combination with antibody against a tumor surface antigen enhances treatment of the cancer patient, more particularly increases reduction in tumor volume and/or increases survival of the cancer patient.

We claim:

1. Use of a pharmaceutical combination in the manufacture of a medicament for reducing tumor size and/or increasing survival in a cancer patient, the combination comprising:

(a) a recombinant modified vaccinia virus Ankara (MVA), wherein the recombinant MVA is to be administered via intravenous administration to said patient, and wherein the recombinant MVA comprises:

(i) a first nucleic acid encoding a first heterologous tumor-associated antigen (TAA); and

(ii) a second nucleic acid encoding CD40L; and

(b) an antibody, wherein the antibody comprises an Fc domain and is specific to an antigen that is expressed on the cell membrane of a tumor cell;

wherein administration of (a) and (b) to the cancer patient reduces tumor size and/or increases the survival rate of the cancer patient as compared to a non-intravenous administration of (a) or an administration of (b) alone.

2. Use of claim 1, wherein the recombinant MVA further comprises a third nucleic acid encoding a second heterologous TAA.

3. Use of any one of claims 1- 2, wherein the first and/or second TAA is selected from the group consisting of: 5-α-reductase, α-fetoprotein ("AFP"), AM-1, APC, April, B melanoma antigen gene ("BAGE"), β-catenin, Bcl12, bcr-abl, Brachyury, CA-125, caspase-8 ("CASP-8", also known as "FLICE"), Cathepsins, CD19, CD20, CD21/complement receptor 2 ("CR2"), CD22/BL-CAM, CD23/FcεRII, CD33, CD35/complement receptor 1 ("CR1"), CD44/PGP-1, CD45/leucocyte common antigen ("LCA"), CD46/membrane cofactor protein ("MCP"), CD52/CAMPATH-1, CD55/decay accelerating factor ("DAF"), CD59/protectin, CDC27, CDK4, carcinoembryonic antigen ("CEA"), c-myc, cyclooxygenase-2 ("cox-2"), deleted in colorectal cancer gene ("DCC"), DcR3, E6/E7, CGFR, EMBP, Dna78, farnesyl transferase, fibroblast growth factor-8a ("FGF8a"), fibroblast growth factor-8b ("FGF8b"), FLK-1/KDR, folic acid receptor, G250, G melanoma antigen gene family ("GAGE-family"), gastrin 17, gastrin-releasing hormone, ganglioside 2 ("GD2")/ganglioside 3 ("GD3")/ganglioside-monosialic acid-2 ("GM2"),

gonadotropin releasing hormone ("GnRH"), UDP-GlcNAc:R1Man(α1-6)R2 [GlcNAc to Man(α1-6)] β1,6-N¬-acetylglucosaminyltransferase V ("GnT V"), GP1, gp100/Pme117, gp-100-in4, gp15, gp75/tyrosine-related protein-1 ("gp75/TRP-1"), human chorionic gonadotropin ("hCG"), heparanase, HER2, human mammary tumor virus ("HMTV"), 70 kiloDalton heat-shock protein ("HSP70"), human telomerase reverse transcriptase ("hTERT"), insulin-like growth factor receptor-1 ("IGFR-1"), interleukin-13 receptor ("IL-13R"), inducible nitric oxide synthase ("iNOS"), Ki67, KIAA0205, K-ras, H-ras, N-ras, KSA, LKLR-FUT, melanoma antigen-encoding gene 1 ("MAGE-1"), melanoma antigen-encoding gene 2 ("MAGE-2"), melanoma antigen-encoding gene 3 ("MAGE-3"), melanoma antigen-encoding gene 4 ("MAGE-4"), mammaglobin, MAP17, Melan-A/melanoma antigen recognized by T-cells-1 ("MART-1"), mesothelin, MIC A/B, MT-MMPs, mucin, testes-specific antigen NY-ESO-1, osteonectin, p15, P170/MDR1, p53, p97/melanotransferrin, PAI-1, platelet-derived growth factor ("PDGF"), μPA, PRAME, probasin, progenipoietin, prostate-specific antigen ("PSA"), prostate-specific membrane antigen ("PSMA"), RAGE-1, Rb, RCAS1, SART-1, SSX-family, STAT3, STn, TAG-72, transforming growth factor-alpha ("TGF-α"), transforming growth factor-beta ("TGF-β"), Thymosin-beta-15, tumor necrosis factor-alpha ("TNF-α"), TP1, TRP-2, tyrosinase, vascular endothelial growth factor ("VEGF"), ZAG, p16INK4, and glutathione-S-transferase ("GST").

