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Dual-function near-infrared (NIR) photosensitizer for fluorescence imaging and photodynamic therapy (PDT) of Cancer

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We report herein, the synthesis and biological efficacy of near-infrared (NIR), bacteriochlorin analogs: 3-(1'-butyloxy)ethyl-3-deacetyl-bacteriopurpurin-18-N-butylimide methyl ester and the corresponding carboxylic acid. In *in vitro* assays, compared to its methyl ester analog, the corresponding carboxylic acid derivative showed higher photosensitizing efficacy. However, due to drastically different pharmacokinetics *in vivo*, the desired PS (HPLC purity >99%) showed higher tumor uptake and long-term tumor cure than the corresponding carboxylic acid (HPLC purity > 96.5%) in BALB/c mice bearing colon 26 tumors. Isomerically pure *R*- and *S*- isomers of the desired analog (HPLC purity >99%) under similar treatment parameters showed identical efficacy *in vitro and in vivo.* In addition, the NIR photosensitizer (PS) showed limited skin phototoxicity, and provides an additional advantage over the clinically approved chemically complex hematoporphyrin derivative (Photofrin) as well as other porphyrin-based PDT agents, which makes it a promising dual-function agent for fluorescence-guided surgery with an option of phototherapy of cancer.

Biography

Ravindra K Pandey has worked on investigating the utility of porhyrin-based compounds and nanoparticles (ORMOSIL, polyacrylamide, gold, rHDL, chitosan and polymers) as multifunctional agents for cancer-imaging and therapy. One of the photosensitizers (HPPH) synthesized in his laboratory is currently undergoing phase II human clinical trials for head and neck cancer, and other two candidates which show potential for tumor imaging by PET and near infrared (NIR) fluorescence-guided photodynamic therapy (including surgery) are at the advanced stages of preclinical studies. The current focus of his laboratory is also to explore the use of PDT in combination with other treatment modalities (e. g., surgery and chemotherapy).

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