CLAIMS

1. A humanized antibody capable of binding to mucin subtype 5AC, comprising

a heavy chain variable region consisting of

(1) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 1,

(2) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 2,

(3) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 3, or

(4) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 4,

and

a light chain variable region consisting of

(5) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 5,

(6) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 6,

(7) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 7, or,

(8) an amino acid sequence having not less than 98% sequence identity with the amino acid sequence shown in SEQ ID NO: 8,

or an antigen-binding fragment thereof.

2. The humanized antibody or an antigen-binding fragment thereof according to claim 1, comprising

a heavy chain variable region consisting of

(1) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 1,

(2) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 2,

(3) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 3, or

(4) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 4, and

a light chain variable region consisting of

(5) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 5,

(6) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 6,

(7) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 7, or,

(8) an amino acid sequence having not less than 99% sequence identity with the amino acid sequence shown in SEQ ID NO: 8.

3. The humanized antibody or an antigen-binding fragment thereof according to claim 1 or 2, comprising

a heavy chain variable region consisting of

(1) an amino acid sequence shown in SEQ ID NO: 1,

(2) an amino acid sequence shown in SEQ ID NO: 2,

(3) an amino acid sequence shown in SEQ ID NO: 3, or

(4) an amino acid sequence shown in SEQ ID NO: 4, and

a light chain variable region consisting of

(5) an amino acid sequence shown in SEQ ID NO: 5,

(6) an amino acid sequence shown in SEQ ID NO: 6,

(7) an amino acid sequence shown in SEQ ID NO: 7, or,

(8) an amino acid sequence shown in SEQ ID NO: 8~~, or an antigen-binding fragment thereof~~.

4. The humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 3, comprising

a heavy chain variable region consisting of the amino acid sequence shown in SEQ ID NO: 1, and a light chain variable region consisting of the amino acid sequence shown in SEQ ID NO: 7.

5. A humanized antibody capable of binding to mucin subtype 5AC, comprising

(1) a heavy chain variable region consisting of an amino acid sequence having not less than 95% sequence identity with the amino acid sequence shown in SEQ ID NO: 1,

(7) a light chain variable region consisting of an amino acid sequence having not less than 95% sequence identity with the amino acid sequence shown in SEQ ID NO: 7, and

having stable physical property and tumor accumulation, or an antigen-binding fragment thereof.

6. The humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 3, having stable physical property and tumor accumulation.

7. The humanized antibody or an antigen-binding fragment thereof according to claim 5 or 6,

wherein the stable physical property is one or more selected from a group consisting of (i) a denaturation midpoint temperature (Tm1) of not less than 50°C and (ii) an aggregation start temperature (Tagg) of not less than 50°C.

8. The humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 7, having an in vitro binding activity to mucin subtype 5AC comparable to or greater than that of a chimeric antibody

wherein the chimeric antibody comprises a heavy chain variable region consisting of the amino acid sequence shown in SEQ ID NO: 14, and a light chain variable region consisting of the amino acid sequence shown in SEQ ID NO: 15.

9. A composition comprising the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8.

10. A pharmaceutical composition comprising the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, and a pharmaceutically acceptable carrier.

11. A pharmaceutical composition for use in therapy of a cancer overexpressing mucin subtype 5AC, comprising the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, and a pharmaceutically acceptable carrier.

12. The pharmaceutical composition for use according to claim 11, wherein the cancer is pancreatic cancer, thyroid cancer, liver cancer, colorectal cancer, gastric cancer, urothelial cancer, breast cancer, cervical cancer, ovarian cancer, endometrial carcinoma, or bile duct cancer.

13. A nucleic acid encoding the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8.

14. An expression vector comprising the nucleic acid according to claim 13.

15. A host cell comprising the expression vector according to claim 14.

16. A method for producing a humanized antibody or an antigen-binding fragment thereof in the host cell according to claim 15, comprising

(1) a step of inserting a nucleic acid encoding the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8 into an expression vector,

(2) a step of introducing the nucleic acid of step (1)

into a host cell by the expression vector containing the nucleic acid,

(3) a step of culturing the host cell containing the expression vector, and

(4) a step of isolating the humanized antibody or an antigen-binding fragment thereof from a culture supernatant of the host cell by purifying by chromatography.

17. Use of the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8 in producing the composition according to claim 9, or the pharmaceutical composition according to any one of claims 10 to 12.

18. A method for evaluating an expression level of mucin subtype 5AC in a cell or a tissue, comprising

(1) a step of obtaining a labeled humanized antibody or an antigen-binding fragment thereof by attaching a label to the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, wherein the label enables detection of the antibody or the antigen-binding fragment,

(2) a step of contacting the cell or tissue with the labeled humanized antibody or an antigen-binding fragment thereof, and

(3) a step of measuring the amount of the label bound to the cell or tissue, and evaluating based thereon an expression level of mucin subtype 5AC expressed in the cell or tissue.

19. A therapeutic agent for a cancer overexpressing mucin subtype 5AC, comprising an effective amount of a pharmaceutical composition comprising the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, and a pharmaceutically acceptable carrier.

20. A method for measuring the volume of a cancer overexpressing mucin subtype 5AC in a subject, comprising

(1) a step of obtaining a labeled humanized antibody or an antigen-binding fragment thereof by attaching a label to the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, wherein the label enables detection of the antibody or the antigen-binding fragment,

(2) a step of contacting in vitro a tissue of the subject and a tissue of a healthy subject with the labeled humanized antibody or an antigen-binding fragment thereof,

(3) a step of measuring the amount of the label in the tissue of the subject and the tissue of the healthy subject, and

(4) a step of comparing the amount of the label measured in the tissue of the subject with a standard amount which is the amount of the label measured in the tissue of the healthy subject, and a step of measuring the volume of a cancerous tissue in a part where the amount measured in the subject is larger than the standard amount.

21. A method for measuring a volume of a cancer overexpressing mucin subtype 5AC in a subject, comprising

(1) a step of obtaining a labeled humanized antibody or an antigen-binding fragment thereof by attaching a label to the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8, wherein the label enables detection of the antibody or the antibody-binding fragment,

(2) a step of detecting in vitro the label in a tissue of the subject administered with the labeled humanized antibody or an antigen-binding fragment thereof, and

(3) a step of measuring the volume of the cancer by

measuring the volume of a part where accumulation of the labeled humanized antibody or an antigen-binding fragment thereof was detected in the above-mentioned step (2).

22. A kit for the treatment and/or diagnosis of a cancer overexpressing mucin subtype 5AC, comprising the humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8 with a label that enables detection of the antibody or an antigen-binding antibody fragment thereof.

23. A humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8 for use in therapy.

24. Use of a humanized antibody or an antigen-binding fragment thereof according to any one of claims 1 to 8 in the manufacture of a medicament for treating a cancer overexpressing mucin subtype 5AC.

25. The use according to claim 24, wherein the cancer is pancreatic cancer, thyroid cancer, liver cancer, colorectal cancer, gastric cancer, urothelial cancer, breast cancer, cervical cancer, ovarian cancer, endometrial carcinoma, or bile duct cancer.