CLAIMS

1. A nucleic acid encoding

a T-cell receptor (TCR) comprising an α chain and a β chain and a CD8 polypeptide comprising an α chain, wherein the CD8 α chain comprises an amino acid sequence at least 98% to SEQ ID NO: 5.

2. The nucleic acid of claim 1, wherein the nucleic acid sequence comprises a nucleic acid at least 90% identical to the nucleic acid sequence of SEQ ID NO: 279.

3. The nucleic acid of claim 2, wherein the nucleic acid sequence is at least 95% identical to the nucleic acid sequence of SEQ ID NO: 279.

4. The nucleic acid of claim 1, wherein the nucleic acid comprises the nucleic acid sequence of SEQ ID NO: 279.

5. A polypeptide encoded by the nucleic acid of claim 1.

6. A polypeptide comprising an amino acid sequence at least about 90% identical to the amino acid sequence of SEQ ID NO: 280.

7. The polypeptide of claim 6, wherein the amino acid sequence is at least 95% identical to the amino acid sequence of SEQ ID NO: 280.

8. The polypeptide of claim 6, wherein the amino acid comprises the amino acid sequence of SEQ ID NO: 280.

9. A vector comprising the nucleic acid of claim 1.

10. The vector of claim 9, wherein the vector further comprises a nucleic acid encoding a 2A peptide or an internal ribosome entry site (IRES) positioned between the nucleic acid encoding the CD8 α chain and the nucleic acid encoding the CD8 β chain.

11. The vector of claim 9, wherein the vector further comprises a nucleic acid encoding a 2A peptide or an IRES positioned between the nucleic acid encoding the TCR α chain and the nucleic acid encoding the TCR β chain.

12. The vector of claim 11, wherein the 2A peptide is P2A (SEQ ID NO: 93), T2A (SEQ ID NO: 94), E2A (SEQ ID NO: 95), or F2A (SEQ ID NO: 96).

13. The vector of claim 12, wherein the vector further comprises a post-transcriptional regulatory element (PRE) sequence selected from a Woodchuck PRE (WPRE), Woodchuck PRE (WPRE) mutant 1, Woodchuck PRE (WPRE) mutant 2, or hepatitis B virus (HBV) PRE (HPRE).

14. The vector of claim 13, wherein the post-transcriptional regulatory element (PRE) sequence comprises Woodchuck PRE (WPRE) mutant 1 comprising the amino acid sequence of SEQ ID NO: 256.

15. The vector of claim 13, wherein the post-transcriptional regulatory element (PRE) sequence comprises Woodchuck PRE (WPRE) mutant 2 comprising the amino acid sequence of SEQ ID NO: 257.

16. A method of preparing T cells for immunotherapy comprising

isolating T cells from a blood sample of a human subject,

activating the isolated T cells,

transducing the activated T cells with the nucleic acid of claim 1, and

expanding the transduced T cells.

