

CLAIMS

[Claim 1]

A monoclonal antibody or an antibody fragment thereof that binds to CCR8, which recognizes tyrosine at position 17 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 2]

The antibody or an antibody fragment thereof according to claim 1, which is a neutralizing antibody.

[Claim 3]

The antibody or an antibody fragment thereof according to claims 1 or 2, which further recognizes one or more of amino acids at positions 94 to 107 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 4]

The antibody or an antibody fragment thereof according to any one of claims 1 to 3, which further recognizes one or more of amino acids at positions 172 to 202 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 5]

The antibody or an antibody fragment thereof according to any one of claims 1 to 4, which recognizes one or more amino acids of isoleucine at position 20, serine at position 22, lysine at position 35, leucine at position 181, cysteine at position 183, and asparagine at position 188 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 6]

The antibody or an antibody fragment thereof according to any one of claims 1 to 5, which is a humanized monoclonal antibody or an antibody fragment thereof.

[Claim 7]

The monoclonal antibody or an antibody fragment thereof that binds to CCR8, having:

1) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2 optionally having deletion, substitution, insertion and/or addition of one or two amino acids,

a CDR2 having the amino acid sequence of SEQ ID NO: 3 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a CDR3 having the amino acid sequence of SEQ ID NO: 4 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 5 optionally having deletion, substitution, insertion and/or addition of one or two amino acids,

a CDR2 having the amino acid sequence of SEQ ID NO: 6 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a CDR3 having the amino acid sequence of SEQ ID NO: 7 optionally having deletion, substitution, insertion and/or addition of one or two amino acids;

2) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2 optionally having deletion, substitution, insertion and/or addition of one or two amino acids,

a CDR2 having the amino acid sequence of SEQ ID NO: 3 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a CDR3 having the amino acid sequence of SEQ ID NO: 4 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a heavy chain variable region including

3) a light chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 9 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a heavy chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 6 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

4) a light chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 3 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a heavy chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 6 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

5) a light chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 15 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

a heavy chain variable region including

a CDR2 having the amino acid sequence of SEQ ID NO: 18 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and

6) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 20 optionally having deletion, substitution, insertion and/or addition of one or two amino acids,
a CDR2 having the amino acid sequence of SEQ ID NO: 21 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and
a CDR3 having the amino acid sequence of SEQ ID NO: 22 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and
a heavy chain variable region including
a CDR1 having the amino acid sequence of SEQ ID NO: 23 optionally having deletion, substitution, insertion and/or addition of one or two amino acids,
a CDR2 having the amino acid sequence of SEQ ID NO: 24 optionally having deletion, substitution, insertion and/or addition of one or two amino acids, and
a CDR3 having the amino acid sequence of SEQ ID NO: 25 optionally having deletion, substitution, insertion and/or addition of one or two amino acids.

[Claim 8]

The antibody or an antibody fragment thereof according to claim 7, having:

1) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2,
a CDR2 having the amino acid sequence of SEQ ID NO: 3, and
a CDR3 having the amino acid sequence of SEQ ID NO: 4, and
a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 5,
a CDR2 having the amino acid sequence of SEQ ID NO: 6, and
a CDR3 having the amino acid sequence of SEQ ID NO: 7,

wherein one or more of the following substitutions are optionally present:

A) substitution of asparagine with lysine at position 10 in the amino acid sequence of SEQ ID NO: 2,

B) substitution of glycine with glutamine, threonine, alanine, lysine, leucine or arginine at position 11 in the amino acid sequence of SEQ ID NO: 2,

C) substitution of asparagine with glutamine at position 4 in the amino acid sequence of SEQ ID NO: 3,

D) substitution of leucine with isoleucine at position 5 in the amino acid sequence of SEQ ID NO: 3,

E) substitution of leucine with isoleucine at position 4 in the amino acid sequence of SEQ ID NO: 4,

F) substitution of tyrosine with phenylalanine at position 6 in the amino acid sequence of SEQ ID NO: 4,

G) substitution of serine with threonine at position 16 in the amino acid sequence of SEQ ID NO: 6, and

H) substitution of aspartic acid with glutamic acid at position 19 in the amino acid sequence of SEQ ID NO: 6;

2) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2,
a CDR2 having the amino acid sequence of SEQ ID NO: 3, and
a CDR3 having the amino acid sequence of SEQ ID NO: 4, and
a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 8,
a CDR2 having the amino acid sequence of SEQ ID NO: 6, and
a CDR3 having the amino acid sequence of SEQ ID NO: 7;

3) a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2,
 a CDR2 having the amino acid sequence of SEQ ID NO: 9, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 10, and
 a heavy chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 8,
 a CDR2 having the amino acid sequence of SEQ ID NO: 6, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 11,
 wherein one or more of the following substitutions are optionally present:
 A) substitution of serine with threonine at position 2 in the amino acid sequence of
 SEQ ID NO: 2,
 B) substitution of serine with threonine at position 3 in the amino acid sequence of
 SEQ ID NO: 2,
 C) substitution of serine with threonine at position 5 in the amino acid sequence of
 SEQ ID NO: 2,
 D) substitution of glutamine with asparagine at position 2 in the amino acid sequence
 of SEQ ID NO: 10,
 E) substitution of threonine with serine at position 1 in the amino acid sequence of
 SEQ ID NO: 8,
 F) substitution of alanine with valine at position 14 in the amino acid sequence of
 SEQ ID NO: 6,
 G) substitution of lysine with arginine at position 18 in the amino acid sequence of
 SEQ ID NO: 6,
 H) substitution of aspartic acid with glutamic acid at position 19 in the amino acid
 sequence of SEQ ID NO: 6,
 I) substitution of asparagine with glutamine at position 5 in the amino acid sequence
 of SEQ ID NO: 11, and
 J) substitution of tyrosine with phenylalanine at position 12 in the amino acid
 sequence of SEQ ID NO: 11;
 4) a light chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 2,
 a CDR2 having the amino acid sequence of SEQ ID NO: 3, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 10, and
 a heavy chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 12,
 a CDR2 having the amino acid sequence of SEQ ID NO: 6, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 13;
 5) a light chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 14,
 a CDR2 having the amino acid sequence of SEQ ID NO: 15, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 16, and
 a heavy chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 17,
 a CDR2 having the amino acid sequence of SEQ ID NO: 18, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 19; or
 6) a light chain variable region including
 a CDR1 having the amino acid sequence of SEQ ID NO: 20,
 a CDR2 having the amino acid sequence of SEQ ID NO: 21, and
 a CDR3 having the amino acid sequence of SEQ ID NO: 22, and
 a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 23,
a CDR2 having the amino acid sequence of SEQ ID NO: 24, and
a CDR3 having the amino acid sequence of SEQ ID NO: 25.
[Claim 9]

The antibody or an antibody fragment thereof according to claim 8, having:
a light chain variable region including
a CDR1 having the amino acid sequence of SEQ ID NO: 2,
a CDR2 having the amino acid sequence of SEQ ID NO: 3, and
a CDR3 having the amino acid sequence of SEQ ID NO: 4, and
a heavy chain variable region including
a CDR1 having the amino acid sequence of SEQ ID NO: 5,
a CDR2 having the amino acid sequence of SEQ ID NO: 6, and
a CDR3 having the amino acid sequence of SEQ ID NO: 7,
wherein one or more of the following substitutions are present:
A) substitution of asparagine with lysine at position 10 in the amino acid sequence of SEQ ID NO: 2;
B) substitution of glycine with glutamine, threonine, alanine, lysine, leucine or arginine at position 11 in the amino acid sequence of SEQ ID NO: 2;
C) substitution of asparagine with glutamine at position 4 in the amino acid sequence of SEQ ID NO: 3;
D) substitution of leucine with isoleucine at position 5 in the amino acid sequence of SEQ ID NO: 3;
E) substitution of leucine with isoleucine at position 4 in the amino acid sequence of SEQ ID NO: 4;
F) substitution of tyrosine with phenylalanine at position 6 in the amino acid sequence of SEQ ID NO: 4;
G) substitution of serine with threonine at position 16 in the amino acid sequence of SEQ ID NO: 6; and
H) substitution of aspartic acid with glutamic acid at position 19 in the amino acid sequence of SEQ ID NO: 6.

