

WHAT IS CLAIMED IS:

1. A conjugate, comprising:
a targeting moiety that binds to a cell surface molecule of a target cell; and
a target cell surface-editing enzyme.
2. The conjugate of Claim 1, wherein the targeting moiety is selected from the group consisting of: an antibody, a ligand, an aptamer, a nanoparticle, and a small molecule.
3. The conjugate of Claim 2, wherein the targeting moiety is an antibody.
4. The conjugate of Claim 3, wherein the antibody is an IgG, an IgG1, a single chain Fv (scFv), Fab, (Fab)₂, or (scFv')₂.
5. The conjugate of Claim 3 or Claim 4, wherein the antibody is a monoclonal antibody, optionally wherein the antibody is a humanized or human antibody.
6. The conjugate of any one of Claims 3 to 5, wherein the target cell surface-editing enzyme is conjugated to a light chain of the antibody, a heavy chain of the antibody, an Fc region of the antibody, or the C-terminus of a heavy chain of the antibody.
7. The conjugate of any one of Claims 1 to 6, wherein the target cell surface-editing enzyme is site-specifically conjugated to the targeting moiety, optionally wherein the targeting moiety comprises a non-natural amino acid to which the target cell surface-editing enzyme is site-specifically conjugated.
8. The conjugate of any one of Claims 1 to 7, wherein the target cell surface-editing enzyme is conjugated to the targeting moiety via a linker.
9. The conjugate of Claim 8, wherein the linker is a peptide.
10. The conjugate of Claim 9, wherein the conjugate is a fusion protein.

11. The conjugate of any one of Claims 1 to 10, wherein the target cell is a cancer cell, optionally wherein the cancer cell is a carcinoma cell.
12. The conjugate of Claim 11, wherein the cell surface molecule is a tumor-associated cell surface molecule or a tumor-specific cell surface molecule.
13. The conjugate of Claim 11 or Claim 12, wherein the cancer cell is selected from the group consisting of: a breast cancer cell, an ovarian cancer cell, a gastric cancer cell, and a colon cancer cell, optionally wherein the cell surface molecule is human epidermal growth factor receptor 2 (HER2), optionally wherein the targeting moiety is trastuzumab.
14. The conjugate of any one of Claims 3 to 10, wherein the targeting moiety is selected from the group consisting of: cetuximab, daratumumab, girentuximab, panitumumab, ofatumumab, and rituximab.
15. The conjugate of any one of Claims 1 to 14, wherein the target cell surface-editing enzyme cleaves a molecule on the surface of the target cell, oxidizes a molecule on the surface of the target cell, reduces a molecule on the surface of the target cell, adds a moiety to a molecule on the surface of the target cell, or removes a moiety from a molecule on the surface of the target cell.
16. The conjugate of any one of Claims 1 to 14, wherein the target cell surface-editing enzyme cleaves a molecule on the surface of the target cell.
17. The conjugate of Claim 16, wherein the molecule on the surface of the target cell is a ligand, optionally wherein the ligand is a ligand of an inhibitory immune receptor, optionally wherein the inhibitory immune receptor is present on an immune cell selected from the group consisting of: a natural killer (NK) cell, a macrophage, a monocyte, a neutrophil, a dendritic cell, a T cell, a B cell, a mast cell, a basophil, and an eosinophil.
18. The conjugate of Claim 17, wherein the ligand is a ligand of a sialic acid-binding Ig-like lectin (Siglec) receptor.

