CLAIMS

1. An anti-MUC1 antibody or an antigen-binding fragment thereof, comprising a heavy chain variable region and a light chain variable region, wherein the heavy chain variable region comprises a HCDR1, a HCDR2, and a HCDR3, and the light chain variable region comprises a LCDR1, a LCDR2, and a LCDR3, wherein:

a. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 4, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 5, respectively; or

b. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 of any one of SEQ ID NO: 6 or 47, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 7, respectively; or

c. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 8, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 9, respectively; or

d. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 of any one of SEQ ID NO: 63, 10, or 64, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 11, respectively;

preferably,

a. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 4, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 5, respectively; or

b. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 6, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 7, respectively; or

c. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 8, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region

comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 9, respectively; or

d. the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 63, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 11, respectively;

more preferably, the HCDR1, HCDR2, and HCDR3 of the heavy chain variable region comprise the amino acid sequences of a HCDR1, a HCDR2, and a HCDR3 in SEQ ID NO: 4, respectively, and the LCDR1, LCDR2, and LCDR3 of the light chain variable region comprise the amino acid sequences of a LCDR1, a LCDR2, and a LCDR3 in SEQ ID NO: 5, respectively.

2. The anti-MUC1 antibody or the antigen-binding fragment thereof according to claim 1, wherein:

a. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 12, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 13, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 14; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 15, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 16, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 17; or

b. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 18, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 19, and the HCDR3 comprises the amino acid sequence of any one of SEQ ID NO: 20 or 113; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 21, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 22, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 23; or

c. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 24, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 25, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 26; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 27, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 28, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 29; or

d. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 30, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 31, and the HCDR3 comprises the amino acid sequence of any one of SEQ ID NO: 114, 32, or 115; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 33, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 34, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 35;

preferably,

a. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 12, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 13, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 14; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 15, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 16, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 17;

b. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 18, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 19, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 20; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 21, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 22, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 23; or

c. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 24, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 25, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 26; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 27, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 28, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 29; or

d. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 30, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 31, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 114; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 33, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 34, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 35;

more preferably, in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 12, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 13, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 14; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 15, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 16, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 17.

3. The anti-MUC1 antibody or the antigen-binding fragment thereof according to claim 1 or 2, being a murine antibody, a chimeric antibody, a humanized antibody, or a fully human-derived antibody, preferably a chimeric antibody or a humanized antibody, and more preferably a humanized antibody.

4. The anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 3, wherein:

a. the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 36, 37, or 38, and the light chain variable region

comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 39, 40, 41, or 42; or the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 4, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 5; or

b. the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 43, 44, 45, 46, 47, 48, or 49, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 50, 51, or 52; or the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 6, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 7; or

c. the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 53, 54, or 55, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 56, 57, 58, or 59; or the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 8, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 9; or

d. the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 63, 60, 61, 62, or 64, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 67, 68, 65, or 66; or the heavy chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 10, and the light chain variable region comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 11;

preferably,

a. the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 36, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 39 or 40; or

the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 37, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 39 or 40; or

the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 4, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 5;

b. the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 43, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 50; or

the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 44, and the light chain variable region comprises the amino acid sequence of SEQ ID NO:

51; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 45, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 50 or 51; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 46, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 51; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 6, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 7;
c. the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 53, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 56, 57, or 59; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 54, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 57; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 8, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 9;
d. the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 60, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 65 or 68; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 61, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 65, 66, 67, or 68; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 63, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 67 or 68; or
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 10, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 11;
more preferably, the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 36, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 39.

5. The anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 4, being an antibody fragment, wherein preferably, the antibody fragment is selected from the group consisting of Fab, Fab', F(ab')2, Fd, Fv, scFv, dsFv, and dAb.

6. The anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 4, wherein the anti-MUC1 antibody comprises a heavy chain constant region and a light chain constant region;

preferably, the heavy chain constant region is a human IgG1, IgG2, IgG3, or IgG4 heavy chain constant region, and
the light chain constant region is a human κ or λ light chain constant region;
more preferably, the heavy chain constant region comprises the amino acid sequence of SEQ ID NO: 69 or 186, and
the light chain constant region comprises the amino acid sequence of SEQ ID NO: 70.

