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Laser triggered release of gemcitabine from polymer coated gold nanoshells for pancreatic cancer

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The unique combination of optical and chemical properties of Gold Nanoparticles (GNPs) renders them an appealing nano-scale platform for cancer therapeutics. In this project, we focused on the development of a new generation of theranostic GNPs for cancer treatment by the co-delivery of anti-cancer drugs in concert with confined laser induced photothermal tumor ablation. We anticipate that the combinatorial photo-chemotherapeutic protocol will exhibit significantly higher apoptotic cell rates without damaging the non-irradiated healthy tissue areas. Gold Nanoshells (GNSs) were synthesized with the capability to carry and deliver gemcitabine and exert synergistic photo-chemo-therapeutic properties. A protein repellent thiol capped poly (ethylene glycol) methacrylate polymer, with molecular weight of 15000 g/mol, was synthesized by Radical Addition Fragmentation (RAFT) polymerization and used as a particle stabilizing polymeric shield. Significant levels of stability enhancement were achieved allowing for the co-functionalization of GNSs with Gemcitabine (GEM) for applications in assays and drug carrier systems. GNSs mediated strong photothermal effect owing to their strong surface plasmon absorption in the NIR region. This property was exploited for the controlled release of GEM using NIR light as the external photostimulus to trigger drug release. The drug loaded GNSs exhibited synergistic cytotoxicity against a model pancreatic cell line (MiaPaCa-2) owing to the concerted antitumor activity of GEM with the photothermal effect of the GNSs upon irradiation with the laser.

Biography

Mina Emamzadeh is a PhD student of Cancer Nanomedicine at UCL School of Pharmacy, London. Her research is focused on the development of therapeutic nanoparticle for cancer therapy. In the present project, she develops radically new therapeutic protocols that combine lasers and gold nanoparticles to direct drugs at the diseased sites of the body in a specific manner without damaging healthy tissue. She also has experience in dendrimer-based nanomedicine.

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