CLAIMS

1. A multi-antigen construct, comprising: (a) at least one nucleotide sequence encoding an immunogenic mucin 1 (MUC1) polypeptide; (b) at least one nucleotide sequence encoding an immunogenic mesothelin (MSLN) polypeptide; and (c) at least one nucleotide sequence encoding an immunogenic telomerase reverse transcriptase (TERT) polypeptide, wherein the immunogenic MUC1 polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:8;

(ii) an amino acid sequence comprising amino acids 4-537 of SEQ ID NO:8;

(iii) an amino acid sequence comprising amino acids 24-537 of SEQ ID NO:8;

(iv) the amino acid sequence of SEQ ID NO:16;

(v) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16; and

(vi) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16 with the proviso that the amino acid at position 513 is T.

2. The multi-antigen construct of claim 1, wherein the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) an amino acid sequence comprising amino acids 37-597 of the amino acid sequence of SEQ ID NO:2;

(ii) an amino acid sequence consisting of amino acids 37-597 of the amino acid sequence of SEQ ID NO:2;

(iii) the amino acid sequence of SEQ ID NO:6; and

(iv) an amino acid sequence comprising amino acids 4-564 of the amino acid sequence of SEQ ID NO:6.

3. The multi-antigen construct of claim 1, wherein the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:10;

(ii) the amino acid sequence of SEQ ID NO:12;

(iii) the amino acid sequence of SEQ ID NO:14;

(iv) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(v) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(vi) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

4. The multi-antigen construct of claim 3, wherein:

(i) the immunogenic MUC1 polypeptide comprises the amino acid sequence selected from the group consisting of:

(1) the amino acid sequence of SEQ ID NO:8;

(2) an amino acid sequence comprising amino acids 4-537 of SEQ ID NO:8;

(3) an amino acid sequence comprising amino acids 24-537 of SEQ ID NO:8;

(4) the amino acid sequence of SEQ ID NO:16;

(5) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16; and

(6) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16 with the proviso that the amino acid at position 513 is T; and

(ii) the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) an amino acid sequence comprising amino acids 37-597 of SEQ ID NO:2;

(2) an amino acid sequence consisting of amino acids 37-597 of SEQ ID NO:2;

(3) the amino acid sequence of SEQ ID NO:6; and

(4) an amino acid sequence comprising amino acids 4-564 of SEQ ID NO:6.

5. A multi-antigen construct, comprising: (a) at least one nucleotide sequence encoding an immunogenic MUC1 polypeptide; (b) at least one nucleotide sequence encoding an immunogenic MSLN polypeptide; and (c) at least one nucleotide sequence encoding an immunogenic TERT polypeptide, wherein the nucleotide sequence encoding the immunogenic MUC1 polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:7;

(ii) a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7;

(iii) the nucleotide sequence of SEQ ID NO:15;

(iv) a nucleotide sequence comprising nucleotides 10-1551 of SEQ ID NO:15; and

(v) a degenerate variant of any of the nucleotide sequences (i)-(iv).

6. The multi-antigen construct of claim 1, wherein the nucleotide sequence encoding the immunogenic MSLN polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:5;

(ii) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(iii) a degenerate variant of (1) the nucleotide sequence of SEQ ID NO:5 or (2) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5.

7. The multi-antigen construct of claim 1, wherein the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:9;

(ii) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(iii) the nucleotide sequence of SEQ ID NO:11;

(iv) a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11;

(v) the nucleotide sequence of SEQ ID NO:13;

(vi) a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13; and

(vii) a degenerate variant of any of the nucleotide sequences (i)-(vi).

