CLAIMS

[Claim 1]

A monoclonal antibody or an antibody fragment thereof, wherein the monoclonal antibody or antibody fragment thereof binds to a hemagglutinin stem region (HA stem region) of an influenza A virus.

[Claim 2]

The monoclonal antibody or antibody fragment thereof according to claim 1, wherein the monoclonal antibody or antibody fragment thereof binds to at least one peptide consisting of an amino acid sequence selected from the group consisting of SEQ ID NOs: 1 to 18.

[Claim 3]

The monoclonal antibody or antibody fragment thereof according to claim 1 or 2, wherein the monoclonal antibody or antibody fragment thereof binds to an LAH (long alpha helix) region of the HA stem region.

[Claim 4]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 3, wherein the monoclonal antibody or antibody fragment thereof binds to at least one peptide consisting of an amino acid sequence selected from the group consisting of SEQ ID NOs: 19 to 36.

[Claim 5]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 4, wherein the monoclonal antibody or antibody fragment thereof comprises:

a heavy chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 47, 55, 63, 71, 79, and 87 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 47, 55, 63, 71, 79, and 87, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 48, 56, 64, 72, 80, and 88 or an amino acid sequence

in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 48, 56, 64, 72, 80, and 88, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 49, 57, 65, 73, 81, and 89 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 49, 57, 65, 73, 81, and 89; and/or

a light chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 50, 58, 66, 74, 82, and 90 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 50, 58, 66, 74, 82, and 90, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 51, 59, 67, 75, 83, and 91 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 51, 59, 67, 75, 83, and 91, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 52, 60, 68, 76, 84, and 92 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence selected from the group consisting of SEQ ID NOs: 52, 60, 68, 76, 84, and 92.

[Claim 6]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 5, wherein the monoclonal antibody or antibody fragment thereof comprises:

a heavy chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 47, 55, 63, 71, 79, and 87, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 48, 56, 64, 72, 80, and 88, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 49, 57, 65, 73, 81, and 89; and/or

a light chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 50, 58, 66, 74, 82, and 90, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 51, 59, 67, 75, 83, and 91, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 52, 60, 68, 76, 84, and 92.

[Claim 7]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 6, wherein the monoclonal antibody or antibody fragment thereof comprises:

a heavy chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 47, 55, and 63, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 48, 56, and 64, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 49, 57, and 65; and/or

a light chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 50, 58, and 66, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 51, 59, and 67, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 52, 60, and 68.

[Claim 8]

The monoclonal antibody or antibody fragment thereof according to claims 1 to 6, wherein the monoclonal antibody or antibody fragment thereof comprises:

a heavy chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 71, 79, and 87, CDR2 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 72, 80, and 88, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 73, 81, and 89; and/or

a light chain variable region comprising CDR1 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 74, 82, and 90, CDR2 comprising an

amino acid sequence selected from the group consisting of SEQ ID NOs: 75, 83, and 91, and CDR3 comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 76, 84, and 92.

[Claim 9]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 5, wherein the monoclonal antibody or antibody fragment thereof comprises:

(a) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 47 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 48 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 49 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 50 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 51 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 52 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(b) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 55 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 56 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 57 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 58 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 59 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 60 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(c) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 63 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequenc ,

CDR2 comprising an amino acid sequence of SEQ ID NO: 64 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 65 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 66 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 67 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 68 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(d) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 71 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 72 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 73 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 74 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 75 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 76 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(e) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 79 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 80 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 81 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 82 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 83 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 84 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence; or

(f) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 87 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 88 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 89 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 90 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 91 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 92 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence.

[Claim 10]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 6, wherein the monoclonal antibody or antibody fragment thereof comprises:

(a') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 47,

CDR2 comprising an amino acid sequence of SEQ ID NO: 48, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 49, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 50,

CDR2 comprising an amino acid sequence of SEQ ID NO: 51, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 52;

(b') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 55,

CDR2 comprising an amino acid sequence of SEQ ID NO: 56, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 57, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 58,

CDR2 comprising an amino acid sequence of SEQ ID NO: 59, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 60;

(c') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 63,

CDR2 comprising an amino acid sequence of SEQ ID NO: 64, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 65, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 66,

CDR2 comprising an amino acid sequence of SEQ ID NO: 67, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 68;

(d') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 71,

CDR2 comprising an amino acid sequence of SEQ ID NO: 72, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 73, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 74,

CDR2 comprising an amino acid sequence of SEQ ID NO: 75, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 76;

(e') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 79,

CDR2 comprising an amino acid sequence of SEQ ID NO: 80, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 81, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 82,

CDR2 comprising an amino acid sequence of SEQ ID NO: 83, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 84; or

(f') a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 87,

CDR2 comprising an amino acid sequence of SEQ ID NO: 88, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 89, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 90,

CDR2 comprising an amino acid sequence of SEQ ID NO: 91, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 92.

