VEGF-3 Antibody Functionalized Gold Nanoshells for Near Infrared Photothermal Ablation of Lymphatic Endothelial Cells

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Tumor-associated lymphatics play an important role in tumor growth and metastasis. In this in vitro study, gold nanoshell (AuNS) mediated photothermolysis of lymphatic endothelial cells (LECs) was investigated as a strategy to inhibit tumor metastasis through lymphatics. AuNS are optically tunable nanoparticles that can absorb light in the near-infrared region (NIR) and efficiently convert absorbed light to heat. This property was utilized to induce photothermal ablation of LECs. The effects of incubation time, irradiation time and AuNS concentration on photothermolysis of LECs were examined. Cell death was observed through methods such as Trypan Blue, LDH assays and spectrophotometry. Specificity of LEC ablation was improved by introducing VEGF-3 antibody onto the AuNS surface through a polyethylene glycol linker, allowing modified AuNS to actively target LECs which over-express VEGFR-3 receptors at the tumor site. In addition, the AuNS were coated with PEG-thiol to prevent aggregation and to prolong AuNS circulation time. To confirm antibody attachment, uptake studies, statistical analysis, and irradiation studies were conducted. It was concluded that the antibody was attached to AuNS and AuNS mediated photothermolysis could prove to be a novel, site specific, and much less traumatic method of inducing lymphatic endothelial cell lysis to inhibit lymphatic mediated tumor metastasis.

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