Near Infrared-Sensitive Nanoparticles for Targeted Drug Delivery

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***Abstract*—The invasive nature and undesirable side-effects related to conventional cancer therapy, such as surgery and chemotherapy, have led to the development of novel drug delivery systems (DDS). A minimally invasive DDS using near-infrared (NIR) light as a trigger for drug release is investigated to reduce the adverse side-effects triggered by systemic delivery of chemotherapeutic drugs. The low tissue absorbance in the NIR region, λ = 650–2500 nm, allows the irradiation to penetrate through tissues to release cisplatin from a NIR-sensitive nanocomposite of Au-Au_2S.**

Our laboratory has recently shown that cisplatin can be effectively released from Au-Au_2S upon NIR irradiation. Cisplatin was loaded onto Au-Au_2S through its adsorption on COOH-functionalized alkanethiols coated on Au-Au_2S. The current work focuses on the development of methods to control the release of cisplatin. Drug release is controlled by either the irradiation parameters or the type of coatings. The effect of different coatings on NIR sensitivity and drug release is investigated. Molecular layers of HS-(CH_2)n-COOH and HS-CH_2-COO-$CH_2(CH_2CH_2O)xCH_2$-COOH have been successfully coated onto Au-Au_2S. The effect of different surface layers on drug adsorption is being examined. In addition, a mathematical model has been developed to describe the thermal effects of different irradiation parameters on soft tissues.

[Full Text Not Available]