

Multimodality Agents for Tumor Imaging (PET, Fluorescence) and Photodynamic Therapy. A Possible “See and Treat” Approach

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Abstract

Methyl 3-(1'-*m*-iodobenzyloxyethyl)-3-devinylpyropheophorbide-*a* (**2**), obtained in a sequence of reactions from pyropheophorbide-*a* (a chlorophyll-*a* derivative), was found to be a promising imaging agent and a photosensitizer for photodynamic therapy (PDT). The electrophillic aromatic iodination of the corresponding trimethylstannyl intermediate with Na¹²⁴I in the presence of an Iodogen bead afforded ¹²⁴I-labeled photosensitizer **4** with >95% radioactive specificity. In addition to drug-uptake, the light fluence and fluence rate that were used for the light treatment had a significant impact in long-term tumor cure. The iodo photosensitizer **2** (nonlabeled analogue of **4**) produced 100% tumor cure (5/5 mice were tumor free on day 60) at a dose of 1.5 μmol/kg and a light dose of 128 J/cm², 14 mW/cm² for 2.5 h (λ_{max} 665 nm) at 24 h postinjection. The photosensitizer also showed promising tumor fluorescence and PET imaging ability. Our present work demonstrates the utility of the first ¹²⁴I-labeled photosensitizer as a “multimodality agent”, which could further be improved by using more tumor-avid and/or target-specific photosensitizers.