

CLAIMS:

1. A chimeric antigen receptor (CAR) comprising an antigen binding domain having antigenic specificity for CD33, a transmembrane domain, and an intracellular T cell signaling domain, wherein
 - (a) the antigen binding domain comprises the light chain variable region comprising the CDR1, CDR2, and CDR3 regions of Hu195; or
 - (b) the antigen binding domain comprises the heavy chain variable region comprising the CDR1, CDR2, and CDR3 regions of Hu195,wherein the CDR regions are those of SEQ ID NOS: 41-46.
2. The CAR according to claim 1, wherein the antigen binding domain comprises the heavy chain variable region of SEQ ID NO: 15.
3. The CAR according to claim 1 or 2, wherein the antigen binding domain comprises the light chain variable region of SEQ ID NO: 16.
4. The CAR according to any one of claims 1-3, wherein the antigen binding domain comprises a linker sequence of SEQ ID NO: 4.
5. The CAR according to any one of claims 1-4, wherein the antigen binding domain comprises the antigen binding domain of SEQ ID NOS: 15, 4, and 16.
6. The CAR according to any one of claims 1-5, wherein the CAR comprises (i) a CD8 transmembrane domain of SEQ ID NO: 7 and a CD8 hinge domain of SEQ ID NO: 6, or (ii) a CD28 transmembrane domain of SEQ ID NO: 11 and a CD28 hinge domain of SEQ ID NO: 10.
7. The CAR according to any one of claims 1-6, wherein the intracellular T cell signaling domain comprises the 4-1BB intracellular T cell signaling domain of SEQ ID NO: 8, the CD3 zeta intracellular T cell signaling domain of SEQ ID NO: 9, or both.

8. The CAR according to any one of claims 1-7, wherein the CAR further comprises a spacer.

9. A chimeric antigen receptor (CAR) comprising an antigen binding domain having antigenic specificity for CD33, a transmembrane domain, and an intracellular T cell signaling domain, wherein

(a) the antigen binding domain comprises the light chain variable region comprising the CDR1, CDR2, and CDR3 regions of hP67.6; and/or

(b) the antigen binding domain comprises the heavy chain variable region comprising the CDR1, CDR2, and CDR3 regions of hP67.6

wherein the CDR regions are those of SEQ ID NOS: 47-52.

10. The CAR according to claim 9, wherein the antigen binding domain comprises the heavy chain variable region of SEQ ID NO: 3.

11. The CAR according to claim 9 or 10, wherein the antigen binding domain comprises the light chain variable region of SEQ ID NO: 5.

12. The CAR according to any one of claims 9-11, wherein the antigen binding domain comprises a linker sequence of SEQ ID NO: 4.

13. The CAR according to any one of claims 9-12, wherein the antigen binding domain comprises the antigen binding domain of SEQ ID NOS: 3, 4, and 5.

14. The CAR according to any one of claims 9-13, wherein the CAR comprises (i) a CD8 transmembrane domain of SEQ ID NO: 7 and a CD8 hinge domain of SEQ ID NO: 6, or (ii) a CD28 transmembrane domain of SEQ ID NO: 11 and a CD28 hinge domain of SEQ ID NO: 10.

15. The CAR according to any one of claims 9-14, wherein the intracellular T cell signaling domain comprises the 4-1BB intracellular T cell signaling domain of SEQ ID NO: 8, the CD3 zeta intracellular T cell signaling domain of SEQ ID NO: 9, or both.
16. The CAR according to any one of claims 9-15, wherein the CAR further comprises a spacer.
17. A CAR comprising SEQ ID NO: 16 or 17 or 20 or 21.
18. A nucleic acid comprising a nucleotide sequence encoding the CAR according to any one of claims 1-17.
19. The nucleic acid according to claim 18, wherein the nucleotide sequence is codon-optimized.
20. A recombinant expression vector comprising the nucleic acid according to claim 18 or 19.
21. An isolated host cell comprising the recombinant expression vector of claim 20.
22. A population of cells comprising at least one host cell of claim 21.
23. A pharmaceutical composition comprising the CAR any one of claims 1-17, the nucleic acid of claim 18 or 19, the recombinant expression vector of claim 20, the host cell of claim 21, or the population of cells of claim 22, and a pharmaceutically acceptable carrier.
24. A method of detecting the presence of cancer, comprising:
 - (a) contacting a sample comprising one or more cells with the CAR any one of claims 1-17, the nucleic acid of claim 18 or 19, the recombinant expression vector of claim 20, the host

cell of claim 21, or the population of cells of claim 22, or the pharmaceutical composition of claim 23, thereby forming a complex, and

(b) detecting the complex, wherein detection of the complex is indicative of the presence of cancer.

25. The method of claim 24, wherein the cancer is acute myeloid leukemia.

26. The CAR of any one of claims 1-17, the nucleic acid of claim 18 or 19, the recombinant expression vector of claim 20, the host cell of claim 21, the population of cells of claim 22, or the pharmaceutical composition of claim 23, for use in the treatment or prevention of cancer in a mammal.

27. The CAR, nucleic acid, recombinant expression vector, host cell, population of cells, or pharmaceutical composition of claim 26, wherein the cancer is acute myeloid leukemia.