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Polyacrylamide-based nanoparticles for tumor-imaging and photodynamic therapy: A "See and Treat" approach

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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 124I. 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.

Biography

Pandey, Distinguished professor and Director of Pharmaceutical Chemistry at Roswell Park Cancer Institute, Buffalo has been investigating the utility of porphyrin-based compounds in PDT and imaging (MRI, PET, Fluorescence, Photoacoustic & Raman). One of the NIR photosensitizers developed in his laboratory is in Phase II human clinical trials and several other agents (including nano-formulations) are at advanced preclinical stages. He has published >260 research papers, 40 patents, several review articles and book chapters. He has received several "Inventor of the Year" awards, International award in heterocyclic chemistry, Excellence on PDT award by International Society of Porphyrins and Phthalocyanines, Regional Award by American Chemical Society and the RPCI President's Certification of Recognition award. He has organized several national and international conferences/symposiums, delivered several plenary/invited lectures all over the world. He is also the Founder and CSO of Photolitec, LLC and PlantMedica, LLC.

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