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Rose Bengal attached and dextran coated gadolinium oxide nanoparticles for potential diagnostic imaging applications

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Abstract

We report here, reverse micelle mediated synthesis of multifunctional dextran (dex) coated Gd_2O_3 nanoparticles (NPs) carrying rose bengal (RB) dye for magnetic resonance and optical imaging. The diameter of these RB attached dex coated Gd_2O_3 NPs (Gd-dex-RB NPs) was found to be ~17nm as measured by TEM. NMR line broadening effect on the surrounding water protons affirmed the paramagnetic nature of these NPs. Optical properties of Gd-dex-RB NPs were validated by UV-Vis and fluorescence spectroscopy. Time dependent release profile of RB from NPs at two different pH of 7.4 and 5.0 revealed that these NPs behave as slow releasing system. *In-vitro* study revealed that NPs are efficiently taken up by cells and show optical activity in cellular environment. *In vitro* cell viability (SRB) assay was performed on cancerous (A-549, U-87) and normal (HEK-293) cell lines, showed the absence of cytotoxic effect of Gd-dex-RB NPs. Therefore, such multifunctional NPs can be efficiently used for bio-imaging and optical tracking.

Key Words- Rose Bengal, Reverse Micelle, Gadolinium Oxide Nanoparticles, Contrast Agent, Optical Imaging.

1 Introduction

Possession of numerous unique properties at nano-scale enables nanomaterials to exhibit novel theranostic (therapeutic & diagnostic) applications. Additionally, NPs work as an excellent nanocarriers for various drug molecules or therapeutic agents which can either be incorporated within the particles or attached to its surface [1][2]. A lot of research is advancing to develop multimodal NPs in 'advance' medicine field which could target more than one issue in tandem. Nanoscale magnetic material, such as iron oxide and gadolinium oxide, has been actively researched for their novel applications in bio-medical field. These magnetic NPs can be conjugated with other functional molecules, such as fluorophore, biomolecules or drugs, for imaging, diagnosis and therapy [3]. A combination of magnetic resonance imaging (MRI) and optical imaging in a single entity would render simultaneous multiple diagnoses in biological specimen.

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