

WHAT IS CLAIMED IS:

1. A vector comprising:

a polynucleotide encoding a chimeric antigen receptor (CAR) comprising: (a) an antigen binding domain of a cancer or tumor targeting antibody; (b) a hinge domain; (c) a transmembrane domain; (d) and an intracellular domain; and

a polynucleotide encoding a bispecific antibody comprising an antigen binding domain that recognizes and binds NKG2D.

2. The vector of claim 1, wherein the CAR comprises: (a) an antigen binding domain of a cancer or tumor targeting antibody; (b) a CD8 α hinge domain; (c) a CD8 α transmembrane domain; (d) a CD28 costimulatory signaling region and/or a 4-1BB costimulatory signaling region; and (e) a CD3 zeta signaling domain.

3. The vector of claims 1 or 2, wherein the cancer or tumor targeting antibody targets B-cell maturation antigen (BCMA) and/or SLAMF7 (also known as CS1 or CD319), and/or an equivalent of each thereof.

4. The vector of any one of claims 1 to 3, wherein the bispecific antibody comprises a ligand of NKG2D or an anti-NKG2D scFv and an antigen binding domain of an anti-SLAMF7 antibody (also known as CS1 or CD319), and/or an equivalent each thereof.

5. The vector of any one of claims 1 to 3, wherein the bispecific antibody comprises CDR regions of an antibody to NKG2D and an antigen binding domain of an anti-SLAMF7 antibody (also known as CS1 or CD319), and/or an equivalent of each thereof.

6. The vector of claim 5, wherein the bispecific antibody comprises the heavy chain and light chain variable region of an antibody to NKG2D and an antigen binding domain of an anti-SLAMF7 antibody (also known as CS1 or CD319), and/or an equivalent of each thereof.

7. The vector of claim 5 or 6, wherein the bispecific antibody comprises a single chain variable fragment (scFV) derived from an antibody to NKG2D, optionally, a single chain variable fragment (scFv) derived from an anti-SALMF7 antibody (also known as CS1 of CD319), and/or an equivalent each thereof.

8. The vector of any one of claims 1 to 7, wherein the vector is a plasmid, and optionally a promoter to regulate expressson of the polynucleotide.

9. The vector of any one of claims 1 to 7, wherein the vector is a viral vector selected from the group of a retroviral vector, a lentiviral vector, an adenoviral vector, and an adeno-associated viral vector, and optionally a promoter to regulate expressson of the polynucleotide.
10. An isolated cell comprising the vector of any one of claims 1 to 9.
11. The isolated cell of claim 10, wherein the cell is a prokaryotic cell or a eukaryotic cell.
12. The isolated cell of claim 11, wherein the cell is a eukaryotic cell.
13. The isolated of claim 12, wherein the eukaryotic cell is selected from an animal cell, a mammalian cell, a bovine cell, a feline cell, a canine cell, a murine cell, an equine cell or a human cell.
14. The isolated cell of claim 12 or 13, wherein the eukaryotic cell is an immune cell, optionally a T-cell, a B cell, a NK cell, a dendritic cell, a myeloid cell, a monocyte, or a macrophage.
15. The isolated cell of any one of claims 10 to 14, wherein the isolated cell expresses the CAR and secretes the bispecific antibody.
16. A composition comprising the vector of any one of claims 1 to 9 and/or the isolated cell of any one of claims 10 to 15, and, optionally, a pharmaceutically acceptable carrier.
17. An isolated complex comprising an isolated cell comprising of any one of claims 10 to 15 bound to a cell expressing a cancer or tumor antigen, optionally, wherein the cancer or tumor antigen is NKG2D and/or SLAMF7 (also known as CS1 or CD319), and/or an equivalent of each thereof.
18. An isolated complex comprising the isolated cell of any one of claims 10 to 15 bound to a cancer or tumor antigen or a fragment thereof, optionally, wherein the cancer or tumor antigen is BCMA or SLAMF7 (also known as CS1 or CD319), and/or an equivalent of each thereof.
19. A method of producing a CAR expressing cell comprising transducing an isolated cell with vector of any one of claims 1 to 9.

20. The method of claim 18, wherein the isolated cells are selected from a group consisting of T-cells, B cells, NK cells, dendritic cells, myeloid cells, monocytes, or macrophages.
21. A method of inhibiting the growth of a cancer cell or tumor expressing a cancer or tumor antigen, comprising contacting the cancer cell or tumor with the isolated cell of any one of claims 10 to 15.
22. The method of claim 21, wherein the contacting is *in vitro* or *in vivo*.
23. The method of claim 22, wherein the contacting is *in vivo* and the isolated cells are autologous or allogeneic to a subject being treated.
24. The method of claim 21, wherein the contacting is *in vivo* and the isolated cells are allogenic to a subject being treated.
25. The method of claim 23 or 24, further comprising administering to the subject an effective amount of a cytoreductive therapy or chemotherapy or therapy that upregulates the expression of a target antigen.
26. The method of claim 25, wherein the cytoreductive therapy comprises chemotherapy, cryotherapy, hyperthermia, targeted therapy, and/or radiation therapy.
27. The method of any one of claims 21 to 26, wherein the subject is a mammal, a canine, a feline, an equine, a murine or a human patient.
28. A kit comprising a composition as disclosed herein and optionally, instructions for use.