

{CLAIMS}

{Claim 1}

A pharmaceutical composition for preventing or treating a bone disease, comprising:

- 5 an inhibitor of the expression or activity of transmembrane 4 L six family member 19 (TM4SF19) as an active ingredient.

{Claim 2}

10 The composition of claim 1, wherein the inhibitor of TM4SF19 expression or activity is one or more selected from the group consisting of an antisense nucleotide, small hairpin RNA (shRNA), small interfering RNA (siRNA), microRNA (miRNA) and a ribozyme, which complementarily bind to mRNA of a TM4SF19 gene.

{Claim 3}

15 The composition of claim 1, wherein the inhibitor of the expression or activity of TM4SF19 is one or more selected from the group consisting of a compound, a peptide, a peptide mimetic, an aptamer, a fusion protein and an antibody, which specifically bind to a TM4SF19 protein.

20 {Claim 4}

The composition of claim 3, wherein the fusion protein specifically binding to the TM4SF19 protein comprises a TM4SF19 fragment and the immunoglobulin Fc domain.

[Claim 5]

The composition of claim 4, wherein the TM4SF19 fragment comprises all or a part of the extracellular loop 2 region of TM4SF19.

5 [Claim 6]

The composition of claim 1, wherein the bone disease is one or more selected from the group consisting of a metabolic bone disease, an orthopedic bone disease, aplastic bone disease, degenerative bone disease, degenerative arthritis, rheumatoid arthritis, psoriatic arthritis, psoriatic spondylitis, age-related bone loss, osteoporosis, 10 osteogenesis imperfecta, osteomalacia, sarcopenia, fractures, bone defect and hip arthrosis, rickets, Paget's bone disease, periodontal disease, and bone damage caused by the bone metastasis of cancer cells.

[Claim 7]

15 A method of screening a drug for treating a bone disease, comprising:
treating a specimen suspected of a bone disease with a candidate for treating a bone disease; and
comparing the mRNA or protein expression level of a TM4SF19 gene with a control.

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~~[Claim 8]~~

~~A pharmaceutical composition for preventing or treating obesity or an obesity-mediated metabolic disease, comprising:~~

~~an inhibitor of transmembrane 4 L six family member 19 (TM4SF19) expression or activity as an active ingredient.~~

~~[Claim 9]~~

5 ~~The composition of claim 8, wherein the inhibitor of TM4SF19 expression or activity is one or more selected from the group consisting of an antisense nucleotide, small hairpin RNA (shRNA), small interfering RNA (siRNA), microRNA (miRNA) and a ribozyme, which complementarily bind to mRNA of a TM4SF19 gene.~~

10 ~~[Claim 10]~~

~~The composition of claim 8, wherein the inhibitor of the expression or activity of TM4SF19 is one or more selected from the group consisting of a compound, a peptide, a peptide mimetic, an aptamer, a fusion protein and an antibody, which specifically bind to a TM4SF19 protein.~~

15 ~~[Claim 11]~~

~~The composition of claim 10, wherein the fusion protein specifically binding to the TM4SF19 protein comprises a TM4SF19 fragment and the immunoglobulin Fc domain.~~

20 ~~[Claim 12]~~

~~The composition of claim 11, wherein the TM4SF19 fragment comprises all or a part of the extracellular loop 2 region of TM4SF19.~~

[Claim 13]

The composition of claim 8, wherein the obesity-mediated metabolic disease is one or more selected from the group consisting of diabetes, high blood pressure, hyperlipidemia, non-alcoholic steatohepatitis and specific cancers, and more broadly, includes high blood pressure, diabetes, insulin-resistant syndrome, metabolic syndrome, obesity-related gastroesophageal reflux disease, arteriosclerosis, hyperlipidemia, hypertriglyceridemia, hypercholesterolemia, lipodystrophy, non-alcoholic steatohepatitis, cardiovascular disease, and polycystic ovary syndrome.

[Claim 14]

A method of screening a drug for treating obesity or an obesity-mediated metabolic disease, comprising:

treating a specimen suspected of obesity or an obesity-mediated metabolic disease with a candidate material for treating obesity or an obesity-mediated metabolic disease; and

comparing the mRNA or protein expression level of a TM4SF19 gene with a control.

[Claim 15]

A pharmaceutical composition for preventing or treating cancer, or inhibiting cancer metastasis, comprising an inhibitor of transmembrane 4 L six family member 19 (TM4SF19) expression or activity as an active ingredient.