17. The method of claim 16, wherein the blood sample comprises peripheral blood mononuclear cells (PMBC).

18. The nucleic acid of claim 1, wherein the CD8 α chain further comprises a signal peptide comprising SEQ ID NO: 294.

19. The nucleic acid of claim 1, wherein

the TCR α chain is SEQ ID NO: 15 and the TCR β chain is SEQ ID NO: 16, or
the TCR α chain is SEQ ID NO: 23 and the TCR β chain is SEQ ID NO: 24, or
the TCR α chain is SEQ ID NO: 25 and the TCR β chain is SEQ ID NO: 26, or
the TCR α chain is SEQ ID NO: 27 and the TCR β chain is SEQ ID NO: 28, or
the TCR α chain is SEQ ID NO: 29 and the TCR β chain is SEQ ID NO: 30, or
the TCR α chain is SEQ ID NO: 31 and the TCR β chain is SEQ ID NO: 32, or
the TCR α chain is SEQ ID NO: 33 and the TCR β chain is SEQ ID NO: 34, or
the TCR α chain is SEQ ID NO: 35 and the TCR β chain is SEQ ID NO: 36, or
the TCR α chain is SEQ ID NO: 37 and the TCR β chain is SEQ ID NO: 38, or
the TCR α chain is SEQ ID NO: 39 and the TCR β chain is SEQ ID NO: 40, or
the TCR α chain is SEQ ID NO: 41 and the TCR β chain is SEQ ID NO: 42, or
the TCR α chain is SEQ ID NO: 43 and the TCR β chain is SEQ ID NO: 44, or
the TCR α chain is SEQ ID NO: 45 and the TCR β chain is SEQ ID NO: 46, or
the TCR α chain is SEQ ID NO: 47 and the TCR β chain is SEQ ID NO: 48, or
the TCR α chain is SEQ ID NO: 49 and the TCR β chain is SEQ ID NO: 50, or
the TCR α chain is SEQ ID NO: 51 and the TCR β chain is SEQ ID NO: 52, or
the TCR α chain is SEQ ID NO: 53 and the TCR β chain is SEQ ID NO: 54, or
the TCR α chain is SEQ ID NO: 55 and the TCR β chain is SEQ ID NO: 56, or
the TCR α chain is SEQ ID NO: 57 and the TCR β chain is SEQ ID NO: 58, or
the TCR α chain is SEQ ID NO: 59 and the TCR β chain is SEQ ID NO: 60, or
the TCR α chain is SEQ ID NO: 61 and the TCR β chain is SEQ ID NO: 62, or
the TCR α chain is SEQ ID NO: 63 and the TCR β chain is SEQ ID NO: 64, or

the TCR α chain is SEQ ID NO: 65 and the TCR β chain is SEQ ID NO: 66, or
the TCR α chain is SEQ ID NO: 67 and the TCR β chain is SEQ ID NO: 68, or
the TCR α chain is SEQ ID NO: 69 and the TCR β chain is SEQ ID NO: 70, or
the TCR α chain is SEQ ID NO: 71 and the TCR β chain is SEQ ID NO: 303, or
the TCR α chain is SEQ ID NO: 304 and the TCR β chain is SEQ ID NO: 74, or
the TCR α chain is SEQ ID NO: 75 and the TCR β chain is SEQ ID NO: 76, or
the TCR α chain is SEQ ID NO: 77 and the TCR β chain is SEQ ID NO: 78, or
the TCR α chain is SEQ ID NO: 79 and the TCR β chain is SEQ ID NO: 80, or
the TCR α chain is SEQ ID NO: 81 and the TCR β chain is SEQ ID NO: 82, or
the TCR α chain is SEQ ID NO: 83 and the TCR β chain is SEQ ID NO: 84, or
the TCR α chain is SEQ ID NO: 85 and the TCR β chain is SEQ ID NO: 86, or
the TCR α chain is SEQ ID NO: 87 and the TCR β chain is SEQ ID NO: 88, or
the TCR α chain is SEQ ID NO: 89 and the TCR β chain is SEQ ID NO: 90, or
the TCR α chain is SEQ ID NO: 91 and the TCR β chain is SEQ ID NO: 92.

20. The nucleic acid of claim 19, wherein

the TCR α chain is SEQ ID NO: 15 and the TCR β chain is SEQ ID NO: 16, or
the TCR α chain is SEQ ID NO: 57 and the TCR β chain is SEQ ID NO: 58, or
the TCR α chain is SEQ ID NO: 59 and the TCR β chain is SEQ ID NO: 60, or
the TCR α chain is SEQ ID NO: 61 and the TCR β chain is SEQ ID NO: 62, or
the TCR α chain is SEQ ID NO: 63 and the TCR β chain is SEQ ID NO: 64, or
the TCR α chain is SEQ ID NO: 65 and the TCR β chain is SEQ ID NO: 66, or
the TCR α chain is SEQ ID NO: 67 and the TCR β chain is SEQ ID NO: 68, or
the TCR α chain is SEQ ID NO: 69 and the TCR β chain is SEQ ID NO: 70, or
the TCR α chain is SEQ ID NO: 71 and the TCR β chain is SEQ ID NO: 303.