8. A multi-antigen construct, which comprises:

(I) at least one nucleotide sequence encoding an immunogenic MUC1 polypeptide;

(II) at least one nucleotide sequence encoding an immunogenic MSLN polypeptide; and

(III) at least one nucleotide sequence encoding an immunogenic TERT polypeptide, and has a structure of formula (VIII):

TAA1-SPACER1-TAA2-SPACER2-TAA3 (VIII)

wherein in formula (VIII):

(a) TAA1, TAA2, and TAA3 are each a nucleotide sequence encoding an immunogenic tumor-associated antigen (TAA) polypeptide selected from the group consisting of an immunogenic MUC1 polypeptide, an immunogenic MSLN polypeptide, and an immunogenic TERT polypeptide, wherein TAA1, TAA2, and TAA3 encode different immunogenic TAA polypeptides; and

(b) SPACER1 and SPACER2 are each a spacer nucleotide sequence and may be the same or different, and wherein;

(i) the nucleotide sequence encoding the immunogenic MUC1 polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID NO:7;

(2) a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7;

(3) the nucleotide sequence of SEQ ID NO:15;

(4) a nucleotide sequence comprising nucleotides 10-1551 of SEQ ID NO:15; and

(5) a degenerate variant of any of: the nucleotide sequence of SEQ ID NO:7; a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7; the nucleotide sequence of SEQ ID NO:15; or a nucleotide sequence comprising nucleotides 10-1551 of SEQ ID NO:15;

(ii) the nucleotide sequence encoding the immunogenic MSLN polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID NO:5;

(2) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(3) a degenerate variant of: the nucleotide sequence of SEQ ID NO:5; or a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(iii) the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID N0:9;

(2) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(3) the nucleotide sequence of SEQ ID NO:11;

(4) a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11;

(5) the nucleotide sequence of SEQ ID NO:13;

(6) a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13; and

(7) a degenerate variant of any of: the nucleotide sequence of SEQ ID NO:9; a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9; the nucleotide sequence of SEQ ID NO:11; a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11; the nucleotide sequence of SEQ ID NO:13; or a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13.

9. A multi-antigen construct, which comprises a nucleotide sequence encoding the amino acid sequence of SEQ ID NO:44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, or 66.

10. The multi-antigen construct of claim 9, which comprises a nucleotide sequence encoding the amino acid sequence of SEQ ID NO:44, 46, 48, or 50.

11. A multi-antigen construct, which comprises a nucleotide sequence encoding the amino acid sequence of SEQ ID NO:44.

12. A multi-antigen construct, which comprises the nucleotide sequence of SEQ ID NO:43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, or 65, or a degenerate variant of the nucleotide sequence of SEQ ID NO: 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, or 65.

13. The multi-antigen construct of claim 12, which comprises the nucleotide sequence of SEQ ID NO:43, 45, 47, or 49, or a degenerate variant of the nucleotide sequence of SEQ ID NO: 43, 45, 47, or 49.

14. A multi-antigen construct, which comprises the nucleotide sequence of SEQ ID NO:43 or a degenerate variant of the nucleotide sequence of SEQ ID NO:43.

15. A vector comprising a multi-antigen construct of claim 1.

16. A composition comprising a multi-antigen construct of claim 1.

17. A pharmaceutical composition comprising: (i) a multi-antigen construct of claim 1; and (ii) a pharmaceutically acceptable carrier.

18. The multi-antigen construct of claim 8, wherein:

(i) the nucleotide sequence encoding the immunogenic MUC1 polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID NO:7;

(2) a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7; and

(3) a degenerate variant of: the nucleotide sequence of SEQ ID NO:7; or a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7;

(ii) the nucleotide sequence encoding the immunogenic MSLN polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID N0:5;

(2) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(3) a degenerate variant of: the nucleotide sequence of SEQ ID NO:5; or a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(iii) the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(1) the nucleotide sequence of SEQ ID N0:9;

(2) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(3) a degenerate variant of: the nucleotide sequence of SEQ ID NO:9; or a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9.

19. A multi-antigen construct, which comprises:

(I) at least one nucleotide sequence encoding an immunogenic MUC1 polypeptide;

(II) at least one nucleotide sequence encoding an immunogenic MSLN polypeptide; and

(III) at least one nucleotide sequence encoding an immunogenic TERT polypeptide, and has a structure of formula (VIII):

TAA1-SPACER1-TAA2-SPACER2-TAA3 (VIII)

wherein in formula (VIII):

(i) SPACER1 and SPACER2 are each a spacer nucleotide sequence encoding a 2A peptide selected from foot-and-mouth disease virus 2A peptide (FMD2A), equine rhinitis A virus 2A peptide (ERA2A), equine rhinitis B virus 2A peptide (ERB2A), encephalomyocarditis virus 2A peptide (EMC2A), porcine teschovirus 2A peptide (PT2A), or Thosea asigna virus 2A peptide (T2A), and

