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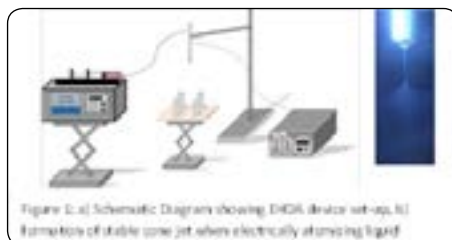
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Development of electrospun timolol maleate-loaded fibrous nanocoatings for ocular lenses

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The complexity of the structure of the eye, more specifically the cornea [1], poses a great challenge with respect to topical ocular drug delivery [2]. As a result, extensive research in this field has yielded an array of approaches to overcome these anatomical barriers; one of which is the use of PEs. In an attempt to utilise PEs to increase the corneal penetration of timolol maleate, electrohydrodynamic atomisation (EHDA) was employed to fabricate drug loaded polymeric fibers containing PEs. EHDA is an on-demand; simple, easily amendable process (figure 1) capable of producing uniform structures which can be utilised as coatings for ocular lenses for ocular drug delivery [3, 4]. The resulting fibrous coatings were characterised with respect to morphology, thermal behaviour, in vitro drug release, release kinetics and ocular biological tolerability. SEM analysis of the electrospun structures confirmed the presence of smooth nano-fibers; whilst thermal analysis confirmed the stability of all formulations. In vitro release studies demonstrated a triphasic release; initial burst release with two subsequent sustained release phases with most of the drug being released after 24 hours (86.7%) Biological evaluation studies confirmed the tolerability of all formulations tested with release kinetics modelling results showing drug release was via quasi-Fickian or Fickian diffusion. There were evident significant differences ($p < 0.05$) in TM release dependant on permeation enhancer. The use of electrospinning to produce contact lens coatings has not yet been scrutinised in the pharmaceutical research remit and has shown great potential here; proposing a novel formulation and ocular drug delivery device to enhance TM release.



Recent Publications:

1. Mehta P, Haj-Ahmad R, Al-Kinani A, et al (2017) Approaches in topical drug delivery and developments in the use of contact lenses as drug-delivery devices. *Therapeutic Delivery*. 8:521-541
2. Taska, P, Tatke A, Majumdar S, (2017). Advances in the use of prodrugs for drug delivery to the eye. *Expert Opinon, Drug Delivery*, 14: 49-63
3. Mehta P, Justo L, Walsh S, et al, (2015) New Platforms for multi-functional ocular lenses: Engineering double-sided functionalised nano-coatings. *Journal of Drug Targeting*, 23:305-310
4. Mehta P, Haj-Ahmad R, Raskeh M, et al (2017) Pharmaceutical and biomaterial engineering via electrohydrodynamic atomization technologies. *Drug Discovery Today*, 22:157-165
5. Morrison PWJ, Khutoryanskiy V.V, (2014) Enhancement of corneal permeability of riboflavin using calcium sequestering compounds. *International Journal of Pharmaceuticals*. 472:56-64.

Biography

Prina Mehta is a final year PhD student whose passion and research resides in the ocular drug delivery remit. I completed my BSc in Pharmaceutical and Cosmetic Sciences in 2014. My final year project used EHDA techniques for mart microneedle coatings and this propelled my interest in the various applications for which this technique could be used for. The concept behind the research for my PhD was to utilize the electrohydrodynamic process to fabricate multifunctional fibrous coatings on a nanoscale for soft contact lenses. The aim was to improve patient compliance, drug bioavailability and ultimately drug permeation through the cornea.

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