

CLAIMS

What is claimed is:

1. An isolated antibody or an antigen-binding fragment thereof, comprising an immunoglobulin heavy chain variable region that comprises an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 35; and an immunoglobulin light chain variable region that comprises an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 5, wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:
 - to a biantennary Le^B/Le^B antigen comprising Fuc₄(Galβ1→3GlcNAc)₂ [I] or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ [II],
 - to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ [III] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ [IV],
 - to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] [V], or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] [VI],
 - and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] [VII] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] [VIII],
 - and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc [IX], or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ [X], or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc [XI], or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc [XII], or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ [XIII] or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc [XIV].

2. The isolated antibody or an antigen-binding fragment thereof of claim 1, comprising:

(a) an immunoglobulin heavy chain variable region that comprises a heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 2 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:2; a heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 3 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:3; a heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 4 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:4; and

(b) an immunoglobulin light chain variable region that comprises a light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 6 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:6; a light chain complementarity determining region 2 (VL CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 7 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 7; and a light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 8 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 8.

3. The isolated antibody or an antigen-binding fragment thereof of claim 1 or claim 2, comprising (i), (ii), (iii), (iv), (v), or (vi), as follows, or any combination thereof:

(i) a VH CDR1 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 2, wherein the variation consists of a Y→A substitution at position 33 according to Kabat numbering; and/or

(ii) a VH CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 4, wherein the variation consists of a Y→A substitution at position 104 according to Kabat numbering;

(iii) a VH CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 4, wherein the variation consists of a H→A substitution at position 106 according to Kabat numbering;

(iv) a VL CDR1 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 6, wherein the variation consists of a Y→A substitution at position 30 according to Kabat numbering;

(v) a VL CDR2 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 7, wherein the variation consists of a G→A substitution at position 50 according to Kabat numbering; or

(vi) a VL CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 8, wherein the variation consists of a T→S substitution at position 93 according to Kabat numbering.

4. An isolated antibody or antigen-binding fragment thereof, comprising: (a) an immunoglobulin heavy chain variable region that comprises a heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 2; a heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 3; a heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 4; and (b) an immunoglobulin light chain variable region that comprises a light chain complementarity determining region 1 (VL CDR1) comprising the amino acid

sequence set forth in SEQ ID NO: 6; a light chain complementarity determining region 2 (VL CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 7; and a light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 8; wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising

Fuc₄(Galβ1→3GlcNAc)₂ [I] or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ [II]

to a biantennary Le^Y/Le^Y antigen comprising

Fuc₄(Galβ1→4GlcNAc)₂ [III] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ [IV],

to a biantennary Le^B/Le^Y antigen comprising

Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] [V], or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] [VI],

and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-

4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] [VII] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] [VIII],

and wherein the antibody or antigen-binding fragment thereof

does not bind specifically to a monoantennary Le^x antigen that comprises

Galβ1→4(Fucα1→3)GlcNAc [IX], or to a biantennary Le^x antigen that

comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ [X], or to a monoantennary Le^A

antigen that comprises Galβ1-3(Fucα1-4)GlcNAc [XI], or to a monoantennary H

antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc [XII], or to a biantennary

H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ [XIII] or to a

monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc [XIV].

5. An isolated antibody or antigen-binding fragment thereof, comprising: an immunoglobulin heavy chain variable region that comprises the amino acid sequence set forth in SEQ ID NO: 35; and an immunoglobulin light chain variable region that comprises the amino acid sequence set forth in SEQ ID NO: 5, wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising Fuc₄(Galβ1→3GlcNAc)₂ [I] or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ [II],
to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ [III] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ [IV],
to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] [V], or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] [VI],
and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] [VII] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] [VIII],
and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc [IX], or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ [X], or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc [XI], or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc [XII], or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ [XIII] or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc [XIV].

6. An isolated antibody comprising an immunoglobulin heavy chain having the amino acid sequence set forth in SEQ ID NO: 10 and an immunoglobulin light chain having the amino acid sequence set forth in SEQ ID NO: 11.

7. The isolated antibody of claim 6 which is monoclonal.

8. The isolated antibody or antigen-binding fragment thereof of any one of claims 1-5 wherein the antibody is monoclonal.

9. The isolated antibody of claim 6 or 7, or the isolated antibody or antigen-binding fragment thereof of any one of claims 1-5 or 8, wherein the antibody is a humanized antibody.

10. The isolated antibody or antigen-binding fragment thereof of any one of claims 1-5, 8, or 9 which is selected from a Fab fragment, an F(ab')₂ fragment, an Fv fragment, a single chain Fv (ScFv) antibody, and a diabody.

