HYDROTHERMAL SYNTHESIS OF WATER-SOLUBLE CHITOSAN NANOPARTICLES FOR POTENTIAL BIOMEDICAL APPLICATION

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Chitosan (CS) is a biodegradable polysaccharide obtained by deacetylation of the naturally abundant biopolymer chitin. CS has been extensively studied for drug delivery, tissue engineering, food packaging, and in the textile industry due to its interesting properties, such as biodegradability, biocompatibility and antimicrobial activity. CS is water-insoluble but can be readily solubilized in organic acid or dilute mineral acid. CS solutions are stable at acid environment because of amino group protonation. However, for various biomedical applications, it is desirable to obtain chitosan that is stable at the physiological pH conditions (pH 7.4). The most common strategy to prepare water-soluble chitosan is to chemically modify the polymeric backbone to attach a hydrophilic molecule. Another strategy is to depolymerize CS using chemical agents such as inorganic acid, organic acid, oxidizing agents, and enzymes. Different physical methods such as radiation, heating, and pressure were also used to depolymerize CS. In this work, we report the combination of chemical (acid depolymerization) and physical hydrothermal conditions) methods to synthetize water-soluble CS nanoparticles. CS was previously solubilized in 1% HCl and then submitted to the hydrothermal treatment at 150°C for 3 hours. The resulted solution was filtered and dialyzed and used for characterization purposes. A part of the dialyzed product was lyophilized to dry powder form to yield estimation and water dispersion. A Dynamic Light Scattering (DLS) instrument was used to measure particle size distribution and colloidal stability was evaluated by Zeta Potential measurement. Cytotoxicity of CS nanoparticles was studied *in vitro* for RAW264.7 (murine macrophage) and A549 (human pulmonary epithelial) cell lines. DLS data on the CS particles showed an average size of 167 nm and zeta potential measurement indicated positive surficial charge (+2.45). Moreover, the CS nanoparticle was shown to be nontoxic and has promising applications in biomedical area. FAPEMIG