

Fabrication, characterization and cytotoxicity of spherical-shaped conjugated gold-cockle shell derived calcium carbonate nanoparticles for biomedical applications

ABSTRACT

The evolution of nanomaterial in science has brought about a growing increase in nanotechnology, biomedicine, and engineering fields. This study was aimed at fabrication and characterization of conjugated gold-cockle shell-derived calcium carbonate nanoparticles (Au-CSCaCO₃NPs) for biomedical application. The synthetic technique employed used gold nanoparticle citrate reduction method and a simple precipitation method coupled with mechanical use of a Programmable roller-ball mill. The synthesized conjugated nanomaterial was characterized for its physicochemical properties using transmission electron microscope (TEM), field emission scanning electron microscope (FESEM) equipped with energy dispersive X-ray (EDX) and Fourier transform infrared spectroscopy (FTIR). However, the intricacy of cellular mechanisms can prove challenging for nanomaterial like Au-CSCaCO₃NPs and thus, the need for cytotoxicity assessment. The obtained spherical-shaped nanoparticles (light-green purplish) have an average diameter size of 35 ± 16 nm, high carbon and oxygen composition. The conjugated nanomaterial, also possesses a unique spectra for aragonite polymorph and carboxylic bond significantly supporting interactions between conjugated nanoparticles. The negative surface charge and spectra absorbance highlighted their stability. The resultant spherical shaped conjugated Au-CSCaCO₃NPs could be a great nanomaterial for biomedical applications.

Keyword: Au-CSCaCO₃NPs; Biomedical applications; Calcium carbonate nanoparticles; Characterization; Cytotoxicity; Fabrication and gold nanoparticles