

CLAIMS

1. A chimeric antigen receptor (CAR) comprising an extracellular ligand-binding domain that specifically binds to CD70, a first transmembrane domain, and an intracellular signaling domain, wherein the extracellular ligand-binding domain comprises a variable heavy chain domain comprising amino acid sequences for CDRH1, CDRH2, and CDRH3 and a variable light chain domain comprising amino acid sequences for CDRL1, CDRL2, and CDRL3, wherein:
 - the CDRH1 comprises an amino acid sequence selected from SEQ ID NOs: 97-99,
 - the CDRH2 comprises an amino acid sequence selected from SEQ ID NOs: 100-101,
 - the CDRH3 comprises the amino acid sequence of SEQ ID NO: 102,
 - the CDRL1 comprises the amino acid sequence of SEQ ID NO: 217,
 - the CDRL2 comprises the amino acid sequence of SEQ ID NO: 218, and
 - the CDRL3 comprises the amino acid sequence of SEQ ID NO: 219.
2. The CD70-specific CAR of claim 1, wherein the intracellular signaling domain comprises a CD3 ζ signaling domain.
3. The CD70-specific CAR of claim 1, wherein the intracellular signaling domain comprises a 4-1BB domain.
4. The CD70-specific CAR of claim 2, further comprising a second intracellular signaling domain.
5. The CD70-specific CAR of claim 4, wherein the second intracellular signaling domain comprises a 4-1BB domain.
6. The CD70-specific CAR of claim 1, further comprising a stalk domain between the extracellular ligand-binding domain and the first transmembrane domain.
7. The CD70-specific CAR of claim 6, wherein the stalk domain is selected from the group consisting of: a human CD8 α hinge, an IgG1 hinge, and an Fc γ RIII α hinge.
8. The CD70-specific CAR of claim 1, further comprising a CD20 epitope.
9. The CD70-specific CAR of claim 8 wherein the CD20 epitope comprises the amino acid sequence shown in SEQ ID NO: 293 or SEQ ID NO: 294 or SEQ ID NO: 609.
10. The CD70-specific CAR of claim 1, wherein the first transmembrane domain comprises a CD8 α chain transmembrane domain.

11. The CD70-specific CAR of claim 1, further comprising another extracellular ligand-binding domain which is not specific for CD70.
12. The CD70-specific CAR of claim 1, wherein the extracellular ligand-binding domain(s), the first transmembrane domain, and intracellular signaling domain(s) are on a single polypeptide.
13. A polynucleotide comprising a nucleic acid sequence encoding the CD70-specific CAR of claim 1.
14. An expression vector comprising the polynucleotide of claim 13.
15. An engineered immune cell expressing at its cell-surface membrane a CD70- specific CAR of claim 1.
16. The engineered immune cell of claim 15, further comprising another CAR which is not specific for CD70.
17. The engineered immune cell of claim 15, further comprising a polynucleotide encoding a suicide polypeptide.
18. The engineered immune cell of claim 17, wherein the suicide polypeptide is RQR8.
19. A population of cells of claim 15, wherein said population of cells comprises a percentage of stem cell memory and central memory cells greater than 20%, 30% or 40%.
20. The population of cells of claim 19, wherein the population of cells achieves lysis of greater than 20% of CD70 expressing cells at day 6 greater than 20% upon repeated exposure of the population of cells to CD70 expressing cells as measured using the assay disclosed in example 4.
21. A method of engineering an immune cell, comprising:
 - a) providing an immune cell; and
 - b) introducing into the cell at least one polynucleotide encoding the CD70-specific CAR of claim 1.
22. The method of engineering an immune cell of claim 21, further comprising introducing at least one other CAR which is not specific for CD70.
23. A pharmaceutical composition comprising the engineered immune cell of claim 15.
24. The CD70-specific CAR of claim 1, wherein the light chain variable domain comprises the amino acid sequence of SEQ ID NO: 17 and the heavy chain variable domain comprises the amino acid sequence of SEQ ID NO: 18.

25. The CD70-specific CAR of claim 1, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 619.
26. The CD70-specific CAR of claim 1, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 628.
27. An engineered immune cell expressing at its cell-surface membrane the CD70- specific CAR of claim 25.
28. An engineered immune cell expressing at its cell-surface membrane the CD70- specific CAR of claim 26.
29. An engineered immune cell expressing at its cell-surface membrane the CD70- specific CAR of claim 24.
30. The engineered immune cell of claim 29, wherein the engineered immune cell further comprises a polynucleotide encoding a suicide polypeptide.
31. The engineered immune cell of claim 30, wherein the suicide polypeptide comprises RSRQR or R2S.
32. The engineered immune cell of claim 17, wherein the suicide polypeptide comprises RSRQR or R2S.
33. A chimeric antigen receptor (CAR) comprising an extracellular ligand-binding domain that specifically binds to CD70, a first transmembrane domain, and an intracellular signaling domain, wherein the extracellular ligand-binding domain comprises a variable light chain domain comprising the amino acid sequence of SEQ ID NO: 18 and a variable light chain domain comprising the amino acid sequence of SEQ ID NO: 17.
34. An engineered immune cell expressing at its cell-surface membrane a CD70-specific CAR of claim 33.
35. The engineered immune cell of claim 34, wherein the engineered immune cell further comprises a polynucleotide encoding a suicide polypeptide.
36. The engineered immune cell of claim 35, wherein the suicide polypeptide comprises RSRQR or R2S.
37. The CD70-specific CAR of claim 1, further comprising a suicide polypeptide.
38. The CD70-specific CAR of claim 37, wherein the suicide polypeptide comprises RSRQR or R2S.

- 39. An engineered immune cell expressing at its cell-surface membrane a CD70- specific CAR of claim 38.
- 40. A pharmaceutical composition comprising the engineered immune cell of claim 27.
- 41. A pharmaceutical composition comprising the engineered immune cell of claim 28.
- 42. A pharmaceutical composition comprising the engineered immune cell of claim 29.
- 43. A pharmaceutical composition comprising the engineered immune cell of claim 31.
- 44. A pharmaceutical composition comprising the engineered immune cell of claim 32.
- 45. A pharmaceutical composition comprising the engineered immune cell of claim 34.
- 46. A pharmaceutical composition comprising the engineered immune cell of claim 36.
- 47. A pharmaceutical composition comprising the engineered immune cell of claim 39.