

Claims

[Claim 1]

An antibody or an antigen-binding fragment of the antibody having the properties of:

(a) specifically binding to human TLR7 or monkey TLR7 and not binding to mouse TLR7 or rat TLR7;~~and~~

(b) inhibiting a function of human TLR7 or monkey TLR7; and

(c) comprising CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 17, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 18 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 19, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 20, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 21 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 22, as complementarity determining regions in the light chain.

[Claim 2]

The antibody or the antigen-binding fragment of the antibody according to claim 1, wherein the human TLR7 is a molecule consisting of the amino acid sequence set forth in SEQ ID NO: 2 or SEQ ID NO: 4, the monkey TLR7 is a molecule consisting of the amino acid sequence set forth in SEQ ID NO: 85, the mouse TLR7 is a molecule consisting of the

amino acid sequence set forth in SEQ ID NO: 83, or the rat TLR7 is a molecule consisting of the amino acid sequence set forth in SEQ ID NO: 84.

[Claim 3]

The antibody or the antigen-binding fragment of the antibody according to claim 1 or 2, having a competitive inhibitory activity for binding to human TLR7 with:

an antibody comprising a heavy chain with a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 5 and a light chain with a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 11;

~~an antibody comprising a heavy chain with a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 7 and a light chain with a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 13; or~~

~~an antibody comprising a heavy chain with a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 9 and a light chain with a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 15.~~

[Claim 4]

~~The antibody or the antigen-binding fragment of the antibody according to any one of claims 1 to 3, comprising:~~

~~(a) CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 17, CDRH2 consisting of the amino acid~~

~~sequence set forth in SEQ ID NO: 18 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 19, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 20, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 21 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 22, as complementarity determining regions in the light chain;~~

~~—— (b) CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 23, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 24 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 25, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 26, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 27 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 28, as complementarity determining regions in the light chain; or~~

~~—— (c) CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 29, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 30 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 31, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 32, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 33 and CDRL3 consisting of the~~

~~amino acid sequence set forth in SEQ ID NO: 34, as
complementarity determining regions in the light chain.~~

~~[Claim 5]~~

~~—— The antibody or the antigen-binding fragment of the
antibody according to claim 4, comprising:~~

~~—— CDRH1 consisting of the amino acid sequence set forth
in SEQ ID NO: 17, CDRH2 consisting of the amino acid
sequence set forth in SEQ ID NO: 18 and CDRH3 consisting of
the amino acid sequence set forth in SEQ ID NO: 19, as
complementarity determining regions in the heavy chain, and~~

~~—— CDRL1 consisting of the amino acid sequence set forth
in SEQ ID NO: 20, CDRL2 consisting of the amino acid
sequence set forth in SEQ ID NO: 21 and CDRL3 consisting of
the amino acid sequence set forth in SEQ ID NO: 22, as
complementarity determining regions in the light chain.~~

~~[Claim 46]~~

The antibody or the antigen-binding fragment of the
antibody according to any one of claims 1 to 35,
comprising:

—— (a) a heavy-chain variable region consisting of the
amino acid sequence set forth in SEQ ID NO: 5 and a light-
chain variable region consisting of the amino acid sequence
set forth in SEQ ID NO: 11;

—— (b) a heavy-chain variable region consisting of the
amino acid sequence set forth in SEQ ID NO: 7 and a light-
chain variable region consisting of the amino acid sequence
set forth in SEQ ID NO: 13; or

~~—— (c) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 9 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 15.~~

[Claim 57]

The antibody or the antigen-binding fragment of the antibody according to any one of claims 1 to 46, wherein a constant region is a human-derived constant region.

[Claim 68]

The antibody or the antigen-binding fragment of the antibody according to claim 57, comprising:

~~—— (a) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 35 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 36;~~

~~—— (b) a heavy chain consisting of an amino acid sequence at positions 20 to 471 in the amino acid sequence set forth in SEQ ID NO: 37 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 38; or~~

~~—— (c) a heavy chain consisting of an amino acid sequence at positions 20 to 470 in the amino acid sequence set forth in SEQ ID NO: 39 and a light chain consisting of an amino acid sequence at positions 21 to 234 in the amino acid sequence set forth in SEQ ID NO: 40.~~

[Claim 79]

The antibody or the antigen-binding fragment of the antibody according to any one of claims 1 to 68, being humanized.