[Claim 16]

~~The composition of claim 15, wherein the inhibitor of TM4SF19 expression or activity is one or more selected from the group consisting of an antisense nucleotide, small hairpin RNA (shRNA), small interfering RNA (siRNA), microRNA (miRNA) and a ribozyme, which complementarily bind to mRNA of a TM4SF19 gene.~~

~~[Claim 17]~~

~~The composition of claim 15, wherein the inhibitor of the expression or activity of TM4SF19 is one or more selected from the group consisting of a compound, a peptide, a peptide mimetic, an aptamer, a fusion protein and an antibody, which specifically bind to a TM4SF19 protein.~~

~~[Claim 18]~~

~~The composition of claim 17, wherein the fusion protein specifically binding to the TM4SF19 protein comprises a TM4SF19 fragment and the immunoglobulin Fc domain.~~

~~[Claim 19]~~

~~The composition of claim 18, wherein the TM4SF19 fragment comprises all or a part of the extracellular loop 2 region of TM4SF19.~~

~~[Claim 20]~~

~~The composition of claim 15, wherein the cancer is one or more selected from the group consisting of colorectal cancer, stomach cancer, colon cancer, breast~~

~~cancer, lung cancer, non-small cell lung cancer, bone cancer, pancreatic cancer, skin cancer, head or neck cancer, melanoma, uterine cancer, ovarian cancer, small intestine cancer, rectal cancer, perianal cancer, fallopian tube carcinoma, endometrial carcinoma, cervical carcinoma, vaginal carcinoma, vulvar carcinoma, esophageal cancer, lymphatic adenocarcinoma, bladder cancer, gallbladder cancer, endocrine cancer, thyroid cancer, parathyroid cancer, adrenal cancer, soft tissue sarcoma, urethral cancer, penile cancer, prostate cancer, chronic or acute leukemia, lymphocytic lymphoma, bladder cancer, kidney or ureter cancer, renal cell carcinoma, renal pelvic carcinoma, central nervous system (CNS) tumors, spinal cord tumors, brainstem glioma, and pituitary adenomas.~~

~~{Claim 21}~~

~~A method of screening a drug for treating cancer or cancer metastasis, comprising:~~

~~treating a specimen suspected of cancer or cancer metastasis with a candidate for preventing or treating cancer or inhibiting cancer metastasis; and
comparing the mRNA or protein expression level of a TM4SF19 gene with a control.~~

~~{Claim 22 8}~~

A fusion protein for inhibiting transmembrane 4 L six family member 19 (TM4SF19) expression or activity, comprising an extracellular loop 2-derived fragment of a TM4SF19 protein and the immunoglobulin Fc domain.

~~{Claim-23_9}~~

The fusion protein of claim-~~22_8~~, wherein the extracellular loop 2 (EC2)-derived fragment of the TM4SF19 protein corresponds all or a part of EC2.

5 ~~{Claim-24_10}~~

The fusion protein of claim-~~22_8~~, wherein the amino acid sequence region corresponding to all of EC2 is the region of amino acids 120-169 of a human TM4SF19 protein or the region of amino acids 116-165 of a mouse TM4SF19 protein.

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~~{Claim-25_11}~~

The fusion protein of claim-~~22_8~~, wherein the amino acid sequence region corresponding to a part of EC2 is the region of amino acids 145-169 of a human TM4SF19 protein.

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~~{Claim-26_12}~~

The fusion protein of claim-~~22_8~~, which comprises an amino acid sequence represented by SEQ ID NO: 10, SEQ ID NO: 13, SEQ ID NO: 16, or SEQ ID NO: 19.

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~~{Claim-27}~~

~~A method of preventing or treating a bone disease, comprising:—~~

~~administering a therapeutically effective amount of composition for preventing or treating a bone disease including an inhibitor of transmembrane 4 L six family member 19 (TM4SF19) expression or activity into a subject.~~

5 ~~[Claim 28]~~

~~A method of preventing or treating obesity or an obesity-mediated metabolic disease, comprising:~~

10 ~~administering a therapeutically effective amount of composition for preventing or treating obesity or an obesity-mediated metabolic disease including an inhibitor of transmembrane 4 L six family member 19 (TM4SF19) expression or activity into a subject.~~

~~[Claim 29]~~

15 ~~A method of preventing or treating cancer or cancer metastasis, comprising:~~
~~administering a therapeutically effective amount of composition for preventing or treating cancer or inhibiting cancer metastasis including an inhibitor of transmembrane 4 L six family member 19 (TM4SF19) expression or activity into a subject.~~