Preparation and characterization of electrospinning PEG-PLA nanofibers for sustained release of tamoxifen

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Background and Aims: Polyethylene glycol (PEG) is hydrophilic polymer and most popular used because of many advantages, such as good hydrophilicity, flexibility, antiphagocytosis against macrophages, and biocompatibility. Polylactic acid (PLA) is a synthetic biodegradable polymer which its application has been limited due to its weak hydrophilicity, excessively long degradation time, and low drug loading of polar drugs. To overcome this shortcoming, copolymerization with PEG has been proposed by different researchers in order to improve hydrophilicity, degradation rate and crystallization of PLA for development in new drug delivery systems. Recently, there is a growing interest to use nanofibers for sustained release of various therapeutic agents. Electrospinning has been recognized as an efficient technique for the fabrication of polymeric nanofibers. In this study, nanfibers of PEG-PLA copolymers were prepared and characterized in order to be used as drug delivery system.

Methods: Triblock copolymer of PLA-PEG was synthesized successfully. GPC, DSC, NMR and FTIR analysis of PEG-PLA copolymer was performed. The nanofibers were produced by electrospinning technique using a solution of copolymer in DCM (30%). Scanning electron microscopy (SEM) was used to investigate the morphology and average diameter of the electrospun nanofibers.

Results: The structure and composition of the synthesized PLA-PEG-PLA Tri-block copolymer was confirmed by HNMR, and FT-IR. The presence of methine . SEM analysis confirmed the formation of nanofibers. GPC analysis was used to determine the average molecular weight of copolymer. The diameter of nanofibers was revealed by SEM to be in range of 157 nm. DSC was also used to characterize prepared nanofibers. The results showed that tamoxifen was well incorporated and dispersed uniformly in biodegradable PEG–PLA fibers by using electrospinning method.

Conclusions: In general, it can be concluded that PLA-PEG nanofibers can be prepared by electrospinning method and are suitable as a nanocarrier for tamoxifen.

Keywords: PLA-PEG-PLA; Nanofibers; Tamoxifen