dye conjugates for use in such methods, for example, strategies that minimize or avoid photodegradation and improve the activity of the conjugate when used for PIT. Provided are methods and conjugates that meet such needs.

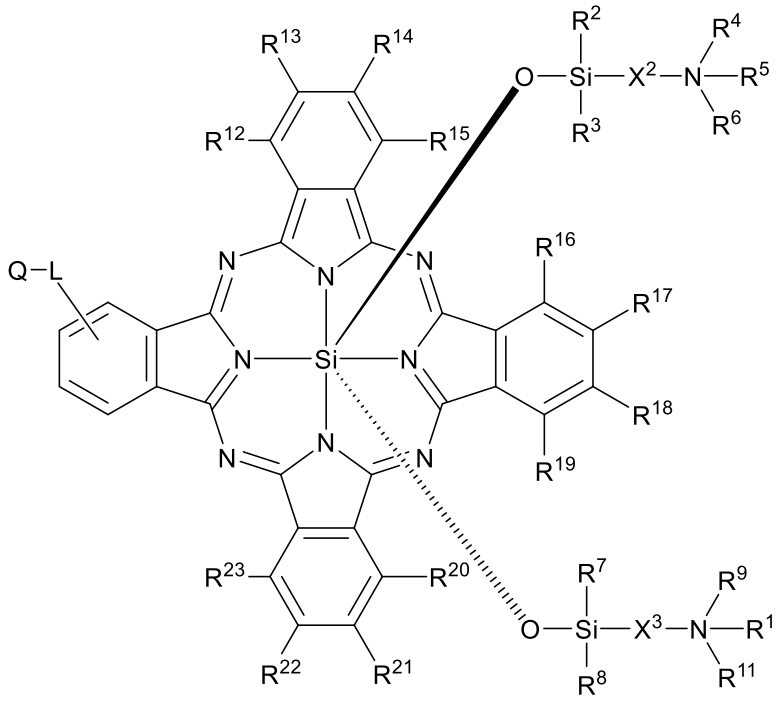
Summary

[0004a] In one aspect, there is provided a pharmaceutical composition comprising:

(i) a conjugate containing a phthalocyanine dye linked to a targeting molecule; and

(ii) a pharmaceutically acceptable excipient;

wherein the targeting molecule binds to a cell surface target molecule on a surface of a cell or pathogen, wherein the phthalocyanine dye comprises the formula:



, wherein:

L is a linker;

Q is a reactive group for attachment of the dye to the targeting molecule;

R^2, R^3, R^7, and R^8 are each independently selected from among optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group;

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22} and R^{23} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy; and

X^2 and X^3 are each independently C_1–C_{10} alkylene, optionally interrupted by a heteroatom; and

wherein greater than 90% of the conjugate is present as a main monomer component.

[0004b] In another aspect, there is provided a container comprising the composition as described herein, wherein the container protects from transmission of light having a wavelength from or from about 500 nm to about 725 nm.

[0004c] In another aspect, there is provided a packaging system for protecting a phthalocyanine dye-targeting molecule conjugate from light comprising:

a first container comprising the container as described herein; and

a second container comprising the first container, wherein the second container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

[0004d] In another aspect, there is provided a kit, comprising:

the container as described herein or the packaging system as described herein;

a light-protected cover capable of covering a device capable of administering a composition comprising a phthalocyanine dye-targeting molecule conjugate; and

optionally instructions for use.

[0004e] In another aspect, there is a use of the pharmaceutical composition as described herein in the manufacture of a medicament for treating a hyperplasia or a tumor in a human subject comprising:

a) a therapeutically effective amount of the composition to be administered to the subject, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and

b) the hyperplasia or the tumor is to be irradiated at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the subject.

[0004f] In another aspect, there is a pharmaceutical composition as described herein for use in therapy.

[0005] Provided in some examples ~~embodiments~~ is a method of manufacturing a phthalocyanine dye- conjugate. In some examples~~embodiments~~, the method includes contacting a targeting molecule, such as a macromolecule, with a phthalocyanine dye, which in some cases contains a reactive chemical group, under conditions to produce a conjugate containing the phthalocyanine dye linked to, such as covalently bound to, the targeting molecule. In some examples~~embodiments~~, the method includes formulating the conjugate in a pharmaceutically acceptable buffer. In some examples~~embodiments~~, before, during, and/or after preparation of the conjugate, the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm. In some examples~~embodiments~~, before, during, and/or after preparation of the conjugate, such as during the contacting and/or formulating steps, the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

[0006] In some examples~~embodiments~~, the method includes contacting a targeting molecule with a phthalocyanine dye at a molar ratio of dye to targeting molecule of from or from about 1:1 to 1000:1. In some examples~~embodiments~~, the dye includes a reactive chemical group, under conditions to produce a conjugate containing the phthalocyanine dye covalently linked to an attachment group of the targeting molecule. In some examples~~embodiments~~, the method includes formulating the conjugate in a pharmaceutically acceptable buffer to a concentration from or from about 0.01 mg/mL to 1000.0 mg/mL. In some examples~~embodiments~~, before, during, and/or after preparation of the conjugate, such as during the contacting and/or formulating steps, the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

[0007] In some examples~~embodiments~~, the conjugate is formulated to a concentration from or from about 0.01 mg/mL to about 200.0 mg/mL or from about 0.5 mg/mL to about 10.0 mg/mL. In some examples~~embodiments~~, the conjugate is formulated to a concentration from or from about 0.5 mg/mL to about 5.0 mg/mL.

[0008] In some examples~~embodiments~~, prior to the contacting step, the phthalocyanine dye is dissolved in a solvent under conditions in which the only light to which the dye is exposed has a wavelength within a range from about 400 nm to about 650 nm. In some examples~~embodiments~~, the only light to which the dye is exposed during or after being dissolved in solvent has an intensity of less than 500 lux. In some examples~~embodiments~~, the dye is dissolved in the solvent to a

concentration in a range from or from about 0.1 mg/mL to about 100 mg/mL. In some examplesembodiments, the dye is dissolved in the solvent to a concentration from or from about 1 mg/mL to about 50 mg/mL. In some examplesembodiments, the concentration of the phthalocyanine dye in the solvent is about 10 mg/mL. In some examplesembodiments, the solvent is dimethylsulfoxide (DMSO) or DMF and water-based solvents.

[0009] In some examplesembodiments, the formulating step includes concentrating the conjugate.

[0010] In some examplesembodiments, the contacting step is carried out for at least 5 minutes, at least 15 minutes, at least 30 minutes, at least 60 minutes, at least 90 minutes, at least 120 minutes, at least 240 minutes, at least 360 minutes, at least 24 hours, at least 72 hours, or at least 120 hours. In some examplesembodiments, the contacting step is carried out for 5 minutes to 150 hours, 5 minutes to 100 hours, 5 minutes to 48 hours, 5 minutes to 24 hours, 5 minutes to 6 hours, 5 minutes to 2 hours, 5 minutes to 90 minutes, 5 minutes to 60 minutes, 5 minutes to 30 minutes, 30 minutes to 150 hours, 30 minutes to 100 hours, 30 minutes to 48 hours, 30 minutes to 24 hours, 30 minutes to 6 hours, 30 minutes to 2 hours, 30 minutes to 90 minutes, 30 minutes to 60 minutes, 60 minutes to 150 hours, 60 minutes to 100 hours, 60 minutes to 48 hours, 60 minutes to 24 hours, 60 minutes to 6 hours, 60 minutes to 2 hours, 60 minutes to 90 minutes, 90 minutes to 150 hours, 90 minutes to 100 hours, 90 minutes to 48 hours, 90 minutes to 24 hours, 90 minutes to 6 hours, 90 minutes to 2 hours, 2 hours to 150 hours, 2 hours to 100 hours, 2 hours to 48 hours, 2 hours to 24 hours, 2 hours to 6 hours, 6 hours to 150 hours, 6 hours to 100 hours, 6 hours to 48 hours, 6 hours to 24 hours, 24 hours to 150 hours, 24 hours to 100 hours, 24 hours to 48 hours, 48 hours to 150 hours, 48 hours to 100 hours or 100 hours to 150 hours. In some examplesembodiments, the contacting step is carried out at a temperature between or between about 4º C and about 37º C. In some examplesembodiments, the contacting step is carried out at a temperature of about 25º C ± 2.0 ºC, 25º C ± 1.0 ºC or 25º C ± 0.3ºC.

[0011] In some examplesembodiments, the phthalocyanine dye is covalently or non-covalently linked to the targeting molecule. In some examplesembodiments, the phthalocyanine dye contains a reactive chemical group and contacting the phthalocyanine dye and targeting molecule produces a conjugate comprising the phthalocyanine dye covalently bound to an attachment group of the targeting molecule.

[0012] In some examplesembodiments, the method further includes quenching the conjugate, such as to remove unconjugated dye. In some examplesembodiments, the only light to which the conjugate is exposed during the quenching step has a wavelength within a range from about 400 nm to

about 650 nm. In some examples~~embodiments~~, the only light to which the conjugate is exposed during the quenching step has an intensity of less than 500 lux.

[0013] In some examples~~embodiments~~, the formulating step includes ultrafiltration, diafiltration or dialysis. In some examples~~embodiments~~, the method further includes sterile filtration of the conjugate.

[0014] In some examples~~embodiments~~, the method includes packaging the conjugate, such as in one or more light-protected container. In some examples~~embodiments~~, during the packaging step the only light to which the conjugate is exposed has a wavelength within a range from about 400 nm to about 650 nm. In some examples~~embodiments~~, during the packaging step, the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

[0015] In some examples~~embodiments~~, the methods include dissolving a phthalocyanine dye, which, in some cases containsa reactive chemical group, in a solvent to a concentration of about 0.1 -100 mg/mL. In some examples~~embodiments~~, the method further includes contacting a targeting molecule with the phthalocyanine dye at a molar ratio of dye to targeting molecule from 1:1 to 1000:1, under conditions to produce a conjugate containing the phthalocyanine dye linked to, *e.g.*, covalently bound to, the targeting molecule. In some examples~~embodiments~~, the method further includes formulating the conjugate in a pharmaceutically acceptable buffer to a concentration from or from about 0.01 to 1000.0 mg/mL. In some examples~~embodiments~~, the method further includes packaging the conjugate in one or more light-protected container. In some examples~~embodiments~~, before, during and/or after the steps of the method, such as the dissolving, contacting, formulating, and packaging steps, the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm, or the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

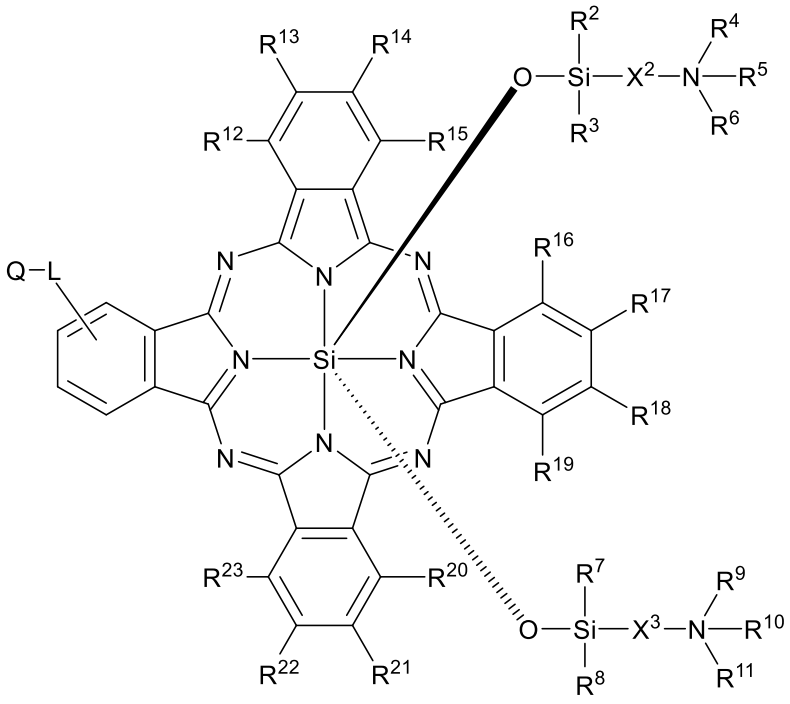
[0016] Provided in some examples~~embodiments~~ is a method of manufacturing a phthalocyanine dye-targeting molecule conjugate, comprising: a) dissolving a phthalocyanine dye in a solvent to a concentration of about 0.1 -100 mg/mL; b) contacting a targeting molecule with the phthalocyanine dye at a molar ratio of dye to targeting molecule from 1:1 to 1000:1 under conditions to produce a conjugate comprising the phthalocyanine dye linked to the targeting molecule; c) formulating the conjugate in a pharmaceutically acceptable buffer to a concentration from or from about 0.01 to about 200.0 mg/mL; and d) packaging the conjugate in one or more light-protected container, wherein in each of steps a) – d): the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm, or the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

[0017] In some of any such examples~~embodiments~~, the phthalocyanine dye is covalently or non-covalently linked to the targeting molecule. In some of any such examples~~embodiments~~, the phthalocyanine dye includes a reactive chemical group and contacting the phthalocyanine dye and targeting molecule produces a conjugate comprising the phthalocyanine dye covalently bound to an attachment group of the targeting molecule.

[0018] In some examples~~embodiments~~, during the steps of the provided methods, the total exposure of the dye and conjugate to any light is for no more than 5000 lux hours, no more than 2500 lux hours, no more than 1000 lux hours, no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours or no more than 80 lux hours. In some examples~~embodiments~~, during the packaging step of the provided method, the total exposure of the conjugate to any light is for no more than 5000 lux hours, no more than 2500 lux hours, no more than 1000 lux hours, no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours or no more than 80 lux hours.

[0019] In some examples~~embodiments~~, the dye has a maximum absorption wavelength from or from about 600 nm to about 850 nm. In some examples~~embodiments~~, the dye has a maximum absorption wavelength from or from about 650 nm to about 850 nm. In some examples~~embodiments~~, the dye has a maximum absorption wavelength from or from about 680 nm to about 850 nm.

[0020] In some examples~~embodiments~~, the phthalocyanine dye contains the formula:



, wherein:

L is a linker;

Q is a reactive group for attachment of the dye to the targeting molecule;

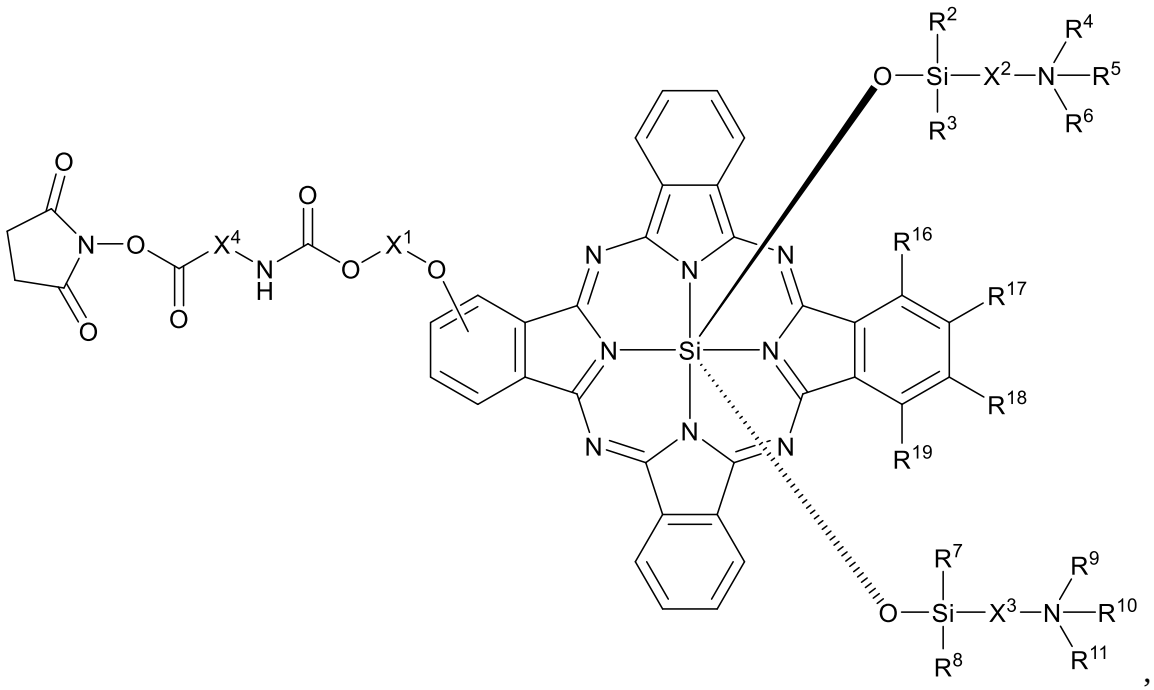
R^2, R^3, R^7, and R^8 are each independently selected from among optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group;

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22} and R^{23} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy; and

X^2 and X^3 are each independently C_1–C_{10} alkylene, optionally interrupted by a heteroatom.

[0021] In some examples~~embodiments~~, the phthalocyanine dye includes the formula:



,

wherein:

X^1 and X^4 are each independently a C_1-C_{10} alkylene optionally interrupted by a heteroatom;

R^2, R^3, R^7, and R^8 are each independently selected from optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group; and

R^{16}, R^{17}, R^{18} and R^{19} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy.

