Analysis of drug release kinetics from electrospun-based nanofibrous wound dressings

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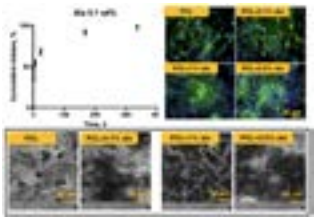
Wound healing often requires use of antibiotics, which might produce negative side effects like trouble sleeping, headache, diarrheas, etc. Thus, there is heightened interest of local delivery of a drug to a wound. Accordingly, electrospinning is a versatile method to produce biologically functional nanofibrous wound dressings for further applications in tissue engineering as local drug delivery systems. However, kinetics of drug release from such systems is still poorly understood. The purpose of this study is to develop nanofibrous wound dressing materials modified with incorporation of drugs. Moreover, the aim is to investigate drug release kinetics from the obtained wound dressings considering different drug loadings. Additionally, cell interactions and cytotoxicity of the fabricated mats was investigated. Finally, an attempt to establish a mathematical model for prediction of release kinetics of examined drug delivery system, proceeding from experimentally obtained data and on the basis of the solution of the diffusion equation, has been made. The fabricated nanofibrous mats in this study had biphasic kinetics of drug release. The mat with lower concentration was able to release the drug in a sustained manner for at least 7 days; Increment of the drug loading supported cells proliferation; None of tested drug loading was found cytotoxic. The characterization of the process of drug release from nanofibres and the development of a mathematical model for the calculation of drug concentration will facilitate the design and preparation of nanofibrous wound dressings. The main impact of this study is therefore mainly in tissue engineering and regenerative medicine. Furthermore, in the pharmaceutical industry, due to its perspective to avoid adverse effects and reduction of the required dosages; the importance of such research is proofed by the growing interest of leading pharmaceutical companies in this field.



Recent Publications:

1. L Preem et al.(2017) Interactions between chloramphenicol, carrier polymers and bacteria-implications for designing electrospun drug delivery systems countering wound infection. Molecular Pharmaceutics 14(12):4417-4430.
2. Z Huo et al.(2015) Electrospinning preparation of timosaponin b-ii-loaded plla nanofibers and their antitumor recurrence activities *in vivo*. Journal of Nanomaterials 2015(Art ID367964):1-9.
3. K Kataria et al.(2014) *In vivo* wound healing performance of drug loaded electrospun composite nano fibers transdermal patch. International Journal of Pharmaceutics 469 (1):102-110.

Biography

Nikifor Asatiani has completed her graduation from Technical University of Liberec (Czech Republic), in 2018 with the specialties including Nonwoven materials, Tissue Engineering and Nanomaterials. Later on, he continued his research in development of electrospun-based wound dressings. Presently he is working at the Technical University and the Institute for Nanomaterials, Advanced Technology and Innovation at the Liberec City.

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