[Claim 10]

The antibody or an antibody fragment thereof according to claim 9, wherein one or more of the following substitutions are present:
A) substitution of asparagine with lysine at position 10 in the amino acid sequence of SEQ ID NO: 2;
B) substitution of glycine with leucine or arginine at position 11 in the amino acid sequence of SEQ ID NO: 2; and
C) substitution of asparagine with glutamine at position 4 in the amino acid sequence of SEQ ID NO: 3.

[Claim 11]

The antibody or an antibody fragment thereof according to claims 9 or 10, wherein
asparagine at position 4 in the amino acid sequence of SEQ ID NO: 3 is substituted with glutamine; and
further, any one of the following substitutions are optionally present:
A) substitution of asparagine with lysine at position 10 in the amino acid sequence of SEQ ID NO: 2; and
B) substitution of glycine with leucine or arginine at position 11 in the amino acid sequence of SEQ ID NO: 2.

[Claim 12]

The antibody or an antibody fragment thereof according to claim 11, wherein asparagine at position 4 in the amino acid sequence of SEQ ID NO: 3 is substituted with glutamine; and glycine at position 11 in the amino acid sequence of SEQ ID NO: 2 is substituted with arginine.

[Claim 13]

The antibody or an antibody fragment thereof according to claim 8, having:
a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2,

a CDR2 having the amino acid sequence of SEQ ID NO: 9, and

a CDR3 having the amino acid sequence of SEQ ID NO: 10, and

a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 8,

a CDR2 having the amino acid sequence of SEQ ID NO: 6, and

a CDR3 having the amino acid sequence of SEQ ID NO: 11;

wherein one or more of the following substitutions are present:

A) substitution of serine with threonine at position 2 in the amino acid sequence of SEQ ID NO: 2;

B) substitution of serine with threonine at position 3 in the amino acid sequence of SEQ ID NO: 2;

C) substitution of serine with threonine at position 5 in the amino acid sequence of SEQ ID NO: 2;

D) substitution of glutamine with asparagine at position 2 in the amino acid sequence of SEQ ID NO: 10;

E) substitution of threonine with serine at position 1 in the amino acid sequence of SEQ ID NO: 8;

F) substitution of alanine with valine at position 14 in the amino acid sequence of SEQ ID NO: 6;

G) substitution of lysine with arginine at position 18 in the amino acid sequence of SEQ ID NO: 6;

H) substitution of aspartic acid with glutamic acid at position 19 in the amino acid sequence of SEQ ID NO: 6;

I) substitution of asparagine with glutamine at position 5 in the amino acid sequence of SEQ ID NO: 11; and

J) substitution of tyrosine with phenylalanine at position 12 in the amino acid sequence of SEQ ID NO: 11.

[Claim 14]

The antibody or an antibody fragment thereof according to any one of claims 7 to 13, which is a humanized monoclonal antibody or an antibody fragment thereof.

[Claim 15]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 14, having:

a light chain variable region having

the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45, or 47, or

an amino acid sequence having 95% or more identity to the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45, or 47; and

a heavy chain variable region having

the amino acid sequence of SEQ ID NO: 41 or 46, or

an amino acid sequence having 95% or more identity to the amino acid sequence of

SEQ ID NO: 41 or 46.

[Claim 16]

The humanized monoclonal antibody or an antibody fragment thereof according to claims 14 or 15, having:

- 1) a light chain variable region having the amino acid sequence of SEQ ID NO: 40, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 2) a light chain variable region having the amino acid sequence of SEQ ID NO: 42, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 3) a light chain variable region having the amino acid sequence of SEQ ID NO: 43, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 4) a light chain variable region having the amino acid sequence of SEQ ID NO: 44, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 5) a light chain variable region having the amino acid sequence of SEQ ID NO: 45, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 6) a light chain variable region having the amino acid sequence of SEQ ID NO: 47, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41;
 - 7) a light chain variable region having the amino acid sequence of SEQ ID NO: 40, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46;
 - 8) a light chain variable region having the amino acid sequence of SEQ ID NO: 42, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46;
 - 9) a light chain variable region having the amino acid sequence of SEQ ID NO: 43, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46;
 - 10) a light chain variable region having the amino acid sequence of SEQ ID NO: 44, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46;
 - 11) a light chain variable region having the amino acid sequence of SEQ ID NO: 45, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46; or
 - 12) a light chain variable region having the amino acid sequence of SEQ ID NO: 47, and
a heavy chain variable region having the amino acid sequence of SEQ ID NO: 46,
- wherein one or more of the following substitutions are optionally present:
- A) substitution of asparagine with lysine at position 33 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;
 - B) substitution of glycine with glutamine, threonine, alanine, lysine, leucine or arginine at position 34 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;
 - C) substitution of asparagine with glutamine at position 58 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;
 - D) substitution of leucine with isoleucine at position 59 in the amino acid sequence of