[0022] In some examples~~embodiments~~, the reactive group is selected from among an amine-reactive chemical group, a sulfhydryl-reactive chemical group, an activated ester, an acyl halide, an alkyl halide, an anhydride, a carboxylic acid, a carbodiimide, a carbonate, a carbamate, a haloacetamide, an isocyanate, an isothiocyanate, a maleimide, an NHS ester, a phosphoramidite, a platinum complex, a sulfonate ester and a thiocyanate. In some examples~~embodiments~~, the reactive chemical group is a sulfhydryl-reactive chemical group selected from among maleimides, haloacetyls and pyridyl disulfides. In some examples~~embodiments~~, the phthalocyanine dye is covalently bound to a lysine residue of the targeting molecule. In some examples~~embodiments~~, the reactive group is an amine-reactive chemical group. In some examples~~embodiments~~, the reactive chemical group is an amine-reactive chemical group that is an N-hydroxysuccinimide (NHS) ester.

[0023] In some examples~~embodiments~~, the phthalocyanine dye is IRDye 700DX-NHS (IR700-NHS).

[0024] In some examples~~embodiments~~, the targeting molecule binds to an antigen or protein directly or indirectly. For example, in some examples~~embodiments~~, the targeting molecule is a second binding molecule that binds to a first binding molecule, said first binding molecule being capable of binding to the antigen or protein. In some examples~~embodiments~~, the targeting molecule is a secondary antibody.

[0025] In some examples~~embodiments~~, the targeting molecule binds a cell surface target molecule on a surface of a cell or pathogen, such as a stem cell, a proliferating cell, a cancer cell, a cell in a hyperplasia, a tumor cell, an inflammatory cell, a neuron, a pathogen, or a pathogen infected cell. In some examples~~embodiments~~, the pathogen is selected from among viruses, bacteria, fungi, biofilms, and other prokaryote cell systems. In some examples~~embodiments~~, the cell is a cancer cell, a tumor cell, an inflammatory cell or, a neuron. In some examples~~embodiments~~, the cell is present in the microenvironment of a lesion associated with a disease or condition. In some examples~~embodiments~~, the lesion is a tumor and the cell is a cancer cell or a tumor cell. In some examples~~embodiments~~, the cell is a cancer stem cell or a circulating tumor cell.

[0026] In some such examples~~embodiments~~, the inflammatory cell is a leukocyte such as a neutrophil, an eosinophil, a basophil, a lymphocyte, or a monocyte. In some examples~~embodiments~~, the targeting molecule is a neuron, such as a peripheral nervous system neuron or a central nervous system neuron. In some examples~~embodiments~~, the neuron is a nociceptor such as a

nociceptor, mechanical nociceptor, chemical nociceptor or polymodal nociceptor. In some examplesembodiments, the targeting molecule binds to a pathogen, such as a virus, bacterium, fungus, biofilm, or other prokaryote cell system. In some examplesembodiments, the pathogen is a gram-negative or gram-positive bacterium.

[0027] In some examplesembodiments, the cell surface target molecule includes an antigen, a polypeptide, a lipid, or a carbohydrate, or a combination thereof.

[0028] In some examplesembodiments, the cell surface target molecule is selected from among cell membrane phospholipids, prokaryotic peptidoglycans, bacterial cell envelop proteins, viral capsid proteins, ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4-integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, an interleukin receptor (*e.g.* IL-2R, IL11-R, IL-13R) ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or

FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4 and Y5.

[0029] In some examples~~embodiments~~, the cell surface target molecule is selected from among HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR),VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK 4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, and SMO. In some examples~~embodiments~~, the cell surface target molecule is HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen (CEA).

[0030] In some examples~~embodiments~~, at least part of the targeting molecule is or is a combination of a protein, a glycoprotein, an antibody, an antibody fragment, an antigen, an antigen binding fragment, a peptide, a polypeptide, a tissue homing peptide, a small molecule, a polymeric synthetic molecule, a polymeric nanoparticle, a liposome, an enzyme substrate, a hormone, a neurotransmitter, a cell metabolite, a viral particle, a viral capsid, a viral nanoparticle, a bacterial particle, a marker, a cell, a hapten, an avidin, a streptavidin, a monomeric streptavidin, a biotin, a carbohydrate, an oligosaccharide, a polysaccharide, a nucleic acid, a deoxy nucleic acid, a fragment of DNA, a fragment of RNA, an aptamer, nucleotide triphosphates, acyclo terminator triphosphates, or PNA.

[0031] In some examples~~embodiments~~, the targeting molecule is a tissue-specific homing peptide. In some examples~~embodiments~~, the homing peptide has the sequence of amino acids as set forth in any of SEQ ID NOS: 1-52.

[0032] In some examples~~embodiments~~, the targeting molecule is an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a NGR polypeptide, an iNGR

polypeptide, or an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion.

[0033] In some examples~~embodiments~~, the ACPP comprises the structure: A-X1-B-, wherein B is a peptide portion of about 5 to about 20 basic amino acid residues, which is suitable for cellular uptake; A is a peptide portion of about 2 to about 20 acidic amino acid residues, which when linked with portion B is effective to inhibit or prevent cellular uptake of portion B; X1 is a cleavable linker of about 2 to about 100 atoms; and one or more of L-Y is linked to the C-terminus of peptide portion B.

[0034] In some examples~~embodiments~~, the targeting molecule is selected from among adrenocorticotropic hormone (ACTH), angiotensin II, atrial natriuretic factor (ANF), bombesin, bradykinin, brain derived neurotropihic factor (BDNF), bone morphogenetic protein 2 (BMP-2), bone morphogenetic protein 6 (BMP-6), bone morphogenetic protein 7 (BMP-7), calcitonin, cardiotrophin 1 (BMP-2), CD22, CD40, cholecystokinin (CCK), ciliary neurotrophic factor (CNTF), CCL1-CCL28, CXCL1-CXCL17, XCL1, XCL2, CX3CL1, cripto 1 binding peptide, vascular endothelial cell growth factor (VEGF), epidermal growth factor (EGF), endothelin 1, endothelin 1/3, FAS-ligand, fibroblast growth factor 1 (FGF-1), fibroblast growth factor 2 (FGF-2), fibroblast growth factor 4 (FGF-4), fibroblast growth factor 5 (FGF-5), fibroblast growth factor 6 (FGF-6), fibroblast growth factor 1 (FGF-7), fibroblast growth factor 1 (FGF-10), Flt-3, gastrin, gastrin releasing peptide (GRP), granulocyte colony-stimulating factor (G-CSF), granulocyte macrophage stimulating factor (GM-CSF), glucagon like peptide (GLP-1), hepatocyte growth factor (HGF), interferon alpha (IFN-a), interferon beta (IFN-b), interferon gamma (IFNg), insulin-like growth factor 1(IGF-1), insulin-like growth factor 2 (IGF-2), interleukin 1 (IL-1), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL-6), interleukin 7 (IL-7), interleukin 8 (IL-8), interleukin 9 (IL-9), interleukin 10 (IL-10), interleukin 11 (IL-11), interleukin 12 (IL-12), interleukin 13 (IL-13), interleukin 15 (IL-15), interleukin 17 (IL-17), interleukin 19 (IL-19), luteinizing hormone (LH), luteinizing-releasing hormone (LHRH), macrophage colony-stimulating factor (M-CSF), monocyte chemotactic protein 1 (MCP-1), macrophage inflammatory protein 3a (MIP-3a), macrophage inflammatory protein 3b (MIP-3b), nerve growth factor (NGF), neuromedin B, neurotrophin 3 (NT-3), neurotrophin 4 (NT-4), neurotensin, neuropeptide Y, oxytocin, pituitary adenylate cyclase activating peptide (PACAP), platelet derived growth factor AA (PDGF-AA), platelet derived growth factor AB (PDGF-AB), platelet derived growth factor BB (PDGF-BB), platelet derived growth factor CC (PDGF-CC), platelet derived growth factor DD (PDGF-DD), netrin-1 (NTN1), netrin-2

(NTN2), netrin-4 (NTN4), netrin-G1 (NTNG1) and netrin-G2 (NTNG2), ephrin A1 (EFNA1), ephrin A2 (EFNA2), ephrin A3 (EFNA3), ephrin A4 (EFNA4), ephrin A5 (EFNA5), semaphorin 3A (SEMA3A), semaphorin 3B (SEMA3B), semaphorin 3C (SEMA3C), semaphorin 3D (SEMA3D), semaphorin 3F (SEMA3F), semaphorin 3G (SEMA3G), semaphorin 4A (SEMA4A), semaphorin 4B (SEMA4B), semaphorin 4C (SEMA4C), semaphorin 4D (SEMA4D), semaphorin 4F (SEMA4F), semaphorin 4G (SEMA4G), semaphorin 5A (SEMA5A), semaphorin 5B (SEMA5B), semaphorin 6A (SEMA6A), semaphorin 6B (SEMA6B), semaphorin 6D (SEMA6D), semaphorin 7A (SEMA7A), SLIT1, SLIT2, SLIT3, SLIT and NTRK-like family, member 1 (SLITRK1), SLIT and NTRK-like family, member 2 (SLITRK2), SLIT and NTRK-like family, member 3 (SLITRK3), SLIT and NTRK-like family, member 4 (SLITRK4), SLIT and NTRK-like family, member 5 (SLITRK5), SLIT and NTRK-like family, member 6 (SLITRK6), prostaglandin E2 (PGE2), RANTES, Somatostatin-14, Somatostatin-28, stem cell factor (SCF), stromal cell derived factor 1 (SDF-1), substance P, thyroid stimulating hormone (TSH), transforming growth factor alpha (TGF-α), transforming growth factor beta (TGF-b), tumor necrosis factor alpha (TNF-α), thrombin, vasoactive intestinal peptide (VIP), Wntl, Wnt2, Wnt2b/13, Wnt3, Wnt3a, Wnt4, Wnt5a, Wnt5b, Wnt6, Wnt7a, Wnt7b, Wnt7c, Wnt8, Wnt8a, Wnt8b, Wnt8c, Wntl0a, Wntl0b, Wnt11, Wnt14, Wnt15, or Wnt16, Sonic hedgehog, Desert hedgehog, and Indian hedgehog.

[0035] In some examples~~embodiments~~, the targeting molecule is an antibody or an antibody fragment.

[0036] In some examples~~embodiments~~, the antibody is cetuximab, panitumumab, zalutumumab, nimotuzumab, trastuzumab, Ado-trastuzumab emtansine, Tositumomab (Bexxar ®), Rituximab (Rituxan, Mabthera), Ibritumomab tiuxetan (Zevalin), Daclizumab (Zenapax), Gemtuzumab (Mylotarg), Alemtuzumab, CEA-scan Fab fragment, OC125 monoclonal antibody, ab75705, B72.3, Bevacizumab (Avastin ®), Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Erlotinib, Everolimus, Ibrutinib, Imatinib, Lapatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Pertuzumab, Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Basiliximab, Ipilimumab, Nivolumab, pembrolizumab, MPDL3280A, Pidilizumab (CT-011), AMP-224, MSB001078C, or MEDI4736, or is an antigen-binding fragment thereof. In some examples~~embodiments~~, the antibody binds to a cell surface target molecule, such as HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen

(CEA). In some examplesembodiments, the antibody is cetuximab, Panitumumab, Trastuzumab, BMS-935559, MEDI4736, MPDL3280A or MSB0010718C or is an antigen-binding fragment thereof.

[0037] In some examplesembodiments, the dye-targeting molecule conjugate is cetuximab-IR700, Panitumumab-IR700, Trastuzumab-IR700, BMS-935559-IR700, MEDI4736-IR700, MPDL3280A-IR700 or MSB0010718C-IR700.

[0038] In some examplesembodiments, the targeting molecule is contacted with the phthalocyanine dye at a molar ratio of dye to targeting molecule from 1:1 to 100:1 or 1:1 to 10:1. In some examplesembodiments, the molar ratio of dye to targeting molecule is at least or at least about 4:1 or is at least or at least about 10:1. In some examplesembodiments, the conjugate includes from or from about 1 to about 1000 phthalocyanine dye molecules per targeting molecule, from or from about 1 to about 10 phthalocyanine dye molecules per targeting molecule or from or from about 2 to about 5 phthalocyanine dye molecules per targeting molecule.

[0039] In some examplesembodiments, the conjugate is formulated to a concentration that is from or from about 1.0 to about 5.0 mg/mL, such as in a pharmaceutically acceptable buffer. In some examplesembodiments, the pharmaceutically acceptable buffer is phosphate buffered saline. In some examplesembodiments, the pharmacologically acceptable buffer has a pH from or from about pH 6.0 to about pH 8.0. In some examplesembodiments, the conjugate is stable for greater than 3 months with greater than 90% of the conjugate present as a main monomer component. In some examplesembodiments, the conjugate is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time. In some examplesembodiments, the conjugate is stable if greater than 90% of the conjugate is present as a main monomer component. In some examplesembodiments, the pharmacologically acceptable buffer has a pH from or from about pH 6.8 to about pH 7.4.

[0040] In some examplesembodiments, the only light to which the dye and conjugate are exposed has a wavelength within a range from about 425 nm to about 575 nm. In some examplesembodiments, the only light to which the dye and conjugate are exposed has an intensity of less than 200 lux.

[0041] In some examplesembodiments, the container comprising the conjugate protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examplesembodiments, container protects from transmission of light such that the percentage of light transmission by the

container is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the container is green, blue, amber, translucent, opaque, or is wrapped in an opaque foil. In some examples~~embodiments~~, the container is green, blue, amber, translucent, opaque, or is covered by material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~ of the methods provided herein, the container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

[0042] In some examples~~embodiments~~, the light-protected container is a first light-protected container and the method further includes packing the first light-protected container into a second light-protected container. In some examples~~embodiments~~, the second container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examples~~embodiments~~, the second container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the second container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.In some examples~~embodiments~~, the second container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

[0043] In some examples~~embodiments~~, the method provided herein further includes packaging the second container into a third light-protected container. In some examples~~embodiments~~, the third container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examples~~embodiments~~, the third container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the third container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the third container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

[0044] In some examples~~embodiments~~, the amount of the conjugate produced by the method is greater than or greater than about 1 gram, greater than or greater than about 2 grams, greater than or greater than about 3 grams, greater than or greater than about 4 grams, greater than or

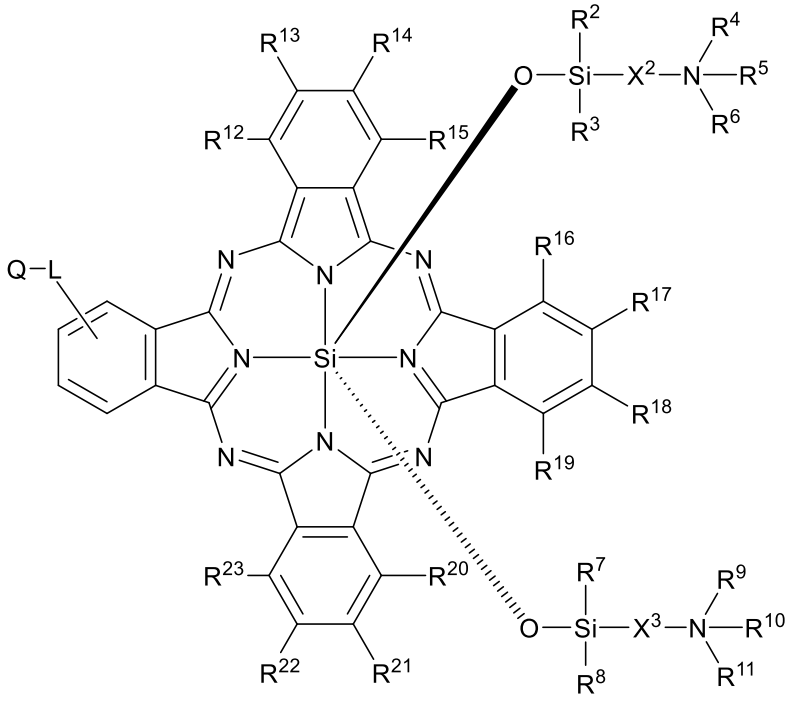
greater than about 5 grams or greater than or greater than about 10 grams. In some examples~~embodiments~~, the conjugate is produced using good manufacturing practice (GMP).

[0045] Provided in some examples~~embodiments~~ is a conjugate produced, formulated or packaged by the method described herein. In some examples~~embodiments~~, the conjugate is stable for greater than three months, such as with greater than 90% of the conjugate present as a main monomer component.

[0046] Provided in some examples~~embodiments~~ is a stable conjugate containing a phthalocyanine dye linked to a targeting molecule. In some examples~~embodiments~~, the stable conjugate is stable for greater than three months, such as with greater than 90% of the conjugate present as a main monomer component.

[0047] In some examples~~embodiments~~, the conjugate is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time. In some examples~~embodiments~~, the conjugate is stable if greater than 90% of the conjugate or stable conjugate is present as a main monomer component. In some examples~~embodiments~~, the conjugate is stable if greater than 95% of the conjugate or stable conjugate is present as a main monomer component. In some examples~~embodiments~~, the conjugate or stable conjugate is stable for greater than 6 months or greater than 12 months. In some examples~~embodiments~~, the conjugate or stable conjugate is stable at a temperature of less than 30 ºC.

