WHAT IS CLAIMED IS:

1. An isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a a-folate receptor (FRα) binding domain and the nucleic acid sequence encoding a 4-1BB (CD137) costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain.

2. The isolated nucleic acid sequence of claim 1 , further comprising the nucleic acid sequence encoding a CD3 zeta signaling domain.

3. The isolated nucleic acid sequence of claim 1, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 22.

4. The isolated nucleic acid sequence of claim 1 comprising the nucleic acid sequence of SEQ ID NO: 20.

5. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain is an antibody or a FRα-binding fragment thereof.

6. The isolated nucleic acid sequence of claim 5, wherein the FRα-binding fragment is a Fab or a scFv.

7. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain binds to a tumor antigen, wherein the rumor antigen is FRα.

8. The isolated nucleic acid sequence of claim 7, wherein the tumor antigen is associated with an epithelial malignancy.

9. The isolated nucleic acid sequence of claim 7, wherein the tumor antigen is associated with a solid tumor.

10. The isolated nucleic sequence of claim 1, wherein the FRα binding domain comprises the amino acid sequence of SEQ ID NO: 23.

11. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain is encoded by the nucleic acid sequence of SEQ ID NO: 21.

12. The isolated nucleic sequence of claim 1 , wherein the 4-1BB costimulatory domain comprises the amino acid sequence of SEQ ID NO: 18.

13. The isolated nucleic acid sequence of claim 1, wherein the 4-1BB costimulatory domain is encoded by the nucleic acid sequence of SEQ ID NO: 6.

14. The isolated nucleic sequence of claim 2, wherein the CD3 zeta signaling domain comprises the amino acid sequence of SEQ ID NO: 19.

15. The isolated nucleic acid sequence of claim 2, wherein the CD3 zeta signaling domain is encoded by the nucleic acid sequence of SEQ ID NO: 7.

16. The isolated nucleic acid sequence of claim 1 , further comprising the nucleic acid sequence of a transmembrane domain.

17. An isolated chimeric antigen receptor (CAR) comprising a FRα binding domain and a 4-1BB costimulatoiy domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain.

18. The isolated CAR of claim 17 further comprising a CD3 zeta signaling domain.

19. The isolated CAR of claim 17, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 22.

20. The isolated CAR of claim 17, wherein the FRα binding domain is an antibody or a FRα-binding fragment thereof.

21. The isolated CAR of claim 20, wherein the FRα-binding fragment is a Fab or a scFv.

22. The isolated CAR of claim 17, wherein the FRα binding domain binds to a tumor antigen, wherein the tumor antigen is FRα.

23. The isolated CAR of claim 22, wherein the tumor antigen is associated with an epithelial malignancy.

24. The isolated CAR of claim 22, wherein the tumor antigen is associated with a solid tumor.

25. The isolated CAR of claim 17, wherein the FRα binding domain comprises the amino acid sequence of SEQ ID NO: 23.

26. The isolated CAR of claim 17, wherein the 4-1BB costimulatory domain comprises the amino acid sequence of SEQ ID NO: 18.

27. The isolated CAR of claim 18, wherein the CD3 zeta signaling domain comprises the amino acid sequence of SEQ ID NO: 19.

28. The isolated CAR of claim 17, further comprising a transmembrane domain.

29. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain.

30. A vector comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain.

31. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain, for use in an anti-tumor immunity treatment.

32. The modified T-cell of claim 31, wherein the isolated nucleic acid sequence further comprises the nucleic acid sequence of a CDS zeta signaling domain.

33. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain, for use as a medicament to stimulate a T cell-mediated immune response.

34. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain, for use in treating ovarian cancer.

35. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain, for use in treating cancer.

36. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized antibody FRα-binding domain, for use as a medicament to generate a persisting population of genetically engineered T cells for treating ovarian cancer.

WHAT IS CLAIMED IS:

1. An isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a a-folate receptor (FRα) binding domain and the nucleic acid sequence encoding a 4-1BB (CD137) costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody.

