

CLAIMS

1. An antibody capable of specifically binding to IL-17A or a functional fragment capable of specifically binding to IL-17A thereof, wherein the antibody or the functional fragment thereof comprise a light chain and a heavy chain;

the light chain comprises a light chain CDR consisting of CDR-L1, CDR-L2 and CDR-L3; the heavy chain comprises a heavy chain CDR consisting of CDR-H1, CDR-H2 and CDR-H3;

the amino acid sequences of the CDR-L1, CDR-L2 and CDR-L3 are respectively set forth in SEQ ID NO: 1, 2 and 3; the amino acid sequences of the CDR-H1, CDR-H2 and CDR-H3 are respectively set forth in SEQ ID NO: 4, 5 and 6;

preferably, the antibody or the functional fragment thereof includes an IL-17A chimeric antibody and a functional fragment thereof, and an IL-17A humanized antibody and a functional fragment thereof.

2. The antibody or the functional fragment thereof according to claim 1, wherein the antibody comprises a constant region sequence of any one selected from the group consisting of human IgG1, IgG2, IgG3, IgG4, IgA, IgM, IgE and IgD.

3. The antibody or the functional fragment thereof according to claim 1 or 2, wherein the functional fragment comprises one or more selected from the group consisting of F(ab')₂, Fab', Fab, Fv, scFv, bispecific antibody and antibody minimal recognition unit.

4. The antibody or the functional fragment thereof according to any one of claims 1 to 3, wherein the amino acid sequences of light chain variable region and heavy chain variable region of the IL-17A chimeric antibody or the functional fragment thereof are respectively set forth in SEQ ID NO: 7 and SEQ ID NO:8;

preferably, the amino acid sequence of the light chain constant region and the heavy chain constant region of the IL-17A chimeric antibody and functional fragment thereof are respectively set forth in SEQ ID NO: 9 and SEQ ID NO: 10.

5. The antibody or the functional fragment thereof according to any one of claims 1 to 3, wherein light chain framework region of the IL-17A humanized antibody or the functional fragment thereof comprises FR-L1, FR-L2, FR-L3 and FR-L4, and heavy chain framework region of the IL-17A humanized antibody or the functional fragment thereof comprises FR-H1, FR-H2, FR-H3 and FR-H4;

the FR-L1 is selected from the amino acid sequence set forth in SEQ ID NO: 11 and the amino sequence having the following substitution or a combination thereof:

the 1st amino acid D is replaced by I;

the 2nd amino acid V is replaced by I;

the FR-L2 is selected from the amino acid sequence set forth in SEQ ID NO: 12 and the amino sequence having the following substitution or a combination thereof:

the 4th amino acid F is replaced by Y;

the 14th amino acid R is replaced by L;

the FR-L3 is selected from the amino acid sequence set forth in SEQ ID NO: 13 and the amino sequence having the following substitution or a combination thereof:

the 35th amino acid Y is replaced by F;

the FR-L4 is selected from the amino acid sequence set forth in SEQ ID NO: 14;

the FR-H1 is selected from the amino acid sequence set forth in SEQ ID NO: 15 and the amino sequence having the following substitution or a combination thereof:

the 4th amino acid L is replaced by V;

the FR-H2 is selected from the amino acid sequence set forth in SEQ ID NO: 16 and the amino sequence having the following substitution or a combination thereof:

the 15th amino acid I is replaced by M;

the FR-H3 is selected from the amino acid sequence set forth in SEQ ID NO: 17 and the amino sequence having the following substitution or a combination thereof:

the 2nd amino acid V is replaced by I;

the 6th amino acid V is replaced by R;

the FR-H4 is selected from the amino acid sequence set forth in SEQ ID NO: 18;

preferably, light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is one selected from SEQ ID NO: 19-26;

preferably, heavy chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is one selected from SEQ ID NO: 27-34;

more preferably, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 19; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 27;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 20; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 28;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 21; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 29;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 22; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 30;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 22; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 31;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 23; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 32;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 24; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 33;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 25; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 32;

alternatively, the light chain variable region sequence of the IL-17A humanized antibody or the functional fragment thereof is set forth in SEQ ID NO: 26; the corresponding heavy chain variable region sequence is set forth in SEQ ID NO: 34;

more preferably, the amino acid sequences of the light chain constant region and the heavy chain constant region of the IL-17A humanized antibody or the functional fragment thereof are respectively set forth in SEQ ID NO: 9 and SEQ ID NO: 10.

6. An isolated nucleic acid molecule selected from:

A) DNA or RNA, encoding the antibody or the functional fragment thereof according to any one of claims 1 to 5; and

B) a nucleic acid complementary to the nucleic acid as defined in A).

7. A composition, comprising the antibody or the functional fragment thereof according to any one of claims 1 to 5, or a compound of the antibody or the functional fragment thereof together with other components, as an active ingredient.

