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Synthesis of gelatin stabilized high aspect ratio gold nanorods with enhanced biological stability as effective photo thermal agent for cancer therapy

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A major challenge in efficient biological application of near infrared gold nanorods is the surfactant bilayer-induced cytotoxicity. Hence, there is a need for the synthesis of biocompatible, non-toxic and stable functionalized gold nanorods. Though the use of gelatin as a passivating agent is a promising material for multifunctional coating, the inherent cytotoxicity, biological stability as well as the photo thermal application performance of gelatin coated gold nanorods still need to be investigated before *in vivo* therapeutic application. In this study, synthesis of gelatin conjugated high aspect ratio gold nanorods (Au-NRs) with enhanced stability in biological system and its application in photo thermal tumor ablation is herein reported for the first time. The gelatin shell required for the appropriate coating was optimized and investigated for their stability in culture media and relative cytotoxicity towards KM-Luc/GFP (mouse fibroblast histiocytoma cell line) and FM3A-Luc (breast carcinoma cell line) cancer cell lines. The optimized ratio of the gelatin-coated Au-NRs (0.5:1) exhibited enhanced biological media stability, improved temperature elevation and excellent photo stability compared to CTAB and PEG capped gold nanorods. The cellular cytotoxicity and *in vitro* laser cytotoxicity experiments further demonstrate the effectiveness of the gelatin coated nanorods in efficiently inhibiting deep embedded tumor cells proliferation.

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