7. The anti-MUC1 antibody or the antigen-binding fragment thereof according to claim 6, wherein the anti-MUC1 antibody or the antigen-binding fragment thereof comprises a heavy chain and a light chain, wherein:
a. the heavy chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 71, 73, 75, or 77, and the light chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 72, 74, 76, or 78; or
b. the heavy chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 79, 81, 83, 85, or 87, and the light chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 80, 82, 84, 86, or 88; or
c. the heavy chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 89, 91, 93, or 95, and the light chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 90, 92, 94, or 96; or
d. the heavy chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 97, 99, 101, 103, 105, 107, 109, or 111, and the light chain comprises an amino acid sequence having at least 70% sequence identity to SEQ ID NO: 98, 100, 102, 104, 106, 108, 110, or 112;
preferably,
a. the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 71, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 72; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 73, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 74; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 75, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 76; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 77, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 78;
b. the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 79, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 80; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 81, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 82; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 83, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 84; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 85, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 86; or

the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 87, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 88;
c. the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 89, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 90; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 91, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 92; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 93, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 94; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 95, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 96;
d. the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 97, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 98; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 99, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 100; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 101, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 102; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 103, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 104; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 105, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 106; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 107, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 108; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 109, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 110; or
the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 111, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 112;
more preferably, the amino acid sequence of the heavy chain is set forth in SEQ ID NO: 71, and the amino acid sequence of the light chain is set forth in SEQ ID NO: 72.

8. An anti-EGFR antibody or an antigen-binding fragment thereof, comprising a heavy chain variable region and a light chain variable region, wherein the heavy chain variable region comprises a HCDR1, a HCDR2, and a HCDR3, and the light chain variable region comprises a LCDR1, a LCDR2, and a LCDR3, wherein:
a. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 116, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 129, 128, 130, or 131; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121; or
b. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of

SEQ ID NO: 126 or 133, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 118; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121; or

c. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 116, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 127, 132, or 134, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 118; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121; or

d. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 126, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 127, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 118; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121;

e. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 126, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 128, 129, 130, or 131; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121;

preferably,

a. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 116, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 129; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121; or

b. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 126, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 128 or 130; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121; or

c. in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 133, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 118; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO:

119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121;
more preferably,
in the heavy chain variable region, the HCDR1 comprises the amino acid sequence of SEQ ID NO: 116, the HCDR2 comprises the amino acid sequence of SEQ ID NO: 117, and the HCDR3 comprises the amino acid sequence of SEQ ID NO: 129; and in the light chain variable region, the LCDR1 comprises the amino acid sequence of SEQ ID NO: 119, the LCDR2 comprises the amino acid sequence of SEQ ID NO: 120, and the LCDR3 comprises the amino acid sequence of SEQ ID NO: 121.

9. The anti-EGFR antibody or the antigen-binding fragment thereof according to claim 8, wherein:
the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 138, 135, 136, 137, 139, 140, 141, 142, 143, 144, 145, 146, 147, or 148, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 149;
preferably, the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 138, 142, 144, or 147, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 149;
more preferably, the heavy chain variable region comprises the amino acid sequence of SEQ ID NO: 138, and the light chain variable region comprises the amino acid sequence of SEQ ID NO: 149.

10. The anti-EGFR antibody or the antigen-binding fragment thereof according to claim 9, being an antibody fragment, wherein preferably, the antibody fragment is selected from the group consisting of Fab, Fab', F(ab')2, Fd, Fv, scFv, dsFv, and dAb.

11. The anti-EGFR antibody or the antigen-binding fragment thereof according to claim 9, wherein the anti-EGFR antibody comprises a heavy chain constant region and a light chain constant region;
preferably, the heavy chain constant region is a human IgG1, IgG2, IgG3, or IgG4 heavy chain constant region, and
the light chain constant region is a human κ or λ light chain constant region;
more preferably, the heavy chain constant region comprises the amino acid sequence of SEQ ID NO: 69 or 186, and
the light chain constant region comprises the amino acid sequence of SEQ ID NO: 70.