8. The composition according to claim 7, wherein the antibody or the functional fragment thereof are coupled to at least one diagnostic agent and/or therapeutic agent to form an immunoconjugate.

9. The composition according to claim 8, wherein the diagnostic agent is one or more selected from the group consisting of a radionuclide, a radioactive contrast agent, a paramagnetic ion, a metal, a fluorescent label, a chemiluminescent label, an ultrasound contrast agent, and a photosensitizer;

preferably, the radionuclide is one or more selected from the group consisting of ^{110}In , ^{111}In , ^{177}Lu , ^{18}F , ^{52}Fe , ^{62}Cu , ^{64}Cu , ^{67}Cu , ^{67}Ga , ^{68}Ga , ^{86}Y , ^{90}Y , ^{89}Zr , $^{94\text{m}}\text{Tc}$, ^{94}Tc , $^{99\text{m}}\text{Tc}$, ^{120}I , ^{123}I , ^{124}I , ^{125}I , ^{131}I , $^{154-158}\text{Gd}$, ^{32}P , ^{11}C , ^{13}N , ^{15}O , ^{186}Re , ^{188}Re , ^{51}Mn , $^{52\text{m}}\text{Mn}$, ^{55}Co , ^{72}As , ^{75}Br , ^{76}Br , $^{82\text{m}}\text{Rb}$ and ^{83}Sr ;

preferably, the paramagnetic ion is one or more selected from the group consisting of chromium (III), manganese (II), iron (III), iron (II), cobalt (II), nickel (II), copper

(II), neodymium (III), samarium (III), ytterbium (III), gadolinium (III), vanadium (II), terbium (III), dysprosium (III), holmium (III) and erbium (III);

preferably, the fluorescent label is one or more selected from the group consisting of Alexa 350, Alexa 405, Alexa 430, Alexa 488, Alexa 555, Alexa 647, AMCA, aminoacridine, BODIPY 630/650, BODIPY 650/665, BODIPY-FL, BODIPY-R6G, BODIPY-TMR, BODIPY-TRX, 5-carboxy-4',5'-dichloro-2',7'-dimethoxyfluorescein, 5-carboxy-2',4',5',7'-tetrachlorofluorescein, 5-carboxyfluorescein, 5-carboxyrhodamine, 6-carboxyrhodamine, 6-carboxytetramethylrhodamine, Cascade Blue, Cy2, Cy3, Cy5, Cy7, 6-FAM, dansyl chloride, fluorescein, HEX, 6-JOE, NBD (7-nitrobenzo-2-oxa-1,3-diazole), Oregon Green 488, Oregon Green 500, Oregon Green 514, Pacific Blue, phthalic acid, terephthalic acid, isophthalic acid, cresyl fast violet, cresyl violet, brilliant cresyl blue, 4-aminobenzoic acid, erythrosine, phthalocyanine, azomethine, cyanine, xanthine, succinyl fluorescein, rare earth metal cryptate, tri-bipyridyldiamine europium, europium cryptate compound or chelate, diamine, dicyanine, La Jolla blue dye, allophycocyanin, allococyanin B, phycocyanin C, phycocyanin R, thiamine, R-phycoerythrin, C-Phycocyanin, phycoerythrin R, REG, rhodamine green, rhodamine isothiocyanate, rhodamine red, ROX, TAMRA, TET, TRIT (tetramethylrhodamine isothiol), tetramethylrhodamine and Texas Red.

10. The composition according to claim 8 or 9, wherein the therapeutic agent is one or more selected from the group consisting of a naked antibody, a cytotoxic agent, a drug, a radionuclide, a boron atom, an immunomodulator, an anti-apoptotic agent, a photosensitizing therapeutic, an immunoconjugate and an oligonucleotide;

preferably, the drug is one or more selected from the group consisting of dexamethasone, diclofenac, nabumetone, meloxicam, celecoxib, methotrexate, cyclophosphamide, azathioprine, cyclosporine A and vincristine;

preferably, the oligonucleotide is one or more selected from the group consisting of shRNA, miRNA and siRNA;

preferably, the immunomodulator is one or more selected from the group consisting of a cytokine, a chemokine, a stem cell growth factor, a lymphotoxin, a

hematopoietic factor, a colony stimulating factor (CSF), an interferon, an erythropoietin, a thrombopoietin, an interleukin (IL), granulocyte-colony stimulating factor (G-CSF), granulocyte macrophage-colony stimulating factor (GM-CSF) and stem cell growth factor;

