CLAIMS

1. A recombinant polypeptide comprising in order from the N to C-terminus, an extracellular domain (ECD) from a TGF–β receptor, a transmembrane domain (TMD); and an intracellular domain (ICD), wherein the ICD consists of an amino acid sequence having at least 80% sequence identity to the amino acid sequence of SEQ ID NO: 6, wherein the recombinant polypeptide binds to TGF- β1 and functions as a dominant negative inhibitor of TGF- β receptor.

2. The recombinant polypeptide according to claim 1, wherein the ECD is TGF–βRI or TGF–βRII.

3. The recombinant polypeptide according to claim 1 or 2, wherein the TMD is selected from the group consisting of TMDs of TGF–βRI, TGF–βRII, PDGFR, CD4, CD8, CD28, CD127, CD132, CD3ζ, 4–IBB, OX40, ICOS, CTLA–4, PD–1, LAG–3, 2B4, IL–5, IL–7, IL–7Rα, BTLA and variants of any of the foregoing.

4. The recombinant polypeptide according to any one of claims 1–3, wherein the ECD comprises an amino acid sequence having at least 75% sequence identity to the amino acid sequence of SEQ ID NO: 15 and the TMD comprises an amino acid sequence having at least 75% sequence identity to the amino acid sequence of SEQ ID NO: 16.

5. The recombinant polypeptide according to any one of claims 1- 4, wherein the ECD comprises the sequence of SEQ ID NO: 15, and the TMD comprises the sequence of SEQ ID NO: 16.

6. The recombinant polypeptide according to any one of claims 1-4, wherein the ECD consists of the sequence of SEQ ID NO: 15, and the TMD consists of the sequence of SEQ ID NO: 16.

7. The recombinant polypeptide according to any one of claims 1-3, wherein the ECD comprises an amino acid sequence having at least 75% sequence identity to the sequence of SEQ ID NO: 3 and the TMD comprises an amino acid sequence having at least 75% sequence identity to the sequence of SEQ ID NO: 4.

8. The recombinant polypeptide of claim 7, wherein the ECD comprises the amino acid sequence of SEQ ID NO: 3, and the TMD comprises the amino acid sequence of SEQ ID NO:4.

9 The recombinant polypeptide according to claim 7, wherein the ECD consists of the amino acid sequence of SEQ ID NO: 3, and the TMD consists of the amino acid sequence of SEQ ID NO:4.

10. The recombinant polypeptide according to any one of claims 1–9, wherein the ICD consists of the amino acid sequence set forth in SEQ ID NO: 6.

11. The recombinant polypeptide according to claim 1, wherein the recombinant polypeptide comprises an amino acid sequence having at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, or 100% sequence identity to the amino acid sequence of SEQ ID NO: 14.

12. The recombinant polypeptide according to claim 1, wherein the recombinant polypeptide consists of an amino acid sequence having at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, or 100% sequence identity to the amino acid sequence of SEQ ID NO: 14.

13. The recombinant polypeptide according to claim 1, wherein the recombinant polypeptide comprises an amino acid sequence having at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, or 100% sequence identity to the sequence of SEQ ID NO: 10.

14. The recombinant polypeptide according to claim 1, wherein the recombinant polypeptide consists of an amino acid sequence having at least 75%, at least 80%, at least 85%, at least 90%, at least 95%, or 100% sequence identity to the sequence of SEQ ID NO: 10.

15. The recombinant polypeptide according to claim 1, wherein the sequence of the ECD, TMD and ICD together of the recomibinant polypeptide consists of an amino acid sequence that is at least 85% identical, at least 90% identical, or at least 95% identical to the sequence of SEQ ID NO: 7.

16. The recombinant polypeptide according to claim 15, wherein the sequence of the ECD, TMD and ICD together of the polypeptide consists of the amino acid sequence of SEQ ID NO: 7.

17. The recombinant polypeptide according to claim 1, wherein the sequence of the ECD, TMD and ICD together of the recombinant polypeptide consists of an amino acid sequence that is at least 85% identical, at least 90% identical, or at least 95% identical to the sequence of amino acids 23 to 194 of SEQ ID NO: 14.

18. The recombinant polypeptide according to claim 17, wherein the sequence of the ECD, TMD and ICD of the recombinant polypeptide together consists of amino acids 23 to 194 of SEQ ID NO: 14.

19. The recombinant polypeptide according to claim 1, comprising the amino acid sequence set forth in SEQ ID NO:7.

20. The recombinant polypeptide according to claim 1, comprising amino acids 23 to 194 of SEQ ID NO: 14.

21. A polynucleotide comprising a nucleic acid sequence encoding a recombinant polypeptide according to any one of claims 1-20. .

21. The polynucleotide of claim 20, wherein the ECD comprises the amino acid sequence of SEQ ID NO: 3, and the TMD comprises the amino acid sequence of SEQ ID NO: 4.

22. The polynucleotide according to claim 21, further comprising a nucleic acid sequence encoding a chimeric antigen receptor (CAR).

23. The polynucleotide according to claim 22, wherein the CAR specifically binds to a tumour antigen.

24. The polynucleotide according to claim 23, wherein the tumour antigen is one of: human GPC3, human CD19, human BCMA, human CD20, human CD28, human 4-1BB, human CLL-1, human PSCA, or human PSMA.

25. The polynucleotide according to claim 23, wherein the tumour antigen is human GPC3.

26. The polynucleotide according to any one of claims 22-25, wherein the nucleic acid encoding the CAR is linked to the N-terminus of the nucleic acid encoding the recombinant polypeptide via a nucleic acid encoding a linker.

27. The polynucleotide according to claim 26, wherein the linker comprises a 2A peptide.

28. The polynucleotide of claim 27, wherein the 2A peptide comprises the amino acid sequence of SEQ ID NO: 46.

29. The polynucleotide according to claim 22, comprising a nucleic acid sequence encoding a polypeptide comprising an amino acid sequence that is at least 85% identical to the sequence of SEQ ID NO: 47.

30. The polynucleotide according to claim 22, comprising a nucleic acid sequence encoding a polypeptide comprising an amino acid sequence that is at least 95% identical to the sequence of SEQ ID NO: 47.

31. The polynucleotide according to claim 22, comprising a nucleic acid sequence encoding a polypeptide comprising the amino acid sequence of SEQ ID NO: 47.

32. A vector comprising a nucleic acid encoding the recombinant polypeptide according to any one of claims 1–20; or comprising the polynucleotide of any one of claims 21-31.

33. The vector according to claim 32, wherein the nucleic acid sequence comprises a nucleotide sequence that is at least 85% identical to the sequence of SEQ ID NO: 51.

34. The vector according to claim 33, wherein the nucleic acid sequence further comprises a nucleotide sequence that is at least 85% identical to the sequence of SEQ ID NO: 48.

35. The vector according to claim 34, wherein the nucleic acid sequence comprises a sequence that encodes a polypeptide comprising a sequence that is at least 90% identical to the amino acid sequence of SEQ ID NO: 47.

36. The vector according to claim 34, wherein the nucleic acid sequence comprises a sequence that encodes a polypeptide comprising a sequence that is at least 95% identical to the amino acid sequence of SEQ ID NO: 47.

37. The vector according to claim 34, wherein the nucleic acid sequence comprises a sequence that encodes the polypeptide comprising the amino acid sequence of SEQ ID NO: 47.

38. An isolated T cell transduced with the vector of any one of claims 32-37.

39. An isolated T cell transduced with a vector comprising the polynucleotide according to any one of claims 22-31.