[0048] In some examples~~embodiments~~, the phthalocyanine dye contained in the stable conjugate includes the formula:



, wherein:

L is a linker;

Q is a reactive group for attachment of the dye to the targeting molecule;

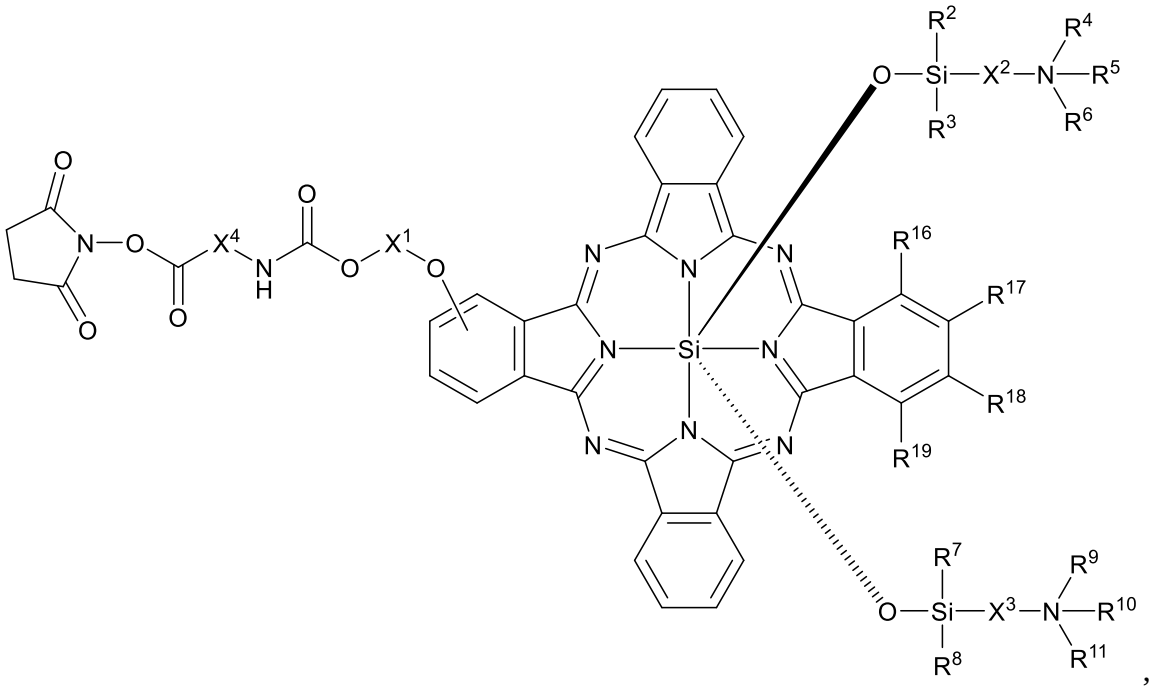
R^2, R^3, R^7, and R^8 are each independently selected from among optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group;

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22} and R^{23} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy; and

X^2 and X^3 are each independently C_1–C_{10} alkylene, optionally interrupted by a heteroatom.

[0049] In some examples~~embodiments~~, the stable conjugate containing the phthalocyanine dye includes the formula:



wherein:

X^1 and X^4 are each independently a C_1-C_{10} alkylene optionally interrupted by a heteroatom;

R^2, R^3, R^7, and R^8 are each independently selected from optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group; and

R^{16}, R^{17}, R^{18} and R^{19} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy

[0050] In some examples~~embodiments~~, the dye contained in the stable conjugate has a maximum absorption wavelength from or from about 600 nm to about 850 nm, from or from about 650 nm to about 850 nm, or from or from about 680 nm to about 850 nm.

[0051] In some examples~~embodiments~~, the dye contained in the stable conjugate is IRDye 700DX (IR700).

[0052] In some examples~~embodiments~~, the targeting molecule contained in the stable conjugate binds to a cell surface target molecule on a surface of a cell or pathogen, such as a proliferating cell, a cancer cell, a cell in hyperplasia, a tumor cell, an inflammatory cell, a neuron, or a pathogen. In some examples~~embodiments~~, the cell is a stem cell, a proliferating cell, a

cell in a hyperplasia, or a pathogen infected cell. In some examples~~embodiments~~, the pathogen is selected from among viruses, bacteria, fungi, biofilms, and other prokaryote cell systems. In some examples~~embodiments~~, the inflammatory cell is a leukocyte, such as a neutrophil, an eosinophil, a basophil, a lymphocyte, or a monocyte. In some examples~~embodiments~~, the targeting molecule is a neuron, such as a peripheral nervous system neuron or a central nervous system neuron. In some examples~~embodiments~~, the neuron is a nociceptor such as a nociceptor, mechanical nociceptor, chemical nociceptor or polymodal nociceptor. In some examples~~embodiments~~, the targeting molecule binds to a pathogen, such as a virus, bacterium, fungus, biofilm, or other prokaryote cell system. In some examples~~embodiments~~, the pathogen is a gram-negative or gram-positive bacterium.

[0053] In some examples~~embodiments~~, the cell surface target molecule bound by the targeting molecule contained in the stable conjugate includes an antigen, a polypeptide, a lipid, or a carbohydrate, or a combination thereof.

[0054] In some examples~~embodiments~~, the cell surface target molecule is selected from among cell membrane phospholipids, prokaryotic peptidoglycans, bacterial cell envelop proteins, viral capsid proteins, ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4-integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, an interleukin receptor (*e.g.* IL-2R, IL11-R, IL-13R), ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-

cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4, and Y5.

[0055] In some examples~~embodiments~~, the cell surface target molecule is selected from among HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR),VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK 4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, and SMO. In some examples~~embodiments~~, the cell surface target molecule is HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen (CEA).

[0056] In some examples~~embodiments~~, at least part of the targeting molecule is or is a combination of a protein, a glycoprotein, an antibody, an antibody fragment, an antigen, an antigen binding fragment, a peptide, a polypeptide, a tissue homing peptide, a small molecule, a polymeric synthetic molecule, a polymeric nanoparticle, a liposome, an enzyme substrate, a hormone, a neurotransmitter, a cell metabolite, a viral particle, a viral capsid, a viral nanoparticle, a bacterial particle, a marker, a cell, a hapten, an avidin, a streptavidin, a monomeric streptavidin, a biotin, a carbohydrate, an oligosaccharide, a polysaccharide, a nucleic acid, a deoxy nucleic acid, a fragment of DNA, a fragment of RNA, an aptamer, nucleotide triphosphates, acyclo terminator triphosphates, or PNA.

[0057] In some examples~~embodiments~~, the targeting molecule is a tissue-specific homing peptide. In some examples~~embodiments~~, the homing peptide has the sequence of amino acids as set forth in any of SEQ ID NOS: 1-52.

[0058] In some examples~~embodiments~~, the targeting molecule is an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a NGR polypeptide, an iNGR polypeptide, or an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion.

[0059] In some examples~~embodiments~~, the ACPP comprises the structure: A-X1-B-, wherein B is a peptide portion of about 5 to about 20 basic amino acid residues, which is suitable for cellular uptake; A is a peptide portion of about 2 to about 20 acidic amino acid residues, which when linked with portion B is effective to inhibit or prevent cellular uptake of portion B; X1 is a cleavable linker of about 2 to about 100 atoms; and one or more of L-Y is linked to the C-terminus of peptide portion B.

[0060] In some examples~~embodiments~~, the targeting molecule is selected from among adrenocorticotropic hormone (ACTH), angiotensin II, atrial natriuretic factor (ANF), bombesin, bradykinin, brain derived neurotropihic factor (BDNF), bone morphogenetic protein 2 (BMP-2), bone morphogenetic protein 6 (BMP-6), bone morphogenetic protein 7 (BMP-7), calcitonin, cardiotrophin 1 (BMP-2), CD22, CD40, cholecystokinin (CCK), ciliary neurotrophic factor (CNTF), CCL1-CCL28, CXCL1-CXCL17, XCL1, XCL2, CX3CL1, cripto 1 binding peptide, vascular endothelial cell growth factor (VEGF), epidermal growth factor (EGF), endothelin 1, endothelin 1/3, FAS-ligand, fibroblast growth factor 1 (FGF-1), fibroblast growth factor 2 (FGF-2), fibroblast growth factor 4 (FGF-4), fibroblast growth factor 5 (FGF-5), fibroblast growth factor 6 (FGF-6), fibroblast growth factor 1 (FGF-7), fibroblast growth factor 1 (FGF-10), Flt-3, gastrin, gastrin releasing peptide (GRP), granulocyte colony-stimulating factor (G-CSF), granulocyte macrophage stimulating factor (GM-CSF), glucagon like peptide (GLP-1), hepatocyte growth factor (HGF), interferon alpha (IFN-a), interferon beta (IFN-b), interferon gamma (IFNg), insulin-like growth factor 1(IGF-1), insulin-like growth factor 2 (IGF-2), interleukin 1 (IL-1), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL-6), interleukin 7 (IL-7), interleukin 8 (IL-8), interleukin 9 (IL-9), interleukin 10 (IL-10), interleukin 11 (IL-11), interleukin 12 (IL-12), interleukin 13 (IL-13), interleukin 15 (IL-15), interleukin 17 (IL-17), interleukin 19 (IL-19), luteinizing hormone (LH), luteinizing-releasing hormone (LHRH), macrophage colony-stimulating factor (M-CSF), monocyte chemotactic protein 1 (MCP-1),

macrophage inflammatory protein 3a (MIP-3a), macrophage inflammatory protein 3b (MIP-3b), nerve growth factor (NGF), neuromedin B, neurotrophin 3 (NT-3), neurotrophin 4 (NT-4), neurotensin, neuropeptide Y, oxytocin, pituitary adenylate cyclase activating peptide (PACAP), platelet derived growth factor AA (PDGF-AA), platelet derived growth factor AB (PDGF-AB), platelet derived growth factor BB (PDGF-BB), platelet derived growth factor CC (PDGF-CC), platelet derived growth factor DD (PDGF-DD), netrin-1 (NTN1), netrin-2 (NTN2), netrin-4 (NTN4), netrin-G1 (NTNG1) and netrin-G2 (NTNG2), ephrin A1 (EFNA1), ephrin A2 (EFNA2), ephrin A3 (EFNA3), ephrin A4 (EFNA4), ephrin A5 (EFNA5), semaphorin 3A (SEMA3A), semaphorin 3B (SEMA3B), semaphorin 3C (SEMA3C), semaphorin 3D (SEMA3D), semaphorin 3F (SEMA3F), semaphorin 3G (SEMA3G), semaphorin 4A (SEMA4A), semaphorin 4B (SEMA4B), semaphorin 4C (SEMA4C), semaphorin 4D (SEMA4D), semaphorin 4F (SEMA4F), semaphorin 4G (SEMA4G), semaphorin 5A (SEMA5A), semaphorin 5B (SEMA5B), semaphorin 6A (SEMA6A), semaphorin 6B (SEMA6B), semaphorin 6D (SEMA6D), semaphorin 7A (SEMA7A), SLIT1, SLIT2, SLIT3, SLIT and NTRK-like family, member 1 (SLITRK1), SLIT and NTRK-like family, member 2 (SLITRK2), SLIT and NTRK-like family, member 3 (SLITRK3), SLIT and NTRK-like family, member 4 (SLITRK4), SLIT and NTRK-like family, member 5 (SLITRK5), SLIT and NTRK-like family, member 6 (SLITRK6), prostaglandin E2 (PGE2), RANTES, Somatostatin-14, Somatostatin-28, stem cell factor (SCF), stromal cell derived factor 1 (SDF-1), substance P, thyroid stimulating hormone (TSH), transforming growth factor alpha (TGF-α), transforming growth factor beta (TGF-b), tumor necrosis factor alpha (TNF-α), thrombin, vasoactive intestinal peptide (VIP), Wntl, Wnt2, Wnt2b/13, Wnt3, Wnt3a, Wnt4, Wnt5a, Wnt5b, Wnt6, Wnt7a, Wnt7b, Wnt7c, Wnt8, Wnt8a, Wnt8b, Wnt8c, Wntl0a, Wntl0b, Wnt11, Wnt14, Wnt15, or Wnt16, Sonic hedgehog, Desert hedgehog, and Indian hedgehog.

[0061] In some examples~~embodiments~~, the targeting molecule is an antibody or an antibody fragment.

[0062] In some examples~~embodiments~~, the antibody is cetuximab, panitumumab, zalutumumab, nimotuzumab, trastuzumab, Ado-trastuzumab emtansine, Tositumomab (Bexxar ®), Rituximab (Rituxan, Mabthera), Ibritumomab tiuxetan (Zevalin), Daclizumab (Zenapax), Gemtuzumab (Mylotarg), Alemtuzumab, CEA-scan Fab fragment, OC125 monoclonal antibody, ab75705, B72.3, Bevacizumab (Avastin ®), Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Erlotinib, Everolimus, Ibrutinib, Imatinib, Lapatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Pertuzumab,

Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Basiliximab, Ipilimumab, Nivolumab, pembrolizumab, lambrolizumab, MPDL3280A, Pidilizumab (CT-011), MSB001078C, BMS-935559 or MEDI4736, AMP-224, or is an antigen-binding fragment thereof. In some examples~~embodiments~~, the antibody binds to a cell surface target molecule, such as HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen (CEA). In some examples~~embodiments~~, the antibody is cetuximab, Panitumumab, Trastuzumab, BMS-935559, MEDI4736, MPDL3280A or MSB0010718C or is an antigen-binding fragment thereof.

[0063] In some examples~~embodiments~~, the stable dye-targeting molecule conjugate is cetuximab-IR700, Panitumumab-IR700, Trastuzumab-IR700, BMS-935559-IR700, MEDI4736-IR700, MPDL3280A-IR700 or MSB0010718C-IR700.

[0064] In some examples~~embodiments~~, the stable conjugate includes from or from about 1 to about 1000 phthalocyanine dye molecules per targeting molecule, from or from about 1 to about 10 or from or from about 2 to about 5 phthalocyanine dye molecules per targeting molecule.

[0065] Provided in some examples~~embodiments~~ is a composition containing the conjugate or stable conjugate.

[0066] Provided in some examples~~embodiments~~ is a pharmaceutical composition containing the conjugate or stable conjugate and a pharmaceutically acceptable excipient.

[0067] In some examples~~embodiments~~, the composition is formulated in phosphate buffered saline. In some examples~~embodiments~~, composition has a pH of greater than 6.0.

[0068] Provided in some examples~~embodiments~~ is a pharmaceutical composition containing a phthalocyanine dye linked to a targeting molecule and a pharmaceutically acceptable excipient. In some such examples~~embodiments~~, the composition has a pH of greater than 6.0 and the conjugate in the composition is stable for greater than three months, such as with greater than 90% of the conjugate present as a main monomer component. In some such examples~~embodiments~~, the conjugate in the composition is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time. In some such examples~~embodiments~~, the conjugate in the composition is stable if greater than 90% of the conjugate is present as a main monomer component. In some examples~~embodiments~~, the pH of the composition is greater than 6.0 or is from or from about pH 6.0 to about 8.0, inclusive.

[0069] In some examples~~embodiments~~, the concentration of the conjugate in the composition is from or from about 0.01 mg/mL to about 200 mg/mL. In some examples~~embodiments~~, the concentration of the conjugate in the composition is from or from about 0.5 mg/mL to about 10 mg/mL. In some examples~~embodiments~~, the concentration of the conjugate in the composition is from or from about 1.0 to about 5.0 mg/mL. In some examples~~embodiments~~, the concentration of the conjugate in the composition is from or from about 1.8 to about 2.1 mg/mL.

[0070] In some examples~~embodiments~~, the volume of the composition is from or from about 0.5 mL to about 100 mL, from or from about 1 mL to about 50 mL or from or from about 1 mL to about 10 mL.

[0071] Provided in some examples~~embodiments~~ is a container comprising the conjugate or stable conjugate. In some examples~~embodiments~~, the container protects from transmission of light having a wavelength from or from about 500 nm to 725 nm or 650 nm to 725 nm. In some examples~~embodiments~~, the container protects from transmission of light such that the percentage of light transmission by the container is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the container is wrapped in an opaque foil.

[0072] Provided in some examples~~embodiments~~ is a packaging system for protecting a phthalocyanine dye-targeting molecule conjugate from light. In some examples~~embodiments~~, the packaging system includes an internal packaging material comprising the container described herein. In some examples~~embodiments~~, the internal packaging material has a light transmittance of no more than 5%. In some examples~~embodiments~~, an external packaging material contains the internal packaging material. In some examples~~embodiments~~, the external packaging material has a light transmittance of no more than 5%. In some examples~~embodiments~~, the internal packaging material includes an opaque foil.

[0073] Provided in some examples~~embodiments~~ is a packaging system for protecting a phthalocyanine dye-targeting molecule conjugate from light that includes a first container, such as any container provided herein, and a second container comprising the first container, wherein the second container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examples~~embodiments~~, the second container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than

20%, less than 10% or less than 5%. In some examples~~embodiments~~, the second container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the first and second container are independently selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

[0074] In some examples~~embodiments~~, any of the provided packaging system further includes a third container comprising the second container, wherein the third container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examples~~embodiments~~, the third container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the third container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the third container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

[0075] Provided in some examples~~embodiments~~ is a kit that includes any of the containers described herein or any of the packaging systems described herein; a light-protected cover capable of covering a device capable of administering a composition comprising a phthalocyanine dye-targeting molecule conjugate; and optionally instructions for use. In some examples~~embodiments~~, the administration device is an intravenous infusion bag. In some examples~~embodiments~~, the light-protected cover protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm. In some examples~~embodiments~~, the light-protected cover protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the light-protected cover is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

[0076] Provided in some examples~~embodiments~~ is a method of preparing a composition comprising a phthalocyanine-dye conjugate for administration that includes: unpacking one or more of any of the containers described herein or one or more of any of the packaging system described herein that includes any of the containers described herein; and transferring

the composition present in the one or more containers into a device capable of administering the composition to a subject, wherein the only light to which the composition is exposed has a wavelength within a range from about 400 nm to about 650 nm, or the only light to which the composition is exposed has an intensity of less than 500 lux. In some examples~~embodiments~~, the only light in which the composition is exposed has an intensity of less than 200 lux or less than 100 lux. In some examples~~embodiments~~, the method provided is performed in a biosafety cabinet, biosafety hood or a sterile environment. In some examples~~embodiments~~, the one or more containers together comprise a therapeutically effective dose of the phthalocyanine-dye conjugate. In some examples~~embodiments~~, the one or more containers include at least or about at least or 2, 4, 6, 8, 10, 12, 18 or 24 containers. In some examples~~embodiments~~, the provided method is carried out for no more than 1 hour, no more than 30 minutes or no more than 15 minutes; or the total exposure of the composition to any light during the method is no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours, no more than 50 lux hours or no more than 25 lux hours.

