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Synthesis and Characterization of Self-assembled Hydrogels Based on Amphiphilic Derivates of Chitosan and Gelatin

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Abstract

Self-assembled hydrogels based on amphiphilic derivates of biocompatible polymers, prepared through non-covalent interactions, without using chemical cross-linking agents, are receiving great attention as matrix for cells encapsulation. To our best knowledge, there are no studies in the literature regarding the design of self assembled hydrogels based on a combination between palmitoyl chitosan and palmitoyl gelatin. In this context, this paper is devoted to the synthesis and characterization of self-assembled hydrogels based on amphiphilic derivates of chitosan and gelatin. Palmitoyl-chitosan and palmitoyl gelatin were prepared through the acylation reaction of polymers (chitosan and gelatin) with palmitoyl chloride. Self-assembled hydrogels based on amphiphilic derivatives of chitosan and gelatin were obtained by dropwise adding of the polymer solutions in cell culture media and spherical hydrogels with stable structure and a diameter of 4–5 mm were obtained. The composition of the hydrogels was confirmed by FTIR-ATR spectroscopy and the stereomicroscopy data indicated a porous structure. The hydrogels swelling degree and mechanical features, in terms of elastic modulus were evaluated and the values obtained for elastic modulus, registered in the range between 3801.52 N/m² and 4577.49 N/m² are suitable for hydrogels manipulation and their applications in soft tissue engineering. In vitro cytotoxicity tests, pointed out their cytocompatibility that offers future perspectives for applications in 3D-cell culturing and encapsulation.

Keywords: self-assembled hydrogels, palmitoyl chitosan, palmitoyl gelatin, encapsulation



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