[Claim 810]

The antibody or the antigen-binding fragment of the antibody according to claim 79, comprising:

~~(I)~~ a heavy-chain variable region consisting of an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence set forth in SEQ ID NO: 41;

(b) the amino acid sequence set forth in SEQ ID NO: 42;

(c) an amino acid sequence having a homology of at least 95% or more to the sequence (a) or (b); and

(d) an amino acid sequence derived from the sequence (a) or (b) by deletion, substitution or addition of 1 to 10 amino acids; and

a light-chain variable region consisting of an amino acid sequence selected from the group consisting of:

(e) the amino acid sequence set forth in SEQ ID NO: 43;

(f) the amino acid sequence set forth in SEQ ID NO: 44;

(g) an amino acid sequence having a homology of at least 95% or more to the sequence (e) or (f); and

(h) an amino acid sequence derived from the sequence (e) or (f) by deletion, substitution or addition of 1 to 10 amino acids; ~~or~~

~~—— (II) a heavy-chain variable region consisting of an amino acid sequence selected from the group consisting of:~~

~~—— (a) the amino acid sequence set forth in SEQ ID NO: 50;~~

~~—— (b) an amino acid sequence having a homology of at least 95% or more to the sequence (a); and~~

~~—— (c) an amino acid sequence derived from the sequence (a) by deletion, substitution or addition of 1 to 10 amino acids; and~~

~~—— a light-chain variable region consisting of an amino acid sequence selected from the group consisting of:~~

~~—— (d) the amino acid sequence set forth in SEQ ID NO: 51;~~

~~—— (e) an amino acid sequence having a homology of at least 95% or more to the sequence (d); and~~

~~—— (f) an amino acid sequence derived from the sequence (d) by deletion, substitution or addition of 1 to 10 amino acids.~~

[Claim ~~911~~]

The antibody or the antigen-binding fragment of the antibody according to claim ~~810~~, comprising:

(a) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 41 and a light-

chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 43;

(b) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 41 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44;

(c) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 43; or

(d) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44; ~~or~~

~~— (e) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 50 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 51.~~

[Claim 10~~12~~]

The antibody or the antigen-binding fragment of the antibody according to claim 9~~11~~, comprising a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44.

[Claim 11~~13~~]

The antibody or the antigen-binding fragment of the antibody according to claim 911, comprising:

(a) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 45 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48;

(b) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 45 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

(c) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48;

(d) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

(e) a heavy chain consisting of an amino acid sequence at positions 20 to 462 in the amino acid sequence set forth in SEQ ID NO: 47 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48; or

(f) a heavy chain consisting of an amino acid sequence at positions 20 to 462 in the amino acid sequence set forth in SEQ ID NO: 47 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

~~—— (g) a heavy chain consisting of an amino acid sequence at positions 20 to 471 in the amino acid sequence set forth in SEQ ID NO: 52 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53; or~~

~~—— (h) a heavy chain consisting of an amino acid sequence at positions 20 to 468 in the amino acid sequence set forth in SEQ ID NO: 54 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53.~~

[Claim 1214]

The antibody or the antigen-binding fragment of the antibody according to claim 1113, comprising a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49.

[Claim 1315]

An antibody or an antigen-binding fragment of the antibody having the properties of:

(a) specifically binding to human TLR7,

(b) inhibiting a function of human TLR7, and

(c) comprising:

———(1) CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 17, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 18 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 19, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 20, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 21 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 22, as complementarity determining regions in the light chain;

———(2) ~~CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 23, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 24 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 25, as complementarity determining regions in the heavy chain, and CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 26, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 27 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 28, as complementarity determining regions in the light chain; or~~

———(3) ~~CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 29, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 30 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 31, as complementarity determining regions in the heavy chain, and~~

~~CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 32, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 33 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 34, as complementarity determining regions in the light chain.~~

~~[Claim 16]~~

~~— The antibody or the antigen-binding fragment of the antibody according to claim 15, comprising:~~

~~— CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 17, CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 18 and CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 19, as complementarity determining regions in the heavy chain, and~~

~~— CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 20, CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 21 and CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 22, as complementarity determining regions in the light chain.~~

~~[Claim 1417]~~

The antibody or the antigen-binding fragment of the antibody according to claim ~~1315~~ or 16, comprising:

— (a) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 5 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 11;

— (b) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 7 and a light-

~~chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 13; or~~

~~—— (c) a heavy chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 9 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 15.~~

[Claim 15~~18~~]

The antibody or the antigen-binding fragment of the antibody according to claim 13 or 14~~any one of claims 15 to 17~~, wherein a constant region is a human-derived constant region.

