

WHAT IS CLAIMED IS:

1. An antibody or fragment thereof, wherein the antibody or fragment thereof has specificity to a T cell immunoreceptor with Ig and ITIM domains (TIGIT) protein and comprises a heavy chain variable region (VH) comprising a VH CDR1 comprising the amino acid sequence of SEQ ID NO:1, a VH CDR2 comprising the amino acid sequence of SEQ ID NO:2, and a VH CDR3 comprising the amino acid sequence of SEQ ID NO:3, and a light chain variable region (VL) comprising a VL CDR1 comprising the amino acid sequence of SEQ ID NO:4, a VL CDR2 comprising the amino acid sequence of SEQ ID NO:5, and a VL CDR3 comprising the amino acid sequence of SEQ ID NO:6.
2. The antibody or fragment thereof of claim 1, further comprising a Fc fragment.
3. The antibody or fragment thereof of claim 2, wherein the Fc fragment is a human IgG1 Fc fragment.
4. The antibody or fragment thereof of any preceding claim, which is humanized.
5. The antibody or fragment thereof of any preceding claim, wherein the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NO:9-14 and the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NO:15-18.
6. The antibody or fragment thereof of claim 5, wherein the VH comprises the amino acid sequence of SEQ ID NO:11 and the VL comprises the amino acid sequence of SEQ ID NO:15.
7. The antibody or fragment thereof of claim 5, wherein the VH comprises the amino acid sequence of SEQ ID NO:10 and the VL comprises the amino acid sequence of SEQ ID NO:16.
8. The antibody or fragment thereof of any preceding claim, which is antibody-dependent cellular cytotoxicity (ADCC)-competent.
9. A bispecific antibody comprising a fragment of any one of claims 1-8 and a second antigen-binding fragment having a second specificity.
10. The bispecific antibody of claim 9, wherein the second specificity is to a molecule on an immune cell or a tumor antigen.
11. The bispecific antibody of claim 9, wherein the second specificity is to a molecule selected from the group consisting of CD33, CD47, CD73, Her2, EGFR, CEA VEGF, CD155,

CD112, CD113, PVRL3, PVRIG, CD3, CTLA-4, GITR, 4-1BB, PD-L1, PD-1, LAG-3, CD28, CD122, TIM3, OX-40, OX40L, CD40, CD40L, LIGHT, ICOS, ICOSL, GITR, GITRL, CD27, VISTA, B7H3, B7H4, HEVM, BTLA, KIR, and combinations thereof.

12. The bispecific antibody of any one of claims 9-11, wherein the fragment and the second antigen-binding fragment each is independently selected from a Fab fragment, a single-chain variable fragment (scFv), or a single-domain antibody.

13. A composition comprising the antibody or fragment thereof of any one of claims 1-12 and a pharmaceutically acceptable carrier.

14. One or more polynucleotides encoding the antibody or fragment thereof of any one of claims 1-12.

15. An isolated cell comprising one or more polynucleotide encoding the antibody or fragment thereof of any one of claims 1-12.

16. A method of treating cancer in a patient in need thereof, comprising administering to the patient the antibody or fragment thereof of any one of claims 1-12.

17. Use of the antibody or fragment thereof of any one of claims 1-12 for the manufacture of a medicament for treating cancer.

18. The method of claim 16 or the use of claim 17, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, colorectal cancer, endometrial cancer, esophageal cancer, head and neck cancer, kidney cancer, leukemia, liver cancer, lung cancer, lymphoma, melanoma, pancreatic cancer, prostate cancer, and thyroid cancer.

19. The method of claim 16 or 18, or the use of claim 17 or 18, wherein the patient is further treated with a second agent, preferably an immune checkpoint inhibitor.

20. The method or use of claim 19, wherein the immune checkpoint inhibitor is an antibody or antigen-binding fragment specific to PD-1, PD-L1, CTLA-4, LAG-3, CD28, CD122, 4-1BB, or BTLA.

21. A method of treating or inhibiting infection in a patient in need thereof, comprising administering to the patient the antibody or fragment thereof of any one of claims 1-12.

22. Use of the antibody or fragment thereof of any one of claims 1-12 for the manufacture of a medicament for treating or inhibiting infection.

23. The method of claim 21 or the use of claim 22, wherein the infection is viral, bacterial, fungal, or parasite infection.
24. The method of claim 21 or 23 or the use of claim 22 or 23, wherein the infection is HIV infection.
25. A method of treating cancer in a patient in need thereof, comprising (a) treating a T or NK cell, *in vitro*, with the antibody or fragment thereof of any one of claims 1-12; and (b) administering the treated T or NK cell to the patient.
26. The method of claim 25, further comprising, prior to step (a), isolating the T or NK cell from an individual.
27. The method of claim 25 or 26, wherein the T cell is a tumor-infiltrating T lymphocyte, a CD4⁺ T cell, a CD8⁺ T cell, or the combination thereof.
28. The method of claim 25 or 26, wherein an NK cell is treated.
29. A method of detecting expression of TIGIT in a sample, comprising contacting the sample with the antibody or fragment thereof of any one of claims 1-12 under conditions for the antibody or fragment thereof to bind to the TIGIT, and detecting the binding which indicates expression of TIGIT in the sample.