12. The anti-EGFR antibody or the antigen-binding fragment thereof according to claim 11, comprising a heavy chain and a light chain, wherein:
the heavy chain comprises the amino acid sequence of SEQ ID NO: 153, 150, 151, 152, 154, 155, 156, 157, 158, 159, 160, 161, 162, or 163, and the light chain comprises the

amino acid sequence of SEQ ID NO: 164;
preferably, the heavy chain comprises the amino acid sequence of SEQ ID NO: 153, 157, 159, or 162, and the light chain comprises the amino acid sequence of SEQ ID NO: 164;
more preferably, the heavy chain comprises the amino acid sequence of SEQ ID NO: 153, and the light chain comprises the amino acid sequence of SEQ ID NO: 164.

13. An antigen-binding molecule that specifically binds to EGFR and MUC1, comprising:
at least one antigen-binding moiety that specifically binds to EGFR, and
at least one antigen-binding moiety that specifically binds to MUC1, wherein:
the antigen-binding moiety that specifically binds to EGFR comprises a heavy chain variable region EGFR-VH and a light chain variable region EGFR-VL, and
the antigen-binding moiety that specifically binds to MUC1 comprises a heavy chain variable region MUC1-VH and a light chain variable region MUC1-VL, wherein:
a. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 129, 128, 130, or 131, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or
b. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 126 or 133, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 118, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or
c. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 127, 132, or 134, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 118, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or
d. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 126, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 127, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 118, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121;
e. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 126, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 128, 129, 130, or 131, and

the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121;

preferably,

a. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 129, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or

b. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 126, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 128 or 130, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or

c. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 133, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 118, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121;

more preferably,

a. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 129, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121.

14. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to claim 13, wherein:

the MUC1-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 12, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 13, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 14, and

the MUC1-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 15, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 16, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 17.

15. The antigen-binding molecule that specifically binds to EGFR and MUC1 according

to claim 14, wherein:
the EGFR-VH comprises the amino acid sequence of SEQ ID NO: 138, 135, 136, 137, 139, 140, 141, 142, 143, 144, 145, 146, 147, or 148, and the EGFR-VL comprises the amino acid sequence of SEQ ID NO: 149;
preferably, the EGFR-VH comprises the amino acid sequence of SEQ ID NO: 138, 142, 144, or 147, and the EGFR-VL comprises the amino acid sequence of SEQ ID NO: 149;
more preferably, the EGFR-VH comprises the amino acid sequence of SEQ ID NO: 138, and the EGFR-VL comprises the amino acid sequence of SEQ ID NO: 149.

16. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to claim 15, wherein the MUC1-VH comprises the amino acid sequence of SEQ ID NO: 36, and the MUC1-VL comprises the amino acid sequence of SEQ ID NO: 39.

17. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 16, wherein the antigen-binding moiety that specifically binds to EGFR or the antigen-binding moiety that specifically binds to MUC1 independently comprises a Titin chain and an Obscurin chain that are capable of forming a dimer;
preferably, the Titin chain comprises the amino acid sequence of SEQ ID NO: 165, and the Obscurin chain comprises the amino acid sequence of SEQ ID NO: 166.

18. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 17, further comprising an Fc region, wherein:
preferably, the Fc region is an IgG Fc region;
further preferably, the Fc region is an IgG1 Fc region;
more preferably, the Fc region comprises one or more amino acid substitutions capable of reducing the binding of the Fc region to an Fcγ receptor.

19. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to claim 18, comprising an Fc region, wherein the Fc region comprises a first subunit Fc1 and a second subunit Fc2 that are capable of associating with each other; the Fc1 and Fc2 each independently comprise one or more amino acid substitutions that reduce the homodimerization of the Fc region;
preferably, the Fc1 has a knob structure according to the knob-into-hole technique, and the Fc2 has a hole structure according to the knob-into-hole technique; or, the Fc2 has a knob structure according to the knob-into-hole technique, and the Fc1 has a hole structure according to the knob-into-hole technique;
more preferably, in the Fc1, the amino acid at position 358 is C, and the amino acid at position 370 is W; and in the Fc2, the amino acid at position 357 is C, the amino acid at position 374 is S, the amino acid at position 376 is A, and the amino acid at position 415 is V, as numbered according to the EU index; or, in the Fc2, the amino acid at position

358 is C, and the amino acid at position 370 is W; and in the Fc1, the amino acid at position 357 is C, the amino acid at position 374 is S, the amino acid at position 376 is A, and the amino acid at position 415 is V, as numbered according to the EU index;
most preferably, the Fc1 comprises the amino acid sequence of SEQ ID NO: 169, and the Fc2 comprises the amino acid sequence of SEQ ID NO: 170; or the Fc1 comprises the amino acid sequence of SEQ ID NO: 182, and the Fc2 comprises the amino acid sequence of SEQ ID NO: 183; or, the Fc2 comprises the amino acid sequence of SEQ ID NO: 169, and the Fc1 comprises the amino acid sequence of SEQ ID NO: 170; or the Fc2 comprises the amino acid sequence of SEQ ID NO: 182, and the Fc1 comprises the amino acid sequence of SEQ ID NO: 183.

20. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 19, comprising:
one antigen-binding moiety that specifically binds to EGFR, and
one antigen-binding moiety that specifically binds to MUC1, wherein:
the antigen-binding moiety that specifically binds to MUC1 is a Fab;
the antigen-binding moiety that specifically binds to EGFR is a replaced Fab comprising a Titin chain and an Obscurin chain that are capable of forming a dimer;
preferably,
the antigen-binding molecule comprises one first chain having a structure represented by formula (a), one second chain having a structure represented by formula (b), one third chain having a structure represented by formula (c), and one fourth chain having a structure represented by formula (d):
formula (a) [MUC1-VH]-[CH1]-[Fc1],
formula (b) [MUC1-VL]-[CL],
formula (c) [EGFR-VH]-[linker 1]-[Titin]-[Fc2], and
formula (d) [EGFR-VL]-[linker 2]-[Obscurin],
wherein:
linker 1 and linker 2 are identical or different and are peptide linkers; or linker 1 or linker 2 is absent;
the structures represented by formulas (a), (b), (c), and (d) are arranged from the N-terminus to the C-terminus;
further preferably, the MUC1-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 12, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 13, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 14, and the MUC1-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 15, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 16, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 17; and
a. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a

HCDR3 comprising the amino acid sequence of SEQ ID NO: 129, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or

b. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 126, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 128 or 130, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121; or

c. the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 133, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 118, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121;

more preferably,

the MUC1-VH comprises the amino acid sequence of SEQ ID NO: 36, and the MUC1-VL comprises the amino acid sequence of SEQ ID NO: 39; and

the EGFR-VH comprises the amino acid sequence of SEQ ID NO: 138, 142, 144, or 147, and the EGFR-VL comprises the amino acid sequence of SEQ ID NO: 149;

most preferably, the antigen-binding molecule comprises:

one first chain comprising the amino acid sequence of SEQ ID NO: 171,

one second chain comprising the amino acid sequence of SEQ ID NO: 74,

one third chain comprising the amino acid sequence of SEQ ID NO: 174, 172, 175, 176, or 177, and

one fourth chain comprising the amino acid sequence of SEQ ID NO: 173;

or, the antigen-binding molecule comprises:

one first chain comprising the amino acid sequence of SEQ ID NO: 178,

one second chain comprising the amino acid sequence of SEQ ID NO: 74,

one third chain comprising the amino acid sequence of SEQ ID NO: 179, and

one fourth chain comprising the amino acid sequence of SEQ ID NO: 173.

21. The antigen-binding molecule that specifically binds to EGFR and MUC1 according to claim 20, wherein the antigen-binding molecule comprises:

one antigen-binding moiety that specifically binds to EGFR, and

one antigen-binding moiety that specifically binds to MUC1, wherein:

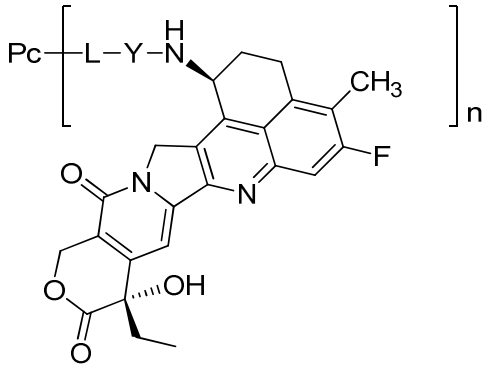
the antigen-binding moiety that specifically binds to MUC1 is a Fab;

the antigen-binding moiety that specifically binds to EGFR is a replaced Fab comprising a Titin chain and an Obscurin chain that are capable of forming a dimer;

