Synthesis, characterization, controlled release and cytotoxic effect of anthranilic acid-loaded chitosan and polyethylene glycol-magnetic nanoparticles on murine macrophage raw 264.7 cells

ABSTRACT

Magnetic nanoparticles (MNPs) were prepared by the coprecipitation method using a molar ratio of Fe3+:Fe2+ of 2:1. The surface of MNP was coated with chitosan (CS) and polyethylene glycol (PEG) to form CSï MNP and PEGï MNP nanoparticles, respectively. Anthranilic acid (AA) was loaded on the surface of the resulting nanoparticles to form AAï CSï MNP and AAï PEGï MNP nanocomposites, respectively. The nanocomposites obtained were characterized using powder X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), thermogravimetry analysis (TGA), vibrating sample magnetometer (VSM) and scanning electron microscopy (SEM). XRD results showed that the as-synthesized nanocomposites are pure magnetite. FTIR results analysis indicated the existence of two polymers on the particle surface of the MNP and the presence of loaded AA on the surface of CSï MNP and PEGï MNP nanoparticles. Anthranilic acid loading and the release profiles of AAï CSï MNP and AAï PEGï MNP nanocomposites showed that up to 8.8% and 5.5% of the adsorbed drug were released in 670 min and 771 min, respectively. Anthranilic acid release profiles followed a pseudo-second-order kinetic controlled process. The cytotoxicity of the as-synthesized anthranilic acid nanocomposities were determined using MTT assay using murine macrophage RAW 264.7 cells. MTT results showed that the cytotoxic effects of AAï CSï MNP were higher than AAï PEGï MNP against the tested cells as compared to free anthranilic acid. In this manner, this study introduces novel anthranilic acid nanocomposites that can be used on-demand for biomedical applications.

Keyword: Anthranilic acid; Cytotoxicity; Magnetic nanoparticles; Raw 264.7 cells; Sustained release