CLAIMS

1. An isolated peptide comprising an immunogenic fragment of a cancer-associated protein, wherein the fragment comprises a heteroclitic mutation.

2. The isolated peptide of claim 1, wherein the heteroclitic mutation is a mutation to a preferred amino acid at an anchor position.

3. The isolated peptide of claim 1 or 2, wherein the fragment is between about 7 and about 11 amino acids in length, between about 8 and about 10 amino acids in length, or about 9 amino acids in length.

4. The isolated peptide of any preceding claim, wherein the cancer-associated protein is a cancer testis antigen or oncofetal antigen.

5. The isolated peptide of any preceding claim, wherein the cancer-associated protein is encoded by one of the following human genes: *CEACAM5*, *GAGE1*, *TERT*, *KLHL7*, *MAGEA3*, *MAGEA4*, *MAGEA6*, *NUF2*, *NYESO1*, *PAGE4*, *PRAME*, *PSA*, *PSMA*, *RNF43*, *SART3*, *SSX2*, *STEAP1*, and *SURVIVIN*.

6. The isolated peptide of claim 5, wherein:

(a) the cancer-associated protein is encoded by *CEACAM5*, and the fragment comprises any one of SEQ ID NOS: 100, 102, 104, 106, and 108;

(b) the cancer-associated protein is encoded by *GAGE1*, and the fragment comprises any one of SEQ ID NOS: 110 and 112;

(c) the cancer-associated protein is encoded by *TERT*, and the fragment comprises SEQ ID NO: 114;

(d) the cancer-associated protein is encoded by *KLHL7*, and the fragment comprises SEQ ID NO: 116;

(e) the cancer-associated protein is encoded by *MAGEA3*, and the fragment comprises any one of SEQ ID NOS: 118, 120, 122, and 124;

(f) the cancer-associated protein is encoded by *MAGEA4*, and the fragment comprises SEQ ID NO: 126;

(g) the cancer-associated protein is encoded by *MAGEA6*, and the fragment comprises SEQ ID NO: 128;

(h) the cancer-associated protein is encoded by *NUF2*, and the fragment comprises any one of SEQ ID NOS: 130 and 132;

(i) the cancer-associated protein is encoded by *NYESO1*, and the fragment comprises any one of SEQ ID NOS: 134 and 136;

(j) the cancer-associated protein is encoded by *PAGE4*, and the fragment comprises SEQ ID NO: 138;

(k) the cancer-associated protein is encoded by *PRAME*, and the fragment comprises SEQ ID NO: 140;

(l) the cancer-associated protein is encoded by *PSA*, and the fragment comprises SEQ ID NO: 142;

(m) the cancer-associated protein is encoded by *PSMA*, and the fragment comprises SEQ ID NO: 144;

(n) the cancer-associated protein is encoded by *RNF43*, and the fragment comprises SEQ ID NO: 146;

(o) the cancer-associated protein is encoded by *SART3*, and the fragment comprises SEQ ID NO: 148;

(p) the cancer-associated protein is encoded by *SSX2*, and the fragment comprises SEQ ID NO: 150;

(q) the cancer-associated protein is encoded by *STEAP1*, and the fragment comprises any one of SEQ ID NOS: 152 and 154; or

(r) the cancer-associated protein is encoded by *SURVIVIN*, and the fragment comprises any one of SEQ ID NOS: 156 and 158.

7. The isolated peptide of claim 6, wherein:

(a) the cancer-associated protein is encoded by *CEACAM5*, and the fragment consists of any one of SEQ ID NOS: 100, 102, 104, 106, and 108;

(b) the cancer-associated protein is encoded by *GAGE1*, and the fragment consists of any one of SEQ ID NOS: 110 and 112;

(c) the cancer-associated protein is encoded by *TERT*, and the fragment consists of SEQ ID NO: 114;

(d) the cancer-associated protein is encoded by *KLHL7*, and the fragment consists of SEQ ID NO: 116;

(e) the cancer-associated protein is encoded by *MAGEA3*, and the fragment consists of any one of SEQ ID NOS: 118, 120, 122, and 124;

