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Monomers to nanoplatforms for tumor-imaging and phototherapy

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Most of the photosensitizers (PS) investigated and/or being used to date in photodynamic therapy (PDT) are highly fluorescent. This property has been used to guide surgical interventions and PDT. Unfortunately, most of the photosensitizers exhibit small Stokes shift(s) between the long-wavelength absorption and emission and are therefore not desirable candidates for fluorescence imaging of cancer. Conversely, certain highly efficient cyanine dye–based fluorophores (non-porphyrin based compounds) generally do not localize within tumors efficiently, but require an additional moiety or process to provide selectivity, such as attachment of a peptide[2] or other moieties that bind to a targeted receptor(s) known for high expression in tumors. Promising clinical-PDT results suggest that certain porphyrin-based photosensitizers preferentially accumulate within a wide range of malignancies compared to their normal tissue surroundings. This characteristic has been used in designing bi- and multifunctional agents in which the PS also helps in delivering the desired imaging agent(s) to tumors. For quite some time, one of the objectives of our laboratory has been to develop agents that can be used concurrently detect tumors (via PET, MRI and/or fluorescence) and treat them (with PDT). One of our approaches involves the synthesis, characterization and pre-clinical validation (including *in vivo* toxicity) of novel conjugates of tumor-avid PS linked to unique near infrared (NIR) fluorescent dyes or the long half-life PET agent labeled with ^{124}I. In another approach, imaging and therapeutic monomers are post-loaded onto biocompatible PAA nanoparticles. Preliminary work shows that some of the multifunctional agents developed in our laboratory provide promising *in vivo* tumor selectivity while maintaining PDT efficacy. This "See and Treat" approach enhances the scope of image guided therapy. The synthesis and comparative tumor-imaging and therapeutic potential of the monomers and the corresponding multifunctional nanoplatforms will be discussed.

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