2. The isolated nucleic acid sequence of claim 1 , further comprising the nucleic acid sequence encoding a CD3 zeta signaling domain.

3. The isolated nucleic acid sequence of claim 1, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 22.

4. The isolated nucleic acid sequence of claim 1 comprising the nucleic acid sequence of SEQ ID NO: 20.

5. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain is an antibody or a FRα-binding fragment thereof.

6. The isolated nucleic acid sequence of claim 5, wherein the FRα-binding fragment is a Fab or a scFv.

7. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain binds to a tumor antigen, wherein the rumor antigen is FRα.

8. The isolated nucleic acid sequence of claim 7, wherein the tumor antigen is associated with an epithelial malignancy.

9. The isolated nucleic acid sequence of claim 7, wherein the tumor antigen is associated with a solid tumor.

10. The isolated nucleic sequence of claim 1, wherein the FRα binding domain comprises the amino acid sequence of SEQ ID NO: 23.

11. The isolated nucleic acid sequence of claim 1, wherein the FRα binding domain is encoded by the nucleic acid sequence of SEQ ID NO: 21.

12. The isolated nucleic sequence of claim 1 , wherein the 4-1BB costimulatory domain comprises the amino acid sequence of SEQ ID NO: 18.

13. The isolated nucleic acid sequence of claim 1, wherein the 4-1BB costimulatory domain is encoded by the nucleic acid sequence of SEQ ID NO: 6.

14. The isolated nucleic sequence of claim 2, wherein the CD3 zeta signaling domain comprises the amino acid sequence of SEQ ID NO: 19.

15. The isolated nucleic acid sequence of claim 2, wherein the CD3 zeta signaling domain is encoded by the nucleic acid sequence of SEQ ID NO: 7.

16. The isolated nucleic acid sequence of claim 1 , further comprising the nucleic acid sequence of a transmembrane domain.

17. An isolated chimeric antigen receptor (CAR) comprising a FRα binding domain and a 4-1BB costimulatoiy domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody.

18. The isolated CAR of claim 17 further comprising a CD3 zeta signaling domain.

19. The isolated CAR of claim 17, wherein the CAR comprises the amino acid sequence of SEQ ID NO: 22.

20. The isolated CAR of claim 17, wherein the FRα binding domain is an antibody or a FRα-binding fragment thereof.

21. The isolated CAR of claim 20, wherein the FRα-binding fragment is a Fab or a scFv.

22. The isolated CAR of claim 17, wherein the FRα binding domain binds to a tumor antigen, wherein the tumor antigen is FRα.

23. The isolated CAR of claim 22, wherein the tumor antigen is associated with an epithelial malignancy.

24. The isolated CAR of claim 22, wherein the tumor antigen is associated with a solid tumor.

25. The isolated CAR of claim 17, wherein the FRα binding domain comprises the amino acid sequence of SEQ ID NO: 23.

26. The isolated CAR of claim 17, wherein the 4-1BB costimulatory domain comprises the amino acid sequence of SEQ ID NO: 18.

27. The isolated CAR of claim 18, wherein the CD3 zeta signaling domain comprises the amino acid sequence of SEQ ID NO: 19.

28. The isolated CAR of claim 17, further comprising a transmembrane domain.

29. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody.

30. A vector comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody.

31. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody, for use in an anti-tumor immunity treatment.

32. The modified T-cell of claim 31, wherein the isolated nucleic acid sequence further comprises the nucleic acid sequence of a CDS zeta signaling domain.

33. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody, for use as a medicament to stimulate a T cell-mediated immune response.

34. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody, for use in treating ovarian cancer.

35. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody, for use in treating cancer.

36. A genetically modified T cell comprising an isolated nucleic acid sequence encoding a chimeric antigen receptor (CAR), wherein the isolated nucleic acid sequence comprises the nucleic acid sequence encoding a FRα binding domain and the nucleic acid sequence encoding a 4-1BB costimulatory domain, wherein the FRα binding domain comprises a human or humanized anti-FRα antibody, for use as a medicament to generate a persisting population of genetically engineered T cells for treating ovarian cancer.