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Electrospun Nanofibrous Scaffolds Modified with Collagen-I and Fibronectin with LX-2 Cells to Study Liver Fibrosis in vitro

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Abstract : Three-dimensional microenvironment is a need to study the event cascades of liver fibrosis in vitro. Electrospun nanofibers modified with essential extracellular matrix proteins can closely mimic the random fibrous structure of native liver extracellular matrix (ECM). In this study, we fabricate a series of 3D electrospun scaffolds by wet electrospinning process modified with different ratios of collagen-I to fibronectin to achieve optimized distribution of these two ECM proteins on the fiber surface. A ratio of 3:1 of collagen-I to fibronectin was found to be optimum for surface modification of electrospun poly(lactic-co-glycolic acid) (PLGA) fibers by chemisorption process. In 3:1 collagen-I to fibronectin modified scaffolds the total protein content increased by ~2 fold compared to collagen-I modified and ~1.5 fold compared to 1:1/9:1 collagen-I to fibronectin modified scaffolds. We have cultured LX-2 cells on this scaffold over 14 days and found that LX-2 cells acquired more quiescent phenotype throughout the culture period and shown significantly lower expression of alpha smooth muscle actin and collagen-I. Thus, this system can be used as a model to study liver fibrosis by using different fibrogenic mediators in vitro.

Keywords : electrospinning, collagen-I and fibronectin, surface modification of fiber, LX-2 cells, liver fibrosis
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