SEQ ID NO: 40, 42, 43, 44, 45 or 47;

E) substitution of leucine with isoleucine at position 97 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

F) substitution of tyrosine with phenylalanine at position 99 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

G) substitution of serine with threonine at position 65 in the amino acid sequence of SEQ ID NO: 41 or 46; and

H) substitution of aspartic acid with glutamic acid at position 68 in the amino acid sequence of SEQ ID NO: 41 or 46.

[Claim 17]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 16, wherein one or more of the following substitutions are present:

A) substitution of asparagine with lysine at position 33 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

B) substitution of glycine with glutamine, threonine, alanine, lysine, leucine or arginine at position 34 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

C) substitution of asparagine with glutamine at position 58 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

D) substitution of leucine with isoleucine at position 59 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

E) substitution of leucine with isoleucine at position 97 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

F) substitution of tyrosine with phenylalanine at position 99 in the amino acid sequence of SEQ ID NO: 40, 42, 43, 44, 45 or 47;

G) substitution of serine with threonine at position 65 in the amino acid sequence of SEQ ID NO: 41 or 46; and

H) substitution of aspartic acid with glutamic acid at position 68 in the amino acid sequence of SEQ ID NO: 41 or 46.

[Claim 18]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 17, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 40 or 42, and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41, wherein one or more of the following substitutions are present:

A) substitution of asparagine with lysine at position 33 in the amino acid sequence of SEQ ID NO: 40 or 42;

B) substitution of glycine with glutamine, threonine, alanine, lysine, leucine or arginine at position 34 in the amino acid sequence of SEQ ID NO: 40 or 42;

C) substitution of asparagine with glutamine at position 58 in the amino acid sequence of SEQ ID NO: 40 or 42;

D) substitution of leucine with isoleucine at position 59 in the amino acid sequence of SEQ ID NO: 40 or 42;

E) substitution of leucine with isoleucine at position 97 in the amino acid sequence of SEQ ID NO: 40 or 42;

F) substitution of tyrosine with phenylalanine at position 99 in the amino acid sequence of SEQ ID NO: 40 or 42;

G) substitution of serine with threonine at position 65 in the amino acid sequence of

SEQ ID NO: 41; and

H) substitution of aspartic acid with glutamic acid at position 68 in the amino acid sequence of SEQ ID NO: 41.

[Claim 19]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 17 or 18, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 40 or 42, and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41, wherein one or more of the following substitutions are present:

A) substitution of asparagine with lysine at position 33 in the amino acid sequence of SEQ ID NO: 40 or 42;

B) substitution of glycine with leucine or arginine at position 34 in the amino acid sequence of SEQ ID NO: 40 or 42; and

C) substitution of asparagine with glutamine at position 58 in the amino acid sequence of SEQ ID NO: 40 or 42.

[Claim 20]

The humanized monoclonal antibody or an antibody fragment thereof according to any one of claim 17 to 19, having:

a light chain variable region having the amino acid sequence of SEQ ID NO: 40 or 42, and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41, wherein asparagine at position 58 in the amino acid sequence of SEQ ID NO: 40 or 42 is substituted with glutamine, and

further, any one of the following substitutions are optionally present:

A) substitution of asparagine with lysine at position 33 in the amino acid sequence of SEQ ID NO: 40 or 42; and

B) substitution of glycine with leucine or arginine at position 34 in the amino acid sequence of SEQ ID NO: 40 or 42.

[Claim 21]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 20, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 42, and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41, wherein asparagine at position 58 in the amino acid sequence of SEQ ID NO: 42 is substituted with glutamine, and glycine at position 34 in the amino acid sequence of SEQ ID NO: 42 is substituted with arginine.