preferably,
the antigen-binding molecule comprises one first chain having a structure represented by formula (a), one second chain having a structure represented by formula (b), one third chain having a structure represented by formula (c), and one fourth chain having a structure represented by formula (d):
formula (a) [MUC1-VH]-[CH1]-[Fc1],
formula (b) [MUC1-VL]-[CL],
formula (c) [EGFR-VH]-[linker 1]-[Titin]-[Fc2], and
formula (d) [EGFR-VL]-[linker 2]-[Obscurin],
wherein:
linker 1 and linker 2 are identical or different and are peptide linkers; or linker 1 or linker 2 is absent;
the structures represented by formulas (a), (b), (c), and (d) are arranged from the N-terminus to the C-terminus;
further preferably, the MUC1-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 12, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 13, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 14, and the MUC1-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 15, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 16, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 17; and
the EGFR-VH comprises a HCDR1 comprising the amino acid sequence of SEQ ID NO: 116, a HCDR2 comprising the amino acid sequence of SEQ ID NO: 117, and a HCDR3 comprising the amino acid sequence of SEQ ID NO: 129, and the EGFR-VL comprises a LCDR1 comprising the amino acid sequence of SEQ ID NO: 119, a LCDR2 comprising the amino acid sequence of SEQ ID NO: 120, and a LCDR3 comprising the amino acid sequence of SEQ ID NO: 121;
more preferably, the MUC1-VH comprises the amino acid sequence of SEQ ID NO: 36, and the MUC1-VL comprises the amino acid sequence of SEQ ID NO: 39; and the EGFR-VH comprises the amino acid sequence of SEQ ID NO: 138, and the EGFR-VL comprises the amino acid sequence of SEQ ID NO: 149;
most preferably, the antigen-binding molecule comprises:
one first chain comprising the amino acid sequence of SEQ ID NO: 171,
one second chain comprising the amino acid sequence of SEQ ID NO: 74,
one third chain comprising the amino acid sequence of SEQ ID NO: 174, and
one fourth chain comprising the amino acid sequence of SEQ ID NO: 173;
or the antigen-binding molecule comprises:
one first chain comprising the amino acid sequence of SEQ ID NO: 178,
one second chain comprising the amino acid sequence of SEQ ID NO: 74,
one third chain comprising the amino acid sequence of SEQ ID NO: 179, and
one fourth chain comprising the amino acid sequence of SEQ ID NO: 173.

22. An immunoconjugate, comprising:
the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7 and an effector, or
the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12 and an effector, or
the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21 and an effector,
wherein the effector is coupled to the anti-MUC1 antibody or the antigen-binding fragment thereof, the anti-EGFR antibody or the antigen-binding fragment thereof, or the antigen-binding molecule that specifically binds to EGFR and MUC1;
preferably, the effector is selected from the group consisting of an anti-tumor agent, an immunomodulator, a biological response modifier, a lectin, a cytotoxic drug, a chromophore, a fluorophore, a chemiluminescent compound, an enzyme, and a metal ion, and any combination thereof.

23. An antibody-drug conjugate represented by general formula (Pc-L-Y-D) or a pharmaceutically acceptable salt thereof, wherein:



(Pc-L-Y-D)

Y is selected from the group consisting of -O-$(CR^aR^b)_m$-CR^1R^2-C(O)-, -O-CR^1R^2-$(CR^aR^b)_m$-, -O-CR^1R^2-, -NH-$(CR^aR^b)_m$-CR^1R^2-C(O)-, and -S-$(CR^aR^b)_m$-CR^1R^2-C(O)-;
R^a and R^b are identical or different and are each independently selected from the group consisting of hydrogen, deuterium, halogen, alkyl, haloalkyl, deuterated alkyl, alkoxy, hydroxy, amino, cyano, nitro, hydroxyalkyl, cycloalkyl, heterocyclyl, aryl, and heteroaryl;
or, R^a and R^b, together with the carbon atom to which they are attached, form cycloalkyl, heterocyclyl, aryl, or heteroaryl;
R^1 is selected from the group consisting of halogen, alkyl, haloalkyl, deuterated alkyl, hydroxy, alkoxy, cyano, amino, cycloalkyl, cycloalkylalkyl, alkoxyalkyl, heterocyclyl, aryl, and heteroaryl;
R^2 is selected from the group consisting of hydrogen, deuterium, halogen, alkyl, haloalkyl, deuterated alkyl, hydroxy, alkoxy, cyano, amino, cycloalkyl, cycloalkylalkyl, alkoxyalkyl, heterocyclyl, aryl, and heteroaryl;
or, R^1 and R^2, together with the carbon atom to which they are attached, form cycloalkyl,

