CLAIMS

WHAT IS CLAIMED IS:

1. A composition comprising a replication-defective virus vector comprising a nucleic acid sequence encoding a prostate specific antigen (PSA) and/or a nucleic acid sequence encoding prostate-specific membrane antigen (PSMA), wherein the PSA has an amino acid sequence at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical with SEQ ID NO: 1 or SEQ ID NO: 34 or the PSMA has an amino acid sequence at least 80% identical with SEQ ID NO: 11.

2. The composition of claim 1, wherein the vector comprises a nucleic acid sequence encoding a PSA having an amino acid sequence at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical with SEQ ID NO: 35 or the nucleic acid sequence encoding PSA has at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical with SEQ ID NO: 2.

3. The composition of claim 1, wherein the vector comprises a nucleic acid sequence encoding a PSMA having an amino acid sequence at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical with SEQ ID NO: 36.

4. The composition of claim 1, further comprising a second replication-defective virus vector comprising a second nucleic acid sequence encoding a Brachyury antigen, a third replication-defective virus vector comprising a third nucleic acid sequence encoding a MUC1 antigen, or a combination thereof.

5. The composition of claim 4, wherein the second replication-defective vector comprises a nucleotide sequence at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical with SEQ ID NO: 3, SEQ ID NO: 4, positions 13 to 1242 of SEQ ID NO: 4, SEQ ID NO: 42.

6. The composition of any of claims 4-5, wherein the second replication-defective vector comprises a nucleotide sequence at least 80% identical, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% to SEQ ID NO: 12 (Ad vector with

sequence encoding ma modifided Brachyury antigen), positions 1033-2083 of SEQ ID NO: 12, or SEQ ID NO: 42.

7. The composition of any of claims 4-6, wherein the MUC1 antigen comprises a sequence at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identical to SEQ ID NO: 10 or SEQ ID NO: 41.

8. The composition of any of claims 4-7, wherein the third nucleic acid sequence encoding a MUC1 antigen comprises at least 80%, at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% identity to SEQ ID NO: 8, SEQ ID NO: 9, or SEQ ID NO: 41.

9. The composition of any of claims 4-8, wherein the MUC-1 antigen binds to HLA-A2, HLA-A3, HLA-A24, or a combination thereof.

10. The composition of any of claims 4-9, wherein the replication-defective virus vector, the second replication-defective virus vector, and/or the third replication-defective virus vector is an adenovirus vector.

11. The composition of claim 10, wherein the adenovirus vector comprises a deletion in an E1 region, an E2b region, an E3 region, an E4 region, or a combination thereof.

12. The composition of any one of claims 1-11, wherein the composition comprises from at least $1x10^9$ virus particles to at least $5x10^{12}$ virus particles.

13. The composition of any of claims 1-12, wherein the composition or the replication-defective virus vector further comprises a nucleic acid sequences encoding a costimulatory molecule.

14. The composition of claim 13, wherein the costimulatory molecule comprises B7, ICAM-1, LFA-3, or a combination thereof.

15. The composition of any one of claims 1-14, wherein the composition further comprises a plurality of nucleic acid sequences encoding a plurality of costimulatory molecules positioned in the same replication-defective virus vector.

16. The composition of any one of claims 1-15, wherein the composition further comprises a plurality of nucleic acid sequences encoding a plurality of costimulatory molecules positioned in separate replication-defective virus vectors.

17. The composition of any one of claims 1-16, wherein the composition further comprises a nucleic acid sequence encoding one or more additional target antigens or immunological epitopes thereof.

18. The composition of any one of claims 1-17, wherein the replication-defective virus vector further comprises a nucleic acid sequence encoding one or more additional target antigens or immunological epitopes thereof.

19. The composition of any one of claims 17-18, wherein the one or more additional target antigens is CEA, folate receptor alpha, WT1, HPV E6, HPV E7, p53, MAGE-A1, MAGE-A2, MAGE-A3, MAGE-A4, MAGE-A6, MAGE-A10, MAGE-A12, BAGE, DAM-6, -10, GAGE-1, -2, -8, GAGE-3, -4, -5, -6, -7B, NA88-A, NY-ESO-1, MART-1, MC1R, Gp100, PSCA, PSMA, PAP, Tyrosinase, TRP-1, TRP-2, ART-4, CAMEL, Cyp-B, Her2/neu, BRCA1, BRACHYURY, BRACHYURY(TIVS7-2, polymorphism), BRACHYURY (IVS7 T/C polymorphism), T BRACHYURY, T, hTERT, hTRT, iCE, MUC1, MUC1 (VNTR polymorphism), MUC1c, MUC1n, MUC2, PRAME, P15, RU1, RU2, SART-1, SART-3, WT1, AFP, β-catenin/m, Caspase-8/m, CDK-4/m, Her2/neu, Her3, ELF2M, GnT-V, G250, HSP70-2M, HST-2, KIAA0205, MUM-1, MUM-2, MUM-3, Myosin/m, RAGE, SART-2, TRP-2/INT2, 707-AP, Annexin II, CDC27/m, TPI/mbcr-abl, ETV6/AML, LDLR/FUT, Pml/RARα, or TEL/AML1, or a modified variant, a splice variant, a functional epitope, an epitope agonist, or a combination thereof.

20. The composition of any one of claims 1-19, wherein the replication-defective virus vector further comprises a selectable marker.

21. A composition comprising one or more replication-defective virus vectors comprising a nucleic acid sequence encoding a prostate specific antigen (PSA), a nucleic acid sequence encoding prostate-specific membrane antigen (PSMA), a nucleic acid sequence encoding a Brachyury antigen, a nucleic acid sequence encoding a MUC1 antigen, or a combination thereof.

22. A composition comprising one or more replication-defective virus vectors comprising a nucleic acid sequence encoding a prostate specific antigen (PSA), a nucleic acid sequence encoding prostate-specific membrane antigen (PSMA), a nucleic acid sequence

encoding a Brachyury antigen, a nucleic acid sequence encoding a MUC1 antigen, and a nucleic acid sequence encoding a CEA antigen.

23. A pharmaceutical composition comprising the composition according to any one of claims 1-22 and a pharmaceutically acceptable carrier.

24. A host cell comprising the composition according to any one of claims 1-22.

25. The composition according to any one of claims 1-22 for use as a tumor vaccine.

26. The composition of any of claims 1-22 for use in enhancing an immune response in a subject in need thereof.

27. The composition of any of claims 1-22 for use in treating a PSA-expressing or PSMA-expressing cancer in a subject in need thereof.

28. Use of the composition according to any one of claims 1-22 in the manufacture of a pharmaceutical composition for treating a PSA-expressing or PSMA-expressing cancer in a subject in need thereof.