(f) the cancer-associated protein is encoded by *MAGEA4*, and the fragment consists of SEQ ID NO: 126;

(g) the cancer-associated protein is encoded by *MAGEA6*, and the fragment consists of SEQ ID NO: 128;

(h) the cancer-associated protein is encoded by *NUF2*, and the fragment consists of any one of SEQ ID NOS: 130 and 132;

(i) the cancer-associated protein is encoded by *NYESO1*, and the fragment consists of any one of SEQ ID NOS: 134 and 136;

(j) the cancer-associated protein is encoded by *PAGE4*, and the fragment consists of SEQ ID NO: 138;

(k) the cancer-associated protein is encoded by *PRAME*, and the fragment consists of SEQ ID NO: 140;

(l) the cancer-associated protein is encoded by *PSA*, and the fragment consists of SEQ ID NO: 142;

(m) the cancer-associated protein is encoded by *PSMA*, and the fragment consists of SEQ ID NO: 144;

(n) the cancer-associated protein is encoded by *RNF43*, and the fragment consists of SEQ ID NO: 146;

(o) the cancer-associated protein is encoded by *SART3*, and the fragment consists of SEQ ID NO: 148;

(p) the cancer-associated protein is encoded by *SSX2*, and the fragment consists of SEQ ID NO: 150;

(q) the cancer-associated protein is encoded by *STEAP1*, and the fragment consists of any one of SEQ ID NOS: 152 and 154; or

(r) the cancer-associated protein is encoded by *SURVIVIN*, and the fragment consists of any one of SEQ ID NOS: 156 and 158.

8. The isolated peptide of claim 7, wherein:

(a) the cancer-associated protein is encoded by *CEACAM5*, and the isolated peptide consists of any one of SEQ ID NOS: 100, 102, 104, 106, and 108;

(b) the cancer-associated protein is encoded by *GAGE1*, and the isolated peptide consists of any one of SEQ ID NOS: 110 and 112;

(c) the cancer-associated protein is encoded by *TERT*, and the isolated peptide consists of SEQ ID NO: 114;

(d) the cancer-associated protein is encoded by *KLHL7*, and the isolated peptide consists of SEQ ID NO: 116;

(e) the cancer-associated protein is encoded by *MAGEA3*, and the isolated peptide consists of any one of SEQ ID NOS: 118, 120, 122, and 124;

(f) the cancer-associated protein is encoded by *MAGEA4*, and the isolated peptide consists of SEQ ID NO: 126;

(g) the cancer-associated protein is encoded by *MAGEA6*, and the isolated peptide consists of SEQ ID NO: 128;

(h) the cancer-associated protein is encoded by *NUF2*, and the isolated peptide consists of any one of SEQ ID NOS: 130 and 132;

(i) the cancer-associated protein is encoded by *NYESO1*, and the isolated peptide consists of any one of SEQ ID NOS: 134 and 136;

(j) the cancer-associated protein is encoded by *PAGE4*, and the isolated peptide consists of SEQ ID NO: 138;

(k) the cancer-associated protein is encoded by *PRAME*, and the isolated peptide consists of SEQ ID NO: 140;

(l) the cancer-associated protein is encoded by *PSA*, and the isolated peptide consists of SEQ ID NO: 142;

(m) the cancer-associated protein is encoded by *PSMA*, and the isolated peptide consists of SEQ ID NO: 144;

(n) the cancer-associated protein is encoded by *RNF43*, and the isolated peptide consists of SEQ ID NO: 146;

(o) the cancer-associated protein is encoded by *SART3*, and the isolated peptide consists of SEQ ID NO: 148;

(p) the cancer-associated protein is encoded by *SSX2*, and the isolated peptide consists of SEQ ID NO: 150;

(q) the cancer-associated protein is encoded by *STEAP1*, and the isolated peptide consists of any one of SEQ ID NOS: 152 and 154; or

(r) the cancer-associated protein is encoded by *SURVIVIN*, and the isolated peptide consists of any one of SEQ ID NOS: 156 and 158.

