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 of a α-folate receptor (FRα) binding domain and the nucleic acid sequence of a 4-1BB (CD137) costimulatory domain.

2. The isolated nucleic acid sequence of claim 1, further comprising the nucleic acid sequence of 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: 13 or SEQ ID NO: 22.

4. The isolated nucleic acid sequence of claim 1 comprising the nucleic acid sequence of SEQ ID NO: 1 or 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 tumor 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: 15 or 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: 3 or 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 costimulatory 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: 13 or 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: 15 or 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain.

31. A method for providing anti-tumor immunity in a subject, the method comprising: administering to the subject an effective amount of 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, thereby providing anti-tumor immunity in the subject.

32. The method of claim 31, wherein the isolated nucleic acid sequence further comprises the nucleic acid sequence of a CD3 zeta signaling domain.

33. The method of claim 31, wherein the presence of the costimulatory domain enhances T cell survival.

34. The method of claim 31, wherein the presence of the costimulatory domain increases the efficacy of anti-tumor immunity in a subject.

35. The method of claim 31, wherein the subject is a mammal.

36. The method of claim 31, wherein the subject is a human.

37. A method for stimulating a T cell-mediated immune response to a cell population or tissue in a subject, the method comprising: administering to the subject an effective amount of 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, thereby stimulating a T cell-mediated immune response in the subject.

38. A method for treating an ovarian cancer in a subject, the method comprising: administering to the subject an effective amount of 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, thereby treating the ovarian cancer in the subject.

39. A method for treating cancer in a subject, the method comprising: administering to the subject an effective amount of 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, thereby treating cancer in the subject.

40. A method of generating a persisting population of genetically engineered T cells in a subject diagnosed with ovarian cancer, the method comprising: administering to the subject an effective amount of 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, wherein the persisting population of genetically engineered T cells persists in the subject for at least one month after administration.

41. The method of claim 40, wherein the persisting population of genetically engineered T cells persists in the human for at least three months after administration.

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 of a a-folate receptor (FRα) binding domain and the nucleic acid sequence of a 4-1BB (CD137) costimulatory domain.

2. The isolated nucleic acid sequence of claim 1 , further comprising the nucleic acid sequence of 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: 13 or SEQ ID NO: 22.

4. The isolated nucleic acid sequence of claim 1 comprising the nucleic acid sequence of SEQ ID NO: 1 or 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: 15 or 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: 3 or SEQ ID NO: 21.

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

13. The isolated nucleic acid sequence of claim 1, wherein the 4-1BB costimulatoiy 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.

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: 13 or 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; 15 or 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: 1.

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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory 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 of a FRα binding domain and the nucleic acid sequence of a 4-1BB costimulatory domain, for use as a medicament to generate a persisting population of genetically engineered T cells for treating ovarian cancer.