[Claim 16~~19~~]

The antibody or the antigen-binding fragment of the antibody according to claim 15~~18~~, comprising:

~~—— (a) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 35 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 36;~~

~~—— (b) a heavy chain consisting of an amino acid sequence at positions 20 to 471 in the amino acid sequence set forth in SEQ ID NO: 37 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 38, or~~

~~—— (c) a heavy chain consisting of an amino acid sequence at positions 20 to 470 in the amino acid sequence set forth in SEQ ID NO: 39 and a light chain consisting of an amino~~

~~acid sequence at positions 21 to 234 in the amino acid sequence set forth in SEQ ID NO: 40.~~

[Claim 1720]

The antibody or the antigen-binding fragment of the antibody according to any one of claims 1315 to 1619, being humanized.

[Claim 1821]

The antibody or the antigen-binding fragment of the antibody according to claim 1720, comprising:

~~(I)~~ a heavy-chain variable region consisting of an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence set forth in SEQ ID NO: 41;

(b) the amino acid sequence set forth in SEQ ID NO: 42;

(c) an amino acid sequence having a homology of at least 95% or more to the sequence (a) or (b); and

(d) an amino acid sequence derived from the sequence (a) or (b) by deletion, substitution or addition of 1 to 10 amino acids; and

a light-chain variable region consisting of an amino acid sequence selected from the group consisting of:

(e) the amino acid sequence set forth in SEQ ID NO: 43;

(f) the amino acid sequence set forth in SEQ ID NO: 44;

(g) an amino acid sequence having a homology of at least 95% or more to the sequence (e) or (f); and

(h) an amino acid sequence derived from the sequence (e) or (f) by deletion, substitution or addition of 1 to 10 amino acids; ~~or~~

~~—— (II) a heavy chain variable region consisting of an amino acid sequence selected from the group consisting of:~~

~~—— (a) the amino acid sequence set forth in SEQ ID NO: 50;~~

~~—— (b) an amino acid sequence having a homology of at least 95% or more to the sequence (a); and~~

~~—— (c) an amino acid sequence derived from the sequence (a) by deletion, substitution or addition of 1 to 10 amino acids; and~~

~~—— a light chain variable region consisting of an amino acid sequence selected from the group consisting of:~~

~~—— (d) the amino acid sequence set forth in SEQ ID NO: 51;~~

~~—— (e) an amino acid sequence having a homology of at least 95% or more to the sequence (d); and~~

~~—— (f) an amino acid sequence derived from the sequence (d) by deletion, substitution or addition of 1 to 10 amino acids.~~

[Claim 1922]

The antibody or the antigen-binding fragment of the antibody according to claim 1821, comprising:

(a) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 41 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 43;

(b) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 41 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44;

(c) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 43; or

(d) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44; ~~or~~

~~— (e) a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 50 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 51.~~

[Claim 2023]

The antibody or the antigen-binding fragment of the antibody according to claim 1922, comprising a heavy-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 42 and a light-chain variable region consisting of the amino acid sequence set forth in SEQ ID NO: 44.

[Claim 2124]

The antibody or the antigen-binding fragment of the antibody according to claim 1922, comprising:

(a) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 45 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48;

(b) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 45 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

(c) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48;

(d) a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

(e) a heavy chain consisting of an amino acid sequence at positions 20 to 462 in the amino acid sequence set forth in SEQ ID NO: 47 and a light chain consisting of an amino

acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48; or

(f) a heavy chain consisting of an amino acid sequence at positions 20 to 462 in the amino acid sequence set forth in SEQ ID NO: 47 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49;

~~—— (g) a heavy chain consisting of an amino acid sequence at positions 20 to 471 in the amino acid sequence set forth in SEQ ID NO: 52 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53; or~~

~~—— (h) a heavy chain consisting of an amino acid sequence at positions 20 to 468 in the amino acid sequence set forth in SEQ ID NO: 54 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53.~~

[Claim 2225]

The antibody or the antigen-binding fragment of the antibody according to claim 2124, comprising a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49.

[Claim 2326]

An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 45 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48.

[Claim ~~24~~²⁷]

An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 48.

[Claim ~~25~~²⁸]

An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 465 in the amino acid sequence set forth in SEQ ID NO: 46 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49.

[Claim ~~26~~²⁹]

An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 462 in the amino acid sequence set forth in SEQ ID NO: 47 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 49.

~~[Claim 30]~~

~~— An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 471 in the amino acid sequence set forth in SEQ ID NO: 52 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53.~~

~~[Claim 31]~~

~~— An antibody or an antigen-binding fragment of the antibody comprising a heavy chain consisting of an amino acid sequence at positions 20 to 468 in the amino acid sequence set forth in SEQ ID NO: 54 and a light chain consisting of an amino acid sequence at positions 21 to 233 in the amino acid sequence set forth in SEQ ID NO: 53.~~

[Claim 2732]

The antibody or the antigen-binding fragment of the antibody according to any one of claims 2326 to 2631, having the properties of:

- (a) specifically binding to human TLR7; and
- (b) inhibiting a function of human TLR7.

