Fabrication of a Hybrid Bio-Adhesive and Bioactive Composite Scaffold to Enhance Cell Adhesion and Induce Osteogenic Differentiation

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Electrospun membranes have been widely used for bone tissue regeneration due to its ability to guide osteoblasts cells to differentiation and maturity. The focus of this project is to improve the adhesion and induce osteogenic differentiation of osteoblastic cells using hybrid composite scaffolds. We will achieve this by incorporating into the nanofiber membranes bioglass, which induces differentiation, and a polydopamine (PDA) coating, which improves cell adhesion to the scaffold. The electrospun membrane will be characterized through Scanning Electron Microscopy (SEM) and Energy dispersive spectroscopy (EDS), Fourier-transform infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA), Atomic force microscopy (AFM), X-Ray Diffraction (XRD) and X-Ray photoelectron spectroscopy (XPS). Once these results have been analyzed and confirmed for structural stability and deposition, we will proceed with cell culture assays. Osteoblasts will be cultured into the hybrid bio-adhesive and bioactive composite scaffolds and analyzed through immunochemistry. BrdU assay will be used for detection of the proliferation of hBMSC *in vitro,* in static culture. Imaging will be performed to study cytoskeleton morphology during the cell growth and to identify expressed proteins responsible for osteogenic differentiation. On the other hand, alkaline phosphatase (ALP) activity will also be measured as a sign of osteoblasts mineralization and maturation.