Claims

[Claim 1]

An antibody specifically binding to Glycoprotein-A Repetitions Predominant (GARP), wherein the antibody has:
(i) CDRH1 consisting of the amino acid sequence at amino acid positions 26 to 35 shown in SEQ ID NO: 2, CDRH2 consisting of the amino acid sequence at amino acid positions 50 to 66 shown in SEQ ID NO: 2 and CDRH3 consisting of the amino acid sequence at amino acid positions 99 to 107 shown in SEQ ID NO: 2, and CDRL1 consisting of the amino acid sequence at amino acid positions 23 to 36 shown in SEQ ID NO: 3, CDRL2 consisting of the amino acid sequence at amino acid positions 52 to 58 shown in SEQ ID NO: 3 and CDRL3 consisting of the amino acid sequence at amino acid positions 91 to 101 shown in SEQ ID NO: 3, or
(ii) CDRH1 consisting of the amino acid sequence at amino acid positions 26 to 35 shown in SEQ ID NO: 4, CDRH2 consisting of the amino acid sequence at amino acid positions 50 to 66 shown in SEQ ID NO: 4 and CDRH3 consisting of the amino acid sequence at amino acid positions 99 to 112 shown in SEQ ID NO: 4, and CDRL1 consisting of the amino acid sequence at amino acid positions 23 to 36 shown in SEQ ID NO: 5, CDRL2 consisting of the amino acid sequence at amino acid positions 52 to 58 shown in SEQ ID NO: 5 and CDRL3

consisting of the amino acid sequence at amino acid positions 91 to 100 shown in SEQ ID NO: 5.

[Claim 2]

The antibody according to claim 1, wherein the antibody has an inhibitory activity to the immunosuppressive function of regulatory T cells.

[Claim 3]

The antibody according to claim 1 or 2, wherein the antibody has antibody-dependent cellular cytotoxic (ADCC) activity.

[Claim 4]

The antibody according to any one of claims 1 to 3, wherein the antibody has in vivo antitumor activity.

[Claim 5]

The antibody according to claim 4, wherein the tumor is a cancer.

[Claim 6]

The antibody according to claim 5, wherein the cancer is lung cancer, kidney cancer, urothelial cancer, colon cancer, prostate cancer, glioblastoma multiforme, ovarian cancer, pancreatic cancer, breast cancer, melanoma, liver cancer, bladder cancer, stomach cancer, esophageal cancer, or blood cancer.

[Claim 7]

The antibody according to any one of claims 1 to 6, which has:

(1) a heavy chain variable region consisting of the amino acid sequence at amino acid positions 1 to 118 shown in SEQ ID NO: 2, and a light chain variable region consisting of the amino acid sequence at amino acid positions 1 to 112 shown in SEQ ID NO: 3, or
(2) a heavy chain variable region consisting of the amino acid sequence at amino acid positions 1 to 123 shown in SEQ ID NO: 4, and a light chain variable region consisting of the amino acid sequence at amino acid positions 1 to 111 shown in SEQ ID NO: 5.

[Claim 8]

The antibody according to any one of claims 1 to 7, wherein the constant region is a human-derived constant region.

[Claim 9]

The antibody according to any one of claims 1 to 6, which has:
(1) a heavy chain consisting of the amino acid sequence shown in SEQ ID NO: 2, and a light chain consisting of the amino acid sequence shown in SEQ ID NO: 3, or
(2) a heavy chain consisting of the amino acid sequence shown in SEQ ID NO: 4, and a light chain consisting of the amino acid sequence shown in SEQ ID NO: 5.

[Claim 10]

The antibody according to any one of claims 1 to 9, which is humanized.

[Claim 11]

A polynucleotide encoding the antibody according to any one of claims 1 to 10.

[Claim 12]

The polynucleotide according to claim 11, which has:
(1) a polynucleotide of CDRH1 consisting of the nucleotide sequence at nucleotide positions 76 to 105 shown in SEQ ID NO: 6, a polynucleotide of CDRH2 consisting of the nucleotide sequence at nucleotide positions 148 to 198 shown in SEQ ID NO: 6 and a polynucleotide of CDRH3 consisting of the nucleotide sequence at nucleotide positions 295 to 321 shown in SEQ ID NO: 6, and a polynucleotide of CDRL1 consisting of the nucleotide sequence at nucleotide positions 67 to 108 shown in SEQ ID NO: 7, a polynucleotide of CDRL2 consisting of the nucleotide sequence at nucleotide positions 154 to 174 shown in SEQ ID NO: 7 and a polynucleotide of CDRL3 consisting of the nucleotide sequence at nucleotide positions 271 to 303 shown in SEQ ID NO: 7, or
(2) a polynucleotide of CDRH1 consisting of the nucleotide sequence at nucleotide positions 76 to 105 shown in SEQ ID NO: 8, a polynucleotide of CDRH2 consisting of the nucleotide sequence at nucleotide positions 148 to 198 shown in SEQ ID NO: 8 and a polynucleotide of CDRH3 consisting of the nucleotide sequence at nucleotide positions 295 to 336 shown in SEQ

ID NO: 8, and a polynucleotide of CDRL1 consisting of the nucleotide sequence at nucleotide positions 67 to 108 shown in SEQ ID NO: 9, a polynucleotide of CDRL2 consisting of the nucleotide sequence at nucleotide positions 154 to 174 shown in SEQ ID NO: 9 and a polynucleotide of CDRL3 consisting of the nucleotide sequence at nucleotide positions 271 to 300 shown in SEQ ID NO: 9.

