

Mineralization studies in hybrid biomembranes

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INTRODUCTION: Different matrixes have been used in the development of biomaterials, especially hybrid materials that can reproduce the properties of the natural bone. Bone is a natural hybrid material constituted of about 65-70 % of hydroxyapatite (HAp) and the remaining, 35 to 30%, corresponding to an organic phase composed by collagen and other negatively charged proteins. **OBJECTIVES:** Preparation of hybrid, non-toxic, and bioactive membranes that mimic bone tissue and improve the osteoblasts viability. **MATERIALS AND METHODS:** Dissolving 5 wt.% of biopolymers in 10 mL of an aqueous mixture containing 10 mmol/L $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ and 3,33 mmol/L H_3PO_4 , were prepared gels consisting of Collagen and carrageenan, a sulphated polysaccharide. In the sequence, glycerol was added to the solution in a proportion of 25% relative to the total weight of the biopolymers. The hydrogels were exposed for 7 hours to $\text{CO}_2(\text{g})$ and $\text{NH}_3(\text{g})$ arising from the decomposition of $(\text{NH}_4)_2\text{CO}_3$, in a closed box. Subsequently, the samples were dried at 75°C. The bioactivity of the membranes was evaluated by their exposure to simulated body fluid (SBF). The toxicity of membranes on osteoblasts cultures was studied using the MTT methodology¹. **DISCUSSION AND RESULTS:** Scanning electron microscopy confirmed the formation of an inorganic nanoparticulate phase agglomerated as larger particles in the interstices of the membrane after exposure by 7h. The increase in collagen concentration origin porous and highly organized structures, similar to bone tissue.² Furthermore, after exposure to SBF, the surface morphology is modified due to the deposition of an inorganic phase. X-ray diffraction patterns reveal the formation of crystalline calcium phosphate structures assigned to HAp, and monetite, after exposure to SBF. The samples induced changes in the pH of the osteoblasts culture media which was responsible for the cells death after 14 days of culture. New experiments have been carried out in order to achieve a better control of the experimental parameters. **CONCLUSION:** The patterns of HAp and monetite, both after 7h of exposure as after exposure to SBF, revealed by the analysis of XRD, vouched the bioactivity of the hybrid membranes.

Keywords: Collagen; Hydroxyapatite; Hybrid Materials; Carrageenan; Biopolymer membrane

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