9. The isolated peptide of any preceding claim, wherein the fragment binds to one or more of the following HLA types: HLA-A*02:01, HLA-A*03:01, HLA-A*24:02, and HLA-B*07:02.

10. A nucleic acid encoding the isolated peptide of any preceding claim.

11. The nucleic acid of claim 10, wherein the nucleic acid is codon optimized for expression in humans.

12. The nucleic acid of claim 10, wherein the nucleic acid is codon optimized for expression in *Listeria monocytogenes*.

13. The nucleic acid of any one of claims 10-12, wherein the nucleic acid comprises DNA.

14. The nucleic acid of any one of claims 10-12, wherein the nucleic acid comprises RNA.

15. The nucleic acid of any one of claims 10-14, wherein the nucleic acid comprises a sequence selected from any one of SEQ ID NOS: 223-977 and degenerate variants thereof that encode the same amino acid sequence.

16. The nucleic acid of claim 15, wherein the nucleic acid consists of a sequence selected from any one of SEQ ID NOS: 223-977 and degenerate variants thereof that encode the same amino acid sequence.

17. A pharmaceutical composition comprising:

(a) one or more isolated peptides of any one of claims 1-9 or one or more nucleic acids of any one of claims 10-16; and

(b) an adjuvant.

18. The pharmaceutical composition of claim 17, wherein the adjuvant comprises a detoxified listeriolysin O (dtLLO), a granulocyte/macrophage colony-stimulating factor (GM-CSF) protein, a nucleotide molecule encoding a GM-CSF protein, saponin QS21, monophosphoryl lipid A, an unmethylated CpG-containing oligonucleotide, or Montanide ISA 51.

19. The pharmaceutical composition of claim 17 or 18, wherein the pharmaceutical composition comprises peptides or nucleic acids encoding peptides that bind to each of the following HLA types: HLA-A*02:01, HLA-A*03:01, HLA-A*24:02, and HLA-B*07:02.

20. The pharmaceutical composition of any one of claims 17-19, wherein the pharmaceutical composition comprises:

(a) two or more of the peptides set forth in Table 3 or nucleic acids encoding two or more of the peptides set forth in Table 3;

(b) two or more of the peptides set forth in Table 5 or nucleic acids encoding two or more of the peptides set forth in Table 5;

(c) two or more of the peptides set forth in Table 7 or nucleic acids encoding two or more of the peptides set forth in Table 7;

(d) two or more of the peptides set forth in Table 9 or nucleic acids encoding two or more of the peptides set forth in Table 9;

(e) two or more of the peptides set forth in Table 11 or nucleic acids encoding two or more of the peptides set forth in Table 11;

(f) two or more of the peptides set forth in Table 13 or nucleic acids encoding two or more of the peptides set forth in Table 13;

(g) two or more of the peptides set forth in Table 15 or nucleic acids encoding two or more of the peptides set forth in Table 15;

(h) two or more of the peptides set forth in Table 17 or nucleic acids encoding two or more of the peptides set forth in Table 17;

(i) two or more of the peptides set forth in Table 19 or nucleic acids encoding two or more of the peptides set forth in Table 19; or

(j) two or more of the peptides set forth in Table 21 or nucleic acids encoding two or more of the peptides set forth in Table 21.

21. The pharmaceutical composition of claim 20, wherein the pharmaceutical composition comprises:

(a) all of the peptides set forth in Table 3 or nucleic acids encoding all of the peptides set forth in Table 3;

(b) all of the peptides set forth in Table 5 or nucleic acids encoding all of the peptides set forth in Table 5;

(c) all of the peptides set forth in Table 7 or nucleic acids encoding all of the peptides set forth in Table 7;

(d) all of the peptides set forth in Table 9 or nucleic acids encoding all of the peptides set forth in Table 9;

(e) all of the peptides set forth in Table 11 or nucleic acids encoding all of the peptides set forth in Table 11;

(f) all of the peptides set forth in Table 13 or nucleic acids encoding all of the peptides set forth in Table 13;

(g) all of the peptides set forth in Table 15 or nucleic acids encoding all of the peptides set forth in Table 15;

(h) all of the peptides set forth in Table 17 or nucleic acids encoding all of the peptides set forth in Table 17;

(i) all of the peptides set forth in Table 19 or nucleic acids encoding all of the peptides set forth in Table 19; or

(j) all of the peptides set forth in Table 21 or nucleic acids encoding all of the peptides set forth in Table 21.

