Supporting Information for

REVIEW

Recent progress in sono-photodynamic cancer therapy: From developed new sensitizers to nanotechnology-based efficacy-enhancing strategies

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Table S1 Different NDDSs for enhanced SPDT.

NP Platform	Carrier material	Sensitizer	Light dose	Ultrasonic dose	Cancer cell type	Species	Function	Ref.
Polymeric NPs	FA-PEG-PLGA/ PVA/MNPs	HMME	–	1 MHz, 3 W/cm^2, 5 min	MDA-MB-231	Female BALB/c nude mice	Tumor-targeted delivery Integration of diagnosis and therapy	1
	PEG-SS-Ce6-MMP2	Ce6	633 nm 50 mW/cm^2, 30 min	–	A549	Female BALB/c-nude mice	Tumor-targeted delivery Integration of diagnosis and therapy	2
	PEG-*b*-PCL-TK-PAMAM-ICG	Ce6	660 nm 0.3 W/cm^2, 30 min 808 nm 1.0 W/cm^2, 10 min	–	4T1	Female BALB/c nude mice	Intratumoral delivery Combination therapy	3
	UDCA-Cs	Ce6	664 nm 2 J/cm^2	–	HuCC-T1	–	Delivery across biological barriers	4
	TPGS-CA-DOX	Ce6	633 nm 50 mW/cm^2, 30 min	–	A549	Female BALB/c-nude mice	Stimuli-responsive release Combination therapy Integration of diagnosis and therapy	5
	CAT-Ce6/F-PEI	Ce6	660 nm 200 mW/cm^2, 15 min	–	T24	Female BALB/c nude mice	O_2 supply	6
	PLGA/PFP/OXP	ICG	808 nm 1.5 W/cm^2, 2 min	1.0 W/cm^2, 1 min	ID8	Female C57BL/6 mice	Immunity modulation Combination therapy Integration of diagnosis and therapy	7
	PLGA/PFP/PTX	ICG	808 nm 1.5W/cm^2, 5 min	1 MHz, 1 W/cm^2, 1 min	SKOV3	Female BALB/c athymic nude mice	O_2 supply Combination therapy Integration of diagnosis and therapy	8
	CRGDK-PEG-PCL/mPEG-PCL/	IR780	808 nm 2 W/cm^2, 20 s	–	MDA-MB-231	Female BALB/c nude mice	Tumor-targeted delivery O_2 supply	9

	PFOB						Integration of diagnosis and therapy	
	PEG-PCL/MET	IR780	808 nm 1 W/cm^2 , 5 min	–	MKN-45P	SCID nude mice	O_2 supply Combination therapy Integration of diagnosis and therapy	10
	FCs/CAT-TCPP	TCPP	–	40 kHz, 3 W/cm^2, 15 min	MB49	C57 BL/6 mice	O_2 supply	11
	HA-PLGA/ PLGA-HBA-5-ALA/ART	5-ALA	–	2 W/cm^2, 60 s	HepG2	BALB/c nude mice	Tumor-targeted delivery Stimuli-responsive release Combination therapy	12
	PEGylated Hp/DOX	Hp	633 nm 5 J/cm^2	–	ADR/MCF-7	Female BALB/c nude mice	Stimuli-responsive release Combination therapy	13
	ALG-Pba/DOX	Pba	670 nm 200 J/cm^2	–	B16	Female C57BL6 mice	Stimuli-responsive release Combination therapy	14
Micelles	CAT/Cs	Ce6	650 nm 12 J/cm^2	–	CAL-27	Female BALB/c nude mice	Stimuli-responsive release O_2 supply	15
	$C_{18}GR_7RGDS$/ICG	ICG	808 nm 1.5 W/cm^2, 3 min	1 MHz, 2.4 W/cm^2, 5 min, 50% duty cycle	MDA-MB-231	Male nude mice	Intratumor delivery Combination therapy	16
	α-CD-Ce6/α-CD-NO/PEG-*b*-PMPC	Ce6	660 nm 0.5 W, 5 min	–	MCF-7	Female BALB/c nude mice	O_2 supply Combination therapy	17
Lipid-based NPs	DPPC/Cholesterol/DSPE-PEG/DSPE-PEG-iRGD/DOTAP	ICG	808 nm 1.0 W/cm^2, 10 min	–	Hep-2	Male SCID mice	Tumor-targeted delivery Combination therapy Integration of diagnosis and therapy	18
	DPPC/DPPG/DS	ICG	808 nm	300 kHz,	SKOV3	Female BALB/c	Tumor-targeted delivery	19