heterocyclyl, aryl, or heteroaryl;
or, R^a and R^2, together with the carbon atoms to which they are attached, form cycloalkyl, heterocyclyl, aryl, or heteroaryl;
m is 0, 1, 2, 3, or 4;
n is 1 to 10;
L is a linker unit;
Pc is the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7, or the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, or the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21;
preferably, Pc is the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21.

24. The antibody-drug conjugate represented by general formula (Pc-L-Y-D) or the pharmaceutically acceptable salt thereof according to claim 23, wherein:
Y is $-O-(CR^aR^b)_m-CR^1R^2-C(O)-$,
wherein R^a and R^b are identical or different and are each independently selected from the group consisting of hydrogen, deuterium, halogen, and alkyl;
R^1 is cycloalkyl-alkyl or cycloalkyl;
R^2 is selected from the group consisting of hydrogen, haloalkyl, and cycloalkyl;
or, R^1 and R^2, together with the carbon atom to which they are attached, form cycloalkyl;
m is 0, 1, 2, 3, or 4;
n is 1 to 10;
L is a linker unit;
Pc is the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7, or the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, or the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21;
preferably, Pc is the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21.

25. The antibody-drug conjugate represented by general formula (Pc-L-Y-D) or the pharmaceutically acceptable salt thereof according to claim 23 or 24, wherein the linker unit -L- is $-L^1-L^2-L^3-L^4-$,
wherein:
L^1 is selected from the group consisting of -(succinimid-3-yl-*N*)-W-C(O)-, $-CH_2-C(O)-NR^3$-W-C(O)-, and -C(O)-W-C(O)-, and W is selected from the group consisting of alkylene and alkylene-cycloalkyl, wherein the alkylene or alkylene-cycloalkyl is independently and optionally substituted with one or more substituents selected from the group consisting of halogen, hydroxy, cyano, amino, alkyl, haloalkyl, deuterated alkyl, alkoxy, and cycloalkyl;
L^2 is selected from the group consisting of $-NR^4(CH_2CH_2O)p^1CH_2CH_2C(O)-$, $-NR^4(CH_2CH_2O)p^1CH_2C(O)-$, $-S(CH_2)p^1C(O)-$, and a chemical bond, wherein p^1 is an integer from 1 to 20;

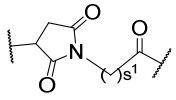
L^3 is a peptide residue consisting of 2 to 7 amino acid residues, wherein the amino acid residues are selected from the group consisting of amino acid residues formed from amino acids from phenylalanine, alanine, glycine, valine, lysine, citrulline, serine, glutamic acid, and aspartic acid, and are optionally substituted with one or more substituents selected from the group consisting of halogen, hydroxy, cyano, amino, alkyl, haloalkyl, deuterated alkyl, alkoxy, and cycloalkyl;

L^4 is selected from the group consisting of $-NR^5(CR^6R^7)_t-$, $-C(O)NR^5-$, $-C(O)NR^5(CH_2)_t-$, and a chemical bond, wherein t is 1, 2, 3, 4, 5, or 6;

R^3, R^4, and R^5 are identical or different and are each independently selected from the group consisting of hydrogen, alkyl, haloalkyl, deuterated alkyl, and hydroxyalkyl;

R^6 and R^7 are identical or different and are each independently selected from the group consisting of hydrogen, halogen, alkyl, haloalkyl, deuterated alkyl, and hydroxyalkyl;

preferably, the linker unit $-L^1-L^2-L^3-L^4-$ is as follows:

L^1 is , wherein s^1 is 2, 3, 4, 5, 6, 7, or 8;

