

Controlled Release Of Nano Liposome-Encapsulated Metformin-HCL Loaded In PCL-Chitosan/ PVA Core-Shell Nanofibers For Wound Healing Applications

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Abstract:

Liposomes and nanofibers are widely used as nanocarriers for controlled drug delivery systems due to their favorable features. These nanostructures' ability to encapsulate large amounts of drugs, minimizing unwanted side effects, high efficacy, biodegradable nature, and low toxicity has attracted the interest of researchers. In this work, Metformin-HCl were incorporated into the liposome nanoparticles, and the following were loaded into the PCL-Chitosan/PVA core-shell electrospun nanofibers for controlled release of metformin-HCl over the required time for the wound healing process. The nanocarrier's physicochemical and mechanical properties, including degradation rate, water uptake, drug loading efficiency, in vitro release profile, and mechanical characteristics, have been investigated. The biological tests, such as MTT assay, the scaffold's biocompatibility, cell adhesion, and antibacterial behavior, were conducted. Given the scaffold's architecture and engineering, it could be used as a suitable scaffold for skin tissue engineering. The results confirmed that liposomal-metformin HCL loaded in PCL-Chitosan / PVA core-shell nanofibers are potential nanocarrier candidates for sustained

drug delivery in wound healing applications.

Pharmaceutical nano-fibers have attracted widespread attention from researchers for reasons such as adaptability of the electro-spinning process and ease of production. As a flexible method for fabricating nano-fibers, electro-spinning is extensively used. An electro-spinning unit is composed of a pump or syringe, a high voltage current supplier, a metal plate collector and a spinneret. Optimization of the attained nano-fibers is undertaken through manipulation of the variables of the process and formulation, including concentration, viscosity, molecular mass, and physical phenomenon, as well as the environmental parameters including temperature and humidity. The nano-fibers achieved by electro-spinning can be utilized for drug loading. The mixing of two or more medicines can be performed via electro-spinning. Facilitation or inhibition of the burst release of a drug can be achieved by the use of the electro-spinning approach. This potential is anticipated to facilitate progression in applications of drug release modification and tissue engineering (TE). The present review aims to focus on electro-spinning, optimization parameters, pharmacological applications, biological characteristics, and in vivo analyses of the electro-spun nano-fibers. Furthermore, current developments and upcoming investigation directions are outlined for the advancement of electro-spun nano-fibers for TE. Moreover, the possible applications, complications and future developments of these nano-fibers are summarized in detail.