

An Investigation of Peptide Functionalized Gold Nanoparticles On Colon Cancer Cells For Biomedical Application

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Abstract : According to the world health organisation, colon cancer is among the most common cancers diagnosed in both men and women. Specifically, it is the second leading cause of cancer related deaths accounting for over 860 000 deaths worldwide in 2018. Currently, chemotherapy has become an essential component of most cancer treatments. Despite progress in cancer drug development over the previous years, traditional chemotherapeutic drugs still have low selectivity for targeting tumour tissues and are frequently constrained by dose-limiting toxicity. The creation of nanoscale delivery vehicles capable of directly directing treatment into cancer cells has recently caught the interest of researchers. Herein, the development of peptide-functionalized polyethylene glycol gold nanoparticles (Peptide-PEG-AuNPs) as a cellular probe and delivery agent is described, with the higher aim to develop a specific diagnostic prototype and assess their specificity not only against cell lines but primary human cells as well. Gold nanoparticles (AuNPs) were synthesized and stabilized through chemical conjugation. The synthesized AuNPs were characterized, stability in physiological solutions was assessed, their cytotoxicity against colon carcinoma and non-carcinoma skin fibroblasts was also studied. Furthermore, genetic effect through real-time polymerase chain reaction (RT-PCR), localization and uptake, peptide specificity were also determined. In this study, different peptide-AuNPs were found to have preferential toxicity at higher concentrations, as revealed by cell viability assays, however, all AuNPs presented immaculate stability for over 3 months following the method of synthesis. The final obtained peptide-PEG-AuNP conjugates showed good biocompatibility in the presence of high ionic solutions and biological media and good cellular uptake. Formulation of colon cancer specific targeting peptide was successful, additionally, the genes/pathways affected by the treatments were determined through RT-PCR. Primary cells study is still on going with promising results thus far.

Keywords : nanotechnology, cancer, diagnosis, therapeutics, gold nanoparticles.

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