[0077] In some examples~~embodiments~~, the administration device is an intravenous infusion bag. In some examples~~embodiments~~, the administration device comprises a light-protected cover capable of covering the device. In some examples~~embodiments~~, the light-protected cover protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

[0078] In some examples~~embodiments~~, the light-protected cover protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%. In some examples~~embodiments~~, the light-protected cover is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

[0079] Provided in some examples~~embodiments~~ is a light-protected device that includes the composition prepared using the methods provided herein.

[0080] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a subject, that includes: (a) administering a composition comprising a phthalocyanine-dye conjugate from any of the light-protected device provided herein to a subject, wherein prior to and during the administration step the composition is not exposed to an intensity of environmental light greater than 500 lux; and (b) irradiating the unwanted

cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the subject.

[0081] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a subject that includes: a) administering to a subject a therapeutically effective amount of any of the conjugates or compositions described herein, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the subject.

[0082] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a subject that includes: a) administering to a subject a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule capable of binding an unwanted cell or pathogen, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and b) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the subject.

[0083] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a subject that includes: a) administering to a subject a therapeutically effective amount of a first binding molecule capable of binding an unwanted cell or pathogen; b) administering to the subject a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is a second binding molecule that is capable of binding to the first binding molecule; and c) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the subject.

[0084] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a sample, that includes: (a) administering a composition comprising a phthalocyanine-dye conjugate from any of the light-protected device provided herein to a sample, wherein prior to and during the administration step the composition is not exposed to an intensity of environmental light greater than 500 lux; and (b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the sample.

[0085] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a sample that includes: a) administering to a sample a therapeutically effective amount of any of the conjugates or compositions described herein, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the sample.

[0086] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a sample that includes: a) administering to a sample a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule capable of binding an unwanted cell or pathogen, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and b) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the sample.

[0087] Provided in some examples~~embodiments~~ is a method of removing unwanted cells or pathogens in a sample that includes: a) administering to a sample a therapeutically effective amount of a first binding molecule capable of binding an unwanted cell or pathogen; b) administering to the sample a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is a second binding molecule that is capable of binding to the first binding molecule; and c) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the sample.

[0088] In some examples~~embodiments~~, the method is performed *in vitro* or *ex vivo*. In some examples~~embodiments~~, the method is performed using an extracorporeal device.

[0089] In some examples~~embodiments~~ of the methods provided herein, the first binding molecule is administered to the subject prior to the conjugate or the first binding molecule and conjugate are administered simultaneously to the subject. In some examples~~embodiments~~, the targeting molecule is a secondary antibody. In some examples~~embodiments~~, prior to and during the administration of the conjugate, the conjugate is not exposed to an intensity of environmental light greater than 500 lux.

[0090] In some examples~~embodiments~~, the cell is a stem cell, a proliferating cell, a cell in a hyperplasia, an inflammatory cell, a negative regulatory immune cell, which optionally is a T cell, a pathogen infected cell, a neuron, a fat cell or adipocyte. In some examples~~embodiments~~, the cell

is a cancer cell or a tumor cell. In some examples~~embodiments~~, the cell is associated with, causes or contributes to the etiology of a disease or condition. In some examples~~embodiments~~, the disease of condition is a tumor or cancer, an infection, an inflammatory disease or condition, or a neuronal disease or condition. In some examples~~embodiments~~, the cell is a neuron and the disease or condition is a neurological disorder, which optionally is pain; the cell is a fat cell or adipocyte and the disease or condition involves excess fat; the cell is a pathogen infected cell and the disease or condition is an infection; the cell is a pathogen and the disease or condition is an infection; the cell is an inflammatory cell and the disease or condition is an inflammatory disease; the cell is a an immune cell, which optionally is a regulatory T cell, and the disease or condition is a tumor or cancer; or the cell is a tumor or cancer cell and the disease or condition is a tumor or a cancer.

[0091] In some examples~~embodiments~~, the cell is present in the microenvironment of a lesion associated with a disease or condition or is in a hyperplasia. In some examples~~embodiments~~, the lesion is a tumor and the disease or condition is a tumor or cancer. In some examples~~embodiments~~, the method treats the disease or condition.

[0092] Provided in some examples~~embodiments~~ is a method of removing a pathogen infected cell in a subject that includes: a) administering to a subject a therapeutically effective amount of a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is capable of binding to the pathogen infected cell directly or indirectly; and b) irradiating the pathogen infected cell at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the pathogen infected cell in the subject. In some examples~~embodiments~~, the pathogen is a virus, bacterium, fungus, biofilm, or other prokaryote cell system. In some examples~~embodiments~~, prior to and during the administration of the conjugate, the conjugate is not exposed to an intensity of environmental light greater than 500 lux.

[0093] Provided in some examples~~embodiments~~ is a method of removing a pathogen infected cell in a sample that includes: a) administering to a sample a therapeutically effective amount of a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is capable of binding to the pathogen infected cell directly or indirectly; and b) irradiating the pathogen infected cell at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the pathogen infected cell in the sample. In some examples~~embodiments~~, the pathogen is a virus, bacterium, fungus, biofilm, or other prokaryote cell system. In some examples~~embodiments~~, prior to and during the administration of

the conjugate, the conjugate is not exposed to an intensity of environmental light greater than 500 lux.

[0094] In some examples~~embodiments~~, the method is performed *in vitro* or *ex vivo*. In some examples~~embodiments~~, the *ex vivo* irradiation is method is performed using an extracorporeal device. Provided in some examples~~embodiments~~ is a method of treating hyperplasia or a tumor in a subject. In some examples~~embodiments~~, the method includes administering to the subject a therapeutically effective amount of the conjugate or stable conjugate or composition, where prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux. In some examples~~embodiments~~, the method further includes irradiating the hyperplasia or the tumor at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length, thereby treating the tumor in the subject.

[0095] Provided in some examples~~embodiments~~ is a method of treating hyperplasia or a tumor in a subject. In some such examples~~embodiments~~, the method includes administering to the subject a therapeutically effective amount of a conjugate containing IRDye 700DX (IR700) linked to a targeting molecule. In some examples~~embodiments~~, the conjugate is targeted to the hyperplasia or the tumor and prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux. In some examples~~embodiments~~, the method further includes irradiating the tumor at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the subject.

[0096] Provided in some examples~~embodiments~~ is a method of treating hyperplasia or a tumor in a sample. In some examples~~embodiments~~, the method includes administering to the sample a therapeutically effective amount of the conjugate or stable conjugate or composition, where prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux. In some examples~~embodiments~~, the method further includes irradiating the hyperplasia or the tumor at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length, thereby treating the tumor in the sample.

[0097] Provided in some examples~~embodiments~~ is a method of treating hyperplasia or a tumor in a sample. In some such examples~~embodiments~~, the method includes administering to the sample a therapeutically effective amount of a conjugate containing IRDye 700DX (IR700) linked to a targeting molecule. In some examples~~embodiments~~, the conjugate is targeted to the hyperplasia or the tumor and prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux. In some examples~~embodiments~~, the method further includes irradiating the tumor at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the sample.

[0098] In some examplesembodiments, the method is for treating a tumor, wherein the targeting molecule of the conjugate targets the conjugate to the tumor or a microenvironment of the tumor. In some examplesembodiments, irradiating the tumor is at a wavelength of 600 to 800 nm and at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length, thereby treating the tumor, e.g., the tumor in the subject or in the sample.

[0099] In some examplesembodiments, the targeting molecule is an antibody, an antigen binding fragment, a protein, a glycoprotein, a peptide, a polypeptide, a virus, a viral capsid, or a viral particle. In some examplesembodiments, the targeting molecule is an antibody or an antibody fragment.

[0100] In some examplesembodiments, administration is performed under fluorescent lighting or LED lighting and in the absence of direct or indirect sunlight.

[0101] In some examplesembodiments, any exposure of the conjugate to light less than 500 lux is for less than 20 minutes, less than 15 minutes, less than 10 minutes or less than 5 minutes. In some examplesembodiments, the exposure of the conjugate to any light is light with an intensity that is not greater than 50 lux.

[0102] In some examplesembodiments, the tumor is a cancer. In some examplesembodiments, the cancer is a cancer located at the head and neck, breast, liver, colon, ovary, prostate, pancreas, brain, cervix, bone, skin, eye, bladder, stomach, esophagus, peritoneum, or lung. In some examplesembodiments, the cancer is a cancer of the blood.

[0103] In some examplesembodiments, the conjugate is targeted to a protein expressed in the tumor. In some examplesembodiments, the conjugate is targeted to a protein expressed on the surface of a cell present in the tumor microenvironment. In some examplesembodiments, the cell is a tumor cell, an immune cell or a cancer stem cell.

[0104] In some examplesembodiments, the protein expressed in the tumor is ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4-integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors

of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, IL11-R, IL-13R, ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4, or Y5.

[0105] In some examples~~embodiments~~, the protein expressed in the tumor is HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR), VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK 4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, or SMO.

[0106] In some examples~~embodiments~~, the conjugate is targeted to a protein expressed in the tumor. In some examples~~embodiments~~, the cell, hyperplasia or tumor is irradiated at a wavelength from or from about 600 nm to about 850 nm. In some examples~~embodiments~~, the tumor is irradiated at a wavelength of 690 ± 50 nm or 690 ± 20 nm.

[0107] In some examples~~embodiments~~, the cell, hyperplasia or tumor is irradiated at a dose of from or from about 2 J cm^{-2} to about 400 J cm^{-2} or from or from about 2 J/cm fiber length to about 500 J/cm fiber length. In some examples~~embodiments~~, the cells, hyperplasia or tumor are irradiated at a dose of at least or at least about 2 J cm^{-2}, 5 J cm^{-2}, 10 J cm^{-2}, 25 J cm^{-2}, 50 J cm^{-2}, 75 J cm^{-2}, 100 J cm^{-2}, 150 J cm^{-2}, 200 J cm^{-2}, 300 J cm^{-2}, 400 J cm^{-2}, or 500 J cm^{-2}; or the cells, tumor or hyperplasia are irradiated at a dose of at least or at least about 2 J/cm fiber length, 5 J/cm fiber length, 10 J/cm fiber length, 25 J/cm fiber length, 50 J/cm fiber length, 75 J/cm fiber length, 100 J/cm fiber length, 150 J/cm fiber length, 200 J/cm fiber length, 250 J/cm fiber length, 300 J/cm fiber length, 400 J/cm fiber length or 500 J/cm fiber length.

[0108] In some examples~~embodiments~~, the disease or condition is a tumor and the tumor is a superficial tumor. In some examples~~embodiments~~, the tumor is irradiated at a dose of at least or about at least or about10 J/cm^2, 25 J/cm^2, 50 J/cm^2, 150 J/cm^2, or 250 J/cm^2.

[0109] In some examples~~embodiments~~, the disease or condition is a tumor and the tumor is an interstitial tumor. In some examples~~embodiments~~, the tumor is irradiated at a dose of at least or about at least or about 50 J/cm fiber length, 100 J/cm fiber length, 200 J/cm fiber length, or 300 J/cm fiber length.

[0110] In some examples~~embodiments~~, the cells, hyperplasia or tumor is irradiated within or within about or about 12 hours, 24 hours, 36 hours, 72 hours or 96 hours after administering the conjugate. In some examples~~embodiments~~, the targeting molecule is administered up to 96 hours prior to administration of the conjugate. In some examples~~embodiments~~, the conjugate is administered in an amount that is from or from about 0.5 mg/kg to about 100 mg/kg or 20 mg/m^2 to about 4000 mg/m^2.

[0111] In some examples~~embodiments~~, the conjugate is administered in an amount that is at least or about at least or is or is about 0.5 mg/kg, 2.0 mg/kg, 4.0 mg/kg, 8.0 mg/kg, 16.0 mg/kg, 32.0 mg/kg or 64 mg/kg; or the conjugate is administered in an amount that is at least or about at least or is or is about 20 mg/m^2, 40 mg/m^2, 160 mg/m^2, 320 mg/m^2, 640 mg/m^2, 1280 mg/m^2 or 2560 mg/m^2.

[0112] In some examples~~embodiments~~ of the methods provided herein, prior to administration of the conjugate the targeting molecule is administered, *e.g.*, administered to the subject or the sample. In some examples~~embodiments~~, the targeting molecule is administered at a dose within a range from or from about 10 mg/m^2 to about 500 mg/m^2.

[0113] In some examples~~embodiments~~, the targeting molecule is an antibody or antigen binding fragment. In some examples~~embodiments~~, the antibody is cetuximab.

[0114] Provided in some examples~~embodiments~~ is a conjugate containing a phthalocyanine dye and a targeting molecule. In some such examples~~embodiments~~, the targeting molecule is a tissue-specific homing peptide, an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a NGR polypeptide, an iNGR polypeptide, an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion, or an antibody, such as Ado-trastuzumab emtansine, Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Everolimus, Ibrutinib, Imatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Ipilimumab, Nivolumab, pembrolizumab, MPDL3280A, Pidilizumab (CT-011), AMP-224, MSB001078C, or MEDI4736, or an antigen-binding fragment thereof.

[0115] In some examples~~embodiments~~, the ACPP comprises the structure: A-X1-B-, wherein B is a peptide portion of about 5 to about 20 basic amino acid residues, which is suitable for cellular uptake; A is a peptide portion of about 2 to about 20 acidic amino acid residues, which when linked with portion B is effective to inhibit or prevent cellular uptake of portion B; X1 is a cleavable linker of about 2 to about 100 atoms; and one or more of L-Y is linked to the C-terminus of peptide portion B.

[0116] In some examples~~embodiments~~, the homing peptide has a sequence as set forth in any of SEQ ID NOs: 1-52. In some examples~~embodiments~~, the dye is IR700.

Brief Description of the Drawings

[0117] **FIG.1A** displays the relative amounts of high molecular weight species (aggregates) and monomer form of the Cetuximab-IRDye 700DX as assessed by High Pressure Liquid Chromatography using a Size Exclusion column (HPLC-SEC) of a sample in a clear vial before 24 hours of light exposure.

CLAIMS

1. A method of manufacturing a phthalocyanine dye-targeting molecule conjugate, comprising:

a) contacting a targeting molecule with a phthalocyanine dye under conditions to produce a conjugate comprising the phthalocyanine dye linked to the targeting molecule; and

b) formulating the conjugate in a pharmaceutically acceptable buffer,

wherein in each of steps a) – b):

the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm, or

the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

2. A method of manufacturing a phthalocyanine dye-targeting molecule conjugate, comprising:

a) contacting a targeting molecule with a phthalocyanine dye at a molar ratio of dye to targeting molecule of from or from about 1:1 to 1000:1 under conditions to produce a conjugate comprising the phthalocyanine dye covalently linked to the targeting molecule; and

b) formulating the conjugate in a pharmaceutically acceptable buffer to a concentration from or from about 0.01 mg/mL to about 200.0 mg/mL,

wherein in each of steps a) – b):

the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm, or

the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

3. The method of claim 1 or claim 2, wherein the conjugate is formulated to a concentration from or from about 0.01 mg/mL to about 200.0 mg/mL or from about 0.5 mg/mL to about 10.0 mg/mL.

4. The method of any of claims 1-3, wherein the conjugate is formulated to a concentration from or from about 0.5 mg/mL to about 5.0 mg/mL.

~~5. The method of any of claims 1-4, wherein prior to the contacting step, the phthalocyanine dye is dissolved in a solvent under conditions in which the only light to which the dye is exposed has a wavelength within a range from about 400 nm to about 650 nm, or the only light to which the dye is exposed has an intensity of less than 500 lux.~~

~~6. The method of claim 5, wherein the dye is dissolved in the solvent to a concentration in a range from or from about 0.1 mg/mL to about 100 mg/mL.~~

~~7. The method of claim 5 or claim 6, wherein the dye is dissolved in the solvent to a concentration from or from about 1 mg/mL to about 50 mg/mL.~~

~~8. The method of any of claims 1-7, wherein the concentration of the phthalocyanine dye in the solvent is about 10 mg/mL.~~

~~9. The method of any of claims 5-8, wherein the solvent is selected from dimethylsulfoxide (DMSO) and DMF and water-based solvent.~~

~~10. The method of any of claims 5-9, wherein the solvent is DMSO.~~

~~11. The method of any of claims 1-10, wherein the formulating step comprises concentrating the conjugate.~~

~~12. The method of any of claims 1-11, wherein the contacting step is carried out for at least 15 minutes at a temperature between or between about 4º C and about 37º C.~~

~~13. The method of any of claims 1-12, wherein the contacting step is carried out for 90 minutes to 150 minutes.~~

~~14. The method of any of claims 1-13, wherein the contacting step is carried out at a temperature of about 25º C ± 1.0ºC.~~

~~15. The method of any of claims 1-14, wherein the phthalocyanine dye is covalently or non-covalently linked to the targeting molecule.~~

16. The method of any of claims 1-14, wherein the phthalocyanine dye comprises a reactive chemical group and contacting the phthalocyanine dye and targeting molecule produces a conjugate comprising the phthalocyanine dye covalently bound to an attachment group of the targeting molecule.

