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Tissue behavior in response to alginate-hydroxyapatite-capsul containing membrane

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Abstract. The aim of this study was to evaluate the tissue behavior to alginate hydroxyapatite-capsul containing membranes. The biomaterials were implanted subcutaneously and subperiostealy into mice, in accord with the following groups: G1=alginate-capsul membrane and G2=alginate-hydroxyapatite-capsul membrane. After 1, 3 and 9 weeks, animals were killed and samples were prepared to histological analysis. Mild revascularization was noted in all periods. Biodegradation was associated with the presence of new loose connective tissue. The presence of giant multinucleated cells was discrete and the inflammatory reaction was moderate. In conclusion, the experimental alginate and alginate-hydroxyapatite membranes can be considered biocompatible and partially reabsorbable.

Guided tissue and bone regeneration are based on concept of create a barrier to avoid undesirable tissue ingrowth and promote the proliferation of target cells involved with repair process. An optimal membrane should be biocompatible, occlusive, synthetic, space maintaining, clinically manageable and degradable, but the ideal material is not available yet. Polymers as alginates show low toxicity and high biocompatibility and hydroxyapatite (HA) have been reported with osteoinductive or osteoconductive potential. Composites binding these properties could be a good choice for a development of new biomaterials.

In this study, physical characterization used 3 samples of each material (G1=alginate-capsul membrane and G2=alginate-hydroxyapatite-capsul membrane) for scanning electron microscopy analysis (SEM). For biological characterization, both membranes were implanted subcutaneously and subperiostealy into mice (register CEPA-UFF36/2008), in accord to the following groups: After 1, 3 and 9 weeks (ISO 10993-6), animals were killed and samples were prepared to histological analysis that used as staining methods hematoxylin-eosin (H-E), picrosirius and alcian blue. The parameters evaluated were: biodegradation, vascularization, tissue integration and foreign body reactions.

SEM analysis showed irregular topography (G1/G2) and tiny particles associated to alginate resembling HA (G2). In biological evaluation, both groups showed similar results. Mild revascularization was noted in all periods. Small biodegradation was associated with the presence of new loose connective tissue, poor in collagen fibers. The presence of giant multinucleated cells was discrete and the inflammatory reaction was moderate. In conclusion, the experimental alginate and alginate-hydroxyapatite membranes can be considered biocompatible and partially reabsorbable.

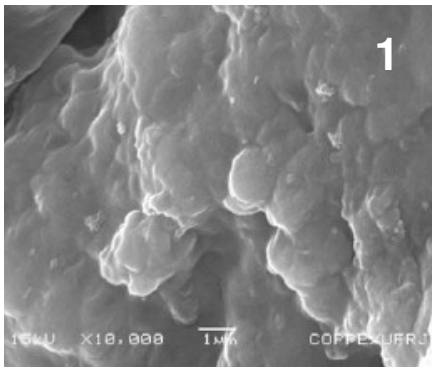

Figure 1: SEM image of alginate-HA-capsul membrane.

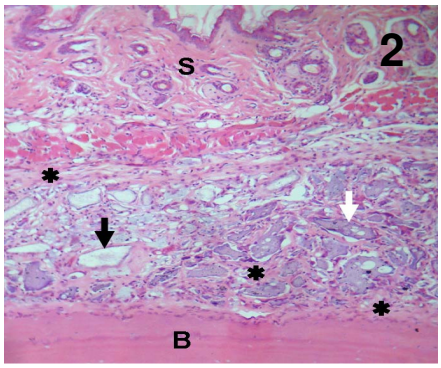

Figure 2: Photomicrography of alginate-HA-capsul membrane into subperiosteal site. S-skin, B-bone, asterisks-loose connective tissue, black arrow-hydroxyapatite and white arrow-alginate. H-E, 200x.

Reference:

[1] C. Jardelino, E. R. Takamori, S. R. A. Santos, A. M. Rossi, J. M. Granjeiro. Biocompatibility of bovine anorganic xenograft. Key Engineering Materials 396 (2009) 3-6.