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Nanofibrous Meshes Promoting Celular Proliferation

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Biomedical applications of electrospun nanofibrous meshes have been receive tremendous attentions because of their unique structures and versatilities as novel biomaterials. Incorporation of growth factors in fibrous meshes can be performed by surface-modification and encapsulation. Those growth factors stimulate differentiation and proliferation of specific types of cells and thus lead tissue regenerations of specific cell types. Topographical cues of electrospun nanofibrous meshes also increase differentiation of specific cell types according to alignments of fibrous structures. Wound healing treatments of diabetic ulcers were performed using nanofibrous meshes encapsulating multiple growth factors. Aligned nanofibrous meshes and those with random configuration were compared for differentiating mesenchymal stem cells into neuronal cells. Thus, nanofibrous meshes can be applied to novel drug delivery carriers and matrix for promoting cellular proliferation.

Keywords: Nanofiber, Wound helaing, Differentiation, Stem cell

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Biomimetic Electrospun Fibers for Tissue Engineering Applications

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The central strategy in tissue engineering involves a biomaterial scaffold as a delivery carrier of cells and a depot to deliver bioactive molecules. The ability of scaffolds to control cellular response to direct particular repair and regeneration processes is essential to obtain functional tissue engineering constructs. Therefore, many efforts have been made to understand local interactions of cells with their extracellular matrix (ECM) microenvironment and exploit these interactions for designing an ideal scaffold mimicking the chemical, physiological, and structural features of native ECM. ECM is composed of a number of biomacromolecules including proteins, glycosaminoglycans, and proteoglycans, which are assembled together to form complex 3-dimensional network. Electrospinning is a process to generate highly porous 3-dimensional fibrous structure with nano to micro scaled-diameter, which can closely mimic the structure of ECM. In this presentation, our approaches to develop biomimetic electrospun fibers for modulation of cell function will be discussed.

Keywords: Tissue engineering, Electrospun fiber, Biomimetic