COMPOSITES SCAFFOLDS FROM NANO-HYDROXYAPATITE/POLYELECTROLYTE COMPLEX FOR BONE TISSUE ENGINEERING

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In recent years there has been an increasing interest in the design of biomaterials for cartilage and bone tissue engineering. To regenerate tissue, it is necessary a scaffold that works as a temporary matrix for cell proliferation until the tissue is totally regenerated. Recently, we used an ultrasound methodology to prepare a compatibilized blend of polyelectrolyte complexes (PEC) based on carboxymethyl cellulose (CMC) and chitosan (CHI). The scaffolds properties indicated that these materials could be useful in cartilage tissue regeneration. In order to improve the properties of the scaffolds, we obtained polymeric blends of CMC-CHI-nano HA (Hidroxiapatite) a natural component of the bone, highly biocompatible, promoter of the cell adhesion and improver of the osteogenic and mechanical properties in polymeric blends. The biocomposite were prepared from 1% w/v CHI solutions in 0.25% w/v acetic acid and 1% w/v CMC; the nano HA was obtained by a procedure developed in our laboratory and was added at different percentages from 0-20%. The scaffolds were obtained by dropping CMC into a solution of CHI-HA under constant stirring and in the presence of ultrasound. Finally, the composites were freeze-drying until constant weight was achieved. The morphology (by SEM), polyelectrolyte interactions (by FTIR), swelling and mechanical properties of these composites were analyzed. In vitro cytotoxicity was evaluated using macrophage cells in culture. SEM results showed a three-dimensional porous structure of the scaffolds with a mean pore size suitable for cell proliferation. FTIR analysis showed specific interactions between the components in the biocomposite and the HA in the structure. The swelling studies and mechanical test indicate that the composite displays hydrogel properties with enhanced mechanical properties. Finally, no cytotoxicity was found for any scaffold. These results let us concluded that CMC-CHI-nanoHA composite is a promising candidate for bone regeneration.