Characterization and in vitro sustained release of silibinin from ph responsive carbon nanotube-based drug delivery system

Abstract

The objective of the present study was to develop and characterize an in vitro sustained release formulation of silibinin (SB) using commercially available carboxylated multiwalled carbon nanotubes (COOH-MWCNTs) and to investigate cytotoxicity action of the synthesized nanohybrid (SB-MWCNTs). The resulting nanohybrid was characterized with Fourier transform infrared (FTIR), Raman spectroscopy, thermogravimetric analysis (TGA), ultraviolet-visible spectrophotometry (UV-Vis), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). FTIR, Raman spectroscopy, and TGA analysis confirmed the adsorption of SB molecules to the COOH-MWCNTs. The release of SB from the COOH-MWCNTs nanocarrier was found to be sustained and pH-dependent. The maximum percentage release of SB from the nanocarrier reached approximately 96.6% and 43.1% within 1000 minutes when exposed to pH 7.4 and pH 4.8 solutions, respectively. It was observed that the release of kinetic behaviour of SB from the MWCNTs nanocarrier conformed well to pseudo-second order kinetic model. The obtained MTT result showed that the SB-MWCNTs exhibited enhanced cytotoxicity to human cancer cell lines in comparison with free SB at lower concentrations. These results suggest that SB-MWCNTs nanohybrid may be a promising nanodrug delivery system with sustained release property for the treatment of cancers.

Keyword: In Vitro; Silibinin; Carbon nanotubes; Drug delivery