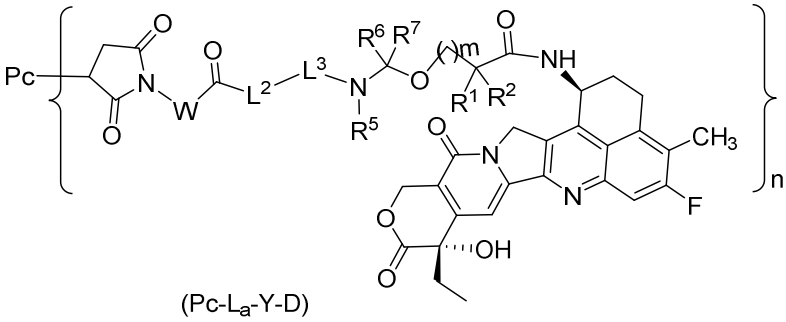
L^2 is a chemical bond;

L^3 is a tetrapeptide residue; preferably, L^3 is a tetrapeptide residue set forth in SEQ ID NO: 180;

L^4 is $-NR^5(CR^6R^7)t-$, wherein R^5, R^6, or R^7 is identical or different and is independently hydrogen or alkyl, and t is 1 or 2;

the L^1 terminus of -L- is attached to Pc, and the L^4 terminus is attached to Y.

26. The antibody-drug conjugate represented by general formula (Pc-L-Y-D) or the pharmaceutically acceptable salt thereof according to any one of claims 23 to 25, being an antibody-drug conjugate represented by general formula ($Pc-L_a-Y-D$) or a pharmaceutically acceptable salt thereof:



($Pc-L_a-Y-D$)

wherein:

Pc is the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7, or the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, or the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21;

preferably, Pc is the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21;

m is 0, 1, 2, 3, or 4;

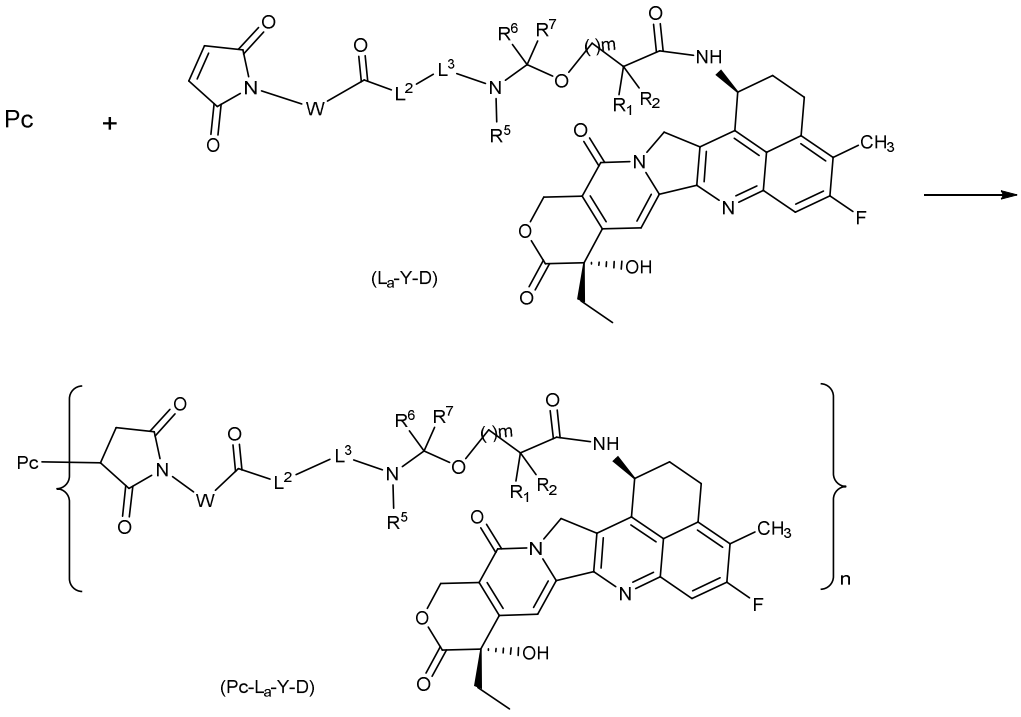
n is 1 to 10;

R^1 is cycloalkyl-alkyl or cycloalkyl;