11. An isolated polynucleotide encoding the antibody or antigen-binding fragment thereof of any one of claims 1-10.

12. The isolated polynucleotide of claim 11, wherein the polynucleotide is codon-optimized for expression in a host cell.

13. A recombinant vector comprising the polynucleotide of either claim 11 or claim 12.

14. The recombinant vector of claim 13 comprising an expression control sequence operably linked to the polynucleotide encoding the antibody or antigen-binding fragment thereof.

15. The recombinant vector of claim 14 which is an expression vector in which the expression control sequence comprises a promoter.

16. A host cell that comprises the recombinant vector of claim

13.

17. A host cell that comprises the expression vector of claim 15.

18. A method of producing an antibody or an antigen-binding fragment thereof that is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising structure **[I]** or structure **[II]**,

to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ **[III]** or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ **[IV]**,

to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] **[V]**, or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] **[VI]**,

and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] **[VII]** or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] **[VIII]**,

and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc **[IX]**, or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ **[X]**, or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc **[XI]**, or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc **[XII]**, or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ **[XIII]** or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc **[XIV]**,

the method comprising:

culturing the host cell of claim 16 under conditions and for a time sufficient for expression by the host cell of the polynucleotide encoding the antibody or antigen-binding fragment thereof, thereby to obtain a culture comprising the antibody or antigen-binding fragment thereof; and

recovering the antibody or antigen-binding fragment thereof from the culture.

19. An antibody conjugate comprising the isolated antibody or an antigen-binding fragment thereof of any one of claims 1-10; and a payload molecule linked thereto.

20. A pharmaceutical composition comprising: the isolated antibody or an antigen-binding fragment thereof of any one of claims 1-10, or the antibody conjugate of claim 19 or of claims 21-35; and a pharmaceutical carrier.

21. The antibody conjugate of claim 19, wherein the payload molecule is covalently linked by a linker to the antibody or antigen-binding fragment thereof.

22. The antibody conjugate of claim 21, wherein the linker is selected from a cleavable linker and a non-cleavable linker.

23. The antibody conjugate of claim 22, wherein the cleavable linker is a protease-sensitive linker, a pH-sensitive linker, or a glutathione-sensitive linker.

24. The antibody conjugate of claim 23, wherein the cleavable linker is a protease-sensitive linker comprising a valine-citrulline dipeptide.

25. The antibody conjugate of any one of claims 22-24, wherein the linker comprises a maleimide group.

26. The antibody conjugate of any one of claims 22-25, wherein the antibody or antigen-binding fragment thereof comprises a reduced disulfide bridge in a hinge region and the reduced disulfide bridge is coupled to the maleimide group.

27. The antibody conjugate of any one of claims 22-26, wherein the linker further comprises a self-demolishing group.

28. The antibody conjugate of claim 27, wherein the self-demolishing group is para-amino benzyl alcohol (PABC).

29. The antibody conjugate of any one of claims 19 or 21-28, wherein the payload molecule is selected from a therapeutic agent and a detectable indicator.

30. The antibody conjugate of claim 29, wherein the payload molecule is a therapeutic agent selected from a tubulin-targeting anti-mitotic agent, a peptide-based toxin, a pyrrolobenzodiazepine (PBD) dimer, an antibiotic, a pyrimidine synthesis inhibitor, an anti-metabolite, a DNA alkylating agent, and a topoisomerase inhibitor.

31. The antibody conjugate of claim 30, wherein the payload molecule is selected from a maytansinoid, an auristatin, doxorubicin, calicheamicin, a PBD dimer, monomethylauristatin E (MMAE), and monomethylauristatin F (MMAF).

32. The antibody conjugate of claim 29, wherein the payload molecule is a detectable indicator.

33. The antibody conjugate of claim 32, wherein the detectable indicator is selected from a radionuclide, a dye, a radiometal, a fluorescent moiety, an MRI contrast agent, a microbubble, a carbon nanotube, a gold particle, fluorodeoxyglucose, an enzyme, a chromophore, and a radio-opaque marker.

34. The antibody conjugate of claim 33, wherein the detectable indicator is a radionuclide selected from ^{68}Ga , ^{64}Cu , ^{86}Y , ^{89}Zr , ^{124}I , $^{99\text{m}}\text{Tc}$, ^{123}I , ^{111}In , ^{177}Lu , ^{131}I , ^{76}Br , ^{78}Zr , ^{18}F , and ^{124}T .

35. The antibody conjugate of either claim 33 or claim 34, further comprising a radionuclide chelator selected from maleimide-labeled DOTA, N-hydroxysuccinimide-DOTA, and desferrioxamine (DFO).

36. A method of treating or detecting cancer, comprising administering the pharmaceutical composition of claim 20 to a subject in need thereof.