[Claim 2833]

The antigen-binding fragment of the antibody according to any one of claims 1 to 2732, wherein the antigen-binding fragment is selected from the group consisting of Fab, F(ab)₂, Fab' and Fv.

[Claim 2934]

A polynucleotide comprising a polynucleotide sequence encoding the antibody or the antigen-binding fragment of the antibody according to any one of claims 1 to 2833.

[Claim 3035]

The polynucleotide according to claim 2934, comprising:

~~(1)~~ a polynucleotide sequence encoding CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 17, a polynucleotide sequence encoding CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 18 and a polynucleotide sequence encoding CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 19, and a polynucleotide sequence encoding CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 20, a polynucleotide sequence encoding CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 21 and a polynucleotide sequence encoding CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 22;

~~— (2) a polynucleotide sequence encoding CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 23, a polynucleotide sequence encoding CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 24 and a polynucleotide sequence encoding CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 25, and a polynucleotide sequence encoding CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 26, a polynucleotide sequence encoding CDRL2 consisting of the~~

~~amino acid sequence set forth in SEQ ID NO: 27 and a polynucleotide sequence encoding CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 28; or~~
~~— (3) a polynucleotide sequence encoding CDRH1 consisting of the amino acid sequence set forth in SEQ ID NO: 29, a polynucleotide sequence encoding CDRH2 consisting of the amino acid sequence set forth in SEQ ID NO: 30 and a polynucleotide sequence encoding CDRH3 consisting of the amino acid sequence set forth in SEQ ID NO: 31, and a polynucleotide sequence encoding CDRL1 consisting of the amino acid sequence set forth in SEQ ID NO: 32, a polynucleotide sequence encoding CDRL2 consisting of the amino acid sequence set forth in SEQ ID NO: 33 and a polynucleotide sequence encoding CDRL3 consisting of the amino acid sequence set forth in SEQ ID NO: 34.~~

[Claim ~~31~~36]

The polynucleotide according to claim ~~30~~35, comprising:

~~(I)~~ a polynucleotide sequence selected from the group consisting of:

(a) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 77;

(b) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 78; and

(c) a polynucleotide sequence of a polynucleotide which hybridizes with a polynucleotide consisting of a

polynucleotide sequence complementary to the polynucleotide sequence (a) or (b) under stringent conditions; and

a polynucleotide sequence selected from the group consisting of:

(d) a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 79;

(e) a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 80; and

(f) a polynucleotide sequence of a polynucleotide which hybridizes with a polynucleotide consisting of a polynucleotide sequence complementary to the polynucleotide sequence (d) or (e) under stringent conditions; ~~or~~

~~—— (II) a polynucleotide sequence selected from the group consisting of:~~

~~—— (a) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 81; and~~

~~—— (b) a polynucleotide sequence of a polynucleotide which hybridizes with a polynucleotide consisting of a polynucleotide sequence complementary to the polynucleotide sequence (a) under stringent conditions; and~~

~~—— a polynucleotide sequence selected from the group consisting of:~~

~~—— (c) a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 82; and~~

~~—— (d) a polynucleotide sequence of a polynucleotide which hybridizes with a polynucleotide consisting of a~~

~~polynucleotide sequence complementary to the polynucleotide sequence (c) under stringent conditions.~~

[Claim 3237]

The polynucleotide according to claim 3136,
comprising:

(a) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 77 and a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 79;

(b) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 77 and a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 80;

(c) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 78 and a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 79; or

(d) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 78 and a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 80; ~~or~~

~~—— (e) a polynucleotide sequence encoding the heavy-chain variable region set forth in SEQ ID NO: 81 and a polynucleotide sequence encoding the light-chain variable region set forth in SEQ ID NO: 82.~~

[Claim 3338]

An expression vector comprising the polynucleotide according to any one of claims 2934 to 3237.

[Claim 3439]

A host cell transformed with the expression vector according to claim 3338.

[Claim 3540]

The host cell according to claim 3439, wherein the host cell is a eukaryotic cell.

[Claim 3641]

A method for producing an antibody or an antigen-binding fragment of the antibody, comprising the steps of:
culturing the host cell according to claim 3439 or 3540; and

collecting the antibody or the fragment of interest from the culture obtained in the above step.

[Claim 3742]

An antibody or an antigen-binding fragment of the antibody obtained by the production method according to claim 3641.

