What is claimed is:

1. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) a fusion protein expressed by the yeast vehicle and comprising at least one MUC1 antigen, wherein the MUC1 antigen consists of, in order from N- to C-terminus, a MUC1 SEA/extracellular domain (ED), wherein the MUC1 SEA/ED domain comprises a MUC1 ED flanked at the N-terminus by one or more amino acids from the non-ED portion of the MUC1 SEA domain; at least two variable number of tandem repeat (VNTR) domains; a MUC1 transmembrane (TM) domain; and a MUC1 cytoplasmic domain (CD).

2. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the antigen includes two VNTR domains.

3. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen has an amino acid sequence that is at least 95% identical to SEQ ID NO:15.

4. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 ED has an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 2-59 of SEQ ID NO:15; positions 32-89 of SEQ ID NO:14; positions 116-173 of SEQ ID NO:2; positions 107-164 of SEQ ID NO:4; positions 107-164 of SEQ ID NO:6; positions 98-155 of SEQ ID NO:8; positions 1098-1155 of SEQ ID NO:11; and a corresponding sequence from a different human MUC1 protein.

5. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 ED has an amino acid sequence that is at least 95% identical to positions 2-59 of SEQ ID NO:15 or positions 32-89 of SEQ ID NO:14.

6. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 ED has an amino acid sequence of positions 2-59 of SEQ ID NO:15 or positions 32-89 of SEQ ID NO:14.

7. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 SEA/ED has an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 1-59 of SEQ ID NO:15; positions 31-89 of SEQ ID NO:14; positions 115-173 of SEQ ID NO:2; positions 106-164 of SEQ ID NO:4; positions 106-164 of SEQ ID NO:6; positions 97-155 of SEQ ID NO:8;

positions 1097-1155 of SEQ ID NO:11; and a corresponding sequence from a different human MUC1 protein.

8. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 SEA/ED has an amino acid sequence of positions 1-59 of SEQ ID NO:15 or positions 31-89 of SEQ ID NO:14.

9. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein VNTR domain has an amino acid sequence that is at least 95% identical to any consecutive 20 amino acids between positions 60 and 100 of SEQ ID NO:15; any consecutive 20 amino acids between positions 90 and 130 of SEQ ID NO:14; positions 126-145 of SEQ ID NO:11; any consecutive 20 amino acids between positions 61 and 1020 of SEQ ID NO:11; any consecutive 20 amino acids between positions 126 and 965 of SEQ ID NO:11; SEQ ID NO:12; and a corresponding sequence from a different human MUC1 protein.

10. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein VNTR domain has an amino acid sequence that is at least 95% identical to any consecutive 20 amino acids between positions 60 and 100 of SEQ ID NO:15 or any consecutive 20 amino acids between positions 90 and 130 of SEQ ID NO:14.

11. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the fusion protein has two VNTR domains, and wherein the amino acid sequence of the two VNTR domains is positions 60 and 100 of SEQ ID NO:15 or positions 90 and 130 of SEQ ID NO:14.

12. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 TM domain has an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 101-128 of SEQ ID NO:15, positions 131-158 of SEQ ID NO:14, positions 174-201 of SEQ ID NO:2 , positions 165-192 of SEQ ID NO:4, positions 165-192 of SEQ ID NO:6, positions 156-183 of SEQ ID NO:8, positions 1156-1183 of SEQ ID NO:11, and a corresponding sequence from a different human MUC1 protein.

13. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 TM domain has an amino acid sequence that is at least 95% identical to positions 101-128 of SEQ ID NO:15 or positions 131-158 of SEQ ID NO:14.

14. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 TM domain has an amino acid sequence of positions 101-128 of SEQ ID NO:15 or positions 131-158 of SEQ ID NO:14.

15. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 CD domain has an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 129-200 of SEQ ID NO:15, positions 159-230 of SEQ ID NO:14, positions 202-273 of SEQ ID NO:2, positions 193-264 of SEQ ID NO:4, positions 193-264 of SEQ ID NO:6, positions 184-255 of SEQ ID NO:8, positions 1184-1255 of SEQ ID NO:11, positions 7-78 of SEQ ID NO:17, positions 79-150 of SEQ ID NO:17, positions 151-222 of SEQ ID NO:17; positions 1-72 of SEQ ID NO:18, positions 73-144 of SEQ ID NO:18, positions 145-216 of SEQ ID NO:18, and a corresponding sequence from a different human MUC1 protein.

16. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 CD domain has an amino acid sequence that is at least 95% identical to an amino acid sequence of positions 129-200 of SEQ ID NO:15 or positions 159-230 of SEQ ID NO:14.

17. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 CD domain has an amino acid sequence of positions 129-200 of SEQ ID NO:15 or positions 159-230 of SEQ ID NO:14.

18. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises SEQ ID NO:15 or an amino acid sequence that is at least 99% identical to SEQ ID NO:15.

19. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen has an amino acid sequence of SEQ ID NO:15.

20. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the fusion protein further comprises a MUC1 signal sequence appended to the N-terminus of the MUC1 SEA/ED.

21. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the MUC1 signal sequence has an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 1-27 of SEQ ID NO:2, positions 1-32 of SEQ ID NO:4, positions 1-32 of SEQ ID NO:6, positions 1-27 of SEQ ID NO:8, positions 1-23 of SEQ ID NO:11, positions 1-30 of SEQ ID NO:14, and a corresponding sequence from a different human MUC1 protein.

22. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the MUC1 signal sequence has an amino acid sequence that is at least 95% identical to an amino acid sequence of positions 1-30 of SEQ ID NO:14.

23. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the MUC1 signal sequence has an amino acid sequence of positions 1-30 of SEQ ID NO:14.

24. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 23, wherein the fusion protein has an amino acid sequence that is at least 95% identical to SEQ ID NO:14.

25. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 23, wherein the fusion protein comprises SEQ ID NO:14 or an amino acid sequence that is at least 99% identical to SEQ ID NO:14.

26. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 23, wherein the fusion protein has an amino acid sequence of SEQ ID NO:14.

27. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises between one and eleven amino acid substitutions to create a MUC1 agonist antigen.

28. The Yeast-MUC1 immunotherapeutic composition of Claim 27, wherein the amino acid substitutions, with respect to SEQ ID NO:23, are selected from: A96Y, P97L, G104V, S105Y, T106L, A147Y, C161V, T199L, D200F, S215Y, and T239L.

29. The Yeast-MUC1 immunotherapeutic composition of Claim 27, wherein the MUC1 agonist antigen comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:23.

30. The Yeast-MUC1 immunotherapeutic composition of Claim 27, wherein the MUC1 agonist antigen comprises SEQ ID NO:23 or an amino acid sequence that is at least 99% identical to SEQ ID NO:23.

31. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) a fusion protein expressed by the yeast vehicle and comprising at least one MUC1 agonist antigen, wherein the MUC1 agonist antigen comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:25.

32. The Yeast-MUC1 immunotherapeutic composition of Claim 31, wherein the MUC1 agonist antigen comprises an amino acid sequence that is at least 99% identical to SEQ ID NO:25.

33. The Yeast-MUC1 immunotherapeutic composition of Claim 31, wherein the MUC1 agonist antigen comprises an amino acid sequence of SEQ ID NO:25.

34. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) a fusion protein expressed by the yeast vehicle and comprising at least one MUC1 antigen, wherein the MUC1 antigen consists of two or more cytoplasmic domains (CD) of MUC1.

35. The Yeast-MUC1 immunotherapeutic composition of Claim 34, wherein the MUC1 antigen consists of three cytoplasmic domains (CD) of MUC1.

36. The Yeast-MUC1 immunotherapeutic composition of Claim 34, wherein the three CDs are from the same MUC1 protein.

37. The Yeast-MUC1 immunotherapeutic composition of Claim 34, wherein each CD domain comprises an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 1-72 of SEQ ID NO:18, positions 73-144 of SEQ ID NO:18, positions 145-216 of SEQ ID NO:18, positions 7-78 of SEQ ID NO:17, positions 79-150 of SEQ ID NO:17, positions 151-222 of SEQ ID NO:17, positions 202-273 of SEQ ID NO:2, positions 193-264 of SEQ ID NO:4, positions 193-264 of SEQ ID NO:6, positions 184-255 of SEQ ID NO:8, positions 1184-1255 of SEQ ID NO:11, positions 159-230 of SEQ ID NO:14, positions 129-200 of SEQ ID NO:15, and a corresponding sequence from a different human MUC1 protein.