(ii) TAA1, TAA2, and TAA3 are each a nucleotide sequence encoding an immunogenic tumor-associated antigen (TAA) polypeptide selected from the group consisting of an immunogenic MUC1 polypeptide, an immunogenic MSLN polypeptide, and an immunogenic TERT polypeptide, wherein TAA1, TAA2, and TAA3 encode different immunogenic TAA polypeptides; and wherein the immunogenic MUC1 polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:8;

(ii) an amino acid sequence comprising amino acids 4-537 of SEQ ID NO:8;

(iii) an amino acid sequence comprising amino acids 24-537 of SEQ ID NO:8;

(iv) the amino acid sequence of SEQ ID NO:16;

(v) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16; and

(vi) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16 with the proviso that the amino acid at position 513 is T.

20. The multi-antigen construct of claim 19, wherein the 2A peptide is selected from ERB2A, EMC2A, or T2A.

21. The multi-antigen construct of claim 19, wherein the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:2;

(ii) an amino acid sequence comprising amino acids 37-597 of the amino acid sequence of SEQ ID NO:2;

(iii) the amino acid sequence of SEQ ID NO:6; and

(iv) an amino acid sequence comprising amino acids 4-564 of the amino acid sequence of SEQ ID NO:6.

22. The multi-antigen construct of claim 19, wherein the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:10;

(ii) the amino acid sequence of SEQ ID NO:12;

(iii) the amino acid sequence of SEQ ID NO:14;

(iv) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(v) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(vi) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

23. The multi-antigen construct of claim 20, wherein the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:2;

(ii) an amino acid sequence comprising amino acids 37-597 of the amino acid sequence of SEQ ID NO:2;

(iii) the amino acid sequence of SEQ ID NO:6; and

(iv) an amino acid sequence comprising amino acids 4-564 of the amino acid sequence of SEQ ID NO:6.

24. The multi-antigen construct of claim 20, wherein the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:10;

(ii) the amino acid sequence of SEQ ID NO:12;

(iii) the amino acid sequence of SEQ ID NO:14;

(iv) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(v) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(vi) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

25. The multi-antigen construct of claim 21, wherein the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(i) the amino acid sequence of SEQ ID NO:10;

(ii) the amino acid sequence of SEQ ID NO:12;

(iii) the amino acid sequence of SEQ ID NO:14;

(iv) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(v) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(vi) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

26. A multi-antigen construct, which comprises:

(I) at least one nucleotide sequence encoding an immunogenic MUC1 polypeptide;

(II) at least one nucleotide sequence encoding an immunogenic MSLN polypeptide; and

(III) at least one nucleotide sequence encoding an immunogenic TERT polypeptide, and has a structure of formula (VIII):

TAA1-SPACER1-TAA2-SPACER2-TAA3 (VIII)

wherein in formula (VIII):

(a) TAA1, TAA2, and TAA3 are each a nucleotide sequence encoding an immunogenic TAA polypeptide selected from the group consisting of an immunogenic MUC1 polypeptide, an I mmunogenic MSLN polypeptide, and an immunogenic TERT polypeptide, wherein TAA1, TAA2, and TAA3 encode different immunogenic TAA polypeptides; and

(b) SPACER1 and SPACER2 are each a spacer nucleotide sequence and may be the same or different, and wherein:

(i) the immunogenic MUC1 polypeptide comprises the amino acid sequence selected from the group consisting of:

(1) the amino acid sequence of SEQ ID NO:8;

(2) an amino acid sequence comprising amino acids 4-537 of SEQ ID NO:8;

(3) an amino acid sequence comprising amino acids 24-537 of SEQ ID NO:8;

(4) the amino acid sequence of SEQ ID NO:16;

(5) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16; and

(6) an amino acid sequence comprising amino acids 4-517 of SEQ ID NO:16 with the proviso that the amino acid at position 513 is T;

(ii) the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) an amino acid sequence comprising amino acids 37-597 of SEQ ID NO:2;

(2) an amino acid sequence consisting of amino acids 37-597 of SEQ ID NO:2;

