

Biocompatibility of bio based calcium carbonate nanocrystals aragonite polymorph on NIH 3T3 fibroblast cell line

ABSTRACT

Background: Currently, there has been extensive research interest for inorganic nanocrystals such as calcium phosphate, iron oxide, silicone, carbon nanotube and layered double hydroxide as a drug delivery system especially in cancer therapy. However, toxicological screening of such particles is paramount importance before use as delivery carrier. In this study we examine the biocompatibility of CaCO₃ nanocrystal on NIH 3T3 cell line. **Material and Methods:** Transmission and field emission scanning electron microscopy (TEM and FESEM) were used for the characterisation of CaCO₃ nanocrystals. Cytotoxicity and genotoxic effect of calcium carbonate nanocrystals in cultured mouse embryonic fibroblast NIH 3T3 cell line using various bioassays including MTT, and Neutral red/Trypan blue double-staining assays. LDH, BrdU and reactive oxygen species were used for toxicity analysis. Cellular morphology was examined by scanning electron microscopy (SEM) and confocal fluorescence microscope. **Results:** The outcome of the analyses revealed a clear rod-shaped aragonite polymorph of calcium carbonate nanocrystal. The analysed cytotoxic and genotoxicity of CaCO₃ nanocrystal on NIH 3T3 cells using different bioassays revealed no significance differences as compared to control. A slight decrease in cell viability was noticed when the cells were exposed to higher concentrations of 200 to 400 µg/ml, while increase in ROS generation and LDH released at 200 and 400 µg/ml was observed. **Conclusions:** The study has shown that CaCO₃ nanocrystal is biocompatible and non toxic to NIH 3T3 fibroblast cells. The analysed results offer a promising potential of CaCO₃ nanocrystal for the development of intracellular drugs, genes and other macromolecule delivery systems.

Keyword: Biocompatibility; Calcium carbonate; Nanocrystals; Drugs; Cockle shells