38. The Yeast-MUC1 immunotherapeutic composition of Claim 34, wherein each CD domain comprises an amino acid sequence that is at least 95% identical to an amino acid sequence selected from the group consisting of: positions 1-72 of SEQ ID NO:18, positions 73-144 of SEQ ID NO:18, and positions 145-216 of SEQ ID NO:18, positions 7-78 of SEQ ID NO:17, positions 79-150 of SEQ ID NO:17, positions 151-222 of SEQ ID NO:17, and positions 129-200 of SEQ ID NO:15.

39. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 38, wherein the MUC1 antigen has an amino acid sequence that is at least 95% identical to SEQ ID NO:18.

40. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 38, wherein the MUC1 antigen has an amino acid sequence of SEQ ID NO:18 or an amino acid sequence that is at least 99% identical to SEQ ID NO:18.

41. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 38, wherein the MUC1 antigen has an amino acid sequence of SEQ ID NO:18.

42. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 41, wherein the fusion protein has an amino acid sequence that is at least 95% identical to SEQ ID NO:17.

43. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 41, wherein the fusion protein has an amino acid sequence of SEQ ID NO:17 or an amino acid sequence that is at least 99% identical to SEQ ID NO:17.

44. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 34 to 41, wherein the fusion protein has an amino acid sequence of SEQ ID NO:17.

45. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 44, wherein the yeast vehicle is a whole yeast.

46. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 44, wherein the yeast vehicle is heat-inactivated.

47. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 44, wherein the yeast vehicle is from a mutant yeast strain that produces underglycosylated proteins, as compared to a wild-type yeast strain.

48. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 44, wherein the MUC1 antigen is expressed on the cell wall of the yeast vehicle.

49. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 44, wherein the MUC1 antigen is expressed in the periplasm or cytoplasm of the yeast vehicle.

50. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 49, wherein the yeast vehicle is from *Saccharomyces*.

51. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 49, wherein the yeast vehicle is from *Saccharomyces cerevisiae*.

52. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 51, wherein the immunotherapeutic composition has been produced by culturing a whole yeast expressing the MUC1 antigen in a medium that was maintained at a pH level of between 5.5 and 8.

53. The Yeast-MUC1 immunotherapeutic composition of Claim 52, wherein the medium was buffered with a buffering agent.

54. The Yeast-MUC1 immunotherapeutic composition of Claim 52, wherein the yeast was cultured in a medium that was maintained at a pH level of between 6 and 8.

55. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 54, further comprising at least one biological response modifier.

56. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 54, further comprising a pharmaceutically acceptable excipient.

57. The Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 56, wherein the immunotherapeutic composition has been formulated for injection.

58. A method to reduce tumor burden, inhibit tumor growth, and/or increase survival of an individual who has a cancer that expresses MUC1, comprising administering to the individual an immunotherapeutic composition of any one of Claims 1 to 57.

59. The method of Claim 58, wherein MUC1 expression is detected in the individual's cancer at the time the composition is first administered.

60. The method of Claim 58, wherein the individual has a stage I cancer.

61. The method of Claim 58, wherein the individual has a stage II cancer.

62. The method of Claim 58, wherein the individual has a stage III cancer.

63. The method of Claim 58, wherein the individual has a stage IV cancer.

64. The method of any one of Claims 58 to 63, wherein the individual is being treated or has been treated with another therapy for cancer.

65. The method of Claim 64, wherein the therapy is chemotherapy.

66. The method of Claim 64, wherein the therapy is targeted cancer therapy.

67. The method of Claim 64, wherein the therapy is radiation therapy.

68. The method of Claim 64, wherein the therapy is adoptive T cell transfer.

69. The method of Claim 64, wherein the therapy is administration of one or more additional immunotherapeutic compositions.