preferably, the radionuclide is one or more selected from the group consisting of ¹¹¹In, ¹¹¹At, ¹⁷⁷Lu, ²¹¹Bi, ²¹²Bi, ²¹³Bi, ²¹¹At, ⁶²Cu, ⁶⁷Cu, ⁹⁰Y, ¹²⁵I, ¹³¹I, ¹³³I, ³²P, ³³P, ⁴⁷Sc, ¹¹¹Ag, ⁶⁷Ga, ¹⁵³Sm, ¹⁶¹Tb, ¹⁵²Dy, ¹⁶⁶Dy, ¹⁶¹Ho, ¹⁶⁶Ho, ¹⁸⁶Re, ¹⁸⁸Re, ¹⁸⁹Re, ²¹¹Pb, ²¹²Pb, ²²³Ra, ²²⁵Ac, ⁷⁷As, ⁸⁹Sr, ⁹⁹Mo, ¹⁰⁵Rh, ¹⁴⁹Pm, ¹⁶⁹Er, ¹⁹⁴Ir, ⁵⁸Co, ⁸⁰mBr, ⁹⁹mTc, ¹⁰³mRh, ¹⁰⁹Pt, ¹¹⁹Sb, ¹⁸⁹mOs, ¹⁹²Ir, ²¹⁹Rn, ²¹⁵Po, ²²¹Fr, ²⁵⁵Fm, ¹¹C, ¹³N, ¹⁵O, ⁷⁵Br, ¹⁹⁸Au, ¹⁹⁹Au, ²²⁴Ac, ⁷⁷Br, ¹¹³mIn, ⁹⁵Ru, ⁹⁷Ru, ¹⁰³Ru, ¹⁰⁵Ru, ¹⁰⁷Hg, ²⁰³Hg, ¹²¹mTe, ¹²²mTe, ¹²⁵mTe, ¹⁶⁵Tm, ¹⁶⁷Tm, ¹⁶⁸Tm, ¹⁹⁷Pt, ¹⁰⁹Pd, ¹⁴²Pr, ¹⁴³Pr, ¹⁶¹Tb, ⁵⁷Co, ⁵⁸Co, ⁵¹Cr, ⁵⁹Fe, ⁷⁵Se, ²⁰¹Tl, ⁷⁶Br and ¹⁶⁹Yb.

11. Use of the composition according to any one of claims 7 to 10 for the manufacture of a medicament in prevention and/or treatment of a disease associated with overexpression and/or over-release of IL-17A;

preferably, the disease is one or more selected from the group consisting of airway inflammation, asthma, bronchial asthma, allergic asthma, chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, psoriatic arthritis, psoriasis, multiple sclerosis, systemic sclerosis, systemic lupus erythematosus, lupus nephritis, scleroderma, ulcerative colitis, inflammatory bowel disease, uveitis, helicobacter pylori-associated gastritis, osteoporosis, bone erosion, intraperitoneal abscess and adhesions, Addison's disease, gamma globulin deficiency, alopecia areata, celiac disease, Chagas disease, Crohn's disease, allograft rejection, Behcet's disease, sepsis, septic or endotoxin shock and ischemia.

12. Use of the antibody capable of specifically binding to IL-17A or the functional fragment capable of specifically binding to IL-17A thereof according to any one of

claims 1 to 5 for the manufacture of a medicament in prevention and/or treatment of a disease associated with overexpression and/or over-release of IL-17A;

preferably, the disease is one or more selected from the group consisting of airway inflammation, asthma, bronchial asthma, allergic asthma, chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, psoriatic arthritis, psoriasis, multiple sclerosis, systemic sclerosis, systemic lupus erythematosus, lupus nephritis, scleroderma, ulcerative colitis, inflammatory bowel disease, uveitis, helicobacter pylori-associated gastritis, osteoporosis, bone erosion, intraperitoneal abscess and adhesions, Addison's disease, gamma globulin deficiency, alopecia areata, celiac disease, Chagas disease, Crohn's disease, allograft rejection, Behcet's disease, sepsis, septic or endotoxin shock and ischemia.

13. A drug for prevention and/or treatment of a disease associated with overexpression and/or over-release of IL-17A, comprising the antibody capable of specifically binding to IL-17A or the functional fragment capable of specifically binding to IL-17A thereof according to any one of claims 1 to 5, and a pharmaceutically acceptable carrier;

alternatively, the drug comprises the composition according to any one of claims 7 to 10 and a pharmaceutically acceptable carrier;

preferably, the disease is one or more selected from the group consisting of airway inflammation, asthma, bronchial asthma, allergic asthma, chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, psoriatic arthritis, psoriasis, multiple sclerosis, systemic sclerosis, systemic lupus erythematosus, lupus nephritis, scleroderma, ulcerative colitis, inflammatory bowel disease, uveitis, helicobacter pylori-associated gastritis, osteoporosis, bone erosion, intraperitoneal abscess and adhesions, Addison's disease, gamma globulin deficiency, alopecia areata, celiac disease, Chagas disease, Crohn's disease, allograft rejection, Behcet's disease, sepsis, septic or endotoxin shock and ischemia.

14. Use of the drug according to claim 13 for the manufacture of a medicament in prevention and/or treatment of a disease associated with overexpression and/or over-release of IL-17A.