	PE-PEG-FA/Cholesterol/PFH		1.5 W/cm^2, 5 min	1 W/cm^2, 30 s		nude mice	Combination therapy Integration of diagnosis and therapy	
	DPPC/DPPG/DSPE-PEG-FA/Cholesterol/PFP	IR780	–	2.4 W/cm^2, on 3 min, off 3 min, 4 cycles	4T1	BALB/c nude mice	Delivery across biological barriers Integration of diagnosis and therapy	20
	DPPC/DSPE-PEG-FA/ DSPE-PEG-iRGD/Cholesterol	DVDMS	–	1.0 MHz, 0.6 W/cm^2, 1 min	C6	BALB/c mice	Delivery across biological barriers Tumor-targeted delivery	21
	DPPC/Cholesterol/DSPE-PEG/DVDMS(Mn)	DVDMS	–	0.5 MHz 1.5 W/cm^2, 10 min	U87	Female BALB/c athymic nude mice	Integration of diagnosis and therapy	22
	DPPC/DSPE-PEG-FA/DPPG/Cholesterol/UCNPs-RB/HCPT/PFH	RB	980 nm 2 W/cm^2, 12 min	–	SKOV3	Female nude mice	Tumor-targeted delivery O_2 supply Combination therapy Integration of diagnosis and therapy	23
Protein-based NPs	cRGDfk-SF-Ce6/5-FU	Ce6	650 nm 50 mW/cm^2, 30 min	–	MGC-803	Male BALB/c-nude mice	Tumor-targeted delivery Combination therapy	24
	HSA-Ce6/TAM	Ce6	660 nm 5 mW/cm^2, 30 min	–	4T1	Female nude mice	Intratumor delivery O_2 supply	25
	Ce6-HSA-Azobenzene-4,4′-dicarboxylic acid-Oxa(IV)-HSA	Ce6	660 nm 5 mW/cm^2, 1 h	–	4T1	Female BALB/c nude mice	Intratumor delivery Combination therapy	26
	KALA/Apt/BSA	ICG	808 nm	–	MCF-7	Female BALB/c	Tumor-targeted delivery	27

	/DOX		1.0 W/cm^2, 5 min			nude mouse	Combination therapy Integration of diagnosis and therapy	
Peptide-based NPs	TAT/IR780/DOX	IR780	785 nm 1.0 W/cm^2, 5 min	–	4T1	Female BALB/c mice	Tumor-targeted delivery Combination therapy Integration of diagnosis and therapy	28
	$C_{18}GR_7RGDS$/RB	RB	808 nm 1.5 W/cm^2, 3 min	1.0 MHz, 1.0 W/cm^2, 50%	HeLa	Male nude mice	Intratumoral delivery	29
Biomimetic NPs	4T1 cell membrane/ZIF-8/GSNO	Ce6	–	1.0 MHz, 1.5 W/cm^2, 5 min	4T1	Female BALB/c mice	O_2 supply Combination therapy	30
	RBC membrane/ICG-HSA/PFTBA	ICG	808 nm 1 W/cm^2, 3 min	–	CT26	Male BALB/c mice	Tumor-targeted delivery O_2 supply Combination therapy	31
	RBC membrane/Hb/PDA	MB	660 nm 220 mW/cm^2, 5 min	–	4T1	BALB/c mice	O_2 supply	32
	RBC membrane/Pluronic F-127	Ag_2S QDs	–	1.0 MHz, 1.5 W/cm^2, 5 min	C26	BALB/c nude mice	O_2 supply Integration of diagnosis and therapy	33
	RBC membrane/CAuNCs/HA/PXTK/dPPA	Pba	650 nm 270 mW/cm^2, 4 min	–	4T1	Female BALB/c mice	Intratumoral delivery Combination therapy	34
Inorganic NPs	PEGylated TPP-MS-HMME/Cu^{2+}	HMME	–	1 MHz, 0.75 W/cm^2, 3 min	HepG2	–	Tumor-targeted delivery Combination therapy	35