R^2 is selected from the group consisting of hydrogen, haloalkyl, and cycloalkyl;

or, R^1 and R^2, together with the carbon atom to which they are attached, form cycloalkyl;
W is selected from the group consisting of alkylene and alkylene-cycloalkyl, wherein the alkylene and alkylene-cycloalkyl are each independently and optionally substituted with one or more substituents selected from the group consisting of halogen, hydroxy, cyano, amino, alkyl, haloalkyl, deuterated alkyl, alkoxy, and cycloalkyl;
L^2 is selected from the group consisting of $-NR^4(CH_2CH_2O)p^1CH_2CH_2C(O)-$, $-NR^4(CH_2CH_2O)p^1CH_2C(O)-$, $-S(CH_2)p^1C(O)-$, and a chemical bond, wherein p^1 is an integer from 1 to 20;
L^3 is a peptide residue consisting of 2 to 7 amino acid residues, wherein the amino acid residues are selected from the group consisting of amino acid residues formed from amino acids from phenylalanine, alanine, glycine, valine, lysine, citrulline, serine, glutamic acid, and aspartic acid, and are optionally substituted with one or more substituents selected from the group consisting of halogen, hydroxy, cyano, amino, alkyl, haloalkyl, deuterated alkyl, alkoxy, and cycloalkyl;
R^4 and R^5 are selected from the group consisting of hydrogen, alkyl, haloalkyl, deuterated alkyl, and hydroxyalkyl;
R^6 and R^7 are identical or different and are each independently selected from the group consisting of hydrogen, halogen, alkyl, haloalkyl, deuterated alkyl, and hydroxyalkyl.

27. A method for preparing an antibody-drug conjugate represented by general formula (Pc-L_a-Y-D) or a pharmaceutically acceptable salt thereof, comprising the following step:



subjecting reduced Pc to a coupling reaction with a compound represented by general formula (L_a-Y-D) or a salt thereof to give the antibody-drug conjugate represented by general formula (Pc-L_a-Y-D) or the pharmaceutically acceptable salt thereof,
wherein:
Pc is the anti-MUC1 antibody or the antigen-binding fragment thereof according to any

one of claims 1 to 7, or the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, or the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21; preferably, Pc is the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21;
W, L^2, L^3, R^1, R^2, R^5 to R^7, m, and n are as defined in claim 26.

28. A pharmaceutical composition, comprising:
the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7, the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21, or the antibody-drug conjugate or the pharmaceutically acceptable salt thereof according to any one of claims 23 to 26, and one or more pharmaceutically acceptable carriers, diluents, or excipients.

29. An isolated nucleic acid, encoding the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7 or the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12.

30. A host cell, comprising the isolated nucleic acid according to claim 29.

31. The pharmaceutical composition according to claim 28 for use as a medicament.

32. Use of the anti-MUC1 antibody or the antigen-binding fragment thereof according to any one of claims 1 to 7, the anti-EGFR antibody or the antigen-binding fragment thereof according to any one of claims 8 to 12, the antigen-binding molecule that specifically binds to EGFR and MUC1 according to any one of claims 13 to 21, the antibody-drug conjugate or the pharmaceutically acceptable salt thereof according to any one of claims 23 to 26, or the pharmaceutical composition according to claim 28, in the manufacture of a medicament for preventing or treating a disease, wherein the disease is selected from the group consisting of astrocytoma, glioblastoma, bladder cancer, bone cancer, brain cancer, breast cancer, cervical cancer, colorectal cancer, fallopian tube cancer, gallbladder cancer, gastric cancer, head and neck cancer, idiopathic myelofibrosis, renal cancer, leukemia, liver cancer, esophageal cancer, lung cancer, medulloblastoma, melanoma, Merkel cell carcinoma, mesothelioma, multiple myeloma, neuroblastoma, oligodendroglioma, ovarian cancer, peritoneal tumor, pancreatic cancer, polycythemia vera, primary neuroectodermal tumor, prostate cancer, retinoblastoma, sarcoma, squamous cell carcinoma, thyroid cancer, endometrial cancer, vestibular schwannoma, blastoma, vulvar cancer, thymoma, testicular cancer, cholangiocarcinoma, pheochromocytoma, paraganglioma, and adenoid cystic carcinoma;
most preferably, the disease is selected from the group consisting of lung cancer, head

and neck cancer, esophageal cancer, breast cancer, pancreatic cancer, prostate cancer, thyroid cancer, gastric cancer, ovarian cancer, colorectal cancer, liver cancer, gallbladder cancer, renal cancer, cervical cancer, and bladder cancer.