CELL GROWTH SCAFFOLDS OF CHITOSAN/GELATIN FOR USE IN TISSUE REGENERATION

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ABSTRACT

Chitosan and gelatin have become important biomaterials in scaffolds manufacture for tissue regeneration. The chemical composition of chitosan is very similar to glycosaminoglycans (GAGs) of native extracellular matrix (ECM), which provides a compatible framework to cells. Gelatin is obtained from a partial hydrolysis of collagen, which is a major component of ECM. Both biopolymers have properties such as biocompatibility and biodegradability[1]. It is expected that blending chitosan and gelatin will increase the interaction between cells and the scaffold[2]. This blending will improve cell adhesion, migration and proliferation, which will in turn induce tissue development and organization. On the other hand, chitosan-gelatin blend can be easily processed in a variety of 3D structures and appropriate mechanical propierties[3].

The goal of this research was to produce blended chitosan and gelatin in order to manufacture 3D porous scaffolds by the freeze drying technique, in which gelatin was used in four proportions: 0, 25, 50 and 100% (w/w). These scaffolds were crosslinked with 2,5 -dimethoxy-2,5-dihydrofurane (DHF) using two crosslinking degrees. Structural changes due to crosslinking exhibited absorption bands by infrared spectroscopy (FTIR), related to imine moieties, and the interactions between both polymers were also studied.

Scaffolds structural morphologies were assayed by scanning electron microscopy (SEM), showing high porosity content and interconnectivity between pores, with sizes ranging from 40 to 160µm. Pore sizes increased with gelatin content and decreased with crosslinking degree. Mechanical properties were studied by a compression test, these results showed that elastic modulus increased with gelatin and crosslinking degree, varying within 30 to 38 kPa.

Cell viability was measured using MTT assay; preliminary data showed more than 93% cellular viability during the first 24 hours for all samples. After 72 hours 100% chitosan scaffold and chitosan-gelatin scaffold (75-25%) DHF crosslinked showed higher viability (up to 129%). Crosslinked scaffolds showed higher viability. DNA damage was studied by a comet assay, for all scaffolds. These results suggest that chitosan-gelatin obtained scaffolds could be suitable materials for tissue engineering.

References

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