WHAT IS CLAIMED IS:

1. An antibody or fragment thereof, wherein the antibody or fragment thereof has specificity to a T cell immunoreceptor with Ig and ITIM domains (TIGIT) protein and comprises a heavy chain variable region (VH) comprising a VH CDR1 comprising the amino acid sequence of SEQ ID NO:1, a VH CDR2 comprising the amino acid sequence of SEQ ID NO:2, and a VH CDR3 comprising the amino acid sequence of SEQ ID NO:3, and a light chain variable region (VL) comprising a VL CDR1 comprising the amino acid sequence of SEQ ID NO:4, a VL CDR2 comprising the amino acid sequence of SEQ ID NO:5, and a VL CDR3 comprising the amino acid sequence of SEQ ID NO:6.
2. The antibody or fragment thereof of claim 1, further comprising a Fc fragment.
3. The antibody or fragment thereof of claim 2, wherein the Fc fragment is a human IgG1 Fc fragment.
4. The antibody or fragment thereof of any preceding claim, which is humanized.
5. The antibody or fragment thereof of any preceding claim, wherein the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NO:9-14 and the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NO:15-18.
6. The antibody or fragment thereof of claim 5, wherein the VH comprises the amino acid sequence of SEQ ID NO:11 and the VL comprises the amino acid sequence of SEQ ID NO:15.
7. The antibody or fragment thereof of claim 5, wherein the VH comprises the amino acid sequence of SEQ ID NO:10 and the VL comprises the amino acid sequence of SEQ ID NO:16.

8. The antibody or fragment thereof of any preceding claim, which is antibody-dependent cellular cytotoxicity (ADCC)-competent.
9. A bispecific antibody comprising a fragment of any one of claims 1-8 and a second antigen-binding fragment having a second specificity.
10. The bispecific antibody of claim 9, wherein the second specificity is to a molecule on an immune cell or a tumor antigen.
11. The bispecific antibody of claim 9, wherein the second specificity is to a molecule selected from the group consisting of CD33, CD47, CD73, Her2, EGFR, CEA VEGF, CD155, CD112, CD113, PVRL3, PVRIG, CD3, CTLA-4, GITR, 4-1BB, PD-L1, PD-1, LAG-3, CD28, CD122, TIM3, OX-40, OX40L, CD40, CD40L, LIGHT, ICOS, ICOSL, GITR, GITRL, CD27, VISTA, B7H3, B7H4, HEVM, BTLA, KIR, and combinations thereof.
12. The bispecific antibody of any one of claims 9-11, wherein the fragment and the second antigen-binding fragment each is independently selected from a Fab fragment, a single-chain variable fragment (scFv), or a single-domain antibody.
13. A composition comprising the antibody or fragment thereof of any one of claims 1-12 and a pharmaceutically acceptable carrier.
14. One or more polynucleotides encoding the antibody or fragment thereof of any one of claims 1-12.
15. An isolated cell comprising one or more polynucleotide encoding the antibody or fragment thereof of any one of claims 1-12.

16. Use of the antibody or fragment thereof of any one of claims 1-12, or the composition of claim 13, in the manufacture of a medicament for treating cancer.

17. The use of claim 16, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, colorectal cancer, endometrial cancer, esophageal cancer, head and neck cancer, kidney cancer, leukemia, liver cancer, lung cancer, lymphoma, melanoma, pancreatic cancer, prostate cancer, and thyroid cancer.

18. The use of claim 16 or 17, wherein the medicament is to be administered with a second agent, preferably an immune checkpoint inhibitor.

19. The use of claim 18, wherein the immune checkpoint inhibitor is an antibody or antigen-binding fragment specific to PD-1, PD-L1, CTLA-4, LAG-3, CD28, CD122, 4-1BB, or BTLA.

20. Use of the antibody or fragment thereof of any one of claims 1-12, or the composition of claim 13, in the manufacture of a medicament for treating or inhibiting infection.

21. The use of claim 20, wherein the infection is viral, bacterial, fungal, or parasite infection.

22. The use of claim 20 or 21, wherein the infection is HIV infection.

23. Use of the antibody or fragment thereof of any one of claims 1-12, or the composition of claim 13, in the manufacture of a medicament for treating cancer in a patient in need thereof, wherein the use comprises treating a T or NK cell, *in vitro*, with the antibody or fragment thereof of any one of claims 1-12; and wherein the medicament is formulated for administration of the treated T or NK cell to the patient.

24. The use of claim 23, further comprising isolating the T or NK cell from an individual prior to treating the T or NK cell, *in vitro*.

25. The use of claim 23 or 24, wherein the T cell is a tumor-infiltrating T lymphocyte, a CD4+ T cell, a CD8+ T cell, or the combination thereof.

27. The use of claim 23 or 24, wherein an NK cell is treated.

28. A method of detecting expression of TIGIT in a sample, comprising contacting the sample with the antibody or fragment thereof of any one of claims 1-12 under conditions for the antibody or fragment thereof to bind to the TIGIT, and detecting the binding which indicates expression of TIGIT in the sample.