[Claim 22]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 20, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 59, and a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41.

[Claim 23]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 14, having:

a light chain variable region having

the amino acid sequence of SEQ ID NO: 54, 55, or, 56, or

an amino acid sequence having 95% or more identity to the amino acid sequence of SEQ ID NO: 54, 55, or, 56; and

a heavy chain variable region having
the amino acid sequence of SEQ ID NO: 57 or 58, or
an amino acid sequence having 95% or more identity to the amino acid sequence of
SEQ ID NO: 57 or 58.

[Claim 24]

The humanized monoclonal antibody or an antibody fragment thereof according
to claims 14 or 23, having

1) a light chain variable region having the amino acid sequence of SEQ ID NO: 54,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 57;

2) a light chain variable region having the amino acid sequence of SEQ ID NO: 55,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 57;

3) a light chain variable region having the amino acid sequence of SEQ ID NO: 56,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 57;

4) a light chain variable region having the amino acid sequence of SEQ ID NO: 54,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 58;

5) a light chain variable region having the amino acid sequence of SEQ ID NO: 55,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 58;

6) a light chain variable region having the amino acid sequence of SEQ ID NO: 56,
and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 58,
wherein one or more of the following substitutions are optionally present:

A) substitution of serine with threonine at position 25 in the amino acid sequence of
SEQ ID NO: 54, 55 or 56;

B) substitution of serine with threonine at position 26 in the amino acid sequence of
SEQ ID NO: 54, 55 or 56;

C) substitution of serine with threonine at position 28 in the amino acid sequence of
SEQ ID NO: 54, 55 or 56;

D) substitution of glutamine with asparagine at position 95 in the amino acid
sequence of SEQ ID NO: 54, 55 or 56;

E) substitution of threonine with serine at position 31 in the amino acid sequence of
SEQ ID NO: 57 or 58;

F) substitution of alanine with valine at position 63 in the amino acid sequence of
SEQ ID NO: 57 or 58;

G) substitution of lysine with arginine at position 67 in the amino acid sequence of
SEQ ID NO: 57 or 58;

H) substitution of aspartic acid with glutamic acid at position 68 in the amino acid
sequence of SEQ ID NO: 57 or 58;

I) substitution of asparagine with glutamine at position 99 in the amino acid
sequence of SEQ ID NO: 57 or 58; and

J) substitution of tyrosine with phenylalanine at position 105 in the amino acid
sequence of SEQ ID NO: 57 or 58.

[Claim 25]

The humanized monoclonal antibody or an antibody fragment thereof according
to claim 24, having a light chain variable region having the amino acid sequence of

SEQ ID NO: 56, and a heavy chain variable region having the amino acid sequence of SEQ ID NO: 57, wherein one or more of the following substitutions are optionally present:

- A) substitution of serine with threonine at position 25 in the amino acid sequence of SEQ ID NO: 56;
- B) substitution of serine with threonine at position 26 in the amino acid sequence of SEQ ID NO: 56;
- C) substitution of serine with threonine at position 28 in the amino acid sequence of SEQ ID NO: 56;
- D) substitution of glutamine with asparagine at position 95 in the amino acid sequence of SEQ ID NO: 56;
- E) substitution of threonine with serine at position 31 in the amino acid sequence of SEQ ID NO: 57;
- F) substitution of alanine with valine at position 63 in the amino acid sequence of SEQ ID NO: 57;
- G) substitution of lysine with arginine at position 67 in the amino acid sequence of SEQ ID NO: 57;
- H) substitution of aspartic acid with glutamic acid at position 68 in the amino acid sequence of SEQ ID NO: 57;
- I) substitution of asparagine with glutamine at position 99 in the amino acid sequence of SEQ ID NO: 57; and
- J) substitution of tyrosine with phenylalanine at position 105 in the amino acid sequence of SEQ ID NO: 57.

[Claim 26]

The humanized monoclonal antibody or an antibody fragment thereof according to any one of claims 14 to 25, further having:

a light chain constant region having the amino acid sequence of SEQ ID NO: 52, and a heavy chain constant region having the amino acid sequence of SEQ ID NO: 53, wherein lysine is optionally added to the C-terminal end of SEQ ID NO: 53.