17. The method of claim 16, further comprising quenching the conjugate prior to the concentrating step, wherein:

the only light to which the conjugate is exposed during the quenching step has a wavelength within a range from about 400 nm to about 650 nm, or

the only light to which the conjugate is exposed during the quenching step has an intensity of less than 500 lux.

18. The method of any of claims 1-17, wherein the formulating step comprises ultrafiltration, diafiltration or dialysis.

19. The method of any of claims 1-18, further comprising sterile filtration of the conjugate.

20. The method of any of claims 1-19, further comprising d) packaging the conjugate in one or more light-protected container, wherein during the packaging step:

the only light to which the conjugate is exposed has a wavelength within a range from about 400 nm to about 650 nm, or

the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.

21. A method of manufacturing a phthalocyanine dye-targeting molecule conjugate, comprising:

a) dissolving a phthalocyanine dye in a solvent to a concentration of about 0.1 -100 mg/mL;

b) contacting a targeting molecule with the phthalocyanine dye at a molar ratio of dye to targeting molecule from 1:1 to 1000:1 under conditions to produce a conjugate comprising the phthalocyanine dye linked to the targeting molecule;

c) formulating the conjugate in a pharmaceutically acceptable buffer to a concentration from or from about 0.01 to about 200.0 mg/mL; and

~~d) packaging the conjugate in one or more light-protected container,~~

~~wherein in each of steps a) – d):~~

~~the only light to which the dye and conjugate are exposed has a wavelength within a range from about 400 nm to about 650 nm, or~~

~~the only light to which the dye and conjugate are exposed has an intensity of less than 500 lux.~~

~~22. The method of claim 21, wherein the phthalocyanine dye is covalently or non-covalently linked to the targeting molecule.~~

~~23. The method of claim 21 or claim 22, wherein the phthalocyanine dye comprises a reactive chemical group and contacting the phthalocyanine dye and targeting molecule produces a conjugate comprising the phthalocyanine dye covalently bound to an attachment group of the targeting molecule.~~

~~24. The method of any of claims 1-23, wherein during the method the total exposure of the dye and conjugate to any light is for no more than 5000 lux hours, no more than 2500 lux hours, no more than 1000 lux hours, no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours or no more than 80 lux hours.~~

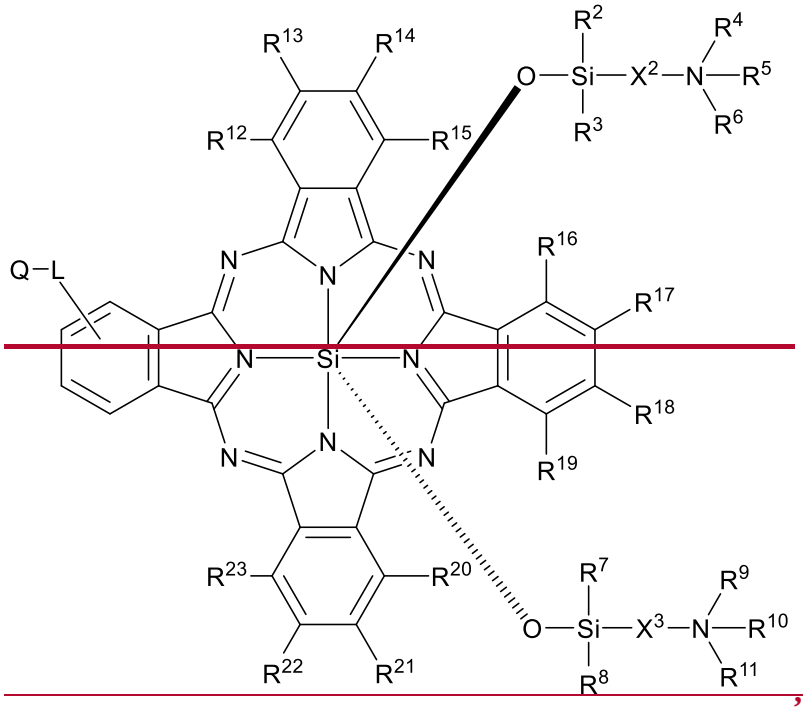
~~25. The method of any of claims 20-24, wherein during the packaging step the total exposure of the conjugate to any light is for no more than 5000 lux hours, no more than 2500 lux hours, no more than 1000 lux hours, no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours or no more than 80 lux hours.~~

~~26. The method of any of claims 1-25, wherein the dye has a maximum absorption wavelength from or from about 600 nm to about 850 nm.~~

~~27. The method of any of claims 1-26, wherein the dye has a maximum absorption wavelength from or from about 650 nm to about 850 nm.~~

~~28. The method of any of claims 1-27, wherein the dye has a maximum absorption wavelength from or from about 680 nm to about 850 nm.~~

29. The method of any of claims 1-28, wherein the phthalocyanine dye comprises the formula:



, wherein:

L is a linker;

Q is a reactive group for attachment of the dye to the targeting molecule;

R^2, R^3, R^7, and R^8 are each independently selected from among optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group;

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22} and R^{23} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy; and

X^2 and X^3 are each independently C_1–C_{10} alkylene, optionally interrupted by a heteroatom.

30. The method of any of claims 1-29, wherein the reactive group is selected from among an amine-reactive chemical group, a sulfhydryl-reactive chemical group, an activated ester, an acyl halide, an alkyl halide, an anhydride, a carboxylic acid, a carbodiimide, a

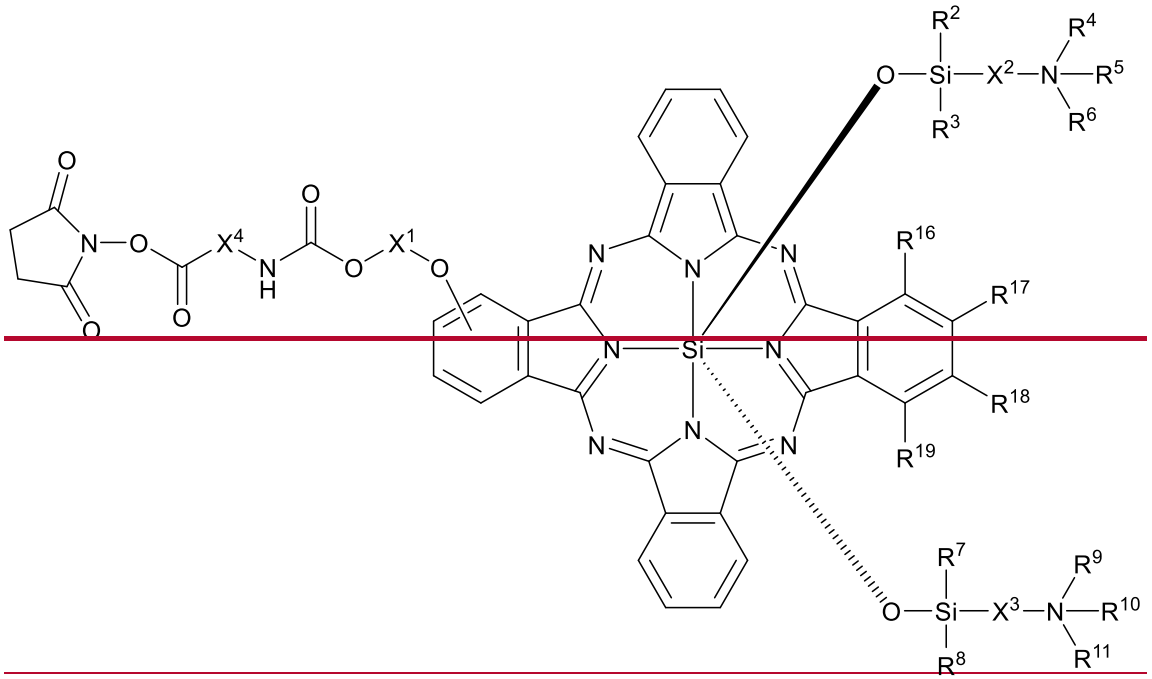
carbonate, a carbamate, a haloacetamide, an isocyanate, an isothiocyanate, a maleimide, a phosphoramidite, a platinum complex, a sulfonate ester and a thiocyanate.

31. The method of any of claims 30, wherein the reactive chemical group is a sulfhydryl-reactive chemical group selected from among maleimides, haloacetyls and pyridyl disulfides.

32. The method of any of claims 1-30, wherein the phthalocyanine dye is covalently bound to a lysine residue of the targeting molecule.

33. The method of claim 32, wherein the reactive group is an amine-reactive chemical group that is an N-hydroxysuccinimide (NHS) ester.

34. The method of any of claims 1-30 and 32-33, wherein the phthalocyanine dye comprises the formula:



, wherein:

X^1 and X^4 are each independently a C_1-C_{10} alkylene optionally interrupted by a heteroatom;

R^2, R^3, R^7, and R^8 are each independently selected from optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group; and

R^{16}, R^{17}, R^{18} and R^{19} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy.

35. The method of any of claims 1-34, wherein the phthalocyanine dye comprises IRDye 700DX-NHS (IR700-NHS).

36. The method of any of claims 1-35, wherein the targeting molecule binds to an antigen or protein directly or indirectly.

37. The method of claim 36, wherein the targeting molecule is a second binding molecule that binds to a first binding molecule, said first binding molecule being capable of binding to the antigen or protein.

38. The method of claim 36 or claim 37, wherein the targeting molecule is a secondary antibody.

39. The method of any of claims 1-38, wherein the targeting molecule binds a cell surface target molecule on a surface of a cell or a pathogen.

40. The method of claim 39, wherein the cell is a stem cell, a proliferating cell, a cell in a hyperplasia, or a pathogen infected cell.

41. The method of claim 39 or claim 40, wherein the pathogen is selected from among viruses, bacteria, fungi, biofilms, and other prokaryote cell systems.

42. The method of claim 39 or claim 40, wherein the cell is a cancer cell, a tumor cell, an inflammatory cell or a neuron.

~~43. The method of any of claims 39-42, wherein the cell is present in the microenvironment of a lesion associated with a disease or condition.~~

~~44. The method of claim 43, wherein the lesion is a tumor and the cell is a cancer cell or a tumor cell.~~

~~45. The method of claim 39 or claim 40, wherein the cell is a cancer stem cell or a circulating tumor cell.~~

~~46. The method of claim 42, wherein the inflammatory cell is a leukocyte selected from among a neutrophil, an eosinophil, a basophil, a lymphocyte, and a monocyte.~~

~~47. The method of claim 42, wherein the neuron is a peripheral nervous system neuron or a central nervous system neuron.~~

~~48. The method of claim 42 or claim 47, wherein the neuron is a nociceptor selected from among thermal nociceptors, mechanical nociceptors, chemical nociceptors and polymodal nociceptors.~~

~~49. The method of any of claims 39-48, wherein the cell surface target molecule comprises an antigen, a polypeptide, a lipid, or a carbohydrate, or a combination thereof.~~

~~50. The method of any of claims 39-49, wherein the cell surface target molecule is selected from among cell membrane phospholipids, prokaryotic peptidoglycans, bacterial cell envelop proteins, viral capsid proteins, ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4-integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2,~~

~~GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, IL11-R, IL-13R, ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase-3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4, and Y5.~~

~~51. The method of any of claims 39-50, wherein the cell surface target molecule is selected from among HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR),VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK-4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, and SMO.~~

52. The method of any of claims 39-51, wherein the cell surface target molecule is HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen (CEA).

53. The method of any of claims 1-52, wherein at least part of the targeting molecule is selected from or is a combination of a protein, a glycoprotein, an antibody, an antibody fragment, an antigen, an antigen binding fragment, a peptide, a polypeptide, a tissue homing peptide, a small molecule, a polymeric synthetic molecule, a polymeric nanoparticle, a liposome, an enzyme substrate, a hormone, a neurotransmitter, a cell metabolite, a viral particle, a viral capsid, a viral nanoparticle, a bacterial particle, a marker, a cell, a hapten, an avidin, a streptavidin, a monomeric streptavidin, a biotin, a carbohydrate, an oligosaccharide, a polysaccharide, a nucleic acid, a deoxy nucleic acid, a fragment of DNA, a fragment of RNA, an aptamer, nucleotide triphosphates, acyclo terminator triphosphates, or PNA.

54. The method of any of claims 1-53, wherein the targeting molecule is a tissue-specific homing peptide.

55. The method of claim 54, wherein the homing peptide has the sequence of amino acids as set forth in any of SEQ ID NOS: 1-52.

56. The method of any of claims 1-53, wherein the targeting molecule is an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a NGR polypeptide, an iNGR polypeptide, or an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion.

57. The method of any of claims 1-53, wherein the targeting molecule is selected from among adrenocorticotropic hormone (ACTH), angiotensin II, atrial natriuretic factor (ANF), bombesin, bradykinin, brain derived neurotropihic factor (BDNF), bone morphogenetic protein 2 (BMP-2), bone morphogenetic protein 6 (BMP-6), bone morphogenetic protein 7 (BMP-7), calcitonin, cardiotrophin 1 (BMP-2), CD22, CD40, cholecystokinin (CCK), ciliary neurotrophic factor (CNTF), CCL1-CCL28, CXCL1-CXCL17, XCL1, XCL2, CX3CL1, cripto 1 binding peptide, vascular endothelial cell growth

~~factor (VEGF), epidermal growth factor (EGF), endothelin 1, endothelin 1/3, FAS-ligand, fibroblast growth factor 1 (FGF-1), fibroblast growth factor 2 (FGF-2), fibroblast growth factor 4 (FGF-4), fibroblast growth factor 5 (FGF-5), fibroblast growth factor 6 (FGF-6), fibroblast growth factor 1 (FGF-7), fibroblast growth factor 1 (FGF-10), Flt-3, gastrin, gastrin releasing peptide (GRP), granulocyte colony-stimulating factor (G-CSF), granulocyte macrophage stimulating factor (GM-CSF), glucagon like peptide (GLP-1), hepatocyte growth factor (HGF), interferon alpha (IFN-a), interferon beta (IFN-b), interferon gamma (IFNg), insulin-like growth factor 1(IGF-1), insulin-like growth factor 2 (IGF-2), interleukin 1 (IL-1), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL-6), interleukin 7 (IL-7), interleukin 8 (IL-8), interleukin 9 (IL-9), interleukin 10 (IL-10), interleukin 11 (IL-11), interleukin 12 (IL-12), interleukin 13 (IL-13), interleukin 15 (IL-15), interleukin 17 (IL-17), interleukin 19 (IL-19), luteinizing hormone (LH), luteinizing-releasing hormone (LHRH), macrophage colony-stimulating factor (M-CSF), monocyte chemotactic protein 1 (MCP-1), macrophage inflammatory protein 3a (MIP-3a), macrophage inflammatory protein 3b (MIP-3b), nerve growth factor (NGF), neuromedin B, neurotrophin 3 (NT-3), neurotrophin 4 (NT-4), neurotensin, neuropeptide Y, oxytocin, pituitary adenylate cyclase activating peptide (PACAP), platelet derived growth factor AA (PDGF-AA), platelet derived growth factor AB (PDGF-AB), platelet derived growth factor BB (PDGF-BB), platelet derived growth factor CC (PDGF-CC), platelet derived growth factor DD (PDGF-DD), netrin-1 (NTN1), netrin-2 (NTN2), netrin-4 (NTN4), netrin-G1 (NTNG1) and netrin-G2 (NTNG2), ephrin A1 (EFNA1), ephrin A2 (EFNA2), ephrin A3 (EFNA3), ephrin A4 (EFNA4), ephrin A5 (EFNA5), semaphorin 3A (SEMA3A), semaphorin 3B (SEMA3B), semaphorin 3C (SEMA3C), semaphorin 3D (SEMA3D), semaphorin 3F (SEMA3F), semaphorin 3G (SEMA3G), semaphorin 4A (SEMA4A), semaphorin 4B (SEMA4B), semaphorin 4C (SEMA4C), semaphorin 4D (SEMA4D), semaphorin 4F (SEMA4F), semaphorin 4G (SEMA4G), semaphorin 5A (SEMA5A), semaphorin 5B (SEMA5B), semaphorin 6A (SEMA6A), semaphorin 6B (SEMA6B), semaphorin 6D (SEMA6D), semaphorin 7A (SEMA7A), SLIT1, SLIT2, SLIT3, SLIT and NTRK-like family, member 1 (SLITRK1), SLIT and NTRK-like family, member 2 (SLITRK2), SLIT and NTRK-like family, member 3 (SLITRK3), SLIT and NTRK-like family, member 4 (SLITRK4), SLIT and NTRK-like family, member 5 (SLITRK5), SLIT and NTRK-like family, member 6 (SLITRK6), prostaglandin E2 (PGE2), RANTES, Somatostatin-14, Somatostatin-28, stem cell factor (SCF), stromal cell derived factor 1 (SDF-1), substance P, thyroid stimulating hormone (TSH), transforming growth factor alpha (TGF-α), transforming growth factor beta~~

