical composition according to claim 11, characterized in that the abnormal bone metabolism is osteoporosis.

13. The pharmaceutical composition according to claim 12, wherein the osteoporosis is postmenopausal osteoporosis, senile osteoporosis, secondary osteoporosis due to the use of a therapeutic agent, or osteoporosis accompanying rheumatoid arthritis.

14. A polynucleotide encoding the antibody according to claim 1.

15. The polynucleotide according to claim 14, comprising a nucleotide sequence that comprises nucleotides 58 to 420 of SEQ ID NO: 5 and a nucleotide sequence that comprises nucleotides 61 to 399 of SEQ ID NO: 3.

16. The polynucleotide according to claim 14, comprising a nucleotide sequence that comprises nucleotides 58 to 1398 of SEQ ID NO: 5 and a nucleotide sequence that comprises nucleotides 61 to 714 of SEQ ID NO: 3.

17. A vector, comprising a polynucleotide according to claim 14.

18. A transformed host cell, comprising a polynucleotide according to claim 14.

19. A transformed host cell, comprising the vector according to claim 17.

20. A method of producing an antibody, comprising culturing the host cell according to claim 18, and purifying an antibody from the resulting culture product.

21. The antibody or antigen binding fragment according to claim 1, wherein the heavy chain includes a deletion of one or two amino acids from the carboxyl terminus.

22. The antibody or antigen binding fragment according to claim 1, wherein glycosylation is controlled to enhance an antibody-dependent cytotoxic activity.

23. An immunoconjugate comprising the antibody according to claim 1 and a compound having a pharmacological effect.