WHAT IS CLAIMED:

1. ~~A method of treating cancer, said method comprising:~~

~~providing a~~A~~A~~Use of a first agent comprising a first targeting component coupled to a cancer therapeutic component, and ~~;~~

~~providing~~ a second agent comprising a second targeting component alone, for use in the preparation of a medicament for the treatment of cancer, wherein the second agent increases the uptake, internalization, and/or retention of the first targeting component coupled to a cancer therapeutic and

~~administering, to a subject having cancer,~~ the first and second agents to treat cancer are to be administered to a subject having cancer.

~~2. The method according to claim 1, wherein the first targeting component is selected from the group consisting of a protein, a peptide, and a small molecule, and the second targeting component is an antibody or antigen binding fragment thereof.~~

~~3. The method according to claim 1, wherein the first and second targeting components target the same molecular target.~~

~~4. The method according to claim 1, wherein the first and second targeting components target different molecular targets on the same cell.~~

2~~5~~. The ~~method according to~~ use of claim 1, wherein the cancer therapeutic component has a maximum tolerated dose, and either (1) the maximum tolerated dose of the cancer therapeutic component is ~~given during said administering~~to be administered or (2) ~~.~~

~~6. The method according to claim 1, wherein the cancer therapeutic component has a maximum tolerated dose, and~~ less than the maximum tolerated dose of the cancer therapeutic component is ~~given during said administering~~to be administered.

~~7. The method according to claim 1, wherein the cancer therapeutic component is selected from the group consisting of a radionuclide and a chemotherapeutic agent.~~

8. The method according to claim 7, wherein the cancer therapeutic component is a radionuclide selected from the group consisting of ^{86}Re, ^{90}Y, ^{67}Cu, ^{169}Er, ^{121}Sn, ^{127}Te, ^{142}Pr, ^{143}Pr, ^{198}Au, ^{199}Au, ^{161}Tb, ^{109}Pd, ^{188}Rd, ^{166}Dy, ^{166}Ho, ^{149}Pm, ^{151}Pm, ^{153}Sm, ^{159}Gd, ^{172}Tm, ^{169}Yb, ^{175}Yb, ^{177}Lu, ^{105}Rh, ^{111}Ag, ^{131}I, ^{177m}Sn, ^{225}Ac, ^{227}Th, ^{211}At, and combinations thereof.

9. The method according to claim 7, wherein the cancer therapeutic component is a chemotherapeutic agent selected from the group consisting of busulfan, cisplatin, carboplatin, chlorambucil, cyclophosphamide, ifosfamide, dacarbazine (DTIC), mechlorethamine (nitrogen mustard), melphalan, carmustine (BCNU), lomustine (CCNU), 5-fluorouracil (5-FU), capecitabine, methotrexate, gemcitabine, cytarabine (ara-C), fludarabine, dactinomycin, daunorubicin, doxorubicin (Adriamycin), idarubicin, mitoxantrone, paclitaxel, docetaxel, cabazitaxel, etoposide (VP-16), vinblastine, vincristine, vinorelbine, prednisone, dexamethasone, tamoxifen, fulvestrant, anastrozole, letrozole, megestrol acetate, bicalutamide, flutamide, leuprolide, goserelin, L-asparaginase, tretinoin, maytansines, auristatins, pyrrolobenzodiazepines, duocarmycins, and combinations thereof.

10. The method according to claim 1, wherein the cancer is prostate cancer.

11. The method according to claim 10, wherein the first and second targeting components target the prostate-specific membrane antigen (PSMA) receptor.

12. The method according to claim 11, wherein the first targeting component is a PSMA receptor binding peptide or PSMA receptor inhibitor and the second targeting component is a PSMA receptor antibody or an antigen binding portion thereof.

13. The method according to claim 12, wherein the first targeting component is a peptide selected from the group consisting of PSMA-617, PSMA I&T, PSMA I&S, PSMA-1007, PSMA-11, DCFPyL, MIP-1404, MIP-1972, MIP-1095, rh(radiohybrid)PSMA, and other PSMA ligands/inhibitors, while the second targeting component is an antibody selected from the group consisting of J591, J415, E99, J533, D2B, 2G7, and 107-1A4.