	HA-Mesoporous $CaCO_3$	HMME	–	1 MHz, 1 W/cm^2, 1 min	MCF-7	BALB/c nude mice	Tumor-targeted delivery Stimuli-responsive release Integration of diagnosis and therapy	36
	anti-EGFR-PEG-TiO_2-UCNPs	TiO_2	980 nm 1000 J/cm^2	–	CAL-27	Female BALB/c nude mice	Tumor-targeted delivery	37
	$Fe(OH)_3$/Silica/UCNPs	Ce6	808 nm 1W/cm^2, 30 min (1 min interval after 5 min irradiation)	–	4T1	Male BALB/c mice	O_2 supply Combination therapy	38
	Au_2Pt-PEG-Ce6	Ce6	808 nm 1 W/cm^2, 5 min 650 nm 0.25 W/cm^2, 5 min	–	U14	Female BALB/c mice	O_2 supply Combination therapy Integration of diagnosis and therapy	39
	PEGylated β-CD/$Cu_{2-x}Se$	Ce6	808 nm 1.0 W/cm^2, 10 min	–	4T1	Male BALB/c mice	O_2 supply Combination therapy	40
	BSA/Honeycomb MnO_2	IR780	785 nm 1 W/cm^2, 5 min	–	HepG2	Nude mice	O_2 supply Combination therapy Integration of diagnosis and therapy	41
	Pt-TiO_2/DOX	TiO_2 NPs	–	1 MHz, 1.5 W/cm^2, 5 min, 50% duty cycle	4T1	Female BALB/c mice	O_2 supply Combination therapy	42
	HS-R8-PGGGAG-EK10/ HS-hyd-5-ALA/ AuNPs	5-ALA	635 nm 2840 mW/cm^2, 6 min	–	SCC-7	Female ICR mice	Tumor-targeted delivery Stimuli-responsive release	43
Metal-organi	LMWHA-PEI-M	HMME	–	3 MHz,	4T1	Female BALB/c	Immunity modulation	44

c frameworks	PB			1.0 W/cm^2, 1 min		mice	O_2 supply	
Hybrid NPs	p-(OEOMA-*co*-MEMA)/Pt-CuS	TAPP	–	1 MHz, 1.0 W/cm^2, 5 min, 60% duty cycle	CT26	Female BALB/c mice	O_2 supply Combination therapy Integration of diagnosis and therapy	45
	PEG-PDA/HIONs	Hp	–	1.0 MHz, 1.5 W/cm^2, 10 min	PC-3	Male BALB/c nu/nu mice	O_2 supply Combination therapy	46
	FA-Cs-GPTMS-HMSNs/DOX	Pba	680 nm 0.5 W/cm^2, 5 min	–	KB	Female BALB/c nude mice	Tumor-targeted delivery Stimuli-responsive release Combination therapy	47
	DPEG/CTPP/HSN	Ce6	660 nm 5 mWcm^2, 1 h	–	4T1	Female BALB/c mice	Tumor-targeted delivery Intratumoral delivery O_2 supply	48
	PC/PE-p-(His)$_{40}$/PE-p(NIPAM)$_{40}$-FA	Ce6	664 nm 1.0 J/cm^2	–	KB	–	Tumor-targeted delivery Stimuli-responsive release	49
	HCCP/HPS/Curcumin/Fe_3O_4	Ce6	660 nm 100 mW/cm^2, 15 min	–	HeLa	BALB/c mice	Stimuli-responsive release Combination therapy Integration of diagnosis and therapy	50
	PEGylated HSA/PLL	Ce6	635 nm 0.2 W/cm^2, 10 min	–	MCF-7	Female BALB/c-nu mice	Stimuli-responsive release	51
	Lipid bilayer/$CaCO_3$/DOX/Ce6(Mn)	Ce6	660 nm 5 mW/cm^2, 1 h	–	4T1	Female BALB/c mice	Stimuli-responsive release Combination therapy Integration of diagnosis and therapy	52
	Er-Cs/MSN/ZnO QDs	ICG	808 nm 1.0 W/cm^2, 5 min	–	PC-9	BALB/c nude mice	Stimuli-responsive release Combination therapy Integration of diagnosis and therapy	53

