CLAIMS

1. A composition comprising an expression vector that comprises

a first nucleotide sequence encoding a secretable gp96-Ig fusion protein, and

a second nucleotide sequence encoding a T cell costimulatory fusion protein,

wherein the T cell costimulatory fusion protein enhances activation of antigen-specific T cells when administered to a subject

and is selected from OX40L-Ig, or a portion thereof that binds to OX40, ICOSL-Ig, or a portion thereof that binds to ICOS, 4 1BBL-Ig, or a portion thereof that binds to 4-1BBR, TL1A-Ig, or a portion thereof that binds to TNFRSF25, GITRL-Ig, or a portion thereof that binds to GITR, CD40L-Ig, or a portion thereof that binds to CD40, and, CD70-Ig, or a portion thereof that binds to CD27.

2. The composition of claim 1, wherein the vector is a DNA-based mammalian expression vector.

3. The composition of claim 1, wherein the gp96-Ig fusion protein lacks the gp96 KDEL (SEQ ID NO:3) sequence.

4. The composition of claim 3, wherein the Ig tag in the 96-Ig fusion protein comprises the Fc region of human IgGl, IgG2, IgG3, IgG4, IgM, IgA, or IgE.

5. The composition of claim 1, wherein the Ig tag in the T cell costimulatory fusion protein comprises the Fc region of human IgGl, IgG2, IgG3, IgG4, IgM, IgA, or IgE.

6. The composition of any one of the above claims, wherein the expression vector is incorporated into a virus or virus-like particle.

7. The composition of any one of the above claims, wherein the expression vector is incorporated into a human tumor cell.

8. The composition of claim 7, wherein the human tumor cell is a cell from an established NSCLC, bladder cancer, melanoma, ovarian cancer, renal cell carcinoma, prostate carcinoma, sarcoma, breast carcinoma, squamous cell carcinoma, head and neck carcinoma, hepatocellular carcinoma, pancreatic carcinoma, or colon carcinoma cell line.

9. The composition of claim 1 for use in treating a subject, wherein the subject is to be administered with an effective amount of the composition comprising an expression vector that comprises a first nucleotide sequence encoding a secretable gp96-Ig fusion protein, and a second nucleotide sequence encoding a T cell costimulatory fusion protein, wherein the T cell costimulatory fusion protein enhances activation of antigen-specific T cells when administered to the subject and is selected from OX40L-Ig, or a portion thereof that binds to OX40, ICOSL-Ig, or a portion thereof that binds to ICOS, 4 1BBL-Ig, or a portion thereof that binds to 4-1BBR, TL1A-Ig, or a portion thereof that binds to TNFRSF25, GITRL-Ig, or a portion thereof that binds to GITR, CD40L-Ig, or a portion thereof that binds to CD40, and, CD70-Ig, or a portion thereof that binds to CD27,

and wherein the vector is incorporated into a virus or virus-like particle; and the vector is incorporated into an irradiated or live and attenuated human tumor cell.

10. A composition comprising an expression vector that comprises a first nucleotide sequence encoding a secretable gp96-Ig fusion protein, and a second nucleotide sequence encoding a T cell costimulatory fusion protein, for use in activating antigen-specific T cells in a subject,
wherein the subject is to be administered with an effective amount of said composition, wherein the T cell costimulatory fusion protein enhances activation of antigen-specific T cells when administered to the subject and is selected from OX40L-Ig, or a portion thereof that binds to OX40, ICOSL-Ig, or a portion thereof that binds to ICOS, 4 1BBL-Ig, or a portion thereof that binds to 4-1BBR, TL1A-Ig, or a portion thereof that binds to TNFRSF25, GITRL-Ig, or a portion thereof that binds to GITR, CD40L-Ig, or a portion thereof that binds to CD40, and, CD70-Ig, or a portion thereof that binds to CD27,

and wherein the vector is incorporated into a virus or virus-like particle; and the vector is incorporated into an irradiated or live and attenuated human tumor cell.

11. Use of a composition comprising an expression vector that comprises a first nucleotide sequence encoding a secretable gp96-Ig fusion protein, and a second nucleotide sequence encoding a T cell costimulatory fusion protein, in the manufacture of a medicament for activating antigen-specific T cells in a subject,
wherein the subject is to be administered with an effective amount of said composition, wherein the T cell costimulatory fusion protein enhances activation of antigen-specific T cells when administered to the subject and is selected from OX40L-Ig, or a portion thereof that binds to OX40, ICOSL-Ig, or a portion thereof that binds to ICOS, 4 1BBL-Ig, or a portion thereof that binds to 4-1BBR, TL1A-Ig, or a portion thereof that binds to TNFRSF25, GITRL-

Ig, or a portion thereof that binds to GITR, CD40L-Ig, or a portion thereof that binds to CD40, and, CD70-Ig, or a portion thereof that binds to CD27,

and wherein the vector is incorporated into a virus or virus-like particle; and the vector is incorporated into an irradiated or live and attenuated human tumor cell.

12. The composition or use of any of the above claims, wherein administration of the composition to the subject increases the activation or proliferation of tumor antigen specific T cells in the subject, wherein the activation or proliferation of tumor antigen specific T cells in the subject is increased by at least 25 percent as compared to the level of activation or proliferation of tumor antigen specific T cells in the subject prior to the administration.

13. The composition or use of any of the above claims , wherein a human cancer patient is to be administered with the composition in combination with an agent that inhibits immunosuppressive molecules produced by tumor cells, the agent being an antibody against PD-1.

14. The composition or use of any of the above claims, wherein administration of the composition to the subject stimulates the activation or proliferation of pathogenic antigen specific T cells or wherein the T cell costimulatory molecule enhances the activation of antigen-specific T cells in the subject to a greater level than gp96-Ig vaccination alone.

15. The composition or use of any of the above claims, wherein the subject is a human.