Chitosan/poly(caprolactone) Fibrous Scaffold for Controlled Release of Hydrocortisone

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Abstract

Electrospinning as a promising technique for making fibrous has attracted enormous research interest due to its flexibility, inexpensively, simplicity, being capable for broad range of polymers, and etc. In addition, the fabrication of electrospun nanofibers using polymers both naturally and synthetic found to be effective in developing appropriate drug delivery system [1,2]. For instance, gelatine, collagen, chitosan (CS), and hyaluronic and synthetic polymers for example poly(caprolactone) (PCL), poly lactic acid) (PLA), polyethylene oxide, and copolymers such as poly(L-lactic-co-glycolic acid) (PLGA) have been used in the synthesis and fabrication fibrous scaffold [3].

In this work, we synthesized fibrous scaffold of CS/PCL containing beads with various loading of hydrocortisone by electrospinning. Fiber diameter, number of beads and morphology of these fibers were examined by field emission scanning electron microscopy (FESEM). Also, the in vitro release of this drug was analyzed by LC/MS system.

Chitosan and poly(caprolactone) were purchased from Sigma-Aldrich. Acid formic, acetone, ethanol, and chloroform as solvent were purchased from Merck. Field emission scanning electron microscopy (FE-SEM, F4160, HITACHI Japan) and LC/MS (Agilent) were used for investigation of the fiber diameter and number of beads, and amount of hydrocortisone release, respectively.

Fibrous scaffold was prepared by ESP technique (Figure 1) with solution of 25 and 75 percent of the CS and PCL dissolved in 4:1 ratio of acid formic and acetone. For preparation scaffold with various loading of drug, the hydrocortisone was dissolved in a mixture of 1 volume of ethanol and 9 volumes of chloroform.

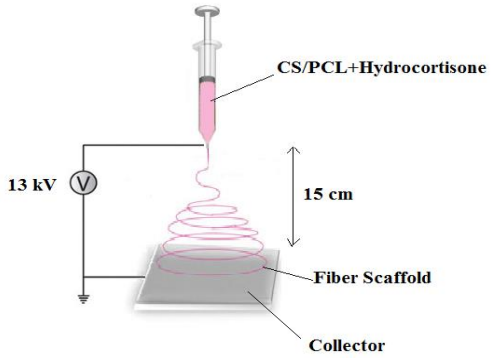


Figure 1: Electrospinning set-up for fabrication of fibrous scaffold containing beads.

The fiber diameter and number of beads were investigated by FE-SEM images (**Error! Reference source not found.**2a). As shown in **Error! Reference source not found.** 2a, the diameter of CS/PCL fiber was significantly decreased by adding hydrocortisone to copolymer solution. **Error! Reference source not found.**2b shows the number of beads per 100 µm2 which were examined by image analyzer software. Figure 3 indicates the varriation of fibers diametrs by hydrocorisone weight

ratio.

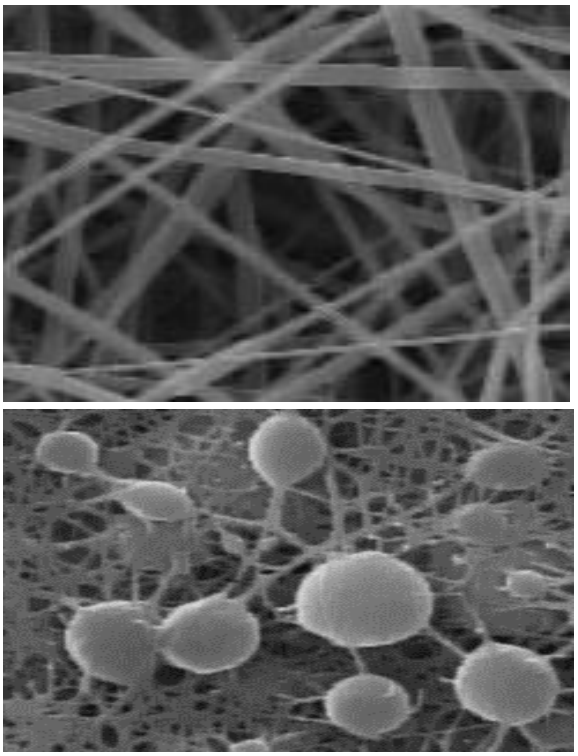


Figure 2: Field emmision scanning electron microscopy images of prisiine and drug containing electrospun scaffolds.

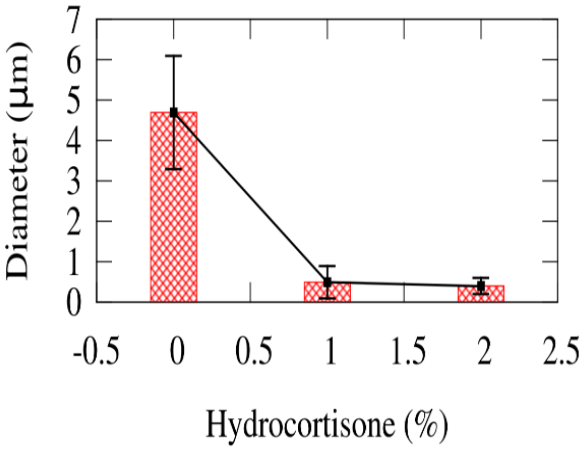


Figure 3: The varriation of fibers diametrs by hydrocorisone weight ratio.

Recent Publications

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Rasoul Moradi Biography

Born and Raised in Iran, Rasoul has taken his PhD in Chemical Engineering-Nanotechnology from Tehran University. His main field of research is about nanotechnology application in various chemical engineering branches especially nanofibers, nanofluids and biocompatible polymeric materials. He has more than 25 Scientific publications and working as senior researcher/lecturer at Khazar university, Baku.

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