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Enhancement of fibroblasts outgrowth onto polycaprolactone nanofibrous grafted by laminin protein using carbon dioxide plasma treatment

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A common approach in tissue engineering is to mimic the architecture of the natural Extracellular Matrix (ECM). The ECM plays an important role in regulating cellular behaviors by influencing cells with biochemical signals and topographical cues. Nanofibrous constructs have been used extensively as potential tissue engineering platforms. It is generally hypothesized that a close imitation of the ECM provides a more conducive environment for cellular functions ranging from adhesion, migration, proliferation to differentiation. In this study, the Polycaprolactone (PCL) nanofibers designed were then modified by carbon dioxide plasma and laminin in order to enhance the cell adhesion, spreading and proliferation. The samples were evaluated by Attenuated Total Reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR), Scanning Electron Microscope (SEM), contact angle and finally, cell culture. ATR-FTIR structural analysis showed the presence of functional groups on the nanofibrous surfaces. The SEM images showed the average diameter of nanofibers to be about 100-300 nm for samples. The 82° difference was obtained in the contact angle analysis, obtained for the laminin-modified nanofibrous mat against the unmodified nanofibrous mat. Cellular investigation showed better adhesion and cell growth and proliferation of laminin-modified nanofibrous samples than other samples. Therefore, the modification of electrospun scaffolds with bioactive protein is beneficial as this can create an environment that consists of biochemical cues to further promote cell adhesion and proliferation.

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