

MASTER'S THESIS

Theranostic porphyrin-cyclen gadolinium complex for photodynamic therapy and magnetic resonance imaging

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Abstract

Photodynamic therapy (PDT) and Magnetic resonance imaging (MRI) are two techniques used in therapeutic and diagnostic purpose respectively. PDT can selectively kill the cancer cells by utilizing light and photosensitizer, while MRI provides invasive imaging on our interior bodies. If these two techniques combine, the probe can act as both PDT and MRI agent at the same time. This theranostic agents can bring great efficiency in the cancer treatment.

In this project, a porphyrin-cyclen gadolinium based dual functions bio-probe, **PZnGdL**, is designed for diagnostic and photodynamic therapeutic functions. **PZnGdL** demonstrated a great T_1 signal enhancement for MRI, in which its T_1 relaxivity is $15.06 \text{ mM}^{-1}\text{s}^{-1}$ (at 1.4T, 37°C). The T_1 relaxivity is five-fold higher than the clinically approved MRI contrasting agent Gd-DOTA, (2.92 at 1.4T, 37°C). Furthermore, **PZnGdL** exhibits low dark toxicity and high photocytotoxicity. Therefore, its photodynamic therapeutic index (PDI) in HeLa cells is as high as 1348 upon 1 J/cm^2 light irradiation. Results from the present study show that **PZnGdL** is an effective photodynamic therapy agent as well as a safe and promising MRI contrasting agent.

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