

“Smart” Nanomaterials for Cancer Therapy

Devika Chithrani

Department of Physics and Astronomy, University of Victoria
Canada

Recent developments in nanotechnology has provided new tools for cancer therapy and diagnosis. The technology is expected to generate innovations and play a critical role in cancer therapeutics. Among other nanoparticle (NP) systems, there has been tremendous progress made in the use of spherical gold NPs (GNPs), gold nanorods (GNRs), gold nanoshells (GNSs) and gold nanocages (GNCs) in cancer therapeutics. In treating cancer, radiation therapy and chemotherapy remain the most widely used treatment options and recent developments in cancer research show that the incorporation of gold nanostructures into these protocols has enhanced tumor cell killing. These nanostructures further provide strategies for better loading, targeting, and controlling the release of drugs to minimize the side effects of highly toxic anticancer drugs used in chemotherapy and photodynamic therapy. In addition, the heat generation capability of gold nanostructures upon exposure to UV or near infrared light is being used to damage tumor cells locally in photothermal therapy. Hence, gold nanostructures provide a versatile platform to integrate many therapeutic options leading to effective combinational therapy in the fight against cancer. In this lecture, the recent progress in the development of gold-based NPs towards improved therapeutics will be discussed. A multifunctional platform based on gold nanostructures with targeting ligands, therapeutic molecules, and imaging contrast agents, holds an array of promising directions for cancer research.