DPPC/DPPG/DSPE-PEG-FA/PLGA/PFP	ICG	808 nm 1.5 W/cm^2, 2 min	1 W/cm^2, 1 min	SKOV3	–	Integration of diagnosis and therapy	54
PC/Cholesterol/DSPE-PEG/AuNPs	ZnPc	630−700 nm 30 mW/cm^2, 20 min	–	MCF-7	Female SD rats	Stimuli-responsive release Combination therapy Integration of diagnosis and therapy	55
FC/HMONs	IR780	–	1 MHz, 1.0 W/cm^2, 20 s, 9 cycles, 100% duty cycle	PANC-1	Nude mice	O_2 supply	56
RGD-PEG-HMONs-PpIX/DOX	PpIX	–	1 MHz, 1.5 W/cm^2, 5 min 50% duty cycle	SMMC-7721	Male BALB/c nude mice	Tumor-targeted delivery Combination therapy	57
FA-PEG-ZIF-90-DOX/MS/UCNPs	RB	808 nm 0.5 W/cm^2, 5 min,	–	H22	Female BALB/c nude mice	O_2 supply Combination therapy Integration of diagnosis and therapy	58

NPs, nanoparticles; PEG, polyethylene glycol; PLGA, poly(lactic-*co*-glycolic) acid; FA, folate/folic acid; PVA, poly(vinyl alcohol); MNPs, melanin nanoparticles; HMME, hematoporphyrin monomethyl ether; Ce6, chlorin e6; MMP2, matrix metalloproteinase 2; PEG-*b*-PCL, PEG-*b*-poly(ε-caprolactone); TK, thioketal; PAMAM, poly(amidoamine) dendrimer; ICG, indocyanine green; UDCA, ursodeoxycholic acid; Cs, chitosan; TPGS, D-α-tocopheryl polyethylene glycol 1000 succinate; CA, *cis*-aconitic anhydride; DOX, doxorubicin; CAT, catalase; F-PEI, fluorinated polyethylenimine; PFP, perfluoropentane; OXP, oxaliplatin; PTX, paclitaxel; CRGDK, Cys-Arg-Gly-Asp-Lys; CRGDK-PEG-PCL, CRGDK modified PEG-PCL; mPEG-PCL, methoxy-PEG-PCL; PFOB, perfluorooctyl bromide; MET, metformin; FCs, fluorinated chitosan; TCPP, meso-tetra(4-carboxyphenyl) porphine; HA, hyaluronic acid; 5-ALA, 5-aminolevulinic acid; HBA, 4-hydrazinobenzoic acid; ART, artemisinin; Hp, hematoporphyrin; ALG, alginate; Pba, pheophorbide a; α-CD, α-cyclodextrin; PEG-*b*-PMPC, PEG-*b*-poly(2-methacryl-oyloxyethyl phosphorylcholine); DPPC, dipalmitoylphosphatidylcholine; DSPE-PEG, 1,2-distearoylsn-glycero-3-glycero-3-phosphoethanolamine-*N*-polyethyleneglycol; iRGD, internalized RGD, CRGDKGPDC; DSPE-PEG-iRGD, iRGD modified DSPE-PEG; DOTAP, 1,2-dioleoyl-3-trimethylammonium-propane (chloride salt); DPPG, 1,2-dipalmitoyl-*sn*-glycero-3-phospho-(1′-rac-glycerol); DSPE-PEG-FA, 1,2-distearoyl-*sn*-glycero-3-phosphoethanolamine-*N*-[folate(polyethyleneglycol)]; PFH, perfluorohexane; DVDMS, sinoporphyrin sodium; DVDMS (Mn), manganese ions (Mn^{2+})-chelated DVDMS; HCPT, 10-hydroxycamptothecin; RB, rose bengal; SF, silk fibroin; 5-FU, 5-fluorouracil; HSA, human serum albumin; TAM, tamoxifen; Oxa(IV),

