

WHAT IS CLAIMED:

1. An isolated antibody, or antigen-binding thereof, that binds to a first group of C10orf54 proteins or chimeric proteins designated CC1 (SEQ ID NO: 1079), CC4 (SEQ ID NO: 1245), CC5 (SEQ ID NO: 1246), CC8 (SEQ ID NO: 1249), and CC10 (SEQ ID NO: 1251), and does not bind to a second group of C10orf54 proteins or chimeric proteins designated CC2 (SEQ ID NO: 1243), CC3 (SEQ ID NO: 1244), CC6 (SEQ ID NO: 1247), CC7 (SEQ ID NO: 1248), and CC9 (SEQ ID NO: 1250).

2. The antibody of claim 1, or antigen-binding thereof, wherein said antibody is a monoclonal antibody.

3. The antibody of any one of claims 1 or 2, or antigen-binding thereof, wherein said antibody is selected from the group consisting of:

a) an antibody 5B comprising:

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1292, CDR-H2 having the sequence SEQ ID No. 1337 and CDR-H3 having the sequence SEQ ID No. 1386; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1426, CDR-L2 having the sequence SEQ ID No. 1474 and CDR-L3 having the sequence SEQ ID No. 1493,

b) an antibody 46A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1292, CDR-H2 having the sequence SEQ ID No. 1342 and CDR-H3 having the sequence SEQ ID No. 1390; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1426, CDR-L2 having the sequence SEQ ID No. 1474 and CDR-L3 having the sequence SEQ ID No. 1496;

c) an antibody 128A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1292, CDR-H2 having the sequence SEQ ID No. 1337 and CDR-H3 having the sequence SEQ ID No. 1386; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1426, CDR-L2 having the sequence SEQ ID No. 1474 and CDR-L3 having the sequence SEQ ID No. 1493;

d) an antibody 146C comprising:

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1292, CDR-H2 having the sequence SEQ ID No. 1337 and CDR-H3 having the sequence SEQ ID No. 1386; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1426, CDR-L2 having the sequence SEQ ID No. 1474 and CDR-L3 having the sequence SEQ ID No. 1493,

e) an antibody 208A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1292, CDR-H2 having the sequence SEQ ID No. 1337 and CDR-H3 having the sequence SEQ ID No. 1386; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1426, CDR-L2 having the sequence SEQ ID No. 1474 and CDR-L3 having the sequence SEQ ID No. 1493;

f) an antibody 26A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1297, CDR-H2 having the sequence SEQ ID No. 1355 and CDR-H3 having the sequence SEQ ID No. 1394; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1432, CDR-L2 having the sequence SEQ ID No. 1477 and CDR-L3 having the sequence SEQ ID No.1499;

g) an antibody 164A comprising:

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1099, CDR-H2 having the sequence SEQ ID No. 1360 and CDR-H3 having the sequence SEQ ID No. 1398; and
- a light chain comprising:
 - o the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1438, CDR-L2 having the sequence SEQ ID No. 1527 and CDR-L3 having the sequence SEQ ID No.1523, or
 - o the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1452, CDR-L2 having the sequence SEQ ID No. 1480 and CDR-L3 having the sequence SEQ ID No.1502;

h) an antibody 230A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1302, CDR-H2 having the sequence SEQ ID No. 1365 and CDR-H3 having the sequence SEQ ID No. 1402; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1455, CDR-L2 having the sequence SEQ ID No. 1103 and CDR-L3 having the sequence SEQ ID No.1505;

i) an antibody 33A comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1312, CDR-H2 having the sequence SEQ ID No. 1082 and CDR-H3 having the sequence SEQ ID No. 1410; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1102, CDR-L2 having the sequence SEQ ID No. 1103 and CDR-L3 having the sequence SEQ ID No. 1511;

j) an antibody 321D comprising

- a heavy chain comprising the following three CDRs as defined according to IMGT, respectively CDR-H1 having the sequence SEQ ID No. 1322, CDR-H2 having the sequence SEQ ID No. 1082 and CDR-H3 having the sequence SEQ ID No. 1083; and
- a light chain comprising the following three CDRs as defined according to IMGT, respectively CDR-L1 having the sequence SEQ ID No. 1102, CDR-L2 having the sequence SEQ ID No. 1103 and CDR-L3 having the sequence SEQ ID No. 1514.