22. A recombinant bacteria strain comprising a nucleic acid encoding any one of the isolated peptides of claims 1-9.

23. A recombinant bacteria strain comprising one or more nucleic acids encoding two or more of the isolated peptides of claims 1-9.

24. The recombinant bacteria strain of claim 23, wherein the two or more peptides comprise:

(a) two or more of the peptides set forth in Table 3 or nucleic acids encoding two or more of the peptides set forth in Table 3;

(b) two or more of the peptides set forth in Table 5 or nucleic acids encoding two or more of the peptides set forth in Table 5;

(c) two or more of the peptides set forth in Table 7 or nucleic acids encoding two or more of the peptides set forth in Table 7;

(d) two or more of the peptides set forth in Table 9 or nucleic acids encoding two or more of the peptides set forth in Table 9;

(e) two or more of the peptides set forth in Table 11 or nucleic acids encoding two or more of the peptides set forth in Table 11;

(f) two or more of the peptides set forth in Table 13 or nucleic acids encoding two or more of the peptides set forth in Table 13;

(g) two or more of the peptides set forth in Table 15 or nucleic acids encoding two or more of the peptides set forth in Table 15;

(h) two or more of the peptides set forth in Table 17 or nucleic acids encoding two or more of the peptides set forth in Table 17;

(i) two or more of the peptides set forth in Table 19 or nucleic acids encoding two or more of the peptides set forth in Table 19; or

(j) two or more of the peptides set forth in Table 21 or nucleic acids encoding two or more of the peptides set forth in Table 21.

25. The recombinant bacteria strain of claim 24, wherein the two or more peptides comprise:

(a) all of the peptides set forth in Table 3 or nucleic acids encoding all of the peptides set forth in Table 3;

(b) all of the peptides set forth in Table 5 or nucleic acids encoding all of the peptides set forth in Table 5;

(c) all of the peptides set forth in Table 7 or nucleic acids encoding all of the peptides set forth in Table 7;

(d) all of the peptides set forth in Table 9 or nucleic acids encoding all of the peptides set forth in Table 9;

(e) all of the peptides set forth in Table 11 or nucleic acids encoding all of the peptides set forth in Table 11;

(f) all of the peptides set forth in Table 13 or nucleic acids encoding all of the peptides set forth in Table 13;

(g) all of the peptides set forth in Table 15 or nucleic acids encoding all of the peptides set forth in Table 15;

(h) all of the peptides set forth in Table 17 or nucleic acids encoding all of the peptides set forth in Table 17;

(i) all of the peptides set forth in Table 19 or nucleic acids encoding all of the peptides set forth in Table 19; or

(j) all of the peptides set forth in Table 21 or nucleic acids encoding all of the peptides set forth in Table 21.

26. The recombinant bacteria strain of any one of claims 23-25, wherein the combination of two or more peptides binds to each of the following HLA types: HLA-A*02:01, HLA-A*03:01, HLA-A*24:02, and HLA-B*07:02.

27. The recombinant bacteria strain of any one of claims 22-26, wherein the bacteria strain is a *Salmonella*, *Listeria*, *Yersinia*, *Shigella*, or *Mycobacterium* strain.

28. The recombinant bacteria strain of claim 27, wherein the bacteria strain is a *Listeria* strain, optionally wherein the *Listeria* strain is a *Listeria monocytogenes* strain.

29. A recombinant *Listeria* strain comprising a nucleic acid comprising a first open reading frame encoding a fusion polypeptide, wherein the fusion polypeptide comprises a PEST-containing peptide fused to an immunogenic fragment of a cancer-associated protein, wherein the fragment comprises a heteroclitic mutation.

30. The recombinant *Listeria* strain of claim 29, wherein the heteroclitic mutation is a mutation to a preferred amino acid at an anchor position.

