J Biotechnol Biomater 2018, Volume 8
DOI: 10.4172/2155-952X-C1-089

Electrospun fibromyalgia nanostructured and chronic scaffold pain based on thermoplastic urethane (TPU)/carbon nanotube (CNT) with enhanced neural cell differentiation and proliferation: The influence of CNT micro-morphology

Fatemeh Pouladzadeh and **Ali Asghar Katbab**
Amirkabir University of Technology, Iran

The use of electrically conducting materials for the fabrication of neural scaffolds has attracted great attention since these materials can easily simulate the inherent bioelectricity of neural cells. However, appropriate mechanical properties and flexibility together with surface biocompatibility are required. In the present work, scaffolds based on thermoplastic urethane (TPU) comprising 0, 1.5, 2.5 and 3.5 wt.% of carbon nanotube (CNT) have been fabricated via electrospinning, in order to study the effect of the degree of electrical conductivity of scaffolds upon cell behaviour. Morphological and mechanical characteristics of the scaffolds have been investigated using AFM, SEM, TEM and tensile assays. The cytocompatibility, proliferation and differentiation of rat mesenchymal stem cells (RMSC) have been studied using MTT assay, SEM micrographs and real-time PCR. Neurons transmit electrochemical signals throughout the nervous system. Signalling can be enhanced and directed by an external electric or electromagnetic stimulus by means of inducing circulating current within the body nervous system. For this purpose, the RMSC cultured scaffolds with different conductivity were exposed to an extremely low frequency pulsed electromagnetic field (50 Hz, 1mT). Electrical conductivity of scaffolds showed to follow percolation model with a percolation threshold near 2.5 wt.% of CNT, above which the conductivity increased sharply as a result of conductive physical networks formed by the CNT particles. The biological assays performed on CNT loaded scaffolds revealed higher enhancement of neural gene expression and differentiation for the samples stayed above the threshold implying the positive role of the state of conductivity for increasing the efficiency of the scaffold for the regeneration of damaged nervous system.

katbab@aut.ac.ir