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The *in vivo* photothermal treatment of gold nanorod in the mouse ear model

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Abstract. Gold nanorod's exceptional light to heat transduction is a robust phonomenon that has been extensively verified. The phenomenon is a trait from which many novel applications across disciplines have been proposed. In this investigation, the feasibility of utilizing heat harvested from such photothermal method to combat cancer is presented. Using non-invasive laser methods, an *in vivo* study is conducted on mouse ear tumors administered with gold nanorods (Au NRs). An emphasis is placed on monitoring the tumor developments after photothermal treatments, over time. The findings reveal significant tumor growth surpression at a threshold laser power of 0.6 W/cm^2 lasting 2 minutes; this energy also brought about dramatic size reduction in treated tumors. Furthermore, the apparent formation of an eschar over the laser treated region indicates extensive hemorrhagic necrosis of the tumor tissue; a phenomenon implicative to the inhibition of angiogenesis.

Keywords: gold nanorod; photothermal; tumor; laser; cancer; necrosis

1. Introduction

Nano photothermal cancer therapeutics, the novel practice of heat treating malignant tumors using energy harvested from light activated nanomaterials, have received considerable interest for a while now; the method is advocated as, at the least, a strategically beneficial candidate for the next generation of cancer treatments (Menon *et al.* 2013). Au NRs in particular, with its biocompatibility and fascinating optical properties, have been adopted extensively in photothermal therapeutic studies (Ekici *et al.* 2008). However, further studies beyond petri dishes—i.e., studies that clinical or posing *in vivo* relevance at the least—are rather limited. Specifically, investigations into the variation in tumor sizes and their corresponding pathological characteristics subsequent to photothermal treatment should prove to be insightful. For *in vivo* studies that have been reported

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