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PH-SENSITIVE AMPHIPHILIC POLYPEPTIDE PRODRUG FOR NIR IMAGING-GUIDED COMBINED PHOTODYNAMIC THERAPY AND CHEMOTHERAPY

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Photodynamic therapy (PDT) is a promising clinical modality for the treatment of tumors and non-malignant nidus. A 4,4-difluoro-4-bora-3a, 4a-diaza-sindacene (BODIPY) core-based photosensitizer (PS) has many of the ideal characteristics of a PDT agent, such as a high extinction coefficient, resistance to photobleaching, and high ratios of light–dark toxicity which could also be recognized as dye for bioimaging. However, the BODIPY mentioned above cannot be dispersed in aqueous solution since it is hydrophobic, and therefore needs a BODIPY-carrier so that the PDT agent can be delivered and then released in the areas of tumors to kill cells. And few researchers have combined chemotherapy using DOX with a photosensitizer which shows great lethality to cancer cells like HepG2 and eminent bioimaging ability. Owing to the significant acidic microenvironments of tumor tissues and low pH (~5.0) inside cancer cells, we have innovatively tried to synthesize hydrazine-based pH-sensitive peptide within PEG shells and entrapped by the novel NIR-BODIPY photosensitizer using DOX for anticancer curing. The integration of chemotherapy and PDT has met the rising necessity of combination for clinical diagnosis. All the polymeric micelles are of suitable size for the EPR effect and can be easily disassembled in an acidic microenvironment to release the DOX or BODIPY for cancer treatment. The polypeptide itself shows great biocompatibility to cells, while severe damage to HepG2 cancer cells was caused by micelles with BODIPY and DOX which have also shown well NIR-imaging ability. All those advantages above mean that dual-agent pH-sensitive polypeptides may be promisingly applied in future medical cures in a combination of PDT and chemotherapy.

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