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Design and characterization of gold nanoparticle based cancer vaccine

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Novel approaches in design and synthesis of gold nanoparticles (AuNP) allowed the scientists to create them in various shapes with highly variable surface modifications, thereby, increasing the biocompatibility of AuNP and making them more applicable and nontoxic in micromolar ranges. Nowadays, the AuNP have been extensively studied for drug delivery as well as vaccine platforms. In general, the AuNP reduce the toxicity and improve the immunogenicity and efficacy of vaccines. Our aim is to develop a novel AuNP-based vaccine consisting of a protein target and TLR ligands and investigate its toxicity, immunogenicity and efficacy using *in vivo* allograft mouse model of prostate cancer. Our AuNP formulation is based on 50 nm gold nanospheres with target proteins, polyethyleneimine and TLR agonists. The synthesized formulation was characterized by UV-vis Spectroscopy, SEM, and Dynamic Light Scattering (DLS). We have also investigated the in vitro and *in vivo* toxicologic properties of the AuNP vaccine in cell culture media using HepG2 cells and in healthy C57BL/6 mice, respectively. The immunogenic properties of AuNP were first investigated *in vitro* by measuring the activation of NF-kB and AP-1 in reporter cell lines. In preclinical studies, the healthy C57BL/6 mice were immunized with the AuNP. T and B cell immune responses to the antigen were measured by IFN-gamma ELISpot and antibody titre assays, respectively. As a result, our studies revealed low toxicity of our AuNP nano-formulation and its highly immunogenic vaccine potential. For future studies, we are going to test the efficacy of AuNP vaccine using *in vivo* cancer model.

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