Abstract

Metal nanoparticles are also under development for anticancer, antimicrobial, self-decontaminating and UV blocking functions and civilian health products. Gold nanoparticles have many applications in biomedical field. Improving delivery of anticancer agents to tumours using nanoparticles is one of the most promising research arenas in the field of nanotechnology. Beside the chemical, physical techniques for the synthesis of metal nanoparticles, biological approach is the most evolving approach of preparation due to easier processing, eco-friendly and less time consuming. On this background the present thesis was aimed to synthesize gold nanoparticles following green synthesis protocol using indole-3-carbinol, phenolic phytomedicine and hydro-chloroauric acid. The biogenic gold nanoparticles (AuNPI3Cs) were characterized by DLS, Zeta potential, UV-vis Spectrophotometer, FTIR, XRD, SEM, TEM, AFM, NMR study. The particle size was 2-7nm and spherical in nature. The acute and sub-acute toxicity study of AuNPI3Cs was performed in *in vitro* and *in vivo* models. Toxicity studies revealed that AuNPI3Cs did not cause acute toxicity and sub-acute toxicity up to 2000µg/kg body wt. for 28 days respectively. AuNPI3Cs were cytotoxic to Jurkat (IC_{50} -13.5µg ml^{-1}), MCF-7 (IC_{50} 11.2 µg ml^{-1}), Ehrlich Ascites Carcinoma (EAC) (IC_{50} - 5µg ml^{-1}) and Dalton's Ascites Lymphoma (DLA) cells (IC_{50} -10µg ml^{-1}) and increased intracellular ROS and chromatin condensation, cell cycle arrest, induction of pro-apoptotic proteins and down regulate of anti-apoptotic proteins in the cancer cells. EAC and DLA bearing mice displayed prominent reduction in body weight, tumour volume and increased mean survival time, normalize haematological and biochemical parameters after AuNPI3Cs treatment. Inhibition of Ki-67 and CD-31 proteins confirmed the antiproliferative and antiangiogenic role of AuNI3Cs in tumour bearing mice. The *in-vitro* antioxidant and anti-inflammatory potential of AuNPI3Cs were investigated. AuNPI3Cs exhibited enhanced DPPH, nitric oxide, hydroxyl radical,

hypochlorous acid, superoxide anion lipid peroxidation and peroxynitrite free radical scavenging activities. Beside this AuNPI3Cs showed significant anti-inflammatory action by stabilizing HRBC membrane and inhibiting protein denaturation activity in *in vitro* as well as by preventing carrageenan induced paw edema in mice. The overall results suggest that biogenic AuNPI3Cs can be used as a potent anticancer agent in future.