4. Use of any one of claims 1-3, wherein the first TAA is HER2.

5. Use of claim 4, wherein the HER2 antigen comprises at least one mutation to: (a) prevent a HER2 antibody binding to the HER2 antigen; (b) prevent extracellular dimerization of the HER2 antigen; (c) prevent tyrosine kinase activity of the HER2 antigen; and/or (d) prevent phosphorylation of the HER2 antigen.

6. Use of claim 5, wherein the HER2 antigen comprises at least one mutation selected from the group consisting of: E580, D582, P594, F595, K615, and Q624.

7. Use of claim 5, wherein the HER2 antigen comprises at least one mutation selected from the group consisting of: H267, Y274, F279, V308, S310, L317, H318, K333, and P337.

8. Use of claim 4 or 5, wherein the HER2 antigen comprises at least one mutation selected from the group consisting of:

(a) a mutation that prevents extracellular dimerization of HER2 that is D277R or E280K;

(b) a mutation that prevents tyrosine kinase activity of HER2 that is K753M; and

(c) a mutation that interferes with phosphorylation of HER2 that is Y1023A or is the deletion of residues 1139-1248.

9. Use of claim 1, wherein the first nucleic acid encodes a HER2 antigen having the amino acid sequence set forth in SEQ ID NO:1 or SEQ ID NO: 13.

10. Use of claim 1, wherein the first nucleic acid encodes a HER2 antigen and the antibody is an anti-HER2 antibody.

11. Use of any of claims 1-2, wherein the first nucleic acid encodes a HER2 antigen that comprises the sequence set forth in SEQ ID NO: 2 or SEQ ID NO:14.

12. Use of any of claims 2-11, wherein the second TAA is Brachyury.

13. Use of claim 12, wherein the Brachyury antigen comprises a deletion of amino acids 286-293.

14. Use of claim 12, wherein the second nucleic acid encodes a Brachyury antigen comprising the amino acid sequence set forth in SEQ ID NO:3.

15. Use of any one of claims 1-14, wherein the antibody is selected from the group consisting of: Anti-CD20 (e.g., rituximab; ofatumumab; tositumomab), Anti-CD52 (e.g., alemtuzumab Campath®), Anti-EGFR (e.g., cetuximab Erbitux®¸ panitumumab), Anti-CD2 (e.g.,Siplizumab), Anti-CD37 (e.g., BI836826), Anti-CD123 (e.g., JNJ-56022473), Anti-CD30 (e.g., XmAb2513), Anti-CD38 (e.g., daratumumab Darzalex®), Anti-PDL1 (e.g., avelumab, atezolilzumab, durvalumab), Anti-GD2 (e.g., 3F8, ch14.18, KW-2871, dinutuximab), anti-CTLA-4, Anti-CEA, Anti-MUC1, Anti-FLT3, Anti-CD19, Anti-CD40, Anti-SLAMF7, Anti-CCR4, Anti-B7-H3, Anti-ICAM1, Anti-CSF1R, anti-CA125 (e.g. Oregovomab), anti-FRα (e.g. MOv18-IgG1, Mirvetuximab soravtansine (IMGN853), MORAb-202), anti-mesothelin (e.g. MORAb-009), anti-Trp1, and Anti-HER2.

16. Use of claim 10, wherein the antibody is selected from Pertuzumab, Trastuzumab, Herzuma, ABP 980, and Ado-trastuzumab emtansine.

17. Use of any one of claims 1-16, wherein the MVA is MVA-BN.

18. Use of any one of claims 1-17, wherein (a) is to be administered at the same time as or after (b).

19. Use of any one of claims 1-18, wherein (a) and (b) are to be administered to the cancer patient in a priming administration followed by one or more boosting administrations of (a) and (b) to be administered to the cancer patient.

20. Use of any one of claims 1-19, wherein the cancer patient is suffering from and/or is diagnosed with a cancer selected from the group consisting of: breast cancer, lung cancer, head and neck cancer, thyroid, melanoma, gastric cancer, bladder cancer, kidney cancer, liver cancer, melanoma, pancreatic cancer, prostate cancer, ovarian cancer, or colorectal cancer.

21. Use of claim 20, wherein the cancer patient is suffering from and/or is diagnosed with breast cancer that is HER2 positive.