[Claim 3843]

The antibody according to any one of claims 1 to 2732, comprising one or more modifications selected from the group consisting of glycosylation to N-linkage, glycosylation to O-linkage, N-terminal processing, C-terminal processing, deamidation, isomerization of aspartic acid, oxidation of methionine, addition of a methionine residue to N-terminal, amidation of a proline residue, and

deletion of one or two amino acids at the carboxyl terminus of the heavy chain.

[Claim 3944]

The antibody according to claim 3843, comprising two heavy chains consisting of one kind of or a combination of any two kinds of heavy chains selected from the group consisting of the full length and deletion variants with one or two amino acids deleted at the carboxyl terminus.

[Claim 4045]

The antibody according to claim 3944, wherein one amino acid is deleted at the carboxyl terminus in each of the two heavy chains.

[Claim 4146]

The antibody according to any one of claims 3843 to 4045, wherein a proline residue at the carboxyl terminus of the heavy chain is further amidated.

[Claim 4247]

A pharmaceutical composition for treating and/or preventing a disease, comprising at least one of the antibodies or the antigen-binding fragments of the antibodies according to claims 1 to 2833 and 3742 to 4146 or the expression vector according to claim 3338 as an active ingredient.

[Claim 4348]

The pharmaceutical composition according to claim 4247, for treating a disease caused by a function of human TLR7, wherein the disease caused by a function of human

TLR7 is an immune inflammation-related disease, an allergic disease, an infection or a cancer.

~~[Claim 49]~~

~~—The pharmaceutical composition according to claim 48, wherein the disease caused by a function of human TLR7 is an immune inflammation-related disease, an allergic disease, an infection or a cancer.~~

[Claim 44~~50~~]

The pharmaceutical composition according to claim 43~~49~~, wherein the immune inflammation-related disease is systemic lupus erythematosus, rheumatoid arthritis, juvenile idiopathic arthritis, adult-onset Still's disease, ankylosing spondylitis, systemic scleroderma, polymyositis, dermatomyositis, psoriatic arthritis, osteoarthritis, mixed connective tissue disease or muscular dystrophy.

[Claim 45~~51~~]

The pharmaceutical composition according to claim 43~~49~~ or 44~~50~~, wherein the immune inflammation-related disease is systemic lupus erythematosus.

[Claim 46~~52~~]

The pharmaceutical composition according to any one of claims 42~~47~~ to 45~~51~~, to be used in combination with an immunosuppressant, an anti-inflammatory drug, an antiallergic agent, an anti-infective agent or an anticancer agent.

[Claim 47~~53~~]

~~A method for treating a disease caused by a function of human TLR7, comprising administering at least one of the antibodies or the antigen-binding fragment of the antibodies~~
The antibody or antigen-binding fragment according to claims 1 to 2833 and 3742 to 4146 for use in the treatment of a disease caused by a function of human TLR7, wherein an effective amount of at least one of the antibodies or the antigen-binding fragment of the antibodies is to be administered to an individual in need thereof, and wherein the disease caused by a function of human TLR7 is an immune inflammation-related disease, an allergic disease, an infection or a cancer.

[Claim 4854]

~~A method for treating a disease caused by a function of human TLR7, comprising administering aUse of the antibody or antigen-binding fragment t least one of the antibodies or the antigen-binding fragment of the antibodies~~
according to claims 1 to 2833 and 3742 to 4146 in the manufacture of a medicament for the treatment of a disease caused by a function of human TLR7, wherein an effective amount of at least one of the antibodies or the antigen-binding fragment of the antibodies is to be administered together with an immunosuppressant, an anti-inflammatory drug, an antiallergic agent, an anti-infective agent or an anticancer agent, simultaneously, separately or sequentially to an individual in need thereof, and wherein the disease caused by a function of human TLR7 is an immune

inflammation-related disease, an allergic disease, an infection or a cancer.

[~~Claim 55~~]

~~—The treatment method according to claim 53 or 54, wherein the disease caused by a function of human TLR7 is an immune inflammation-related disease, an allergic disease, an infection or a cancer.~~

[~~Claim 49~~56]

The use according to claim 48~~The treatment method according to claim 47 or 48~~55, wherein the immune inflammation-related disease is systemic lupus erythematosus, rheumatoid arthritis, juvenile idiopathic arthritis, adult-onset Still's disease, ankylosing spondylitis, systemic scleroderma, polymyositis, dermatomyositis, psoriatic arthritis, osteoarthritis, mixed connective tissue disease or muscular dystrophy.

[~~Claim 50~~57]

The use according to claim 48~~The treatment method according to claim 49~~55 or 56, wherein the immune inflammation-related disease is systemic lupus erythematosus.