31. The recombinant *Listeria* strain of claim 29 or 30, wherein the fragment is between about 7 and about 11 amino acids in length, between about 8 and about 10 amino acids in length, or about 9 amino acids in length.

32. The recombinant *Listeria* strain of any one of claims 29-31, wherein the cancer-associated protein is a cancer testis antigen or oncofetal antigen.

33. The recombinant *Listeria* strain of any one of claims 29-32, wherein the cancer-associated protein is encoded by one of the following human genes: *CEACAM5*, *GAGE1*, *TERT*, *KLHL7*, *MAGEA3*, *MAGEA4*, *MAGEA6*, *NUF2*, *NYESO1*, *PAGE4*, *PRAME*, *PSA*, *PSMA*, *RNF43*, *SART3*, *SSX2*, *STEAP1*, and *SURVIVIN*.

34. The recombinant *Listeria* strain of claim 33, wherein:

(a) the cancer-associated protein is encoded by *CEACAM5*, and the fragment comprises any one of SEQ ID NOS: 100, 102, 104, 106, and 108;

(b) the cancer-associated protein is encoded by *GAGE1*, and the fragment comprises any one of SEQ ID NOS: 110 and 112;

(c) the cancer-associated protein is encoded by *TERT*, and the fragment comprises SEQ ID NO: 114;

(d) the cancer-associated protein is encoded by *KLHL7*, and the fragment comprises SEQ ID NO: 116;

(e) the cancer-associated protein is encoded by *MAGEA3*, and the fragment comprises any one of SEQ ID NOS: 118, 120, 122, and 124;

(f) the cancer-associated protein is encoded by *MAGEA4*, and the fragment comprises SEQ ID NO: 126;

(g) the cancer-associated protein is encoded by *MAGEA6*, and the fragment comprises SEQ ID NO: 128;

(h) the cancer-associated protein is encoded by *NUF2*, and the fragment comprises any one of SEQ ID NOS: 130 and 132;

(i) the cancer-associated protein is encoded by *NYESO1*, and the fragment comprises any one of SEQ ID NOS: 134 and 136;

(j) the cancer-associated protein is encoded by *PAGE4*, and the fragment comprises SEQ ID NO: 138;

(k) the cancer-associated protein is encoded by *PRAME*, and the fragment comprises SEQ ID NO: 140;

(l) the cancer-associated protein is encoded by *PSA*, and the fragment comprises SEQ ID NO: 142;

(m) the cancer-associated protein is encoded by *PSMA*, and the fragment comprises SEQ ID NO: 144;

(n) the cancer-associated protein is encoded by *RNF43*, and the fragment comprises SEQ ID NO: 146;

(o) the cancer-associated protein is encoded by *SART3*, and the fragment comprises SEQ ID NO: 148;

(p) the cancer-associated protein is encoded by *SSX2*, and the fragment comprises SEQ ID NO: 150;

(q) the cancer-associated protein is encoded by *STEAP1*, and the fragment comprises any one of SEQ ID NOS: 152 and 154; or

(r) the cancer-associated protein is encoded by *SURVIVIN*, and the fragment comprises any one of SEQ ID NOS: 156 and 158.

35. The recombinant *Listeria* strain of claim 34, wherein:

(a) the cancer-associated protein is encoded by *CEACAM5*, and the fragment consists of any one of SEQ ID NOS: 100, 102, 104, 106, and 108;

(b) the cancer-associated protein is encoded by *GAGE1*, and the fragment consists of any one of SEQ ID NOS: 110 and 112;

(c) the cancer-associated protein is encoded by *TERT*, and the fragment consists of SEQ ID NO: 114;

(d) the cancer-associated protein is encoded by *KLHL7*, and the fragment consists of SEQ ID NO: 116;

(e) the cancer-associated protein is encoded by *MAGEA3*, and the fragment consists of any one of SEQ ID NOS: 118, 120, 122, and 124;

(f) the cancer-associated protein is encoded by *MAGEA4*, and the fragment consists of SEQ ID NO: 126;

(g) the cancer-associated protein is encoded by *MAGEA6*, and the fragment consists of SEQ ID NO: 128;