oxaliplatin prodrug; BSA, bovine serum albumin; KALA, WEAKLAKALAKALAKHLAKALAKALKACEA; Apt, aptamer; ZIF-8, zeolite imidazole framework-8; GSNO, nitrosoglutathione; RBC, red blood cell; PFTBA, perfluorotributylamine; Hb, hemoglobin; MB, methylene blue; QDs, quantum dots; CAuNCs, cationized gold nanoclusters; PXTK, paclitaxel dimer prodrug; dPPA, anti-PD-L1 peptide; TPP, triphenylphosphonium; MS, mesoporous silica; $CaCO_3$, calcium carbonate; EGFR, epithelial growth factor receptor; UCNPs, upconversion nanoparticles; TiO_2, titanium dioxide; *β*-CD, *β*-cyclodextrin; MnO_2, manganese dioxide; HS-R8-PGGGAG-EK10, thiolated peptide CGGGRRRRRRRRPGGGAGEKEKEKEKEKEKEKEKEKEK; HS-hyd-5-ALA, 2-mercapto acetohydrazide-conjugated 5-ALA; LMWHA, low molecular weight hyaluronic acid; MPB, mesoporous Prussian blue; p-(OEOMA-*co*-MEMA), poly(oligo(ethylene oxide)methacrylate-*co*-2-(2-methoxyethoxy) ethyl methacrylate; CuS, copper sulfide; TAPP, tetra-(4-aminophenyl) porphyrin; HIONs, hollow iron oxide nanoparticles; GPTMS, glycidoxypropyl-trimethoxy-silane; HMSNs, hollow mesoporous silica nanoparticles; HSN, hollow silica nanoparticles; PAH, poly(allylamine hydrochloride); DMMA, 2,3-dimethylmaleic anhydride; DPEG, PEG/DMMA cografted PAH; CTPP, 3-carboxypropyl)triphenylphosphonium bromide; PC, phosphatidylcholine; PE-p-$(His)_{40}$, phosphatidylethanolamine-poly(L-histidine)$_{40}$; PE-p$(NIPAM)_{40}$-FA, FA conjugated phosphatidylethanolamine-poly(*N*-isopropylacrylamide)$_{40}$; HCCP, hexachlorocyclotriphosphazene; HPS, bis-(4-hydroxyphenyl)-disulfide; PLL, poly-$_L$-lsine; Ce6(Mn); Mn^{2+}-chelated Ce6; Er, erlotinib; MSN, mesoporous silica nanoparticles; ZnPc, zinc (II) phthalocyanine; FC, fluorocarbon; HMONs, hollow mesoporous organosilica nanoparticles; PpIX, protoporphyrin IX; ZIF-90, zeolitic imidazolate framework-90; MDA-MB-231, human breast cancer; A549, human non-small lung cancer; 4T1, mouse breast cancer; HuCC-T1, human cholangiocarcinoma; T24, human bladder cancer; ID8, mouse ovarian cancer; SKOV3, human ovarian cancer; MKN-45P, human gastric cancer; SCID, severe combined immunodeficient; MB49, mouse bladder cancer; HepG2, human hepatoma; B16, murine melanoma; CAL-27, human oral squamous cell carcinoma; MCF-7, human breast cancer; Hep-2, human epidermoid larynx; C6, murine glioma; U87, human glioma; MGC-803, human gastric cancer; HeLa, human cervical cancer; CT26, mouse colon cancer; U14, murine cervical carcinoma; SCC-7, mouse squamous cell carcinoma; ICR, Institute of Cancer Research; KB, human oral squamous cell carcinoma; PC-3, human prostate carcinoma; PC-9, human lung cancer; PANC-1, human pancreatic cancer; SMMC-7721, human hepatocellular carcinoma; H22, mouse hepatoma carcinoma; –, not applicable.

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