

Regenerative potential of bioresorbable collagen membranes: ultrastructural profile of Human Periodontal Ligament Fibroblasts exposed to Bovine Pericardium Membranes

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Regenerative dentistry has seen promising advancements in the development of biomaterials that can guide and stimulate the regeneration of dental tissues. Unique chemical, mechanical and biological properties, with a specific mention to osteoinductivity and osteoconductivity, are the main features of these class of biomaterials, which make them suitable to interact with living tissue [1]. A significant contribute to regenerative dentistry derived from resorbable and non-resorbable membranes. Resorbable membranes made of collagen are promising biomaterials, and serum bovine pericardium membranes are the most representative resorbable membranes. The aim of this study is to investigate the ultrastructural profile of human periodontal ligament fibroblasts (HPLFs) cultured in standard conditions and exposed to bovine pericardium membranes of different thicknesses (0.2 mm and 0.4 mm) for 24 hours. The HPLFs underwent transmission electron microscopy (TEM) standard preparative. The ultrastructural profile of HPLFs displayed peculiar changes, when exposed to bovine pericardium membranes for 24 hours. HPLFs in fact showed a large nucleus, prominent nucleoli, clustered rod-like shaped mitochondria, richly developed endoplasmic reticulum (ER) and Golgi apparatus, and extensive tapering cytoplasmic projections. The protein synthesis and metabolism cellular compartments increased, when compared to the control: Unpaired *t*-test and one-way ANOVA showed that HPLFs exposed to membranes displayed an increase in the number of mitochondria (89.23 ± 7.44 vs 66.90 ± 9.58 ; T1 and control; $p < 0.01$ and 84.05 ± 14.01 vs 66.90 ± 9.58 ; T2 and control; $p < 0.05$).

This new ultrastructural evidence ascertains the stimulation of the protheosynthetic active state of HPLFs triggered by the collagen bovine membrane, confirming the active role played by this type of biomaterial in the dynamics of tissue regeneration [2].

References

- 1) Mehta, D.; Deshpande, N.; Dandekar, S. Comparative Evaluation of Platelet-Rich Fibrin Membrane and Collagen Membrane along with Demineralized Freeze-Dried Bone Allograft in Grade II Furcation Defects: A Randomized Controlled Study. *J. Indian Soc. Periodontol.* 2018, 22, 322-327.
- 2) Bianchi, S.; Bernardi, S.; Simeone, D.; Torge, D.; Macchiarelli, G.; Marchetti, E. Proliferation and Morphological Assessment of Human Periodontal Ligament Fibroblast towards Bovine Pericardium Membranes: An In Vitro Study. *Materials* 2022, 15, 8284.