0157

Borosilicate Hydrogel: Innovations in Dental Tissue Regeneration

N. Attik[1, 2], J. Sohier[3], R. Gauthier[4], C. Goutaudier[5], C. Villat[2]
[1]Claude bernard university, Lyon, France, [2]CNRS LMI 5615/ Faculté d'odontologie de Lyon, Lyon, France, [3]Laboratoire de Biologie Tissulaire et d'Ingénierie thérapeutique, Lyon, France, [4]CNRS, INSA de Lyon, UCBL, MATEIS UMR CNRS 5510, Villeurbanne, France, [5]UMR CNRS 5615,, Villeurbanne, France

Objectives Hydrogels have proven to be excellent scaffolds for tissue regeneration. Additionally, borosilicate glass particles have been shown to enhance the biological behavior of dental pulp cells and exhibit acellular bioactivity. In this context, the aim of this study was to assess the in vitro biological behavior of human gingival fibroblasts (HGFs) in contact with an experimental aluminum-free borosilicate glass-functionalized hydrogel.

Methods Two experimental borosilicate particles without aluminum were selected, with Biodentine® particles chosen as the control material.The morphological structure of the elaborated hydrogel based on poly (L-lysine) dendrimers (DGL), with or without experimental aluminum-free borosilicate particles (BAGs), was analyzed using Micro-Computed Tomography (µCT). Scanning Electron Microscopy (SEM) combined with Energy-Dispersive X-ray Spectroscopy (EDX) was employed to investigate the surface composition of the hydrogel compositions. Cytocompatibility with human gingival fibroblasts (HGFs) was assessed using Live/Dead™ staining, and cell colonization was evaluated via confocal imaging. Additionally, Alizarin Red staining was utilized to detect and quantify the formation of mineralized nodules after 7 and 14 days of incubation.

Results The µCT results revealed that the addition of BAGs does not affect the hydrogel porosity, while EDX analysis confirmed the presence of BAGs particles on the surface of the functionalized hydrogel. No cytotoxic effects were observed in contact with the BAGs or Biodentine®-functionalized hydrogels, as indicated by Live/Dead staining. The presence of BAGs promoted cell proliferation and colonization of the hydrogels. Furthermore, Alizarin Red staining showed a notable increase in the number of calcium nodules in the presence of the experimental BAGs-functionalized hydrogels.

Conclusions The experimental aluminum-free borosilicate glass-functionalized hydrogel shows promise in enhancing the textural properties of existing hydrogels and thereby accelerating their bioactivity. These findings offer new insights into the biological behavior of experimental hydrogels containing aluminum-free borosilicate and their potential clinical application for dental tissue regeneration following further development.