ENCAPSULATION OF FGF-2 IN PLGA NANOFIBERS USING COAXIAL ELECTROSPINNING

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Coaxial electrospinning, a modified version of traditional electrospinning makes it possible to produce fibers with a core–shell structure. This study aimed to develop scaffolds of core-shell nanofibers encapsulating the fibroblast growth factor 2 (FGF-2), an important growth factor involved in tissue repair. The core of the fibers was an FGF-2 solution diluted in phosphate-buffered saline (PBS) at 100µg/ml, whereas the shell solution consisted of 18% poly(lactic-co-glycolic acid) (PLGA 75:25) in hexafluoro-2-propanol. The core solution was injected at a controlled flow rate of 0.2 ml/h and the shell solution at 2 ml/h. The applied voltage was 16 kV and the spinneret tip/collector distance was 15 cm. The electrospinning processes were performed at 22 °C and 45% humidity. The morphology of the PLGA/FGF-2 nanofibers was analyzed by scanning electron microscopy and their diameter was calculated using ImageJ software. Verification of the core–shell structure was performed by transmission electron microscopy (TEM) and laser confocal scanning microscopy. The scaffold wettability was analyzed by water contact angle measurements. For the release study, the samples were placed in 7 ml PBS in a shaker at 37°C and 65 rpm and 1 ml of the sample was collected at 1 hr, 8 hr, 24 hr, 5, 10, 15 and 20 days. Coaxial electrospinning resulted in a uniform fiber morphology without any beads with a hydrophobic surface. By TEM analysis, it was possible to visualize the core–shell structure of the nanofibers. Additionally, by using fluorescein in the core, it was possible to confirm the presence of fluorescence inside the fibers by confocal microscopy. The average diameter of the fibers was of 811 ± 0.140nm. Preliminary results by the ELISA technique demonstrated an FGF-2 release over two weeks with an initial burst in the first 8 hours. This study focuses on the use of these fibers for tissue engineering applications, where a controlled rate of growth factor release is desired.