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Nanogels of Polyvinylpyrrolidone Obtained by Gamma Radiation. Physicochemical and Biological Characterization

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Background of the study

Nanogels are nanoscale polymeric matrices with strong affinity for aqueous media. They exhibit stability, are inert to blood flow and favour the incorporation of medicinal drugs and bioactive molecules improving their therapeutic value by increasing bioavailability, solubility and retention time. The aim of this work was the preparation of polyvinylpyrrolidone nanogels induced by γ-irradiation, for evaluation as potential drug delivery system.

Methodology

Experiments were performed in absence of oxygen using diluted aqueous solutions of PVP. The synthesis was carried out in sealed vials in N_2O atmosphere irradiated with different absorbed doses on a γ-irradiation facility ISOGAMMA LLCo. The nanogels were characterized by viscometry, spectroscopy (ATR and UV-vis), thermogravimetry (TGA), diffraction (XRD), electron microscopy (TEM and SEM), dynamic light scattering. Cytotoxicity studies were performed by the of NBT and MTT tests.

Results

The viscometric results show a decrease in intrinsic viscosity with increasing dose accompanied by an increase in molecular weight. Such behaviour indicates the formation of intramolecular cross-linking by nanogels. The nanogels have an average size of 50 nm with a dispersion of 1.04.

The XRD showed certain order in the morphology of the nanogels. Gels are spherical in shape and have a marked protective effect on cell viability. In the interval of concentrations studied (0.001–0.8%) the more dilute systems favoured the formation of nanogels, whereas the more concentrated ones promoted the appearance of microgels IR spectra and thermal behaviour of nanogels coincided with those of the polymer in bulk. Biological test showed a high biocompatibility.

Conclusion

Nano PVP gels were obtained using γ-radiation. It was shown that the degree of cross-linking of the polymer depends on nanogels concentration and the absorbed dose. The obtained nanogels do not exhibit toxicity to cells, and rather have a protective or stimulator effect on cell viability, property which makes them good candidates as platforms for delivery systems.

Country/Organization invited to participate

Cuba

Primary author: Mr RAPADO PANEQUE, Manuel (Center for Applied Technologies and Nuclear Development CEADEN, Cuba)

Co-authors: Mr GES NARANJO, Adrian (High Institute of Technologies and Nuclear Applications InsTEC, Cuba); Mr GARCIA HERNANDEZ, Liudy (Center for Applied Technologies and Nuclear Development CEADEN, Cuba); Mr AGUILERA CORRALES, Yuri (High Institute of Technologies and Nuclear Applications InsTEC, Cuba)

Presenter: Mr RAPADO PANEQUE, Manuel (Center for Applied Technologies and Nuclear Development CEADEN, Cuba)

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