Table 1. The main features of organelle-targeted PTT agents described in this feature article.

Category	Agent construction	Laser irradiation	Photothermal conversion efficiency	Targeting strategy	*in vitro* anticancer efficacy	Side effects	Ref.
Nucleus	GNR/TAT (GNRs-NLS)	808 nm (0.2 W/cm^2, 5 min)	n.d.	Introducing nucleus-targeting ligand (NLS)	18.6 % cell viability (HeLa cells, 60 μg/mL)	Negligible	22
Nucleus	IONP/TAT/Tf (IONP-20-TAT-Tf)	808 nm (1.5 W/cm^2, 5 min)	37% (IONP-20)	Introducing cancer-targeting ligand (Tf) and nucleus-targeting ligand (NLS)	54.1 % cell apoptosis (A549 cells, 50 μg/mL)	Negligible	23
Nucleus	V_2C QD/TAT/RGD-engineered exosome (V_2C-TAT@Ex-RGD)	1064 nm (0.96 W/cm^2, 10 min)	45.05%	Introducing cancer-targeting ligand (RGD-engineered exosomes) and nucleus targeting ligand (NLS)	15.8 % cell viability (MCF-7 cells, 100 μg/mL)	Negligible	24
Nucleus	Ruthenium(IV) oxide NP/Chitosan(CS-RuO_2NPs)	1064 nm (1.0 W/cm^2, 10 min)	52.5%	Controlling the size (2 nm) and surface charge (positive)	The MCF-7 cell nuclei were selectively damaged and karyorrhexis and karyolysis were seen.	Negligible	25
Nucleus	Croconaine/TAT (NucCR)	808 nm (5.0 W/cm^2, 10 min)	n.d.	Introducing nucleus-targeting ligand (NLS)	~58 % cell viability (MCF-7 cells, 20 μM)	n.d.	27
Mitochondria	SWNT/PEG (SWNT-PEG)	980 nm (1.0 W/cm^2, 2 min)	n.d.	Intrinsicmitochondria-targeting	The EMT6 cell mitochondria were selectively destroyed, inducing mitochondrial depolarization, cytochrome c release, and caspase 3 activation.	n.d.	32
Mitochondria	IONP/TPP-appended coumarin (Mito-CIO)	740 nm (0.04 W/cm^2, 20 min)	n.d.	Introducing mitochondria-targeting ligand (TPP)	89.9% dead cell ratio (HeLa cells, 1.4 mg/mL)	n.d.	33
Mitochondria	Cryptocyanine/TPP (Mito-CCy)	730 nm (2.3 W/cm^2, 10 min)	9.51%	Introducing mitochondria-targeting ligand (TPP)	~13% dead cell ratio (HeLa cells, 20 μM)	n.d.	34
Mitochondria	4-hydroxybenzoic acid-appended heptamethine (**7**)	808 nm (1.5 W/cm^2, 2 min)	n.d.	Intrinsicmitochondria-targeting (inherent positive potential and lipophilicity)	Full eradication of four tumor cells (4T1, A549, MCF-7, H460 cells, 16 μM)	Negligible	35
Mitochondria	IONP/Iridium(III) complex (Ir@Fe_3O_4 NPs)	808 nm (1.0 W/cm^2, 15 min)	n.d.	Intrinsicmitochondria-targeting (inherent positive potential and lipophilicity)	Eradication of most HeLa cells (HeLa cells, 0.2 mg/mL)	Negligible	39
Mitochondria	Hemicyanine/TPP (ETP)	650 nm (0.5 W/cm^2, 5 min)	35.9% (Activated ETP)	Introducing mitochondria-targeting ligand (TPP)	IC_{50} value of 28.7 μg/mL (PC-3 cells)	Negligible	40
Lysosome	GO/Cypate (GO-Cypate)	785 nm (1.5 W/cm^2, 5 min	n.d.	Lysosome targeting *via* clathrin-mediated endocytosis	IC_{50} value of 6.0 μg/mL (4T1 cells)	Negligible	49

Lysosome	BDPmPh/DSPE-PEG$_{2000}$ (BDPmPh NPs)	660 nm (1.0 W/cm^2, 3 min)	27.3%	Introducing lysosome-targeting ligand (*N*,*N*-Diethylaminophenyl group)	IC_{50} value of 50.09 μM (HeLa cells)	Negligible	50
	BDPbiPh/DSPE-PEG$_{2000}$ (BDPbiPh NPs)	730 nm (1.0 W/cm^2, 3 min)	37.9%		IC_{50} value of 22.4 μM (HeLa cells)		
	BDPtriPh/DSPE-PEG$_{2000}$ (BDPtriPh NPs)	808 nm (1.0 W/cm^2, 3 min)	60.5%		IC_{50} value of 4.16 μM (HeLa cells)		
Lysosome	GNR/CyHMC (AuNRs-CyHMC)	780 nm (1.0 W/cm^2, 10 min)	55%	Intrinsic lysosome-targeting	~25 % cell viability (B16 cells, 50 μM)	Negligible	51
ER	HAuNS/ICG/FAL (FAL-ICG-HAuNS) together with Hb/E_{80}/cholesterol/FAL-DSPE-PEG$_{2000}$ (FAL-Hb-lipo)	808 nm (1.0 W/cm^2, 1 min)	n.d.	Introducing ER-targeting ligand (FAL)	~40% cell viability (Normoxic CT-26 cells, 25 μg/mL ICG; 50 μg/mL HAuNS; 50 μg/mL Hb) ~45% cell viability (Hypoxic CT-26 cells, 25 μg/mL ICG; 50 μg/mL HAuNS; 50 μg/mL Hb)	Negligible	53
ER	Confeito-like AuNP/citric acid/cystine (30 nm-sized Confeito-AuNPs)	532 nm (2.0 W/cm^2, 1 min)	n.d.	Intrinsic ER-targeting	~25% cell viability (MDA-MB-231 cells, 100 μM)	n.d.	54
Golgi apparatus	Cyanine/BSA (BSA-pH-PTT)	808 nm (1.45 W/cm^2, 60 min)	10%	Assembling with BSA	~40% cell viability (HeLa cells, 25 μM) ~25% cell viability (KB cells, 25 μM) ~28% cell viability (HepG2 cells, 25 μM)	n.d.	59
Multi-organelle	Pt-doped carbon NP/PEG (PEG-PtCNPs)	808 nm (1.0 W/cm^2, 10 min)	41.4%	The positively charged PEG-PtCNPs with a hydrodynamic diameter of ~19 nm	~10% cell viability (A549 cells, 20 μg/mL)	Negligible	60