[Claim 11]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 10, wherein the monoclonal antibody or antibody fragment thereof comprises:

(a") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 53 and/or a light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 54;

(b") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 61 and/or a light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 62;

(c") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 69 and/or a

light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 70;

(d") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 77 and/or a light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 78;

(e") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 85 and/or a light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 86; or

(f") a heavy chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 93 and/or a light chain variable region comprising an amino acid sequence having a sequence identity of at least 90% with an amino acid sequence of SEQ ID NO: 94.

[Claim 12]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 11, wherein the monoclonal antibody or antibody fragment thereof comprises:

(a"') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 53 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 54;

(b"') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 61 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 62;

(c"') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 69 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 70;

(d''') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 77 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 78;

(e''') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 85 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 86; or

(f''') a heavy chain variable region comprising an amino acid sequence of SEQ ID NO: 93 and/or a light chain variable region comprising an amino acid sequence of SEQ ID NO: 94.

[Claim 13]

A monoclonal antibody or an antibody fragment thereof, wherein the monoclonal antibody or antibody fragment thereof competes with the monoclonal antibody or antibody fragment thereof according to any one of claims 5 to 12 for binding to the HA stem region.

[Claim 14]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 13, wherein the monoclonal antibody or antibody fragment thereof binds to HA stem regions of two or more influenza virus HA subtypes.

[Claim 15]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 14, wherein the monoclonal antibody or antibody fragment thereof binds to an HA stem region of an influenza A virus HA subtype belonging to phylogenetic group 1, and binds to an HA stem region of an influenza A virus HA subtype belonging to phylogenetic group 2.

[Claim 16]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 15, wherein the monoclonal antibody or antibody fragment thereof has protective capacity against infection for an influenza A virus.

[Claim 17]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 16, wherein the monoclonal antibody or antibody fragment thereof is a mouse antibody, chimeric antibody, humanized antibody, or fully human antibody, or a fragment thereof.

[Claim 18]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 7 and 9 to 17, wherein the monoclonal antibody or antibody fragment thereof is a mouse antibody or a fragment thereof.

[Claim 19]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 7 and 9 to 17, wherein the monoclonal antibody or antibody fragment thereof is a chimeric antibody or a fragment thereof.

[Claim 20]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 17, wherein the monoclonal antibody or antibody fragment thereof is a fully human antibody or a fragment thereof.

[Claim 21]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 20, comprising a modified constant region.

[Claim 22]

The monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 21, wherein a drug has been bound to the monoclonal antibody or antibody fragment thereof.

[Claim 23]

A pharmaceutical composition comprising the monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 22.

[Claim 24]

The pharmaceutical composition according to claim 23 for use in treating or preventing an influenza A virus.

[Claim 25]

Use of the monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 22 in the manufacture of a medicament for treating or preventing an influenza A virus.

[Claim 26]

A method for detecting or quantifying a membrane fusion-type influenza HA antigen, the method comprising bringing the monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 22 into contact with a sample.

[Claim 27]

The method according to claim 26, wherein the monoclonal antibody or antibody fragment thereof is the monoclonal antibody or antibody fragment thereof according to any one of claims 1 to 4, comprising:

(a) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 47 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 48 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 49 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 50 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 51 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 52 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(b) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 55 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 56 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 57 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 58 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 59 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 60 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(c) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 63 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 64 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 65 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 66 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 67 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 68 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(d) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 71 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 72 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 73 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 74 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence ,

CDR2 comprising an amino acid sequence of SEQ ID NO: 75 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 76 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(e) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 79 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 80 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 81 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 82 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 83 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 84 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence;

(f) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 87 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 88 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 89 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 90 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 91 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 92 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence; or

(g) a heavy chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 39 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 40 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 41 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and/or

a light chain variable region comprising

CDR1 comprising an amino acid sequence of SEQ ID NO: 42 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

CDR2 comprising an amino acid sequence of SEQ ID NO: 43 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence, and

CDR3 comprising an amino acid sequence of SEQ ID NO: 44 or an amino acid sequence in which one or two amino acid residues are independently substituted, deleted, added, or inserted in the amino acid sequence,

or a combination of any of them.

[Claim 28]

The method according to claim 26 or 27, wherein the monoclonal antibody or antibody fragment is a combination of a first antibody and a second antibody, wherein

the first antibody is: the monoclonal antibody or antibody fragment according to any one of claims 1 to 22; or a monoclonal antibody or an antibody fragment, with a heavy chain variable region comprising CDR1 comprising an amino acid sequence of SEQ ID NO: 39, CDR2 comprising an amino acid sequence of SEQ ID NO: 40, and CDR3 comprising an amino acid sequence of SEQ ID NO: 41, and a light chain variable region comprising CDR1

comprising an amino acid sequence of SEQ ID NO: 42, CDR2 comprising an amino acid sequence of SEQ ID NO: 43, and CDR3 comprising an amino acid sequence of SEQ ID NO: 44, and

the second antibody is a monoclonal antibody or an antibody fragment, wherein the monoclonal antibody or antibody fragment differs from the first antibody, and binds to a peptide that consists of an amino acid sequence selected from the group consisting of SEQ ID NOs: 1 to 18 and is capable of being bound by the first antibody.