[Claim 13]

The polynucleotide according to claim 11 or 12, which has:

(1) a polynucleotide of a heavy chain variable region consisting of the nucleotide sequence at nucleotide positions 1 to 354 shown in SEQ ID NO: 6, and a polynucleotide of a light chain variable region consisting of the nucleotide sequence at nucleotide positions 1 to 336 shown in SEQ ID NO: 7, or

(2) a polynucleotide of a heavy chain variable region consisting of the nucleotide sequence at nucleotide positions 1 to 369 shown in SEQ ID NO: 8, and a polynucleotide of a light chain variable region consisting of the nucleotide sequence at nucleotide positions 1 to 333 shown in SEQ ID NO: 9.

[Claim 14]

The polynucleotide according to any one of claims 11 to 13, which has:

(1) a polynucleotide of a heavy chain consisting of the nucleotide sequence shown in SEQ ID NO: 6, and a polynucleotide of a light chain consisting of the nucleotide sequence shown in SEQ ID NO: 7, or
(2) a polynucleotide of a heavy chain consisting of the nucleotide sequence shown in SEQ ID NO: 8, and a polynucleotide of a light chain consisting of the nucleotide sequence shown in SEQ ID NO: 9.

[Claim 15]

An expression vector comprising the polynucleotide according to any one of claims 11 to 14.

[Claim 16]

Host cells transformed with the expression vector according to claim 15.

[Claim 17]

A method for producing an antibody of interest or a fragment thereof, which comprises a step of culturing the host cells according to claim 16, and a step of collecting an antibody of interest from the culture obtained by the aforementioned step.

[Claim 18]

An antibody obtained by the production method according to claim 17.

[Claim 19]

The antibody according to any one of claims 1 to 10 and 18, comprising one or two or more modifications selected from the group consisting of N-linked

glycosylation, O-linked glycosylation, N-terminal processing, C-terminal processing, deamidation, isomerization of aspartic acid, oxidation of methionine, addition of a methionine residue to the N-terminus, amidation of a proline residue, and a heavy chain comprising a deletion of one or two amino acids at the carboxyl terminus.

[Claim 20]

The antibody according to claim 19, wherein one or two amino acids are deleted at the carboxyl terminus of a heavy chain thereof.

[Claim 21]

The antibody according to claim 20, wherein one amino acid is deleted at each of the carboxyl termini of both of the heavy chains thereof.

[Claim 22]

The antibody according to any one of claims 19 to 21, wherein a proline residue at the carboxyl terminus of a heavy chain thereof is further amidated.

[Claim 23]

The antibody according to any one of claims 1 to 10 and 18 to 22, wherein sugar chain modification is regulated in order to enhance antibody-dependent cellular cytotoxicity.

[Claim 24]

A pharmaceutical composition comprising at least one of the antibodies according to claims 1 to 10 and 18 to 23.

[Claim 25]

Use of at least one of the antibodies according to claims 1 to 10 and 18 to 23 for the manufacture of a medicament for treating a tumor in an individual.

[Claim 26]

The use according to claim 25, wherein the tumor is a cancer.

[Claim 27]

The use according to claim 26, wherein the cancer is lung cancer, kidney cancer, urothelial cancer, colon cancer, prostate cancer, glioblastoma multiforme, ovarian cancer, pancreatic cancer, breast cancer, melanoma, liver cancer, bladder cancer, stomach cancer, esophageal cancer, or blood cancer.

[Claim 28]

Use of an antibody in preparation of a medicament for treating a tumor in an individual, wherein the antibody has the following properties:

(1) specifically binding to Glycoprotein-A Repetitions Predominant (GARP);

(2) having an inhibitory activity to the immunosuppressive function of regulatory T cells;

(3) having antibody-dependent cellular cytotoxic (ADCC) activity; and

(4) having in vivo antitumor activity;

wherein the antibody binds to an amino acid sequence portion at amino acid positions 366 to 377, 407 to 445 and 456 to 470 shown in SEQ ID NO: 1, or an amino acid sequence portion at amino acid positions 54 to 112 and 366 to 392 shown in SEQ ID NO: 1.

[Claim 29]

The use according to claim 28, wherein the tumor is a cancer.

[Claim 30]

The use according to claim 29, wherein the cancer is lung cancer, kidney cancer, urothelial cancer, colon cancer, prostate cancer, glioblastoma multiforme, ovarian cancer, pancreatic cancer, breast cancer, melanoma, liver cancer, bladder cancer, stomach cancer, esophageal cancer, or blood cancer.