14. The method according to claim 12, wherein the first agent is PSMA-617-^{177}Lu and the second agent is J591.

15. The method according to claim 1, wherein the subject is a human.

~~16. The method according to claim 1, wherein the cancer is a neuroendocrine cancer.~~

~~17. The method according to claim 16, wherein the first and second targeting components target the somatostatin receptor.~~

~~18. The method according to claim 17, wherein the first and second targeting components target the somatostatin receptor 2 isoform.~~

~~19. The method according to claim 16, wherein the neuroendocrine cancer is selected from the group consisting of carcinoid tumors, gastrinoma, insulinoma, glucagonoma, VIPoma, somatostatinoma, thyroid carcinoma, Merkel cell carcinoma of the skin, tumor of the anterior pituitary, medullary carcinoma, parathyroid tumor, thymus and mediastinal carcinoid tumor, pulmonary neuroendocrine tumor, adrenomedullary tumor, pheochromocytoma, Schwannoma, paraganglioma, and neuroblastoma.~~

~~20. The method according to claim 1, wherein the cancer is breast cancer.~~

~~21. The method according to claim 20, wherein the first and second targeting components target the HER receptor family.~~

~~22. The method according to claim 1, wherein the cancer is non-Hodgkin's Lymphoma.~~

~~23. The method according to claim 22, wherein the first and second targeting components target CD20.~~

~~24. The method according to claim 1, wherein the first and second agents are different.~~

~~25. The method according to claim 1, wherein the first and second targeting components target a cancer cell receptor.~~

~~26~~3. A combination therapeutic for treating cancer comprising:

a first agent comprising a first targeting component coupled to a cancer therapeutic and

a second agent comprising a second targeting component alone, wherein the second agent increases the uptake, internalization, and/or retention of the first targeting component coupled to a cancer therapeutic.

~~27. The combination therapeutic according to claim 26, wherein the first targeting component is selected from the group consisting of a protein, a peptide, and a small molecule, and the second targeting component is an antibody or antigen binding portion thereof.~~

4~~28~~. The ~~method~~ use of claim 1 or the combination therapeutic according to claim 3~~26~~, wherein the first and second targeting components target the same molecular target.

5~~29~~. The ~~method~~ use of claim 1 or the combination therapeutic according to claim 3~~26~~, wherein the first and second targeting components target different molecular targets on the same cell.

~~30. The combination therapeutic according to claim 26, wherein the cancer therapeutic component is selected from the group consisting of a radionuclide and a chemotherapeutic agent.~~

~~31. The combination therapeutic according to claim 30, wherein the cancer therapeutic component is a radionuclide selected from the group consisting of ^{86}Re, ^{90}Y, ^{67}Cu, ^{169}Er, ^{121}Sn, ^{127}Te, ^{142}Pr, ^{143}Pr, ^{198}Au, ^{199}Au, ^{161}Tb, ^{109}Pd, ^{188}Rd, ^{166}Dy, ^{166}Ho, ^{149}Pm, ^{151}Pm, ^{153}Sm, ^{159}Gd, ^{172}Tm, ^{169}Yb, ^{175}Yb, ^{177}Lu, ^{105}Rh, ^{111}Ag, ^{131}I, ^{177m}Sn, ^{225}Ac, ^{227}Th, ^{211}At, and combinations thereof.~~

~~32. The combination therapeutic according to claim 30, wherein the cancer therapeutic component is a chemotherapeutic agent selected from the group consisting of busulfan, cisplatin, carboplatin, chlorambucil, cyclophosphamide, ifosfamide, dacarbazine (DTIC), mechlorethamine (nitrogen mustard), melphalan, carmustine (BCNU), lomustine (CCNU), 5-fluorouracil (5-FU), capecitabine, methotrexate, gemcitabine, cytarabine (ara-C), fludarabine, dactinomycin, daunorubicin, doxorubicin (Adriamycin), idarubicin, mitoxantrone, paclitaxel, docetaxel, cabazitaxel, etoposide (VP-16), vinblastine, vincristine, vinorelbine, prednisone, dexamethasone, tamoxifen, fulvestrant, anastrozole, letrozole, megestrol acetate, bicalutamide, flutamide, leuprolide, goserelin, L-asparaginase, tretinoin, maytansines, auristatins, pyrrolobenzodiazepines, duocarmycins, and combinations thereof.~~

33. The combination therapeutic according to claim 26, wherein the cancer is prostate cancer.

34. The combination therapeutic according to claim 33, wherein the first and second targeting components target the prostate-specific membrane antigen (PSMA) receptor.

35. The combination therapeutic according to claim 34, wherein the first targeting component is a PSMA receptor binding peptide or PSMA receptor inhibitor and the second targeting component is a PSMA receptor antibody or an antigen binding portion thereof.

