Abstract

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Silver nanoparticles impregnated alginate-chitosan-blended nanocarrier induces apoptosis in human glioblastoma cells.

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Abstract

Herein, a green method for the development of a novel biodegradable silver nanoparticles (NPs) impregnated alginate-chitosan-blended nanocarrier (Ag NPs-Alg-Chi NC) is reported. The synthesis of Ag NPs-Alg-Chi NC is based on the polyelectrolyte complex formation between alginate and chitosan. The composite NC is characterized by ultraviolet-visible spectroscopy, transmission electron microscopy, scanning electron microscopy (SEM), Fourier transform infrared spectroscopy, and X-ray diffraction. The Ag NPs in the NC are found to elicit anticell proliferative effect on refractory U87MG (human glioblastoma) cells at IC50 of 2.4 μg mL(-1) for Ag NPs. The cell cycle analysis shows extensive DNA damage. Elevation in reactive oxygen species level indicates induction of oxidative stress in treated cells. Mitochondrial dysfunction in cell death is evident from the depolarization of mitochondrial membrane potential (ΔΨm). Fluorescence and SEM images of the treated cells reveal nuclear and morphological changes characteristic of apoptosis, which is further confirmed by TUNEL assay. The induction of apoptosis at low concentration of Ag NPs present in Ag NPs-Alg-Chi NC in comparison with free Ag NPs makes it a promising tool for cancer therapy.

KEYWORDS: alginate; apoptosis; chitosan; glioblastoma; reactive oxygen species;

silver nanoparticles

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