THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An isolated antibody which binds to a polypeptide comprising amino acid residues 39 to 165 of an amino acid sequence represented by SEQ ID NO: 2 and inhibits osteoclast formation and/or osteoclastic bone resorption, or a functional fragment of the antibody, wherein the antibody or functional fragment thereof comprises:

a heavy chain sequence containing a variable region having CDRH1, CDRH2, and CDRH3, and the CDRH1 comprises an amino acid sequence represented by SEQ ID NO: 44, the CDRH2 comprises any one of amino acid sequences represented by SEQ ID NO: 45 and SEQ ID NO: 97, and the CDRH3 comprises an amino acid sequence represented by SEQ ID NO: 46; and

a light chain sequence containing a variable region having CDRL1, CDRL2, and CDRL3, and the CDRL1 comprises an amino acid sequence represented by SEQ ID NO: 47, the CDRL2 comprises an amino acid sequence represented by SEQ ID NO: 48, and the CDRL3 comprises an amino acid sequence represented by SEQ ID NO: 49, and

wherein the antibody is not:

(i) the antibody produced by hybridoma FERM BP-10999 or a functional fragment, humanised variant or chimeric variant of the antibody produced by hybridoma FERM BP-10999 ; or

(ii) a polyspecific antibody derived from the antibody produced by hybridoma FERM BP-10999 or a functional fragment, humanised variant or chimeric variant thereof.

2. The antibody or a functional fragment of the antibody according to claim 1, which contains a heavy chain variable

region sequence comprising amino acid residues 20 to 140 of an amino acid sequence represented by SEQ ID NO: 41 and a light chain variable region sequence comprising amino acid residues 21 to 132 of an amino acid sequence represented by SEQ ID NO: 43; and wherein the heavy chain has a constant region of a human immunoglobulin G2 heavy chain and the light chain has a constant region of a human immunoglobulin K light chain.

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

4. The isolated antibody according to claim 1 or claim 2, wherein the antibody is an scFv.

5. The isolated antibody or a functional fragment of the isolated antibody according to any one of claims 1 to 3, wherein the antibody is a chimeric antibody.

6. The isolated antibody or a functional fragment of the isolated antibody according to any one of claims 1 to 3, or 5, wherein the antibody is humanized.

7. The isolated antibody according to claim 6 when dependent from claims 1, 3 or 5, wherein the heavy chain has a constant region of a human immunoglobulin G2 heavy chain and the light chain has a constant region of a human immunoglobulin K light chain.

8. A pharmaceutical composition, wherein said pharmaceutical composition comprises at least one of the antibodies or functional fragments of the antibodies according to any one of claims 1 to 7.

9. The pharmaceutical composition according to claim 8, wherein said pharmaceutical composition is a therapeutic and/or preventive agent for abnormal bone metabolism.

10. A pharmaceutical composition for treating and/or preventing abnormal bone metabolism, which comprises at least one of the antibodies or functional fragments of the antibodies according to any one of claims 1 to 7 and at least one member selected from the group consisting of bisphosphonates, active vitamin D3, calcitonin and derivatives thereof, hormones, SERMs (selective estrogen receptor modulators), ipriflavone, vitamin K2 (menatetrenone), calcium preparations, PTH (parathyroid hormone), nonsteroidal anti-inflammatory agents, soluble TNF receptors, anti-TNF-α antibodies or functional fragments of the antibodies, anti-PTHrP (parathyroid hormone-related protein) antibodies or functional fragments of the antibodies, IL-1 receptor antagonists, anti-IL-6 receptor antibodies or functional fragments of the antibodies, anti-RANKL antibodies or functional fragments of the antibodies, and OCIF (osteoclastogenesis inhibitory factor).

11. The pharmaceutical composition according to claim 9 or claim 10, 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, Paget's disease of bone, renal osteodystrophy, and osteogenesis imperfecta.

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

destruction accompanying rheumatoid arthritis, or bone destruction accompanying cancer metastasis to bone.

13. The pharmaceutical composition according to claim 12, wherein the abnormal bone metabolism is osteoporosis.

14. 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.

15. Use of an antibody according to any one of claims 1 to 7 or a functional fragment thereof for the manufacture of a medicament for treating and/or preventing abnormal bone metabolism.

16. Use of an antibody according to any one of claims 1 to 7 or a functional fragment thereof for the manufacture of a medicament for treating and/or preventing abnormal bone metabolism, wherein said medicament is for simultaneous or successive administration with at least one member selected from the group consisting of bisphosphonates, active vitamin D3, calcitonin and derivatives thereof, hormones, SERMs (selective estrogen receptor modulators), ipriflavone, vitamin K2 (menatetrenone), calcium preparations, PTH (parathyroid hormone), nonsteroidal anti-inflammatory agents, soluble TNF receptors, anti-TNF-α antibodies or functional fragments of the antibodies, anti-PTHrP (parathyroid hormone-related protein) antibodies or functional fragments of the antibodies, IL-1 receptor antagonists, anti-IL-6 receptor antibodies or functional fragments of the antibodies, anti-RANKL antibodies or functional fragments of the antibodies, and OCIF (osteoclastogenesis inhibitory factor).

17. The use according to claim 15 or claim 16, wherein the abnormal bone metabolism is osteoporosis, bone destruction accompanying rheumatoid arthritis, or bone destruction accompanying cancer metastasis to bone.

18. The use according to claim 17, wherein the abnormal bone metabolism is osteoporosis.

19. The use according to claim 18, wherein the osteoporosis is postmenopausal osteoporosis, senile osteoporosis, secondary osteoporosis due to the use of a therapeutic agent, or osteoporosis accompanying rheumatoid arthritis.

20. The pharmaceutical composition according to any one of claims 10 to 14, or the use according to claim 15, wherein the hormones are estradiol.

21. The pharmaceutical composition according to claim 14 or the use according to claim 19 wherein the therapeutic agent is a steroid or an immunosuppressant.

22. An isolated polynucleotide encoding the antibody according to claim 2.

23. The isolated polynucleotide according to claim 22, wherein said polynucleotide contains a nucleotide sequence comprising nucleotides 58 to 420 of a nucleotide sequence represented by SEQ ID NO: 40 and a nucleotide sequence comprising nucleotides 61 to 396 of a nucleotide sequence represented by SEQ ID NO: 42.

24. The isolated polynucleotide according to claim 23, wherein said polynucleotide contains a nucleotide sequence comprising nucleotides 58 to 1410 of a nucleotide sequence represented by SEQ ID NO: 40 and a nucleotide sequence comprising nucleotides

61 to 711 of a nucleotide sequence represented by SEQ ID NO: 42.

25. A vector, comprising any one of the polynucleotides according to any one of claims 22 to 24.

26. A transformed host cell, comprising any one of the polynucleotides according to any one of claims 22 to 24.

27. A transformed host cell, comprising the vector according to claim 25.

28. A method of producing the antibody according to claim 2, comprising culturing the host cell according to claim 26 or claim 27, and purifying an antibody from the resulting culture product.