36. The combination therapeutic according to claim 35, wherein the first targeting component is a peptide selected from the group consisting of PSMA-617, PSMA I&T, PSMA I&S, PSMA-1007, PSMA-11, DCFPyL, MIP-1404, MIP-1972, MIP-1095, rh(radiohybrid)PSMA, and other PSMA ligands/inhibitors, while the second targeting component is an antibody selected from the group consisting of J591, J415, E99, J533, D2B, 2G7, and 107-1A4.

37. The combination therapeutic according to claim 35, wherein the first agent is PSMA-617-^{177}Lu or PSMA I&T-^{177}Lu and the second agent is J591.

38. The combination therapeutic according to claim 26, wherein the cancer is a neuroendocrine cancer.

39. The combination therapeutic according to claim 38, wherein the first and second agents target the somatostatin receptor.

40. The combination therapeutic according to claim 39, wherein the first and second targeting components target the somatostatin receptor-2 isoform.

41. The combination therapeutic according to claim 38, wherein the neuroendocrine cancer is selected from the group consisting of carcinoid tumors, gastrinoma, insulinoma, glucagonoma, VIPoma, somatostatinoma, thyroid carcinoma, Merkel cell carcinoma of the skin, tumor of the anterior pituitary, medullary carcinoma, parathyroid tumor, thymus and mediastinal carcinoid tumor, pulmonary neuroendocrine tumor, adrenomedullary tumor, pheochromocytoma, Schwannoma, paraganglioma, and neuroblastoma.

~~42. The combination therapeutic according to claim 26, wherein the cancer is breast cancer.~~

~~43. The combination therapeutic according to claim 42, wherein the first and second targeting components target the HER receptor family.~~

~~44. The combination therapeutic according to claim 26, wherein the cancer is non-Hodgkin's Lymphoma.~~

~~45. The combination therapeutic according to claim 44, wherein the first and second targeting components target CD20.~~

~~46. The combination therapeutic according to claim 26, wherein the first and second targeting components are different.~~

~~47. The combination therapeutic according to claim 26, wherein the first and second targeting components target a cancer cell receptor.~~

~~48~~6. A method of imaging cancer in a subject, said method comprising:

providing a first agent comprising a first targeting component coupled to an imaging component;

providing a second agent comprising a second targeting component alone, wherein the second agent increases the uptake, internalization, and/or retention of the first targeting component coupled to an imaging component and

~~administering, to a subject having cancer,~~ the first and second agents to image cancer are to be administered to a subject having cancer.

7. Use of a first agent comprising a first targeting component coupled to an imaging component in the manufacture of a medicament for the imaging of a cancer; and

a second agent comprising a second targeting component alone, wherein the second agent increases the uptake, internalization, and/or retention of the first targeting component coupled to an imaging component, wherein

the first and second agents are to be administered to a subject having cancer to image cancer.

~~49. The method according to claim 48, wherein the first targeting component is selected from the group consisting of a protein, a peptide, and a small molecules, and the second targeting component is an antibody or binding fragment thereof.~~

~~50. The method according to claim 48, wherein the first and second targeting components target the prostate specific membrane antigen (PSMA) receptor.~~

~~51. The method according to claim 50, wherein the first targeting component is a PSMA receptor binding peptide or PSMA receptor inhibitor and the second targeting component is a PSMA receptor antibody or an antigen binding portion thereof.~~

~~52. The method according to claim 51, wherein the first targeting component is a peptide selected from the group consisting of PSMA-617, PSMA I&T, PSMA I&S, PSMA-1007, PSMA-11, DCFPyL, MIP-1404, MIP-1972, MIP-1095, rh(radiohybrid)PSMA, and other PSMA ligands/inhibitors, while the second targeting component is an antibody selected from the group consisting of J591, J415, E99, J533, D2B, 2G7, and 107-1A4.~~

~~53. The method according to claim 48, wherein the cancer is a neuroendocrine cancer.~~

~~54. The method according to claim 53, wherein the first and second targeting components target the somatostatin receptor.~~

~~55. The method according to claim 54, wherein the first and second targeting components target the somatostatin receptor-2 isoform.~~

~~56. The method according to claim 48, wherein the cancer is breast cancer.~~

~~57. The method according to claim 56, wherein the first and second targeting components target the HER receptor family.~~

~~58. The method according to claim 48, wherein the cancer is non-Hodgkin's Lymphoma.~~

~~59. The method according to claim 58, wherein the first and second targeting components target CD20.~~

~~60. The method according to claim 48, wherein the imaging component is selected from the group consisting of radiolabels, fluorescent labels, nuclear magnetic resonance active labels, chemiluminescent labels, enzymatic markers, radiation emitters, and combinations thereof.~~

~~61~~8. A combination imaging system for imaging cancer comprising:

a first agent comprising a first targeting component coupled to an imaging component and

a second agent comprising a second targeting component alone, wherein the second agent increases the uptake, internalization, and/or retention of the first targeting component coupled to an imaging component.

