TDF/FTC Electrospun Nanofibers for Topical Prevention of HIV Transmission

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Background

Human immunodeficiency virus (HIV) is still a problem for global health so, there is a strong need to develop effective microbicides that can be used safely to protect from infection during sexual intercourse. This pre-exposure prophylaxis (PrEP) may be formulations containing oral or topical microbicides. Topical formulations have advantages as they are suitable for vaginal or rectal application and allow a higher local concentration of drug. It is recognized that the use of electrospun nanofibers for drug carriers is very promising in the biomedical field. So, the objective of this study is to develop a novel device for local application of antiretroviral microbicides enabling a controlled release of tenofovir disoproxil fumarate (TDF) and emtricitabine (FTC), based on electrospun polymeric nanofibers.

Methods

Based on Truvada®, the aim of this study is to encapsulate TDF and FTC into electrospun polymeric nanofibers. Chosen polymers were polycaprolactone (PCL) and poly(vinyl alcohol) (PVA). Nanofibers were characterized by SEM, EDS, DSC, among others. Kinetics of the release of the drugs from the fibers were studied *in vitro*. By using different polymers, polymers blends and sandwich type it was tried to tailor the release of the drugs.

Results

Both morphological (highly porous) and mechanical properties (300% of strain) of the nanofibers were adequate for a topical delivery purpose. Drugs were successfully encapsulated in the nanofibers and their release was evaluated in different media (aqueous and micellar) and with

different methodologies (with and without dialysis bag) simulating the physiological conditions and confinement at the biological application site. Interaction with mucin revealed suitable mucoadhesiveness.

Conclusion

Promising results were obtained showing that it is possible to produce a tunable topical delivery system based in polymeric nanofibers.

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