70. The method of Claim 69, wherein the additional immunotherapeutic compositions comprise a second cancer antigen that is a MUC1 antigen or a cancer antigen that is not a MUC1 antigen.

71. The method of Claim 69, wherein the additional immunotherapeutic compositions comprise a yeast vehicle and a second cancer antigen that does not include MUC1 antigen.

72. The method of Claim 70 or 71, wherein the second cancer antigen is selected from the group consisting of: mutated Ras, carcinoembryonic antigen (CEA), Brachyury, EGFR, BCR-Abl, MART-1, MAGE-1, MAGE-3, GAGE, GP-100, MUC-2, PSMA, tyrosinase, TRP-1 (gp75), NY-ESO-1, TRP-2, TAG72, KSA, CA-125, PSA, HER-2/neu/c-erb/B2, hTERT, p73, B-RAF, adenomatous polyposis coli (APC), Myc, von Hippel-Lindau protein (VHL), Rb-1, Rb-2, androgen receptor (AR), Smad4, MDR1, Flt-3,

BRCA-1, BRCA-2, pax3-fkhr, ews-fli-1, HERV-H, HERV-K, TWIST, Mesothelin, and NGEP.

73. The method of Claim 70 or 71, wherein the second cancer antigen is selected from the group consisting of: mutated Ras, carcinoembryonic antigen (CEA) and Brachyury.

74. The method of Claim 69, wherein the additional immunotherapeutic composition is a viral vector vaccine.

75. The method of Claim 69, wherein the additional immunotherapeutic composition is a dendritic cell/tumor cell fusion.

76. The method of any one of Claims 58 to 75, wherein the method further comprises surgical resection of a tumor from the individual.

77. A method to prevent or delay the onset of a MUC1-expressing cancer, comprising administering to an individual an immunotherapeutic composition of any one of Claims 1 to 57.

78. The method of Claim 77, wherein cancer has not been detected in the individual.

79. The method of Claim 78, wherein the individual is at high risk for developing cancer.

80. The method of Claim 77, wherein the individual has a pre-cancerous lesion.

81. The method of Claim 77, wherein the individual has cancer, but MUC1-expressing cancer cells have not been detected in the cancer.

82. The method of any one of Claims 58 to 81, wherein the cancer is of epithelial cell origin.

83. The method of any one of Claims 58 to 81, wherein the cancer is selected from the group consisting of: breast cancer, small intestine cancer, stomach cancer, pancreatic cancer, kidney cancer, bladder cancer, uterine cancer, ovarian cancer, testicular cancer, lung cancer, colon cancer, prostate cancer, melanoma, multiple myelogenous leukemia (MML), chronic lymphocytic leukemia (CLL), acute myeloid leukemia (AML), Burkitt's lymphoma, Hodgkin's lymphoma, cancers of secretory tissues, and metastatic cancers thereof.

84. The method of any one of Claims 77 to 81, wherein the cancer is selected from the group consisting of breast cancer and colon cancer.

85. The method of any one of Claims 58 to 75, wherein the cancer is selected from the group consisting of breast cancer, colon cancer, pancreas cancer, ovarian cancer, esophageal cancer, and AML.

86. The method of any one of Claims 58 to 75, wherein the cancer is AML, and wherein the yeast-MUC1 immunotherapeutic composition is administered to both donor and recipient of bone marrow transplantation (BMT) therapy.

87. The method of any one of Claims 58 to 75, wherein the cancer is AML, and wherein the yeast-MUC1 immunotherapeutic composition is administered to the individual in conjunction with cytarabine and anthracycline therapy.

88. Use of the Yeast-MUC1 immunotherapeutic composition of any one of Claims 1 to 57 to treat a disease.

89. The use of Claim 88, wherein the disease is cancer.

90. Use of an immunotherapeutic composition according to any one of Claims 1 to 57 to reduce, arrest, reverse or prevent the metastatic progression of cancer in an individual who has cancer.

91. Use of an immunotherapeutic composition according to any one of Claims 1 to 57 to prevent or delay the onset of a MUC1-expressing cancer.