37. The method of claim 36, wherein the subject has or is suspected of having a cancer that is selected from gastric cancer, colon cancer, breast cancer, lung cancer, lymphatic cancer, liver cancer, ovarian cancer, pancreatic prostate cancer, uterine cancer, and squamous cell carcinoma.

38. The method of claim 37, wherein the cancer is selected from a stomach adenocarcinoma, a mucinous stomach adenocarcinoma, an undifferentiated stomach adenocarcinoma, a signet-ring cell stomach carcinoma, a colon adenocarcinoma, an invasive breast ductal carcinoma, a hepatocellular carcinoma, a lung adenocarcinoma, a squamous cell carcinoma, a metastatic lymph node adenocarcinoma, a mucinous ovarian adenocarcinoma, a pancreatic ductal adenocarcinoma, a pancreatic papillary adenocarcinoma, a prostate adenocarcinoma, and an endometrioid carcinoma.

39. The method of any one of claims 36-38, wherein administering comprises administering by a route that is selected from intravenous, parenteral, intragastric, intrapleural, intrapulmonary, intrarectal, intradermal, intraperitoneal, intratumoral, subcutaneous, oral, topical, transdermal, intracisternal, intrathecal, intranasal, and intramuscular.

40. The method of any one of claims 36-39, wherein the subject is receiving or has previously received:

- (a) an immunosuppressive therapy;
- (b) a stimulatory immune checkpoint molecule;
- (c) a radiation therapy;
- (d) a chemotherapy
- (e) a cell immunotherapy; or
- (f) any combination of (a)-(e).

41. The antibody of any one of claims 1-10, the host cell of claim 16 or 17, the antibody conjugate of any one of claims 19 or 21-35, or the composition of claim 20, for use in the treatment, diagnosis, or detection of cancer.

42. The antibody of any one of claims 1-10, the polynucleotide of claim 11 or 12, the recombinant vector of any one of claims 13-15, the host cell of claim 16 or 17, the antibody conjugate of any one of claims 19 or 21-35, or the composition of claim 20, for use in the preparation of a medicament for the treatment, diagnosis, or detection of cancer.

CLAIMS

1. An isolated antibody or an antigen-binding fragment thereof, comprising an immunoglobulin heavy chain variable region that comprises an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 35; and an immunoglobulin light chain variable region that comprises an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 5, wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising Fuc₄(Galβ1→3GlcNAc)₂ **[I]** or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ **[III]**,

to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ **[III]** or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ **[IV]**,

to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] **[V]**, or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] **[VI]**,

and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] **[VII]** or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] **[VIII]**,

and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc **[IX]**, or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ **[X]**, or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc **[XI]**, or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc **[XII]**, or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ **[XIII]** or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc **[XIV]**.

2. The isolated antibody or an antigen-binding fragment thereof of claim 1, comprising:

(a) an immunoglobulin heavy chain variable region that comprises a heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 2 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:2; a heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 3 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:3; and a heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 4 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:4; and

(b) an immunoglobulin light chain variable region that comprises a light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 6 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO:6; a light chain complementarity determining region 2 (VL CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 7 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 7; and a light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 8 or an amino acid sequence that has at least 90, 91, 92, 93, 94, 95, 96, 97, 98 or 99 percent identity to the amino acid sequence set forth in SEQ ID NO: 8.

3. The isolated antibody or an antigen-binding fragment thereof of claim 1, comprising (i), (ii), (iii), (iv), (v), or (vi), as follows, or a combination thereof:

(i) a VH CDR1 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 2, wherein the variant consists of a Y→A substitution at position 33 of SEQ ID NO: 35; and/or

(ii) a VH CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 4, wherein the variant consists of a Y→A substitution at position 104 of SEQ ID NO: 35;

(iii) a VH CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 4, wherein the variant consists of a A→H substitution at position 106 of SEQ ID NO: 35;

(iv) a VL CDR1 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 6, wherein the variant consists of a Y→A substitution at position 30 of SEQ ID NO: 5;

(v) a VL CDR2 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 7, wherein the variant consists of a G→A substitution at position 50 of SEQ ID NO: 5; or

(vi) a VL CDR3 comprising a variant of the amino acid sequence set forth in SEQ ID NO: 8, wherein the variant consists of a T→S substitution at position 93 of SEQ ID NO: 5.