~~(TGF-b), tumor necrosis factor alpha (TNF-α), thrombin, vasoactive intestinal peptide (VIP), Wntl, Wnt2, Wnt2b/13, Wnt3, Wnt3a, Wnt4, Wnt5a, Wnt5b, Wnt6, Wnt7a, Wnt7b, Wnt7c, Wnt8, Wnt8a, Wnt8b, Wnt8c, Wntl0a, Wntl0b, Wnt11, Wnt14, Wnt15, or Wnt16, Sonic hedgehog, Desert hedgehog, and Indian hedgehog.~~

~~58. The method of any of claims 1-53, wherein the targeting molecule is an antibody or an antibody fragment.~~

~~59. The method of claim 58, wherein the antibody is selected from among cetuximab, panitumumab, zalutumumab, nimotuzumab, trastuzumab, Ado-trastuzumab emtansine, Tositumomab (Bexxar ®), Rituximab (Rituxan, Mabthera), Ibritumomab tiuxetan (Zevalin), Daclizumab (Zenapax), Gemtuzumab (Mylotarg), Alemtuzumab, CEA-scan Fab fragment, OC125 monoclonal antibody, ab75705, B72.3, Bevacizumab (Avastin ®), Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Erlotinib, Everolimus, Ibrutinib, Imatinib, Lapatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Pertuzumab, Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Basiliximab, Ipilimumab, Nivolumab, pembrolizumab, BMS-935559, MPDL3280A, Pidilizumab (CT-011), AMP-224, MSB001078C, and MEDI4736, or is an antigen-binding fragment thereof.~~

~~60. The method of claim 58, wherein the antibody binds to a cell surface target molecule selected from among HER1/EGFR, HER2, PD-L1, and carcinoembryonic antigen (CEA).~~

~~61. The method of any of claims 58-60, wherein the antibody is selected from among cetuximab, Panitumumab, Trastuzumab, BMS-935559, MEDI4736, MPDL3280A and MSB0010718C, or is an antigen-binding fragment thereof.~~

~~62. The method of any of claims 1-61, wherein the dye-targeting molecule conjugate is selected from among cetuximab-IR700, Panitumumab-IR700, Trastuzumab-IR700, BMS-935559-IR700, MEDI4736-IR700, MPDL3280A-IR700 and MSB0010718C-IR700.~~

~~63. The method of any of claims 1-62, wherein step b) of contacting a targeting molecule with the phthalocyanine dye is at a molar ratio of dye to targeting molecule from 1:1 to 100:1 or 1:1 to 10:1.~~

~~64. The method of any of claims 1-63, wherein the molar ratio of dye to targeting molecule is at least or at least about 4:1 or is at least or at least about 10:1.~~

~~65. The method of any of claims 1-64, wherein the produced conjugate comprises from or from about 1 to about 1000 phthalocyanine dye molecules per targeting molecule, from or from about 1 to about 10 phthalocyanine dye molecules per targeting molecule or from or from about 2 to about 5 phthalocyanine dye molecules per targeting molecule.~~

~~66. The method of any of claims 1-65, wherein the conjugate is formulated to a concentration that is from or from about 1.0 to about 5.0 mg/mL.~~

~~67. The method of any of claims 1-66, wherein the pharmaceutically acceptable buffer is phosphate buffered saline.~~

~~68. The method of any of claims 1-67, wherein the pharmacologically acceptable buffer comprises a pH from or from about pH 6.0 to about pH 8.0, wherein the conjugate is stable for greater than 3 months.~~

~~69. The method of claim 68, wherein the conjugate is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time.~~

~~70. The method of claim 68, wherein the conjugate is stable if greater than 90% of the conjugate is present as a main monomer component.~~

~~71. The method of any of claims 68-70, wherein the pharmacologically acceptable buffer comprises a pH from or from about pH 6.8 to about pH 7.4.~~

72. The method of any of claims 1-71, wherein the only light to which the dye and conjugate are exposed has a wavelength within a range from about 425 nm to about 575 nm.

73. The method of any of claims 1-72, wherein the only light to which the dye and conjugate are exposed has an intensity of less than 200 lux.

74. The method of any of claims 20-73, wherein the container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

75. The method of claim 74, wherein the container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

76. The method of any of claims 20-75, wherein the container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

77. The method of any of claims 20-76, wherein the container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.

78. The method of any of claims 20-77, wherein the light-protected container is a first light-protected container and the method further comprises packing the first light-protected container into a second light-protected container.

79. The method of claim 78, wherein the second container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

80. The method of claim 78 or claim 79, wherein the second container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

~~81. The method of any of claims 78-80, wherein the second container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~82. The method of any of claims 78-81, wherein the second container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.~~

~~83. The method of any of claims 78-82, further comprising packaging the second container into a third light-protected container.~~

~~84. The method of claim 83, wherein the third container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.~~

~~85. The method of claim 84, wherein the third container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~86. The method of claim 84 or claim 85, wherein the third container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~87. The method of any of claims 83-86, wherein the third container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.~~

~~88. The method of any of claims 1-87, wherein the amount of the conjugate produced by the method is greater than or greater than about 1 gram, greater than or greater than about 2 grams, greater than or greater than about 3 grams, greater than or greater than about 4 grams, greater than or greater than about 5 grams or greater than or greater than about 10 grams.~~

~~89. The method of any of claims 1-88, wherein the conjugate is produced using good manufacturing practice (GMP).~~

~~90. A conjugate produced, formulated or packaged by the method of any of claims 1-89.~~

~~91. The conjugate of claim 90, that is stable for greater than three months.~~

~~92. A stable conjugate, comprising a phthalocyanine dye linked to a targeting molecule, wherein the conjugate is stable for greater than three months.~~

~~93. The conjugate or stable conjugate of claim 91 or claim 92, wherein the conjugate is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time.~~

~~94. The conjugate or stable conjugate of claim 91 or claim 92, wherein the conjugate is stable if greater than 90% of the conjugate is present as a main monomer component.~~

~~95. The conjugate or stable conjugate of claim 94, wherein the conjugate is stable if greater than 95% of the conjugate is present as a main monomer component.~~

~~96. The conjugate or stable conjugate of any of claims 90-95, wherein the conjugate is stable for greater than 6 months or greater than 12 months.~~

~~97. The conjugate or stable conjugate of any of claims 90-96, wherein the conjugate is stable at a temperature of less than 30 ºC.~~

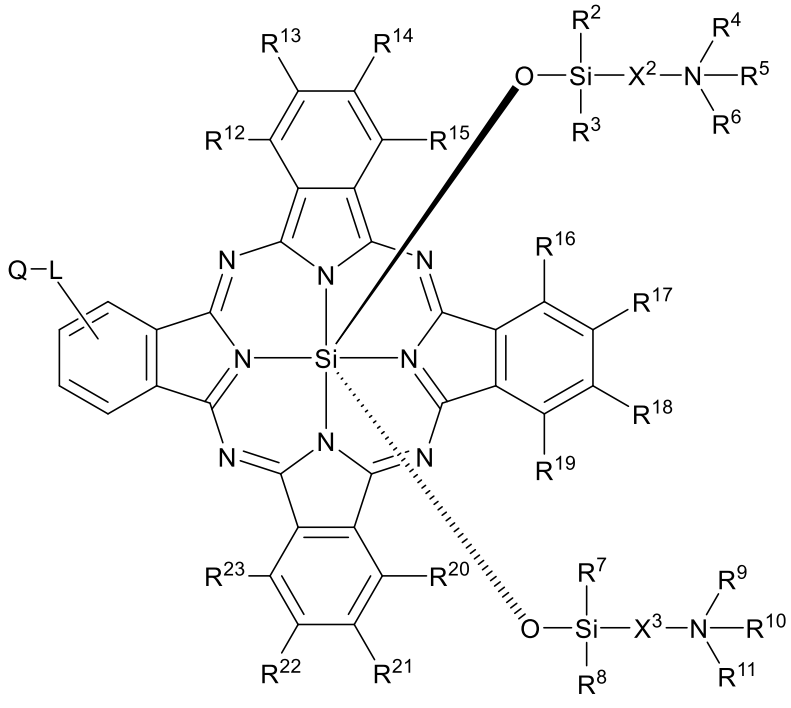
~~98~~1. A pharmaceutical composition comprising:

(i) a conjugate containing a phthalocyanine dye linked to a targeting molecule; and

(ii) a pharmaceutically acceptable excipient;

wherein the targeting molecule binds to a cell surface target molecule on a surface of a cell or pathogen,

~~The conjugate or stable conjugate of any of claims 90-97,~~ wherein the phthalocyanine dye comprises the formula:



, wherein:

L is a linker;

Q is a reactive group for attachment of the dye to the targeting molecule;

R^2, R^3, R^7, and R^8 are each independently selected from among optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group;

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17}, R^{18}, R^{19}, R^{20}, R^{21}, R^{22} and R^{23} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy; and

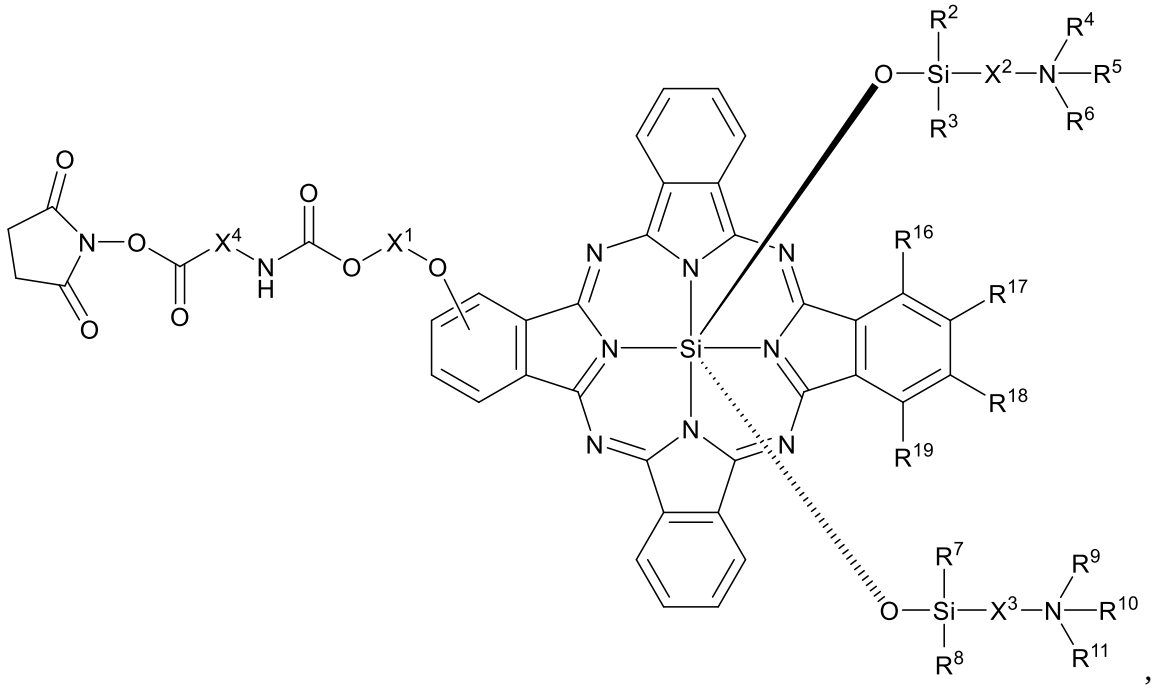
X^2 and X^3 are each independently C_1–C_{10} alkylene, optionally interrupted by a heteroatom; and

wherein greater than 90% of the conjugate is present as a main monomer component.

2. The pharmaceutical composition of claim 1, wherein greater than 95% of the conjugate is present as a main monomer component.

3. The pharmaceutical composition of claim 1 or claim 2, wherein greater than 90% or greater than 95% of the conjugate is present as a main monomer component for greater than three months.

~~994~~. The pharmaceutical composition of any one of claims 1-3~~The conjugate or stable conjugate of any of claims 90-98~~, wherein the phthalocyanine dye comprises the formula:



wherein:

X^1 and X^4 are each independently a C_1-C_{10} alkylene optionally interrupted by a heteroatom;

R^2, R^3, R^7, and R^8 are each independently selected from optionally substituted alkyl and optionally substituted aryl;

R^4, R^5, R^6, R^9, R^{10}, and R^{11} are each independently selected from among hydrogen, optionally substituted alkyl, optionally substituted alkanoyl, optionally substituted alkoxycarbonyl, optionally substituted alkylcarbamoyl, and a chelating ligand, wherein at least one of R^4, R^5, R^6, R^9, R^{10}, and R^{11} comprises a water soluble group; and

R^{16}, R^{17}, R^{18} and R^{19} are each independently selected from among hydrogen, halogen, optionally substituted alkylthio, optionally substituted alkylamino and optionally substituted alkoxy.

~~100. The conjugate or stable conjugate of any of claims 90-99, wherein the dye has a maximum absorption wavelength from or from about 600 nm to about 850 nm, from or from about 650 nm to about 850 nm, or from or from about 680 nm to about 850 nm.~~

~~1015~~. The pharmaceutical composition of any one of claims 1-4~~The conjugate or stable conjugate of any of claims 90-100~~, wherein the dye comprises IRDye 700DX (IR700).

~~102. The conjugate or stable conjugate of any of claims 90-101, wherein the targeting molecule binds a cell surface target molecule on a surface of a cell or a pathogen.~~

~~103. The conjugate or stable conjugate of any of claims 90-102, wherein the cell is a stem cell, a proliferating cell, a cell in a hyperplasia, or a pathogen infected cell.~~

~~104. The conjugate or stable conjugate of claim 102 or claim 103, wherein the pathogen is selected from among viruses, bacteria, fungi, biofilms, and other prokaryote cell systems.~~

~~105. The conjugate or stable conjugate of claim 102 or claim 103, wherein the cell is a proliferating cell, a cancer cell, a cell in a hyperplasia, a tumor cell, an inflammatory cell, a neuron, or a pathogen.~~

~~106. The conjugate or stable conjugate of claim 105, wherein the inflammatory cell is a leukocyte selected from among neutrophils, eosinophils, basophils, lymphocytes, and monocytes.~~

~~107. The conjugate or stable conjugate of claim 105, wherein the neuron is a peripheral nervous system neuron or a central nervous system neuron.~~

~~108. The conjugate or stable conjugate of claim 105 or claim 107, wherein the neuron is a nociceptor selected from among thermal nociceptors, mechanical nociceptors, chemical nociceptors and polymodal nociceptors.~~

~~109. The conjugate or stable conjugate of any of claims 102-108, wherein the cell surface target molecule comprises an antigen, a polypeptide, a lipid, or a carbohydrate, or a combination thereof.~~

~~110. The conjugate or stable conjugate of any of claims 102-109, wherein the cell surface target molecule is selected from among cell membrane phospholipids, prokaryotic peptidoglycans, bacterial cell envelop proteins, viral capsid proteins, ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4 integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV-16/18 and E6/E7 antigens, hTERT, IL11-R, IL-13R, ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE-1, MAGE-2, MAGE-3, MAGE-4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor-1, Y1, Y2, Y4, and Y5.~~

~~111. The conjugate or stable conjugate of any of claims 102-110, wherein the cell surface target molecule is selected from among HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR),VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK-4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, and SMO.~~

~~112. The conjugate or stable conjugate of any of claims 102-111, wherein the cell surface target molecule is HER1/EGFR, HER2, PD-L1, CD25, EpCAM, EphA2, CD206, CD20, CD44, CD133, Mesothelin, Glypican-3, or carcinoembryonic antigen (CEA).~~

~~113. The conjugate or stable conjugate of any of claims 90-112, wherein at least part of the targeting molecule is selected from or is a combination of a protein, a glycoprotein, an antibody, an antibody fragment, an antigen, an antigen binding fragment, a peptide, a polypeptide, a tissue homing peptide, a small molecule, a polymeric synthetic molecule, a polymeric nanoparticle, a liposome, an enzyme substrate, a hormone, a neurotransmitter, a cell metabolite, a viral particle, a viral capsid, a viral nanoparticle, a bacterial particle, a marker, a cell, a hapten, an avidin, a streptavidin, a monomeric streptavidin, a biotin, a carbohydrate, an oligosaccharide, a polysaccharide, a nucleic acid, a deoxy nucleic acid, a fragment of DNA, a fragment of RNA, an aptamer, nucleotide triphosphates, acyclo terminator triphosphates, or PNA.~~

~~114. The conjugate or stable conjugate of any of claims 90-113, wherein the targeting molecule is a tissue-specific homing peptide.~~

115. The conjugate or stable conjugate of claim 114, wherein the homing peptide has the sequence as set forth in any of SEQ ID NOs: 1-52.

116. The conjugate or stable conjugate of any of claims 90-113, wherein the targeting molecule is an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a NGR polypeptide, an iNGR polypeptide, or an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion.