4. The antibody of any one of claims 1 to 3, or antigen-binding thereof, wherein the antibody is humanized.

5. An antibody according to claim 4, or antigen-binding thereof, said antibody being selected from the group consisting of:

- a) an antibody 26A comprising a heavy chain variable domain of sequence selected between amino acid sequences SEQ ID NO. 1529, SEQ ID NO. 1530, and SEQ ID NO. 1531, and a light chain variable domain of sequence selected between amino acid sequences SEQ ID NO. 1532, SEQ ID NO. 1533, and SEQ ID NO. 1534;
- b) an antibody 128A comprising a heavy chain variable domain of sequence selected between amino acid sequences SEQ ID NO. 1535, SEQ ID NO. 1536, and SEQ ID NO. 1537, and a light chain variable

domain of sequence selected between amino acid sequences SEQ ID NO. 1538, SEQ ID NO. 1539, and SEQ ID NO. 1540.

- 5 6. The antibody of any one of claims 1 to 5, wherein the antibody is a Fab Fragment, F(ab')₂ fragment, single chain Fv (sFv), diabody, triabody, or minibody.
7. An antibody-drug conjugate comprising the antibody of any one of claims 1 to 6, conjugated to a cytotoxic agent.
- 10 8. A polynucleotide comprising a nucleotide sequence encoding the antibody of any one of claims 1 to 6.
9. An expression vector comprising the polynucleotide of claim 8.
10. A host cell comprising the expression vector of claim 9.
- 15 11. A method of producing the antibody or antigen-binding fragment thereof, of any of claims 1 to 6, said method comprising a step of culturing the host cell of claim 10 under conditions that promotes the production of the antibody.
12. A pharmaceutical composition comprising the antibody of any one of claims 1 to 6 or the antibody-drug conjugate of claim 7, and a pharmaceutically acceptable diluent, carrier or excipient.
- 20 13. Use of a composition of claim 12 in the manufacture of a medicament for treating, preventing or alleviating one or more symptoms of a cancer.
- 25 14. The use of claim 13, wherein the cancer is a leukemia, preferably acute myeloid leukemia (AML), a bladder cancer, a skin cancer, a colon cancer, a breast cancer, a liver cancer, a kidney cancer, a lung cancer, a stomach cancer, a pancreas cancer, an esophagus cancer or a fibrosarcoma.
- 30 15. Use of a composition of claim 12 in the manufacture of a medicament for inhibiting the growth of a tumor with inflammation in a subject.

16. A composition of claim 12 for use in inhibiting the growth of a cell having cell surface expression of C10orf54.
17. The composition for use of claim 16, wherein the cell is a regulatory T cell.
18. The composition for use of any one of claims 16 or 17, wherein the cell is a cancerous or pre-cancerous cell.
19. A composition of claim 12 for use in modulating an immune response in a subject.
20. The composition for use of claim 19, wherein the modulating comprises:
- a) increasing T cell activation;
 - b) increasing T cell proliferation; or
 - c) increasing cytokine production.
21. Use of an antibody of any one of claims 1 to 6 or the antibody-drug conjugate of claim 7 in the manufacture of a medicament for treating cancer.
22. A method of killing a tumor cell comprising contacting a C10orf54-expressing tumor cell with an amount of an antibody of any one of claims 1 to 6 or an antibody-drug conjugate of claim 7 effective to kill the tumor cell.
23. A method for detecting C10orf54 in a sample comprising contacting the sample with the antibody of any one claims 1 to 6.
24. A kit comprising the antibody of any one of claims 1 to 6.
25. The kit of claim 24, wherein said antibody is conjugated to a detectable substrate.