(3) the amino acid sequence of SEQ ID NO:6; and

(4) an amino acid sequence comprising amino acids 4-564 of SEQ ID NO:6; and

(iii) the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) the amino acid sequence of SEQ ID NO:10;

(2) the amino acid sequence of SEQ ID NO:12;

(3) the amino acid sequence of SEQ ID NO:14;

(4) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(5) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(6) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

27. The multi-antigen construct of claim 19, wherein in formula (VIII): TAA1 is a nucleotide

sequence encoding an immunogenic MUC1 polypeptide, TAA2 is a nucleotide sequence encoding an immunogenic MSLN polypeptide, and TAA3 is a nucleotide sequence encoding an immunogenic TERT polypeptide.

28. The multi-antigen construct of claim 27, wherein the immunogenic TERT polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) the amino acid sequence of SEQ ID NO:10;

(2) the amino acid sequence of SEQ ID NO:12;

(3) the amino acid sequence of SEQ ID NO:14;

(4) an amino acid sequence comprising amino acids 2-892 of SEQ ID NO:10;

(5) an amino acid sequence comprising amino acids 4-591 of SEQ ID NO:12; and

(6) an amino acid sequence comprising amino acids 3-789 of SEQ ID NO:14.

29. The multi-antigen construct of claim 27, wherein the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) an amino acid sequence comprising amino acids 37-597 of SEQ ID NO:2;

(2) an amino acid sequence consisting of amino acids 37-597 of SEQ ID NO:2;

(3) the amino acid sequence of SEQ ID NO:6; and

(4) an amino acid sequence comprising amino acids 4-564 of SEQ ID NO:6.

30. The multi-antigen construct of claim 28, wherein the immunogenic MSLN polypeptide comprises an amino acid sequence selected from the group consisting of:

(1) an amino acid sequence comprising amino acids 37-597 of SEQ ID NO:2;

(2) an amino acid sequence consisting of amino acids 37-597 of SEQ ID NO:2;

(3) the amino acid sequence of SEQ ID NO:6; and

(4) an amino acid sequence comprising amino acids 4-564 of SEQ ID NO:6.

31. The multi-antigen construct of claim 19, wherein the nucleotide sequence encoding the immunogenic MUC1 polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:7;

(ii) a nucleotide sequence comprising nucleotides 10-1611 of SEQ ID NO:7;

(iii) the nucleotide sequence of SEQ ID NO:15;

(iv) a nucleotide sequence comprising nucleotides 10-1551 of SEQ ID NO:15; and

(v) a degenerate variant of any of the nucleotide sequences (i)-(iv).

32. The multi-antigen construct of claim 19, wherein the nucleotide sequence encoding the immunogenic MSLN polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:5;

(ii) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(iii) a degenerate variant of (1) the nucleotide sequence of SEQ ID NO:5 or (2) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5.

33. The multi-antigen construct of claim 19, wherein the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:9;

(ii) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(iii) the nucleotide sequence of SEQ ID NO:11;

(iv) a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11;

(v) the nucleotide sequence of SEQ ID NO:13;

(vi) a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13; and

(vii) a degenerate variant of any of the nucleotide sequences (i)-(vi).

34. The multi-antigen construct of claim 31, wherein the nucleotide sequence encoding the immunogenic MSLN polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:5;

(ii) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5; and

(iii) a degenerate variant of (1) the nucleotide sequence of SEQ ID NO:5 or (2) a nucleotide sequence comprising nucleotides 10-1692 of SEQ ID NO:5.

35. The multi-antigen construct of claim 31, wherein the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:9;

(ii) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(iii) the nucleotide sequence of SEQ ID NO:11;

(iv) a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11;

(v) the nucleotide sequence of SEQ ID NO:13;

(vi) a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13; and

(vii) a degenerate variant of any of the nucleotide sequences (i)-(vi).

36. The multi-antigen construct of claim 34, wherein the nucleotide sequence encoding the immunogenic TERT polypeptide is selected from the group consisting of:

(i) the nucleotide sequence of SEQ ID NO:9;

(ii) a nucleotide sequence comprising nucleotides 4-2679 of SEQ ID NO:9;

(iii) the nucleotide sequence of SEQ ID NO:11;

(iv) a nucleotide sequence comprising nucleotides 10-1782 of SEQ ID NO:11;

(v) the nucleotide sequence of SEQ ID NO:13;

(vi) a nucleotide sequence comprising nucleotides 7-2373 of SEQ ID NO:13; and

(vii) a degenerate variant of any of the nucleotide sequences (i)-(vi).

