CLAIMS

What is claimed is:

1. A composition comprising a replication-defective virus vector comprising a nucleic acid sequence comprising one or more of:

a) a nucleic acid sequence encoding 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 to SEQ ID NO: 8, SEQ ID NO: 9, or SEQ ID NO: 10;

b) a nucleic acid sequence encoding 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 to SEQ ID NO: 12;

c) a nucleic acid sequence having a region 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: 2, SEQ ID NO: 3, or SEQ ID NO: 4;

d) a nucleic acid sequence having a region 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: 5, SEQ ID NO: 18, SEQ ID NO: 6, SEQ ID NO: 19, or SEQ ID NO: 7, SEQ ID NO: 20; and

e) a nucleic acid sequence having a region 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: 11, or SEQ ID NO: 21.

2. The composition of claim 1, wherein the vector is an adenovirus vector.

3. The composition of claim 2, wherein the vector comprises a deletion in an E1 region, an E2b region, an E3 region, an E4 region, or a combination thereof.

4. The composition of any one of claims 1-3, wherein the composition or the vector further comprises a nucleic acid sequences encoding a costimulatory molecule

5. The composition of claim 4, wherein the costimulatory molecule comprises B7, ICAM-1, LFA-3, or a combination thereof.

6. The composition of any one of claims 1-5, 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.

7. The composition of any one of claims 1-5, wherein the composition further comprises a plurality of nucleic acid sequences encoding a plurality of costimulatory molecules positioned in separate replication-defective virus vectors.

8. The composition of any one of claims 1-7, wherein the composition comprises at least 5 x 10^{11} replication-defective virus vectors.

9. The composition of any one of claims 1-8, wherein the composition comprises a nucleotide sequence encoding a fusion protein comprising HPV E6 and HPV E7.

10. The composition of any one of claims 1-8, wherein the composition comprises:

a first replication defective adenovirus vector comprising: a deletion in the E2b region, and a nucleic acid sequence encoding HPV E6; and

a second replication defective adenovirus vector comprising: a deletion in the E2b region, and a nucleic acid sequence encoding HPV E7.

11. The composition of any one of claims 1-10, wherein the replication-defective virus vector further comprises a nucleic acid sequence encoding a selectable marker.

12. The composition of any one of claims 1-11, wherein the antigen is a non-oncogenic HPV antigen.

13. The composition of any one of claims 1-12, wherein the modified HPV antigen binds to HLA-A2, HLA-A3, HLA-A24, or a combination thereof.

14. The composition of any one of claims 1-13, wherein the replication-defective virus further comprises a nucleic acid sequence encoding one or more additional target antigens or immunological epitopes thereof.

15. The composition of claim 14, 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.

16. The composition of any one of claims 1-15, wherein the composition comprises from at least $1x10^9$ virus particles to at least $5x10^{12}$ virus particles.

17. The composition of any one of claims 1-16, wherein the replication-defective virus vector further comprises a nucleic acid sequence encoding an immunological fusion partner.

18. A pharmaceutical composition comprising the composition according to any one of claims 1-17 and a pharmaceutically acceptable carrier.

19. A host cell comprising the composition according to any one of claims 1-17.

20. The composition according to any one of claims 1-17, or the pharmaceutical composition according to claim 18, for use as a tumor vaccine.

21. The composition of any one of claims 1-17 or the pharmaceutical composition of claim 18 for use in enhancing an HPV-specific immune response in a subject in need thereof.

22. The composition of any one of claims 1-17 or the pharmaceutical composition of claim 18 for use in preventing or treating a HPV-induced cancer in a subject in need thereof.

23. Use of the composition according to any one of claims 1-17 in the manufacture of a pharmaceutical composition for preventing or treating a HPV-induced cancer in a subject in need thereof.

24. A composition comprising a replication-defective virus vector comprising a nucleic acid sequence encoding a modified HPV E6, a modified HPV E7 antigen, or a combination thereof, for use in reducing HPV-expressing cells in a subject in need thereof.

25. The composition for use of claim 24, wherein the nucleic acid sequence encodes a modified HPV E6 and a modified HPV E7.

26. The composition for use of any one of claims 24-25, wherein the replication-defective virus vector comprises:

a) a nucleic acid sequence encoding 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 to SEQ ID NO: 8, SEQ ID NO: 9, or SEQ ID NO: 10;

b) a nucleic acid sequence encoding 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 to SEQ ID NO: 12;

c) a nucleic acid sequence having a region 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: 2, SEQ ID NO: 3, or SEQ ID NO: 4;

d) a nucleic acid sequence having a region 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: 5, SEQ ID NO: 18, SEQ ID NO: 6, SEQ ID NO: 19, SEQ ID NO: 7, SEQ ID NO: 20;

e) a nucleic acid sequence having a region 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: 11 or SEQ ID NO: 21;

f) a nucleic acid sequence encoding 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 to SEQ ID NO: 13;

g) a nucleic acid sequence encoding 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 to SEQ ID NO: 14; or

h) a nucleic acid sequence comprising a region 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: 15.

27. The composition for use of any one of claims 24-26, wherein administration of the composition eliminates HPV E6 or HPV E7-expressing cells in the subject.