92. Use of a combination of immunotherapeutic compositions to treat cancer, the immunotherapeutic compositions comprising:

a) a first immunotherapeutic composition according to any one of Claims 1 to 57; and

b) at least one additional immunotherapeutic composition comprising a yeast vehicle and an antigen that is not a MUC1 antigen.

93. The use of Claim 92, wherein the antigen that is not a MUC1 antigen is selected from mutated Ras, carcinoembryonic antigen (CEA), and/or Brachyury.

What is claimed is:

1. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) at least one MUC1 antigen expressed by the yeast vehicle, wherein the MUC1 antigen comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:25 or to positions 92-566 of SEQ ID NO:25, and wherein the MUC1 antigen comprises 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

2. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises an amino acid sequence of SEQ ID NO:25.

3. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the yeast vehicle is a whole yeast.

4. The Yeast-MUC1 immunotherapeutic composition of Claim 3, wherein the whole yeast is heat-inactivated.

5. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the yeast vehicle is from a mutant yeast strain that produces underglycosylated proteins, as compared to a wild-type yeast strain.

6. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the yeast vehicle is from *Saccharomyces cerevisiae*.

7. The Yeast-MUC1 immunotherapeutic composition of claim 1, wherein the MUC1 antigen comprises an amino acid sequence that is at least 95% identical to positions 92-566 of SEQ ID NO:25, and wherein the MUC1 antigen comprises 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

8. The Yeast-MUC1 immunotherapeutic composition of claim 1, wherein the MUC1 antigen comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:25, and wherein the MUC1 antigen comprises 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

9. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1

antigen comprises an amino acid sequence that is at least 97% identical to positions 92-566 of SEQ ID NO:25, and wherein the MUC1 antigen comprises 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

10. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises an amino acid sequence that is at least 97% identical to SEQ ID NO:25, and wherein the MUC1 antigen comprises 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

11. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises an amino acid sequence that is at least 99% identical to positions 92-566 of SEQ ID NO:25.

12. The Yeast-MUC1 immunotherapeutic composition of Claim 1, wherein the MUC1 antigen comprises an amino acid sequence that is at least 99% identical to SEQ ID NO:25.

13. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) at least one MUC1 antigen expressed by the yeast vehicle, wherein the MUC1 antigen comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:25 or to positions 92-566 of SEQ ID NO:25, and wherein the MUC1 antigen comprises at least one of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

14. The Yeast-MUC1 immunotherapeutic composition of claim 1, wherein the MUC1 antigen comprises each of the following amino acids L184, Y232, L233, V240, Y241, L242, Y483, V497, L535, F536, and Y551.

15. The Yeast-MUC1 immunotherapeutic composition of claim 1, wherein the MUC1 antigen consists of positions 92-566 of SEQ ID NO:25.

16. The Yeast-MUC1 immunotherapeutic composition of Claim 13, wherein the yeast vehicle is a whole yeast.

17. The Yeast-MUC1 immunotherapeutic composition of Claim 16, wherein the whole yeast is heat-inactivated.

18. The Yeast-MUC1 immunotherapeutic composition of Claim 13, wherein the yeast vehicle is from a mutant yeast strain that produces underglycosylated proteins, as compared to a wild-type yeast strain.

19. The Yeast-MUC1 immunotherapeutic composition of Claim 13, wherein the yeast vehicle is from *Saccharomyces cerevisiae*.

20. A Yeast-MUC1 immunotherapeutic composition, wherein the immunotherapeutic composition comprises:

a) a yeast vehicle; and

b) a MUC1 antigen expressed by the yeast vehicle, wherein the MUC1 antigen comprises an amino acid sequence that is at least 98% identical to SEQ ID NO:25 or to positions 92-566 of SEQ ID NO:25.

21. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the yeast vehicle is a whole yeast.

22. The Yeast-MUC1 immunotherapeutic composition of Claim 21, wherein the whole yeast is heat-inactivated.

23. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the yeast vehicle is from a mutant yeast strain that produces underglycosylated proteins, as compared to a wild-type yeast strain.

24. The Yeast-MUC1 immunotherapeutic composition of Claim 20, wherein the yeast vehicle is from *Saccharomyces cerevisiae*.