We claim:

1. A method of killing a cell *in vitro*, comprising:

contacting a cell comprising a cell surface protein with a therapeutically effective amount of one or more antibody-IR700 molecules, wherein the antibody specifically binds to the cell surface protein;

irradiating the cell at a wavelength of 660 to 740 nm and at a dose of at least 1 J cm^{-2}; and

contacting the cell with one or more therapeutic agents about 0 to 8 hours after irradiating the cell, thereby killing the cell.

2. A method of detecting cell killing *in vitro* in real-time, comprising:

contacting a cell comprising a cell surface protein with a therapeutically effective amount of one or more antibody-IR700 molecules, wherein the antibody specifically binds to the cell surface protein;

irradiating the cell at a wavelength of 660 to 740 nm and at a dose of at least 30 J cm^{-2};

detecting the cell with fluorescence lifetime imaging about 0 to 48 hours after irradiating the cell, thereby detecting the cell killing in real-time.

3. The method of claim 1, further comprising:

detecting the cell with fluorescence lifetime imaging about 0 to 48 hours after irradiating the cell.

4. The method of any of claims 1 to 3, wherein the cell is a tumor cell.

5. The method of claim 4, wherein the tumor cell is a cancer cell.

6. The method of claim 5, wherein the cancer cell is a cancer cell of the breast, liver, colon, ovary, prostate, pancreas, brain, cervix, bone, skin, or lung.

7. The method of claim 5, wherein the cancer cell is a cancer cell of the blood.

8. The method of any of claims 1-7, wherein the cell surface protein is a tumor-specific protein.

9. The method of claim 8, wherein the tumor-specific protein comprises HER1, HER2, CD20, CD25, CD33, CD52, CD44, CD133, Louis Y, mesothelin, CEA or prostate specific membrane antigen (PSMA).

10. The method of any of claims 1 to 9, wherein the antibody-IR700 molecule comprises a Panitumumab-IR700 molecule, Trastuzumab-IR700 molecule, Basilitumab-IR700 molecule, Zenapax-IR700 molecule, Simitect-IR700 molecule or J591-IR700 molecule.

11. The method of any of claims 1 to 10, wherein the cell is irradiated at a wavelength of 680 nm.

12. The method of any of claims 1 to 11, wherein the one or more antibody-IR700 molecules comprises at least two different antibody-IR700 molecules, wherein a first antibody-IR700 molecule is specific for a first antigen, and a second antibody-IR700 molecule is specific for a different epitope of the first antigen or is specific for a second antigen.

13. The method of any of claims 1 to 12, wherein the method reduces the volume or size of the tumor by at least 25% relative to the absence of treatment.

14. The method of any of claims 1 or 3-13, further comprising:

contacting the cell with one or more antibody-IR700 molecules in an amount less than the therapeutically effective amount; and

irradiating the cell at a wavelength of 660 to 740 nm and at a dose of at least 0.001 J cm^{-2}, thereby permitting detection of the cell.

15. A composition comprising a Panitumumab-IR700 molecule, a Trastuzumab-IR700 molecule, or a J591-IR700 molecule.

WHAT IS CLAIMED:

1. Use of one or more therapeutic agents for the preparation of a medicament for the treatment of a tumor in a subject within 8 hours after photoimmunotherapy of the subject with an antibody-IR700 conjugate, wherein:

the antibody of the antibody-IR700 conjugate specifically binds to a cell surface protein of a tumor cell; and

photoimmunotherapy comprises irradiation of the tumor following administration of the antibody-IR700 conjugate.

2. The use of claim 1, wherein the therapeutic agent is an anti-cancer agent.

3. The use of claim 1 or claim 2, wherein the tumor cell is a cancer cell.

4. The use of claim 3, wherein the cancer cell is a cancer cell of the breast, liver, colon, ovary, prostate, pancreas, brain, cervix, bone, skin, or lung.