37. The multi-antigen construct of claim 27, wherein:
(i) the amino acid sequence of the immunogenic MUC1 polypeptide comprises amino acids 4-537 of SEQ ID NO:8;
(ii) the amino acid sequence of the immunogenic MSLN polypeptide comprises amino acids 4-564 of SEQ ID NO:6; and
(iii) the amino acid sequence of the immunogenic TERT polypeptide comprises amino acids 2-892 of SEQ ID NO:10.

38. The multi-antigen construct of claim 27, wherein:
(i) the nucleotide sequence encoding the immunogenic MSLN polypeptide comprises nucleotides 10-1692 of SEQ ID NO:5;
(ii) the nucleotide sequence encoding the immunogenic MUC1 polypeptide comprises nucleotides 10-1611 of SEQ ID NO:7; and
(iii) the nucleotide sequence encoding the immunogenic TERT polypeptide comprises nucleotides 4-2679 of SEQ ID NO:9.

39. A multi-antigen construct, comprising:
(a) at least one nucleotide sequence encoding an immunogenic mucin 1 (MUC1) polypeptide;
(b) at least one nucleotide sequence encoding an immunogenic mesothelin (MSLN) polypeptide; and
(c) at least one nucleotide sequence encoding an immunogenic telomerase reverse transcriptase (TERT) polypeptide, wherein:
(i) the amino acid sequence of the immunogenic MSLN polypeptide comprises amino acids 4-564 of SEQ ID NO:6;
(ii) the amino acid sequence of the immunogenic MUC1 polypeptide comprises amino acids 4-537 of SEQ ID NO:8; and
(iii) the amino acid sequence of the immunogenic TERT polypeptide comprises amino acids 2-892 of SEQ ID NO:10.

40. A multi-antigen construct, comprising:
(a) at least one nucleotide sequence encoding an immunogenic mucin 1 (MUC1) polypeptide;
(b) at least one nucleotide sequence encoding an immunogenic mesothelin (MSLN) polypeptide; and
(c) at least one nucleotide sequence encoding an immunogenic telomerase reverse transcriptase (TERT) polypeptide, wherein:
(i) the nucleotide sequence encoding the immunogenic MSLN polypeptide comprises nucleotides 10-1692 of SEQ ID NO:5;

(ii) the nucleotide sequence encoding the immunogenic MUC1 polypeptide comprises nucleotides 10-1611 of SEQ ID NO:7; and
(iii) the nucleotide sequence encoding the immunogenic TERT polypeptide comprises nucleotides 4-2679 of SEQ ID NO:9.

41. The multi-antigen construct of claim 19, wherein:
(i) the amino acid sequence of the immunogenic MSLN polypeptide comprises amino acids 4-564 of SEQ ID NO:6;
(ii) the amino acid sequence of the immunogenic MUC1 polypeptide comprises amino acids 4-537 of SEQ ID NO:8; and
(iii) the amino acid sequence of the immunogenic TERT polypeptide comprises amino acids 2-892 of SEQ ID NO:10.

42. The multi-antigen construct of claim 19, wherein:
(i) the nucleotide sequence encoding the immunogenic MSLN polypeptide comprises nucleotides 10-1692 of SEQ ID NO:5;
(ii) the nucleotide sequence encoding the immunogenic MUC1 polypeptide comprises nucleotides 10-1611 of SEQ ID NO:7; and
(iii) the nucleotide sequence encoding the immunogenic TERT polypeptide comprises nucleotides 4-2679 of SEQ ID NO:9.

43. Use of the multi-antigen construct of claim 1 in the manufacture of a medicament for the treatment of cancer associated with over-expression of MUC1, TERT, or MSLN.

44. A multi-antigen construct according of claim 1 or a pharmaceutical composition of claim 17 for use in the treatment of cancer associated with over-expression of MUC1, TERT, or MSLN.