~~62~~9. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the first targeting component is selected from the group consisting of a protein, a peptide, and small molecule, and the second targeting component is an antibody or antigen binding portion thereof.

10. The use of claim 1 or combination therapeutic of claim 3, wherein the cancer therapeutic component is selected from the group consisting of a radionuclide and a chemotherapeutic agent.

11. The use of claim 1 or combination therapeutic of claim 3, wherein the cancer therapeutic component is

a) a radionuclide selected from the group consisting of ^{86}Re, ^{90}Y, ^{67}Cu, ^{169}Er, ^{121}Sn, ^{127}Te, ^{142}Pr, ^{143}Pr, ^{198}Au, ^{199}Au, ^{161}Tb, ^{109}Pd, ^{188}Rd, ^{166}Dy, ^{166}Ho, ^{149}Pm, ^{151}Pm, ^{153}Sm, ^{159}Gd, ^{172}Tm, ^{169}Yb, ^{175}Yb, ^{177}Lu, ^{105}Rh, ^{111}Ag, ^{131}I, ^{177m}Sn, ^{225}Ac, ^{227}Th, ^{211}At, and combinations thereof; or

b) a chemotherapeutic agent selected from the group consisting of busulfan, cisplatin, carboplatin, chlorambucil, cyclophosphamide, ifosfamide, dacarbazine (DTIC), mechlorethamine (nitrogen mustard), melphalan, carmustine (BCNU), lomustine (CCNU), 5-fluorouracil (5-FU), capecitabine, methotrexate, gemcitabine, cytarabine (ara-

C), fludarabine, dactinomycin, daunorubicin, doxorubicin (Adriamycin), idarubicin, mitoxantrone, paclitaxel, docetaxel, cabazitaxel, etoposide (VP-16), vinblastine, vincristine, vinorelbine, prednisone, dexamethasone, tamoxifen, fulvestrant, anastrozole, letrozole, megestrol acetate, bicalutamide, flutamide, leuprolide, goserelin, L-asparaginase, tretinoin, maytansines, auristatins, pyrrolobenzodiazepines, duocarmycins, and combinations thereof.

12. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8, wherein the cancer is prostate cancer, neuroendocrine cancer, breast cancer, or non-Hodgkins lymphoma.

~~63~~13. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8 ~~combination imaging system according to claim 61~~, wherein the first and second targeting components target the prostate specific membrane antigen (PSMA) receptor.

~~64~~14. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the first targeting component is a PSMA receptor binding peptide or PSMA receptor inhibitor and the second targeting component is a PSMA receptor antibody or antigen binding portion thereof.

~~65~~15. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the first targeting component is a peptide selected from the group consisting of PSMA-617, PSMA I&T, PSMA I&S, PSMA 1007, PSMA-11, DCFPyL, MIP-1404, MIP-1972, MIP-1095, rh(radiohybrid)PSMA, and other PSMA ligands/inhibitors, while the second targeting component is an antibody selected from the group consisting of J591, J415, E99, J533, D2B, 2G7, and 107-1A4.

~~66. The combination imaging system according to claim 61, wherein the cancer is a neuroendocrine cancer.~~

~~67~~16. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 60~~, wherein the first and second targeting components target the somatostatin receptor.

~~68. The combination imaging system according to claim 61, wherein the first and second targeting components target the somatostatin receptor-2 isoform.~~

~~69. The combination imaging system according to claim 61, wherein the cancer is breast cancer.~~

~~70~~17. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the first and second targeting components target the HER receptor family.

~~71. The combination imaging system according to claim 61, wherein the cancer is non-Hodgkin's Lymphoma.~~

~~72~~18. The use of claim 1, combination therapeutic of claim 3, method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the first and second targeting components target CD20.

~~73~~19. The method of imaging of claim 6, use of claim 7, or combination imaging system of claim 8~~combination imaging system according to claim 61~~, wherein the imaging component is selected from the group consisting of radiolabels, fluorescent labels, nuclear magnetic resonance active labels, chemiluminescent labels, enzymatic markers, radiation emitters, and combinations thereof.