19. The conjugate of Claim 18, wherein the Siglec receptor is Siglec 7.
20. The conjugate of Claim 18, wherein the Siglec receptor is Siglec 9.
21. The conjugate of any one of Claims 17 to 20, wherein the ligand is a sialoglycan.
22. The conjugate of any one of Claims 1 to 21, wherein the target cell surface-editing enzyme is a sialidase.
23. The conjugate of Claim 22, wherein the sialidase is selected from the group consisting of: a *Salmonella typhimurium* sialidase, a *Vibrio cholerae* sialidase, a mammalian neuraminidase, a human neuraminidase, human neuraminidase 1, human neuraminidase 2, human neuraminidase 3, and human neuraminidase 4.
24. A composition, comprising:
 - a conjugate of any one of Claims 1 to 23; and
 - a pharmaceutically acceptable carrier.
25. A method comprising administering to an individual in need thereof a conjugate of any one of Claims 1 to 23 or a composition of Claim 24.
26. A method of treating cancer comprising administering to an individual having cancer a conjugate of any one of Claims 1 to 23 or a composition of Claim 24.
27. A method of enhancing antibody-dependent cellular cytotoxicity (ADCC) comprising administering to an individual in need of ADCC a conjugate of any one of Claims 1 to 23 or a composition of Claim 24.
28. The method according to any one of Claims 25 to 27, wherein the administering modulates an immune pathway in the individual, optionally wherein the immune pathway is selected from the group consisting of: an inhibitory immune receptor pathway, a complement pathway, a paired immunoglobulin-like type 2 receptor (PILR) pathway, and a natural-killer group 2 member D protein (NKG2D) pathway.

29. The method according to any one of Claims 25 to 28, wherein the target cell comprises a ligand on its surface, and the administering results in editing of the ligand by the target cell surface-editing enzyme, optionally wherein the editing of the ligand comprises cleavage of all or a portion of the ligand, optionally wherein the ligand is a ligand of an inhibitory immune receptor, optionally wherein the inhibitory immune receptor is present on an immune cell selected from the group consisting of: a natural killer (NK) cell, a macrophage, a monocyte, a neutrophil, a dendritic cell, a T cell, a B cell, a mast cell, a basophil, and an eosinophil.
30. The method according to Claim 29, wherein the ligand is a ligand of a sialic acid-binding Ig-like lectin (Siglec) receptor.
31. The method according to Claim 30, wherein the Siglec receptor is Siglec 7.
32. The method according to Claim 30, wherein the Siglec receptor is Siglec 9.
33. The method according to any one of Claims 29 to 32, wherein the ligand is a sialoglycan.
34. The method according to Claim 33, wherein the target cell surface-editing enzyme is a sialidase.
35. The method according to Claim 34, wherein the sialidase is selected from the group consisting of: a *Salmonella typhimurium* sialidase, a *Vibrio cholerae* sialidase, a mammalian neuraminidase, a human neuraminidase, human neuraminidase 1, human neuraminidase 2, human neuraminidase 3, and human neuraminidase 4.
36. The method according to any one of Claims 29 to 35, wherein editing of the ligand by the target cell surface-editing enzyme enhances natural killer (NK) cell activation by increasing natural-killer group 2 member D protein (NKG2D) binding to a NKG2D ligand on the target cell surface.
37. The method according to any one of Claims 25 to 36, wherein the individual has cancer, and wherein the conjugate comprises a targeting moiety that binds to a tumor-

associated cell surface molecule or tumor-specific cell surface molecule on the surface of a cancer cell of the individual, optionally wherein the cancer cell is a carcinoma cell.

38. The method according to Claim 37, wherein the cancer cell is selected from the group consisting of: a breast cancer cell, an ovarian cancer cell, a gastric cancer cell, and a colon cancer cell, optionally wherein the cell surface molecule is human epidermal growth factor receptor 2 (HER2), optionally wherein the targeting moiety is trastuzumab.

39. The method according to any one of Claims 25 to 35, wherein the targeting moiety is selected from the group consisting of: cetuximab, daratumumab, girentuximab, panitumumab, ofatumumab, and rituximab.

40. A kit comprising the conjugate of any one of Claims 1 to 23 or a composition of Claim 24.

41. A method, comprising:
conjugating a target cell surface-editing enzyme to a targeting moiety that binds to a cell surface molecule on the surface of a target cell.

42. The method according to Claim 41, wherein the conjugate is a fusion protein.

43. The method according to Claim 41 or Claim 42, wherein the target cell surface-editing enzyme is a sialidase and the targeting moiety is an antibody.

44. A nucleic acid encoding the fusion protein of Claim 42, optionally wherein the nucleic acid is present in an expression vector comprising a promoter operably linked to the nucleic acid.

45. A host cell comprising the nucleic acid or the expression vector of Claim 44.