[Claim 27]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 26.

[Claim 28]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 26, for use in inhibiting a binding of CCR8 to a CCR8 ligand.

[Claim 29]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 26, for use as a neutralizing antibody.

[Claim 30]

A pharmaceutical composition comprising the monoclonal antibody or an antibody fragment thereof according to any one of claims 1 to 26 that binds to CCR8, for use in recognizing tyrosine at position 17 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 31]

The pharmaceutical composition according to claim 30, for use in inhibiting a binding of CCR8 to a CCR8 ligand.

[Claim 32]

The pharmaceutical composition according to any one of claims 27 to 31, wherein the antibody has ADCC activity.

[Claim 33]

The pharmaceutical composition according to any one of claims 27 to 31, wherein the antibody is an IgG antibody.

[Claim 34]

The pharmaceutical composition according to any one of claims 27 to 33, for use in treating cancer.

[Claim 35]

A polynucleotide encoding a light chain variable region or a heavy chain variable region of the antibody according to any one of claims 7 to 24.

[Claim 36]

An expression vector comprising the polynucleotide according to claim 35.

CLAIMS

[Claim 1]

A monoclonal antibody or an antibody fragment thereof that binds to CCR8, having:

a light chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 2,

a CDR2 having the amino acid sequence of SEQ ID NO: 3, and

a CDR3 having the amino acid sequence of SEQ ID NO: 4, and

a heavy chain variable region including

a CDR1 having the amino acid sequence of SEQ ID NO: 5,

a CDR2 having the amino acid sequence of SEQ ID NO: 6, and

a CDR3 having the amino acid sequence of SEQ ID NO: 7,

wherein asparagine at position 4 in the amino acid sequence of SEQ ID NO: 3 is substituted with glutamine; and glycine at position 11 in the amino acid sequence of SEQ ID NO: 2 is substituted with arginine.

[Claim 2]

The antibody or an antibody fragment thereof according to claim 1, which is a humanized monoclonal antibody or an antibody fragment thereof.

[Claim 3]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 2, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 42, and

a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41,

wherein asparagine at position 58 in the amino acid sequence of SEQ ID NO: 42 is substituted with glutamine, and glycine at position 34 in the amino acid sequence of SEQ ID NO: 42 is substituted with arginine.

[Claim 4]

The humanized monoclonal antibody or an antibody fragment thereof according to claim 2, having

a light chain variable region having the amino acid sequence of SEQ ID NO: 59, and a heavy chain variable region having the amino acid sequence of SEQ ID NO: 41.

[Claim 5]

The humanized monoclonal antibody or an antibody fragment thereof according to any one of claims 2 to 4, further having:

a light chain constant region having the amino acid sequence of SEQ ID NO: 52, and

a heavy chain constant region having the amino acid sequence of SEQ ID NO: 53,

wherein lysine is optionally added to the C-terminal end of SEQ ID NO: 53.

[Claim 6]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 5.

[Claim 7]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 5, for use in inhibiting a binding of CCR8 to a CCR8 ligand.

[Claim 8]

A pharmaceutical composition comprising the antibody or an antibody fragment thereof according to any one of claims 1 to 5, for use as a neutralizing antibody.

[Claim 9]

A pharmaceutical composition comprising the monoclonal antibody or an antibody fragment thereof according to any one of claims 1 to 5 that binds to CCR8, for use in recognizing tyrosine at position 17 in the amino acid sequence set forth in SEQ ID NO: 1.

[Claim 10]

The pharmaceutical composition according to claim 9, for use in inhibiting a binding of CCR8 to a CCR8 ligand.

[Claim 11]

The pharmaceutical composition according to any one of claims 6 to 10, wherein the antibody has ADCC activity.

[Claim 12]

The pharmaceutical composition according to any one of claims 6 to 10, wherein the antibody is an IgG antibody.

[Claim 13]

The pharmaceutical composition according to any one of claims 6 to 12, for use in treating cancer.

[Claim 14]

A polynucleotide encoding a light chain variable region or a heavy chain variable region of the antibody according to any one of claims 1 to 4.

[Claim 15]

An expression vector comprising the polynucleotide according to claim 14.