Nanomedicine & Biotherapeutic Discovery

Extended Abstract

A conductive hydrogel scaffold reinforced with Nano fibers for peripheral nerve tissue engineering

Abstract

Fabrication of conducting fiber-hydrogel composites mimicking the properties of peripheral nerve Extra Cellular Matrix (ECM) is critical for the success of nerve tissue engineering. These systems can promote the regeneration of peripheral nerve tissues which respond to electrical conduction to improve the individual deficiencies of electro spun and hydrogel scaffolds such as insignificant cellular infiltration and poor mechanical properties. In this study electrospinning and amino-lysis reaction were used to prepare Polylactic Acid (PLA) fragmented nanofibers. Next step was grafting conductive Polypyrrole (PPy) to the chitosan (CS) backbone. Scaffolds were obtained by dispersion of fragmented fibers into CS-PPY and gelation occurred by genipin. Scanning Electron Microscopy (SEM) images represented the formation of continues and uniform PLA nanofibers without beads. Grafting NH2 groups onto fragmented PLA nanofibers was confirmed by Fourier Transform Infrared (FTIR) spectroscopy and Energy-dispersive X-ray spectroscopy (EDX). Electrical conductivity and mechanical properties were performed in order to characterize the produced composite properties. Dispersion of nanofibers into the CS-PPY hydrogel improved mechanical properties compared to nanofiber-free scaffolds and reduced water absorption. SEM images showed that conductive composite scaffold supports PC12 cell adhesion, infiltration and proliferation. Therefore, it could be concluded that PLA nanofibers/CS-PPY hydrogel composites are a promising material for peripheral nerve regeneration.

This work is partly presented at joint event 30th Annual Congress on Nanotechnology and Nanomaterials & 8th World Congress on Spectroscopy and Analytical Techniques, September 10 - 11, 2019, Stockholm, Sweden

Alireza Mahjoubnia

Amirkabir University of Technology, Iran