A REVIEW ON THE EFFICIENCY OF ELECTROSPUN NANOFIBERS FOR OCULAR DRUG DELIVERY

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Background: The eye is one most delicate organ in the body and cannot be medicated using the conventional methods. Its inability to hold extra fluids washes out the drug within no time, making the drug delivery system non biocompatible. Other drawbacks are bad permeability of drugs through the cornea, small possibility for drug absorption, preocular retention and sometimes even severe side effects. There is a need of a drug delivery system that can ensure prolonged drug release within the eye without causing drug wastage, corneal abrasion or side effects. Some of the diseases that require treatment are glaucoma, keratomycosis, dry eye the main drug release route of which is through the cornea. One of the potential drug carriers which has massively been a part of recent study are electrospun nanofibers. It is proposed that they have high adaptability and can set well in the cornea because of their soft nature. This puts them at a higher advantage then their semi solid and liquid counterparts, thus overcoming the issue corneal semi permeability. Their high surface area ensures prolonged drug delivery. Some studies also show them in favour of being a replacement for eye drops. This review talks about the impact of several drug polymer combinations used for ocular drug delivery.

Methods: Since the drug delivery must take place through the cornea, the system has to be completely sterile and free of any impurities that might cause irritation. Electrospinning is the process used to generate the nanofibers. The drugs are mostly encapsulated in the polymer solution and are sprayed on a collector plate using a syringe. The driving force is potential difference between the tip of the syringe and the collector plate. Different drugs have different concentration ratios of mixing, some studies even experimented with multiple drugs and other encapsulation methods. Some drugs were even tested with different polymer combinations. FTIR and SEM and drug release studies were carried out on these systems and data were recorded. Some studies were carried in vitro, while some were in vivo (rabbbit's eye).

Results: All the studies conducted with various permutations of drugs and carriers showed prolonged drug release. The ones which involved in vivo studies carried out on rabbit's eye, proved the bio compatible nature of the system by not causing any sort of irritation or toxicity to the cornea. The drug release went from being as low as 24 hours (Dexamethanose loaded ENI) to as high as 30 days (Levoflaxin loaded Polycaprolactone). Other systems showed an approximate drug release of 10 days.

Conclusions: All the studies conclude that the usage of electrospun nanofibers for ocular drug delivery showed a positive result and they can be used as drug carriers in the future. Other necessary conditions like long residence time, sustaining and a constant rate of drug release, betterment of the biocompatibility were all met. On drawing comparisons, Levoflaxin loaded PCL had the best drug release and did not cause any corneal abrasion in the in vivo test, and hence, could be termed as the best candidate for ocular drug delivery.