117. The conjugate or stable conjugate of any of claims 90-113, wherein the targeting molecule is selected from among adrenocorticotropic hormone (ACTH), angiotensin II, atrial natriuretic factor (ANF), bombesin, bradykinin, brain derived neurotropihic factor (BDNF), bone morphogenetic protein 2 (BMP-2), bone morphogenetic protein 6 (BMP-6), bone morphogenetic protein 7 (BMP-7), calcitonin, cardiotrophin 1 (BMP-2), CD22, CD40, cholecystokinin (CCK), ciliary neurotrophic factor (CNTF), CCL1-CCL28, CXCL1-CXCL17, XCL1, XCL2, CX3CL1, cripto 1 binding peptide, vascular endothelial cell growth factor (VEGF), epidermal growth factor (EGF), endothelin 1, endothelin 1/3, FAS-ligand, fibroblast growth factor 1 (FGF-1), fibroblast growth factor 2 (FGF-2), fibroblast growth factor 4 (FGF-4), fibroblast growth factor 5 (FGF-5), fibroblast growth factor 6 (FGF-6), fibroblast growth factor 1 (FGF-7), fibroblast growth factor 1 (FGF-10), Flt-3, gastrin, gastrin releasing peptide (GRP), granulocyte colony-stimulating factor (G-CSF), granulocyte macrophage stimulating factor (GM-CSF), glucagon like peptide (GLP-1), hepatocyte growth factor (HGF), interferon alpha (IFN-a), interferon beta (IFN-b), interferon gamma (IFNg), insulin-like growth factor 1(IGF-1), insulin-like growth factor 2 (IGF-2), interleukin 1 (IL-1), interleukin 2 (IL-2), interleukin 3 (IL-3), interleukin 4 (IL-4), interleukin 5 (IL-5), interleukin 6 (IL-6), interleukin 7 (IL-7), interleukin 8 (IL-8), interleukin 9 (IL-9), interleukin 10 (IL-10), interleukin 11 (IL-11), interleukin 12 (IL-12), interleukin 13 (IL-13), interleukin 15 (IL-15), interleukin 17 (IL-17), interleukin 19 (IL-19), luteinizing hormone (LH), luteinizing-releasing hormone (LHRH), macrophage colony-stimulating factor (M-CSF), monocyte chemotactic protein 1 (MCP-1), macrophage inflammatory protein 3a (MIP-3a), macrophage inflammatory protein 3b (MIP-3b), nerve growth factor (NGF), neuromedin B, neurotrophin 3 (NT-3), neurotrophin 4 (NT-4), neurotensin, neuropeptide Y, oxytocin, pituitary adenylate cyclase-activating peptide (PACAP), platelet derived growth factor AA

~~(PDGF-AA), platelet derived growth factor AB (PDGF-AB), platelet derived growth factor BB (PDGF-BB), platelet derived growth factor CC (PDGF-CC), platelet derived growth factor DD (PDGF-DD), netrin-1 (NTN1), netrin-2 (NTN2), netrin-4 (NTN4), netrin-G1 (NTNG1) and netrin-G2 (NTNG2), ephrin A1 (EFNA1), ephrin A2 (EFNA2), ephrin A3 (EFNA3), ephrin A4 (EFNA4), ephrin A5 (EFNA5), semaphorin 3A (SEMA3A), semaphorin 3B (SEMA3B), semaphorin 3C (SEMA3C), semaphorin 3D (SEMA3D), semaphorin 3F (SEMA3F), semaphorin 3G (SEMA3G), semaphorin 4A (SEMA4A), semaphorin 4B (SEMA4B), semaphorin 4C (SEMA4C), semaphorin 4D (SEMA4D), semaphorin 4F (SEMA4F), semaphorin 4G (SEMA4G), semaphorin 5A (SEMA5A), semaphorin 5B (SEMA5B), semaphorin 6A (SEMA6A), semaphorin 6B (SEMA6B), semaphorin 6D (SEMA6D), semaphorin 7A (SEMA7A), SLIT1, SLIT2, SLIT3, SLIT and NTRK-like family, member 1 (SLITRK1), SLIT and NTRK-like family, member 2 (SLITRK2), SLIT and NTRK-like family, member 3 (SLITRK3), SLIT and NTRK-like family, member 4 (SLITRK4), SLIT and NTRK-like family, member 5 (SLITRK5), SLIT and NTRK-like family, member 6 (SLITRK6), prostaglandin E2 (PGE2), RANTES, Somatostatin-14, Somatostatin-28, stem cell factor (SCF), stromal cell derived factor 1 (SDF-1), substance P, thyroid stimulating hormone (TSH), transforming growth factor alpha (TGF-α), transforming growth factor beta (TGF-b), tumor necrosis factor alpha (TNF-α), thrombin, vasoactive intestinal peptide (VIP), Wntl, Wnt2, Wnt2b/13, Wnt3, Wnt3a, Wnt4, Wnt5a, Wnt5b, Wnt6, Wnt7a, Wnt7b, Wnt7c, Wnt8, Wnt8a, Wnt8b, Wnt8c, Wntl0a, Wntl0b, Wnt11, Wnt14, Wnt15, or Wnt16, Sonic hedgehog, Desert hedgehog, and Indian hedgehog.~~

~~1186~~. The pharmaceutical composition of any of claims 1-5~~The conjugate or stable conjugate of any of claims 90-113~~, wherein the targeting molecule is an antibody or an antibody fragment.

7. The pharmaceutical composition of any one of claims 1-6, wherein:

the cell surface target molecule is selected from among cell membrane phospholipids, prokaryotic peptidoglycans, bacterial cell envelop proteins, viral capsid proteins, ACTHR, endothelial cell Anxa-1, aminopeptidase N, IL-6R, alpha-4-integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7,

CD15, CD34, CD44, CD206, CD271, CEA (Carcinoembryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, IL11-R, IL-13R, ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family, P2X1-5, mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP, TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3, TSH receptor, VEGF receptors, VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, VEGF-3 or FLT-4, voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4, and Y5.

8. The pharmaceutical composition of any one of claims 1-7, wherein the cell surface target molecule is selected from among PD-L1, HER1/EGFR, HER2, CD20, CD25, CD33, CD52, and prostate specific membrane antigen (PSMA).

9. The pharmaceutical composition of any one of claims 1-8, wherein the cell surface target molecule is HER1/EGFR.

10. The pharmaceutical composition of any one of claims 1-9, wherein the targeting molecule is cetuximab or an antigen-binding fragment thereof.

~~119. The conjugate or stable conjugate of claim 118, wherein the antibody is selected from among cetuximab, panitumumab, zalutumumab, nimotuzumab, trastuzumab, Ado-trastuzumab emtansine, Tositumomab (Bexxar ®), Rituximab (Rituxan, Mabthera), Ibritumomab tiuxetan (Zevalin), Daclizumab (Zenapax), Gemtuzumab (Mylotarg), Alemtuzumab, CEA-scan Fab fragment, OC125 monoclonal antibody, ab75705, B72.3, Bevacizumab (Avastin ®), Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Erlotinib, Everolimus, Ibrutinib, Imatinib, Lapatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Pertuzumab, Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Basiliximab, Ipilimumab, Nivolumab, pembrolizumab, BMS-935559, MPDL3280A, Pidilizumab (CT-011), AMP-224, MSB001078C, and MEDI4736, or is an antigen-binding fragment thereof.~~

~~120. The conjugate or stable conjugate of claim 118 or claim 119, wherein the antibody binds to a cell surface target molecule selected from among HER1/EGFR, HER2 PD-L1, and carcinoembryonic antigen (CEA).~~

~~121. The conjugate or stable conjugate of any of claims 118-120, wherein the antibody is selected from among cetuximab, Panitumumab, Trastuzumab, BMS-935559, MEDI4736, MPDL3280A and MSB0010718C, or is an antigen-binding fragment thereof.~~

~~122. The conjugate or stable conjugate of any of claims 118-121, wherein the dye-targeting molecule conjugate is selected from among cetuximab-IR700, Panitumumab-IR700, Trastuzumab-IR700, BMS-935559-IR700, MEDI4736-IR700, MPDL3280A-IR700 and MSB0010718C-IR700.~~

~~123. The conjugate or stable conjugate of any of claims 90-122, wherein the conjugate comprises from or from about 1 to about 1000 phthalocyanine dye molecules per targeting molecule, from or from about 1 to about 10 or from or from about 2 to about 5 phthalocyanine dye molecules per targeting molecule.~~

~~124. A composition comprising the conjugate or stable conjugate of any of claims 90-123 and 234-236.~~

~~125. A pharmaceutical composition comprising the conjugate or stable conjugate of any of claims 90-123 and 234-236 and a pharmaceutically acceptable excipient.~~

~~126. The composition of claim 124 or claim 125, that is formulated in phosphate buffered saline.~~

~~127. The composition of any of claims 124-126 that has a pH of greater than 6.0.~~

~~128. A pharmaceutical composition, comprising a phthalocyanine dye linked to a targeting molecule and a pharmaceutically acceptable excipient, wherein:~~
~~the composition has a pH of greater than 6.0; and~~
~~the conjugate in the composition is stable for greater than three months.~~

~~129. The pharmaceutical composition of claim 128, wherein the conjugate in the composition is stable if it retains greater than or greater than about 30%, 40%, 50%, 60%, 70%, 80%, 90% or more of its potency, activity or purity for greater than 3 months compared to the conjugate prior to the storage for the time.~~

~~130 The pharmaceutical composition of claim 128, wherein the conjugate in the composition is stable if greater than 90% of the conjugate is present as a main monomer component.~~

~~131. The composition of any of claims 127-130, wherein the pH is greater than 6.0 or is from or from about pH 6.0 to about 8.0, inclusive.~~

~~132~~11. The pharmaceutical composition of any one of claims 1-10~~composition of any of claims 124-131~~, wherein the concentration of the conjugate in the composition is from or from about 0.01 mg/mL to about 200 mg/mL.

~~133~~12. The pharmaceutical composition of any one of claims 1-11~~composition of any of claims 124-132~~, wherein the concentration of the conjugate in the composition is from or from about 0.5 mg/mL to about 10 mg/mL.

~~134. The composition of any of claims 124-133, wherein the concentration of the conjugate in the composition is from or from about 1.0 to about 5.0 mg/mL.~~

~~135. The composition of any of claims 124-134, wherein the concentration of the conjugate in the composition is from or from about 1.8 to about 2.1 mg/mL.~~

~~136. The composition of any of claims 124-135, wherein the volume of the composition is from or from about 0.5 mL to about 100 mL, from or from about 1 mL to about 50 mL or from or from about 1 mL to about 10 mL.~~

~~137. A container comprising the conjugate or stable conjugate of any of claims 90-123 and 234-236 or composition of any of claims 124-136.~~

~~138~~13. ~~The~~ A container comprising the composition of any one of claims 1- 12~~of claim 137~~, wherein the container protects from transmission of light having a wavelength from or from about 500 nm to about 725 nm~~ or from about 650 nm to about 725 nm~~.

14. The container of claim 13, wherein the container protects from transmission of light having a wavelength from about 650 nm to about 725 nm.

~~139~~15. The container of claim 13 or claim 14~~claim 137 or claim 138~~, wherein the container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

~~140~~16. The container of any one of claims 13-15~~of claims 137-139~~, wherein the container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

~~141~~17. A packaging system for protecting a phthalocyanine dye-targeting molecule conjugate from light comprising:

a first container comprising the container of any one of claims 13-16~~of claims 137-140~~; and

a second container comprising the first container, wherein the second container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

~~142~~18. The packaging system of claim ~~141~~17, wherein the second container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

~~143~~19. The packaging system of claim 17 or claim 18~~claim 141 or claim 142~~, wherein the second container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

~~144. The packaging system of any of claims 141-143, wherein the first binding molecule and second container are independently selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.~~

~~145. The packaging system of any of claims 141-144, further comprising a third container comprising the second container, wherein the third container protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.~~

~~146. The packaging system of claim 145, wherein the third container protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~147. The packaging system of claim 145 or claim 146, wherein the third container is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~148. The packaging system of any of claims 145-147, wherein the third container is selected from among a vial, a tube, a syringe, a bag, a pouch, and a box.~~

~~149~~20. A kit, comprising:

the container of any one of claims 13-16~~137-140~~ or the packaging system of any one of claims 17-19~~141-148~~;

a light-protected cover capable of covering a device capable of administering a composition comprising a phthalocyanine dye-targeting molecule conjugate; and

optionally instructions for use.

~~150. The kit of claim 149, wherein the administration device is an intravenous infusion bag.~~

~~151. The kit of claim 149 or claim 150, wherein the light-protected cover protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.~~

~~152. The kit of any of claims 149-151, wherein the light-protected cover protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~153. The kit of any of claims 149-152, wherein the light-protected cover is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.~~

~~154. A method of preparing a composition comprising a phthalocyanine-dye conjugate for administration, comprising:~~

~~unpacking one or more containers of any of claims 137-140 or one or more of the packaging system of any of claims 141-148; and~~

~~transferring the composition present in the one or more containers into a device capable of administering the composition to a subject, wherein~~

~~the only light to which the composition is exposed has a wavelength within a range from about 400 nm to about 650 nm, or~~

~~the only light to which the composition is exposed has an intensity of less than 500 lux.~~

155. The method of claim 154, wherein the only light in which the composition is exposed has an intensity of less than 200 lux or less than 100 lux.

156. The method of claim 154 or claim 155 that is performed in a biosafety cabinet, biosafety hood or a sterile environment.

157. The method of any of claims 154-156, wherein the one or more containers together comprise a therapeutically effective dose of the phthalocyanine-dye conjugate.

158. The method of any of claims 154-157, wherein the one or more containers comprise at least or about at least or 2, 4, 6, 8, 10, 12, 18 or 24 containers.

159. The method of any of claims 154-158, wherein:
the method is carried out for no more than 1 hour, no more than 30 minutes or no more than 15 minutes; or
the total exposure of the composition to any light during the method is no more than 500 lux hours, no more than 250 lux hours, no more than 100 lux hours, no more than 50 lux hours or no more than 25 lux hours.

160. The method of any of claims 154-159, wherein the administration device is an intravenous infusion bag.

161. The method of any of claims 154-160, wherein the administration device comprises a light-protected cover capable of covering the device.

162. The method of claim 161, wherein the light-protected cover protects from transmission of light having a wavelength from or from about 250 nm to about 800 nm, from about 250 nm to about 450 nm, from about 400 nm to about 800 nm, from about 450 nm to about 650 nm, or from about 600 nm to about 720 nm.

163. The method of claim 161 or claim 162, wherein the light-protected cover protects from transmission of light such that the percentage of light transmission is less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

164. The method of any of claims 154-163, wherein the light-protected cover is green, blue, amber, translucent, opaque, or is covered by a material with light transmission of less than 50%, less than 40%, less than 30%, less than 20%, less than 10% or less than 5%.

165. A light-protected device comprising the composition prepared by the method of any of claims 154-164.

166. A method of removing unwanted cells or pathogens in a subject, comprising:
(a) administering a composition comprising a phthalocyanine-dye conjugate from the light-protected device of claim 165 to a subject, wherein prior to and during the administration step the composition is not exposed to an intensity of environmental light greater than 500 lux; and
(b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the subject.

167. A method of removing unwanted cells or pathogens in a sample, comprising:
(a) administering a composition comprising a phthalocyanine-dye conjugate from the light-protected device of claim 165 to a sample, wherein prior to and during the administration step the composition is not exposed to an intensity of environmental light greater than 500 lux; and
(b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the sample.

168. A method of removing unwanted cells or pathogens in a subject comprising:
a) administering to a subject a therapeutically effective amount of the conjugate or stable conjugate of any of claims 90-123 and 234-236 or composition of any of claims 124-136, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and
b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the subject.

169. A method of removing unwanted cells or pathogens in a sample comprising:
a) administering to a sample a therapeutically effective amount of the conjugate or stable conjugate of any of claims 90-123 and 234-236 or composition of any of claims 124-

136, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and

b) irradiating the unwanted cells or pathogens at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cell in the sample.

170. A method of removing unwanted cells or pathogens in a subject comprising:

a) administering to a subject a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule capable of binding an unwanted cell or pathogen, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and

b) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the subject.

171. A method of removing unwanted cells or pathogens in a sample comprising:

a) administering to a sample a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule capable of binding an unwanted cell or pathogen, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and

b) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the sample.

172. A method of removing unwanted cells or pathogens in a subject comprising:

a) administering to a subject a therapeutically effective amount of a first binding molecule capable of binding an unwanted cell or pathogen;

b) administering to the subject a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is a second binding molecule that is capable of binding to the first binding molecule; and

c) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the subject.