4. An isolated antibody or antigen-binding fragment thereof, comprising: (a) an immunoglobulin heavy chain variable region that comprises a heavy chain complementarity determining region 1 (VH CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 2; a heavy chain complementarity determining region 2 (VH CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 3; and a heavy chain complementarity determining region 3 (VH CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 4; and (b) an immunoglobulin light chain variable region that comprises a light chain complementarity determining region 1 (VL CDR1) comprising the amino acid sequence set forth in SEQ ID NO: 6; a light chain complementarity determining region 2 (VL CDR2) comprising the amino acid sequence set forth in SEQ ID NO: 7; and a light chain complementarity determining region 3 (VL CDR3) comprising the amino acid sequence set forth in SEQ ID NO: 8; wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising Fuc₄(Galβ1→3GlcNAc)₂ [I] or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ [II],

to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ [III] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ [IV],

to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] [V], or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] [VI],

and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] [VII] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] [VIII],

and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc [IX], or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ [X], or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc [XI], or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc [XII], or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ [XIII] or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc [XIV].

5. An isolated antibody or antigen-binding fragment thereof, comprising: an immunoglobulin heavy chain variable region that comprises the amino acid sequence set forth in SEQ ID NO: 35; and an immunoglobulin light chain variable region that comprises the amino acid sequence set forth in SEQ ID NO: 5, wherein the antibody or antigen-binding fragment thereof is capable of binding specifically:

to a biantennary Le^B/Le^B antigen comprising Fuc₄(Galβ1→3GlcNAc)₂ [I] or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc]₂ [II],

to a biantennary Le^Y/Le^Y antigen comprising Fuc₄(Galβ1→4GlcNAc)₂ [III] or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc]₂ [IV],

to a biantennary Le^B/Le^Y antigen comprising Fuc₂(Galβ1→3GlcNAc)[Fuc₂(Galβ1→4GlcNAc)] [V], or [Fucα1-2Galβ1-3(Fucα1-4)GlcNAc][Fucα1-2Galβ1-4(Fucα1-3)GlcNAc] [VI],

and to a biantennary Le^Y/Le^B antigen comprising Fuc₂(Galβ1-4GlcNAc)[Fuc₂(Galβ1-3GlcNAc)] **[VII]** or [Fucα1-2Galβ1-4(Fucα1-3)GlcNAc][Fucα1-2Galβ1-3(Fucα1-4)GlcNAc] **[VIII]**,

and wherein the antibody or antigen-binding fragment thereof does not bind specifically to a monoantennary Le^x antigen that comprises Galβ1→4(Fucα1→3)GlcNAc **[IX]**, or to a biantennary Le^x antigen that comprises [Galβ1→4(Fucα1→3)GlcNAc]₂ **[X]**, or to a monoantennary Le^A antigen that comprises Galβ1-3(Fucα1-4)GlcNAc **[XI]**, or to a monoantennary H antigen type 2 that comprises Fucα1-2Galβ1-4GlcNAc **[XII]**, or to a biantennary H antigen type 2 that comprises (Fucα1-2Galβ1-4GlcNAc)₂ **[XIII]** or to a monoantennary H antigen type 1 that comprises Fucα1-2Galβ1-3GlcNAc **[XIV]**.

6. An isolated antibody comprising an immunoglobulin heavy chain having the amino acid sequence set forth in SEQ ID NO: 10 and an immunoglobulin light chain having the amino acid sequence set forth in SEQ ID NO: 11.

7. The isolated antibody of claim 6, which is monoclonal.

8. The isolated antibody or antigen-binding fragment thereof of claim 4, wherein the antibody is monoclonal.

9. The isolated antibody or antigen-binding fragment thereof of claim 4, wherein the antibody is a humanized antibody.

10. The isolated antibody or antigen-binding fragment thereof of claim 4, wherein the antigen-binding fragment is selected from a Fab fragment, an F(ab')₂ fragment, an Fv fragment, a single chain Fv (ScFv) antibody, and a diabody.

11. A pharmaceutical composition comprising: the isolated antibody or an antigen-binding fragment thereof of claim 4; and a pharmaceutical carrier.

12. The antibody or antigen-binding fragment of claim 4, wherein the heavy chain variable region comprises an amino acid sequence that has at least 90 percent identity to the amino acid sequence set forth in SEQ ID NO: 35, and the immunoglobulin light chain variable region comprises an amino acid sequence that has at least 90 percent identity to the amino acid sequence set forth in SEQ ID NO: 5.

13. The antibody or antigen-binding fragment of claim 4, wherein the heavy chain variable region comprises an amino acid sequence that has at least 95 percent identity to the amino acid sequence set forth in SEQ ID NO: 35, and the immunoglobulin light chain variable region comprises an amino acid sequence that has at least 95 percent identity to the amino acid sequence set forth in SEQ ID NO: 5.

14. The antibody or antigen-binding fragment of claim 4, wherein the heavy chain variable region comprises an amino acid sequence that has at least 97 percent identity to the amino acid sequence set forth in SEQ ID NO: 35, and the immunoglobulin light chain variable region comprises an amino acid sequence that has at least 97 percent identity to the amino acid sequence set forth in SEQ ID NO: 5.