(h) the cancer-associated protein is encoded by *NUF2*, and the fragment consists of any one of SEQ ID NOS: 130 and 132;

(i) the cancer-associated protein is encoded by *NYESO1*, and the fragment consists of any one of SEQ ID NOS: 134 and 136;

(j) the cancer-associated protein is encoded by *PAGE4*, and the fragment consists of SEQ ID NO: 138;

(k) the cancer-associated protein is encoded by *PRAME*, and the fragment consists of SEQ ID NO: 140;

(l) the cancer-associated protein is encoded by *PSA*, and the fragment consists of SEQ ID NO: 142;

(m) the cancer-associated protein is encoded by *PSMA*, and the fragment consists of SEQ ID NO: 144;

(n) the cancer-associated protein is encoded by *RNF43*, and the fragment consists of SEQ ID NO: 146;

(o) the cancer-associated protein is encoded by *SART3*, and the fragment consists of SEQ ID NO: 148;

(p) the cancer-associated protein is encoded by *SSX2*, and the fragment consists of SEQ ID NO: 150;

(q) the cancer-associated protein is encoded by *STEAP1*, and the fragment consists of any one of SEQ ID NOS: 152 and 154; or

(r) the cancer-associated protein is encoded by *SURVIVIN*, and the fragment consists of any one of SEQ ID NOS: 156 and 158.

36. The recombinant *Listeria* strain of any one of claims 29-35, wherein the fragment binds to one or more of the following HLA types: HLA-A*02:01, HLA-A*03:01, HLA-A*24:02, and HLA-B*07:02.

37. The recombinant *Listeria* strain of any one of claims 29-36, wherein the PEST-containing peptide comprises a bacterial secretion signal sequence, and the fusion polypeptide further comprises a ubiquitin protein fused to the fragment, wherein the PEST-containing peptide, the ubiquitin, and the carboxy-terminal antigenic peptide are arranged in tandem from the amino-terminal end to the carboxy-terminal end of the fusion polypeptide.

38. The recombinant *Listeria* strain of any one of claims 29-37, wherein the fusion polypeptide comprises the PEST-containing peptide fused to two or more immunogenic fragments of cancer-associated proteins, wherein each of the two or more fragments comprises a heteroclitic mutation.

39. The recombinant *Listeria* strain of claim 38, wherein the two or more immunogenic fragments are fused directly to each other without intervening sequence.

40. The recombinant *Listeria* strain of claim 38, wherein the two or more immunogenic fragments are linked to each other via peptide linkers.

41. The recombinant *Listeria* strain of claim 40, wherein one or more of the linkers set forth in SEQ ID NOS: 209-217 are used to link the two or more immunogenic fragments.

42. The recombinant *Listeria* strain of any one of claims 38-41, wherein the combination of two or more immunogenic fragments in the fusion polypeptide binds to each of the following HLA types: HLA-A*02:01, HLA-A*03:01, HLA-A*24:02, and HLA-B*07:02.

43. The recombinant *Listeria* strain of any one of claims 38-42, wherein the two or more immunogenic fragments comprise:

(a) two or more of the peptides set forth in Table 3;

(b) two or more of the peptides set forth in Table 5;

(c) two or more of the peptides set forth in Table 7;

(d) two or more of the peptides set forth in Table 9;

(e) two or more of the peptides set forth in Table 11;

(f) two or more of the peptides set forth in Table 13;

(g) two or more of the peptides set forth in Table 15;

(h) two or more of the peptides set forth in Table 17;

(i) two or more of the peptides set forth in Table 19; or

(j) two or more of the peptides set forth in Table 21.

44. The recombinant *Listeria* strain of claim 43, wherein the two or more immunogenic fragments comprise:

(a) all of the peptides set forth in Table 3;

(b) all of the peptides set forth in Table 5;

(c) all of the peptides set forth in Table 7;

(d) all of the peptides set forth in Table 9;

(e) all of the peptides set forth in Table 11;

(f) all of the peptides set forth in Table 13;

(g) all of the peptides set forth in Table 15;

(h) all of the peptides set forth in Table 17;

(i) all of the peptides set forth in Table 19; or

(j) all of the peptides set forth in Table 21.

