Oxidative stress cytotoxicity induced by platinum-doped magnesia nanoparticles in cancer cells

Abstract

The aim of this study was to prepare, characterize, and determine the in vitro anticancer effects of platinum-doped magnesia (Pt/MgO) nanoparticles. The chemical compositions, functional groups, and size of nano particles were determined using X-ray diffraction, Fourier transform infrared spectroscopy, energy dispersive X-ray spectroscopy, transmission electron microscopy, and scanning electron microscopy. Pt/MgO nanoparticles were cuboid and in the nanosize range of 30–50 nm. The cytotoxicity of Pt/MgO nanoparticles was determined via the 3-(4,5-dimethylthiazol-2-yl)− 2,5-diphenyltetrazolium bromide assay on the human lung and colonic cancer cells (A549 and HT29 respectively) and normal human lung and colonic fibroblasts cells (MRC-5 and CCD-18Co repectively). The Pt/MgO nanoparticles were relatively innocuous to normal cells. Pt/MgO nano-particles downregulated Bcl-2 and upregulated Bax and p53 tumor suppressor proteins in the cancer cells. Pt/ MgO nanoparticles also induced production of reactive oxygen species, decreased cellular glutathione level, and increased lipid peroxidation. Thus, the anticancer effects of Pt/MgO nanoparticles were attributed to the induction of oxidative stress and apoptosis. The study showed the potential of Pt/MgO nanoparticles as an anti-cancer compound.