~~173. The method of claim 172, wherein the first binding molecule is administered to the subject prior to the conjugate or the first binding molecule and conjugate are administered simultaneously to the subject.~~

~~174. A method of removing unwanted cells or pathogens in a sample comprising:~~
~~a) administering to a sample a therapeutically effective amount of a first binding molecule capable of binding an unwanted cell or pathogen;~~
~~b) administering to the sample a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is a second binding molecule that is capable of binding to the first binding molecule; and~~
~~c) irradiating the unwanted cells or pathogens at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the unwanted cells or pathogens in the sample.~~

~~175. The method of any of claims 167, 169, 171 and 174, wherein the sample is a blood sample or a tissue sample.~~

~~176. The method of any of claims 167, 169, 171, 174 and 175, wherein the method is performed *in vitro* or *ex vivo*.~~

~~177. The method of claim 175, wherein the method is performed using an extracorporeal device.~~

~~178. The method of any of claims 172-177, wherein the first binding molecule is administered to the sample prior to the conjugate or the first binding molecule and conjugate are administered simultaneously to the sample.~~

~~179. The method of any of claims 166-178, wherein the targeting molecule is a secondary antibody.~~

~~180. The method of any of claims 166-179, wherein prior to and during the administration of the conjugate, the conjugate is not exposed to an intensity of environmental light greater than 500 lux.~~

~~181. The method of any of claims 166-180, wherein the cell is a stem cell, a proliferating cell, a cell in a hyperplasia, an inflammatory cell, a negative regulatory immune cell, which optionally is a T cell, a pathogen infected cell, a neuron, a fat cell or adipocyte.~~

~~182. The method of any of claims 166-181, wherein the cell is a cancer cell or a tumor cell.~~

~~183. The method of any of claims 166-182, wherein the cell is associated with, causes or contributes to the etiology of a disease or condition.~~

~~184. The method of claim 183, wherein the disease of condition is a tumor or cancer, an infection, an inflammatory disease or condition, or a neuronal disease or condition.~~

~~185. The method of claim 183 or claim 184, wherein:~~
~~the cell is a neuron and the disease or condition is a neurological disorder, which optionally is pain;~~
~~the cell is a fat cell or adipocyte and the disease or condition involves excess fat;~~
~~the cell is a pathogen infected cell and the disease or condition is an infection;~~
~~the cell is a pathogen and the disease or condition is an infection;~~
~~the cell is an inflammatory cell and the disease or condition is an inflammatory disease;~~
~~the cell is a an immune cell, which optionally is a regulatory T cell, and the disease or condition is a tumor or cancer; or~~
~~the cell is a tumor or cancer cell and the disease or condition is a tumor or a cancer.~~

~~186. The method of any of claims 166-185, wherein the cell is present in the microenvironment of a lesion associated with a disease or condition or is in a hyperplasia.~~

~~187. The method of claim 186, wherein the lesion is a tumor and the disease or condition is a tumor or cancer.~~

~~188. The method of any of claims 183-187, wherein the method treats the disease or condition.~~

~~189. A method of removing a pathogen infected cell in a subject comprising:~~

~~a) administering to a subject a therapeutically effective amount of a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is capable of binding to the pathogen infected cell directly or indirectly; and~~
~~b) irradiating the pathogen infected cell at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the pathogen infected cell in the subject.~~

~~190. A method of removing a pathogen infected cell in a sample comprising:~~
~~a) administering to a sample a therapeutically effective amount of a conjugate molecule comprising IRDye 700DX (IR700) linked to a targeting molecule, wherein the targeting molecule is capable of binding to the pathogen infected cell directly or indirectly; and~~
~~b) irradiating the pathogen infected cell at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby removing the pathogen infected cell in the sample.~~

~~191. The method of claim 190, wherein the sample is a blood sample or a tissue sample.~~

~~192. The method of claim 190 or claim 191, wherein the method is performed *in vitro* or *ex vivo*.~~

~~193. The method of claim 192, wherein the method is performed using an extracorporeal device.~~

~~194. The method of any of claims 189-192, wherein the pathogen is a virus, bacterium, fungus, biofilm, or other prokaryote cell system.~~

~~195. The method of any of claims 189-194, wherein prior to and during the administration of the conjugate, the conjugate is not exposed to an intensity of environmental light greater than 500 lux.~~

~~196~~21. Use of the pharmaceutical composition of any one of claims 1-12 in the manufacture of a medicament for~~A method of~~ treating a hyperplasia or a tumor in a human subject comprising:

a) ~~administering to the subject~~ a therapeutically effective amount of the ~~conjugate or stable conjugate of any of claims 90-123 and 234-236 or~~ composition to be administered to

the subject ~~of any of claims 124-136~~, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and

b) ~~irradiating~~ the hyperplasia or the tumor is to be irradiated at a wavelength of 600 to 800~~660 to 740~~ nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the subject.

~~197. A method of treating a hyperplasia or a tumor in a sample comprising:~~

~~a) administering to the sample a therapeutically effective amount of the conjugate or stable conjugate of any of claims 90-123 and 234-236 or composition of any of claims 124-136, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and~~

~~b) irradiating the hyperplasia or the tumor at a wavelength of 660 to 740 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the sample.~~

~~198. A method of treating a hyperplasia or a tumor in a subject comprising:~~

~~a) administering to the subject a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule that targets the conjugate to the tumor or hyperplasia, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and~~

~~b) irradiating the hyperplasia or a tumor at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the subject.~~

~~199. A method of treating a hyperplasia or a tumor in a sample comprising:~~

~~a) administering to the sample a therapeutically effective amount of a conjugate comprising IRDye 700DX (IR700) linked to a targeting molecule that targets the conjugate to the tumor or hyperplasia, wherein prior to and during the administration step the conjugate is not exposed to an intensity of environmental light greater than 500 lux; and~~

~~b) irradiating the hyperplasia or a tumor at a wavelength of 600 to 800 nm at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length thereby treating the tumor in the sample.~~

~~200. The method of claim 197 or claim 199, wherein the sample is a blood sample or a tissue sample.~~

~~201. The method of any of claims 197, 199 or 200, wherein the method is performed *in vitro* or *ex vivo*.~~

~~202. The method of claim 201, wherein the method is performed using an extracorporeal device.~~

~~203. The method of any of claims 196-202 that is for treating a tumor, wherein the targeting molecule of the conjugate targets the conjugate to the tumor or a microenvironment of the tumor.~~

~~204. The method of claim 203, wherein irradiating the tumor is at a wavelength of 600 to 800 nm and at a dose of at least 1 J cm^{-2} or 1 J/cm of fiber length, thereby treating the tumor.~~

~~205. The method of any of claims 166-204, wherein the targeting molecule is an antibody, an antigen binding fragment, a protein, a glycoprotein, a peptide, a polypeptide, a virus, a viral capsid, or a viral particle.~~

~~206. The method of any of claims 166-205, wherein the targeting molecule is an antibody or an antibody fragment.~~

~~207. The method of any of claims 166-206, wherein administration is performed under fluorescent lighting or LED lighting and in the absence of direct or indirect sunlight.~~

~~208. The method of any of claims 166-207, wherein prior to and during the administration step any exposure of the conjugate to light less than 500 lux is for less than 20 minutes, less than 15 minutes, less than 10 minutes or less than 5 minutes.~~

~~209. The method of claim 208, wherein the exposure of the conjugate to any light is light with an intensity that is not greater than 50 lux.~~

~~210. The method of any of claims 196-209, wherein the tumor is a cancer.~~

~~211~~22. The use of claim 21, wherein the tumor~~method of any of claims 184, 185, 187 and 210, wherein the cancer~~ is a cancer located at the head and neck, breast, liver, colon, ovary, prostate, pancreas, brain, cervix, bone, skin, eye, bladder, stomach, esophagus, peritoneum, or lung.

~~212. The method of claim 210 or claim 211, wherein the cancer is a cancer of the blood.~~

~~213. The method of any of claims 196-212, wherein the conjugate is targeted to a protein expressed on the surface of a cell present in the tumor microenvironment.~~

~~214. The method of claim 213, wherein the cell is a tumor cell, an immune cell or a cancer stem cell.~~

~~215. The method of any of claims 166-214, wherein the protein expressed on the surface of a cell is selected from among ACTHR, endothelial cell Anxa-1, aminopetidase N, anti-IL-6R, alpha-4 integrin, alpha-5-beta-3 integrin, alpha-5-beta-5 integrin, alpha-fetoprotein (AFP), ANPA, ANPB, APA, APN, APP, 1AR, 2AR, AT1, B1, B2, BAGE1, BAGE2, B-cell receptor BB1, BB2, BB4, calcitonin receptor, cancer antigen 125 (CA 125), CCK1, CCK2, CD5, CD10, CD11a, CD13, CD14, CD19, CD20, CD22, CD25, CD30, CD33, CD38, CD45, CD52, CD56, CD68, CD90, CD133, CD7, CD15, CD34, CD44, CD206, CD271, CEA (CarcinoEmbryonic Antigen), CGRP, chemokine receptors, cell-surface annexin-1, cell-surface plectin-1, Cripto-1, CRLR, CXCR2, CXCR4, DCC, DLL3, E2 glycoprotein, EGFR, EGFRvIII, EMR1, Endosialin, EP2, EP4, EpCAM, EphA2, ET receptors, Fibronectin, Fibronectin ED-B, FGFR, frizzled receptors, GAGE1, GAGE2, GAGE3, GAGE4, GAGE5, GAGE6, GLP-1 receptor, G-protein coupled receptors of the Family A (Rhodopsin-like), G-protein coupled receptors of the Family B (Secretin receptor-like) like), G-protein coupled receptors of the Family C (Metabotropic Glutamate Receptor-like), GD2, GP100, GP120, Glypican-3, hemagglutinin, Heparin sulfates, HER1, HER2, HER3, HER4, HMFG, HPV 16/18 and E6/E7 antigens, hTERT, IL11-R, IL-13R, ITGAM, Kalikrien-9, Lewis Y, LH receptor, LHRH-R, LPA1, MAC-1, MAGE 1, MAGE 2, MAGE 3, MAGE 4, MART1, MC1R, Mesothelin, MUC1, MUC16, Neu (cell-surface Nucleolin), Neprilysin, Neuropilin-1, Neuropilin-2, NG2, NK1, NK2, NK3, NMB-R, Notch-1, NY-ESO-

1, OT-R, mutant p53, p97 melanoma antigen, NTR2, NTR3, p32 (p32/gC1q-R/HABP1), p75, PAC1, PAR1, Patched (PTCH), PDGFR, PDFG receptors, PDT, Protease-cleaved collagen IV, proteinase 3, prohibitin, protein tyrosine kinase 7, PSA, PSMA, purinergic P2X family (*e.g.* P2X1-5), mutant Ras, RAMP1, RAMP2, RAMP3 patched, RET receptor, plexins, smoothened, sst1, sst2A, sst2B, sst3, sst4, sst5, substance P, TEMs, T-cell CD3 Receptor, TAG72, TGFBR1, TGFBR2, Tie-1, Tie-2, Trk-A, Trk-B, Trk-C, TR1, TRPA, TRPC, TRPV, TRPM, TRPML, TRPP (*e.g.* TRPV1-6, TRPA1, TRPC1-7, TRPM1-8, TRPP1-5, TRPML1-3), TSH receptor, VEGF receptors (VEGFR1 or Flt-1, VEGFR2 or FLK-1/KDR, and VEGF-3 or FLT-4), voltage-gated ion channels, VPAC1, VPAC2, Wilms tumor 1, Y1, Y2, Y4, and Y5.

216. The method of any of claims 166-215, wherein the protein expressed on the surface of a cell is selected from among HER1/EGFR, HER2/ERBB2, CD20, CD25 (IL-2Rα receptor), CD33, CD52, CD133, CD206, CEA, CEACAM1, CEACAM3, CEACAM5, CEACAM6, cancer antigen 125 (CA125), alpha-fetoprotein (AFP), Lewis Y, TAG72, Caprin-1, mesothelin, PDGF receptor, PD-1, PD-L1, CTLA-4, IL-2 receptor, vascular endothelial growth factor (VEGF), CD30, EpCAM, EphA2, Glypican-3, gpA33, mucins, CAIX, PSMA, folate-binding protein, gangliosides (such as GD2, GD3, GM1 and GM2), VEGF receptor (VEGFR), VEGFR2, VEGF-A, integrin αVβ3, integrin α5β1, ERBB3, MET, IGF1R, EPHA3, TRAILR1, TRAILR2, RANKL, FAP, tenascin, AFP, BCR complex, CD3, CD18, CD44, CTLA-4, gp72, HLA-DR 10 β, HLA-DR antigen, IgE, MUC-1, nuC242, PEM antigen, metalloproteinases, Ephrin receptor, Ephrin ligands, HGF receptor, CXCR4, CXCR4, Bombesin receptor, SK-1antigen, Bcr-abl, RET, MET, TRKB, TIE2, ALK, ROS, EML4-ALK, ROS1, BRAFV600E, SRC, c-KIT, PDGFR, mTOR, TSC1, TSC2, BTK, KIT, BRCA, CDK-4/6, JAK1, JAK2, BRAF, FLT-3, MEK1, MEK2, and SMO.

217. The method of any of claims 166-216, wherein the conjugate is targeted to a protein expressed in the tumor.

218. The method of any of claims 166-217, wherein the cell, hyperplasia or tumor is irradiated at a wavelength from or from about 600 nm to about 850 nm.

~~219~~23. The use of claim 21 or claim 22, wherein the~~method of any of claims 166-218, wherein the cell,~~ hyperplasia or tumor is to be irradiated at a wavelength of 690 ± 50 nm or 690 ± 20 nm.

~~220~~24. The use of any one of claims 21-23, wherein the~~method of any of claims 166-219, wherein the cell,~~ hyperplasia or tumor is to be irradiated at a dose of from or from about 2 J cm^{-2} to about 400 J cm^{-2} or from or from about 2 J/cm fiber length to about 500 J/cm fiber length.

~~221. The method of any of claims 166-220, wherein:~~

~~the cells, hyperplasia or tumor are irradiated at a dose of at least or at least about 2 J cm^{-2}, 5 J cm^{-2}, 10 J cm^{-2}, 25 J cm^{-2}, 50 J cm^{-2}, 75 J cm^{-2}, 100 J cm^{-2}, 150 J cm^{-2}, 200 J cm^{-2}, 300 J cm^{-2}, 400 J cm^{-2}, or 500 J cm^{-2}; or~~

~~the cells, tumor or hyperplasia are irradiated at a dose of at least or at least about 2 J/cm fiber length, 5 J/cm fiber length, 10 J/cm fiber length, 25 J/cm fiber length, 50 J/cm fiber length, 75 J/cm fiber length, 100 J/cm fiber length, 150 J/cm fiber length, 200 J/cm fiber length, 250 J/cm fiber length, 300 J/cm fiber length, 400 J/cm fiber length or 500 J/cm fiber length.~~

~~222. The method of any of claims 184-188 and 196-221, wherein the disease or condition is a tumor and the tumor is a superficial tumor.~~

~~223. The method of claim 222, wherein the tumor is irradiated at a dose of at least or about at least or about10 J/cm^2, 25 J/cm^2, 50 J/cm^2, 150 J/cm^2, or 250 J/cm^2.~~

~~224. The method of any of claims 184-188 and 196-221, wherein the disease or condition is a tumor and the tumor is an interstitial tumor.~~

~~225. The method of claim 224, wherein the tumor is irradiated at a dose of at least or about at least or about 50 J/cm fiber length, 100 J/cm fiber length, 200 J/cm fiber length, or 300 J/cm fiber length.~~

~~226. The method of any of claims 166-225, wherein the cells, hyperplasia or tumor is irradiated within or within about or about 12 hours, 24 hours, 36 hours, 72 hours or 96 hours after administering the conjugate.~~

~~227~~25. The use in any one of claims 21-24, wherein the pharmaceutical composition ~~method of any of claims 166-226, wherein the conjugate~~ is to be administered at a dose between ~~in an amount that is from or from about 0.5 mg/kg to about 100 mg/kg or 20~~ 25 mg/m^2 ~~to about 4000~~and 2000 mg/m^2.

26. A pharmaceutical composition of any one of claims 1-12 for use in therapy.

~~228. The method of any of claims 166-227, wherein:~~

~~the conjugate is administered in an amount that is at least or about at least or is or is about 0.5 mg/kg, 2.0 mg/kg, 4.0 mg/kg, 8.0 mg/kg, 16.0 mg/kg, 32.0 mg/kg or 64 mg/kg; or~~

~~the conjugate is administered in an amount that is at least or about at least or is or is about 20 mg/m^2, 40 mg/m^2, 160 mg/m^2, 320 mg/m^2, 640 mg/m^2, 1280 mg/m^2 or 2560 mg/m^2.~~

~~229. The method of any of claims 166-228, wherein prior to administration of the conjugate the targeting molecule is administered.~~

~~230. The method of any of claims 166-229, wherein the targeting molecule is administered up to 96 hours prior to administration of the conjugate.~~

~~231. The method of claim 229 or claim 230, wherein the targeting molecule is administered at a dose within a range from or from about 10 mg/m^2 to about 500 mg/m^2.~~

~~232. The method of any of claims 166-231, wherein the targeting molecule is an antibody or antigen binding fragment.~~

~~233. The method of claim 232, wherein the antibody is cetuximab.~~

~~234. A conjugate, comprising a phthalocyanine dye and a targeting molecule, wherein the targeting molecule is selected from among a tissue-specific homing peptide, an RGD polypeptide, an iRGD polypeptide, a Lyp-1 polypeptide, a cripto-1 binding polypeptide, a somatostatin receptor binding polypeptide, a prohibitin binding polypeptide, a~~

~~NGR polypeptide, an iNGR polypeptide, an activatable cell penetrating peptide (ACPP) comprised of a polycationic cell penetrating peptide (CPP) connected via a cleavable linker to a neutralizing polyanion, and an antibody selected from Ado-trastuzumab emtansine, Afatinib, Axitinib, Bosutinib, Cabozantinib, Ceritinib, Crizotinib, Dabrafenib, Dasatinib, Everolimus, Ibrutinib, Imatinib, Lenvatinib, Nilotinib, Olaparib, Palbociclib, Pazopanib, Ramucirumab, Regorafenib, Ruxolitinib, Sorafenib, Sunitinib, Temsirolimus, Trametinib, Vandetanib, Vemurafenib, Vismodegib, Ipilimumab, Nivolumab, pembrolizumab, pidilizumab, lambrolizumab, BMS-935559, MPDL3280A, Pidilizumab (CT-011), AMP-224, MSB001078C, or MEDI4736, or an antigen-binding fragment thereof.~~

~~235. The conjugate of claim 234, wherein the homing peptide has a sequence as set forth in any of SEQ ID NOs: 1-52.~~

~~236. The conjugate of claim 234 or claim 235, wherein the dye is IR700.~~