5. The use of claim 3, wherein the cancer cell is a cancer cell of the blood.

6. The use of any of claims 1-5, wherein the cell surface protein is a tumor-specific protein.

7. The use of claim 6, wherein the tumor-specific protein comprises HER1, HER2, CD20, CD25, CD33, CD52, CD44, CD133, Louis Y, mesothelin, CEA, or prostate specific membrane antigen (PSMA).

8. The use of any of claims 1-7, wherein the antibody is selected from among Cetuximab, panitumumab, zalutumumab, nimotuzumab, matuzumab, Trastuzumab, pertuzumab, Tositumomab, Rituximab, Daclizumab, Gemtuzumab, Alemtuzumab, J591 and Basiliximab.

9. The use of any of claims 1-8, wherein the therapeutic agent is selected from among a chemotherapeutic agent, an anti-angiogenic agent, an immunosuppressant, a cytokine, a radiotherapeutic agent, an antibiotic, an alkylating agent, an antioxidant, a kinase inhibitor, a microtubule binding agent, a DNA intercalator or cross-linker, a DNA synthesis inhibitor, a DNA or RNA transcription inhibitor, an antibody, an enzyme, and an enzyme inhibitor.

10. The use of any of claims 1-9, wherein the therapeutic agent is nano-sized or is associated with a nanoparticle.

11. The use of claim 10, wherein the nanoparticle comprises a liposome encapsulating the agent.

12. The use of claim 10 or claim 11, wherein the therapeutic agent comprises a diameter of at least 10 nm, at least 30 nm, at least 100 nm or at least 200 nm.

13. A combination comprising a therapeutic agent and an antibody-IR700 conjugate for use in the treatment of a tumor, wherein:

the antibody of the antibody-IR700 conjugate specifically binds to a cell surface protein of a tumor cell;

the therapeutic agent is nano-sized or is associated with a nanoparticle; and

the therapeutic agent is to be administered within 8 hours of photoimmunotherapy with the antibody-IR700 conjugate, wherein photoimmunotherapy comprises irradiation of the tumor following administration of the antibody-IR700 conjugate.

14. The combination for use of claim 13, wherein the therapeutic agent is an anti-cancer agent.

15. The combination for use of claim 13 or claim 14, wherein the tumor cell is a cancer cell.

16. The combination for use of claim 15, wherein the cancer cell is a cancer cell of the breast, liver, colon, ovary, prostate, pancreas, brain, cervix, bone, skin, or lung.

17. The combination for use of claim 15, wherein the cancer cell is a cancer cell of the blood.

18. The combination for use of any of claims 13-17, wherein the cell surface protein is a tumor-specific protein.

19. The combination for use of claim 18, wherein the tumor-specific protein comprises HER1, HER2, CD20, CD25, CD33, CD52, CD44, CD133, Louis Y, mesothelin, CEA, or prostate specific membrane antigen (PSMA).

20. The combination for use of any of claims 13-19, wherein the antibody is selected from among Cetuximab, panitumumab, zalutumumab, nimotuzumab, matuzumab, Trastuzumab, pertuzumab, Tositumomab, Rituximab, Daclizumab, Gemtuzumab, Alemtuzumab, J591 and Basiliximab.

21. The combination for use of any of claims 13-20, wherein the therapeutic agent is associated with a nanoparticle and the nanoparticle comprises a liposome encapsulating the therapeutic agent.

22. The combination for use of any of claims 13-21, wherein the therapeutic agent is selected from among a chemotherapeutic agent, an anti-angiogenic agent, an immunosuppressant, a cytokine, a radiotherapeutic agent, an antibiotic, an alkylating agent, an antioxidant, a kinase inhibitor, a microtubule binding agent, a DNA intercalator or cross-linker, a DNA synthesis inhibitor, a DNA or RNA transcription inhibitor, an antibody, an enzyme, and an enzyme inhibitor.

23. The combination for use of any of claims 13-22, wherein the therapeutic agent comprises a diameter of at least 10 nm, at least 30 nm, at least 100 nm or at least 200 nm.