45. The recombinant *Listeria* strain of any one of claims 29-44, wherein the PEST-containing peptide is on the N-terminal end of the fusion polypeptide.

46. The recombinant *Listeria* strain of claim 45, wherein the PEST-containing peptide is an N-terminal fragment of LLO.

47. The recombinant *Listeria* strain of claim 46, wherein the N-terminal fragment of LLO has the sequence set forth in SEQ ID NO: 59.

48. The recombinant *Listeria* strain of any one of claims 29-47, wherein the nucleic acid is in an episomal plasmid.

49. The recombinant *Listeria* strain of any one of claims 29-48, wherein the nucleic acid does not confer antibiotic resistance upon the recombinant *Listeria* strain.

50. The recombinant *Listeria* strain of any one of claims 29-49, wherein the recombinant *Listeria* strain is an attenuated, auxotrophic *Listeria* strain.

51. The recombinant *Listeria* strain of claim 50, wherein the attenuated, auxotrophic *Listeria* strain comprises a mutation in one or more endogenous genes that inactivates the one or more endogenous genes.

52. The recombinant *Listeria* strain of claim 51, wherein the one or more endogenous genes comprise *actA*, *dal*, and *dat*.

53. The recombinant *Listeria* strain of any one of claims 29-52, wherein the nucleic acid comprises a second open reading frame encoding a metabolic enzyme.

54. The recombinant *Listeria* strain of claim 53, wherein the metabolic enzyme is an alanine racemase enzyme or a D-amino acid aminotransferase enzyme.

55. The recombinant *Listeria* strain of any one of claims 29-54, wherein the fusion polypeptide is expressed from an *hly* promoter.

56. The recombinant *Listeria* strain of any one of claims 29-55, wherein the recombinant *Listeria* strain is a recombinant *Listeria monocytogenes* strain.

57. The recombinant *Listeria* strain of any one of claims 29-56, wherein the recombinant *Listeria* strain is an attenuated *Listeria monocytogenes* strain comprising a deletion of or inactivating mutation in *actA*, *dal*, and *dat*, wherein the nucleic acid is in an episomal plasmid and comprises a second open reading frame encoding an alanine racemase enzyme or a D-amino acid aminotransferase enzyme, and wherein the PEST-containing peptide is an N-terminal fragment of LLO.

58. An immunogenic composition comprising:

(a) the recombinant bacteria strain of any one of claims 22-28 or the recombinant *Listeria* strain of any one of claims 29-57; and

(b) an adjuvant.

59. The immunogenic composition of claim 58, wherein the adjuvant comprises a detoxified listeriolysin O (dtLLO), a granulocyte/macrophage colony-stimulating factor (GM-CSF) protein, a nucleotide molecule encoding a GM-CSF protein, saponin QS21, monophosphoryl lipid A, or an unmethylated CpG-containing oligonucleotide

60. The use of a composition in the manufacture of a medicament for inducing or enhancing an immune response against a tumor or cancer in a subject, wherein the composition comprises the isolated peptide of any one of claims 1-9, the nucleic acid of any one of claims 10-16, the pharmaceutical composition of any one of claims 17-21, the recombinant bacteria strain of any one of claims 22-28, the recombinant *Listeria* strain of any one of claims 29-57, or the immunogenic composition of any one of claims 58-59.

61. The use of a composition in the manufacture of a medicament for preventing or treating a tumor or cancer in a subject, wherein the composition comprises the isolated peptide of any one of claims 1-9, the nucleic acid of any one of claims 10-16, the pharmaceutical composition of any one of claims 17-21, the recombinant bacteria strain of any one of claims 22-28, the recombinant *Listeria* strain of any one of claims 29-57, or the immunogenic composition of any one of claims 58-59.

62. The use of a composition of claim 60 or 61, wherein the cancer is non-small cell lung cancer, prostate cancer, pancreatic cancer, bladder cancer, breast cancer, uterine cancer, ovarian cancer, low-grade glioma, colorectal cancer, or head and neck cancer.