



OVERVIEW

- ✓ Electrospun nanofibers are nanometer-scale novel drug delivery systems with ultrafine structure, a large ratio of surface area to volume ratio, and a high porosity with a small pore size.
- ✓ In our study, to increase the penetration of a lipophilic antifungal drug (voriconazole (VCZ)) into deeper layers of the skin, VCZ was loaded into electrospun nanofibers.

METHODS

Preparation of nanofibers

- ✓ VCZ loaded nanofibers were produced by electrospinning of blends of a natural (sodium alginate (SA)) and synthetic polymer (polyvinyl alcohol (PVA)), then the optimized formulations were characterized.
- ✓ PVA/SA blend was prepared in the volume ratio of 8:2.
- ✓ VCZ was dissolved in 20% of the polymer blend volume of methanol and then added into the polymer blend at a concentration of 0,3% (w/v, VCZ to the polymer blend solution percentage).

Characterization

- ✓ The morphology and size of nanofibers were visualized by scanning electron microscopy (SEM, FEI-QUANTA FEG 450) (Fig. 1).
- ✓ Drug and nanofiber interaction was examined using FTIR Spectroscopy (Perkin Elmer Spectrum 100 FT-IR Spectrometer, Shelton, CT, USA) (Fig. 2)
- ✓ The drug content in nanofibers was determined by HPLC.
- ✓ Mechanical strength of the nanofibers was measured using dynamic mechanical analyzer (DMA, TA Q800).
- ✓ *In vitro* skin penetration of VCZ into stratum corneum and skin were investigated using Franz diffusion cells (diffusion area of 1.76 cm², Permeagear V6A Stirrer, Hellertown, PA, USA) following by 20 sequential tape stripping (Fig. 3).
- ✓ Cytotoxicity of the nanofibers was assessed by MTT test using mouse embryonic fibroblast cell line.

The nanofibers developed showed high dermal drug penetration and no cytotoxic effect.

This study suggests the potential application of VCZ-loaded nanofibers as novel topical drug carriers.

CONCLUSION

RESULTS

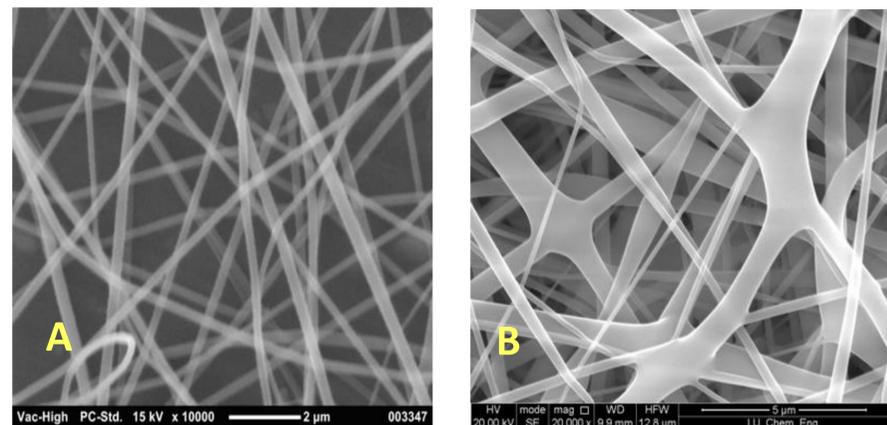


Figure. 1: SEM micrographs of a) PVA/SA nanofibers b) VCZ-loaded PVA/SA nanofibers

- ✓ The average diameter of PVA/SA nanofibers is $242,46 \pm 63,74$ nm and of VCZ-loaded nanofibers is $544,05 \pm 204,8$ nm.
- ✓ Drug content of VCZ-loaded nanofibers is 90,99%.

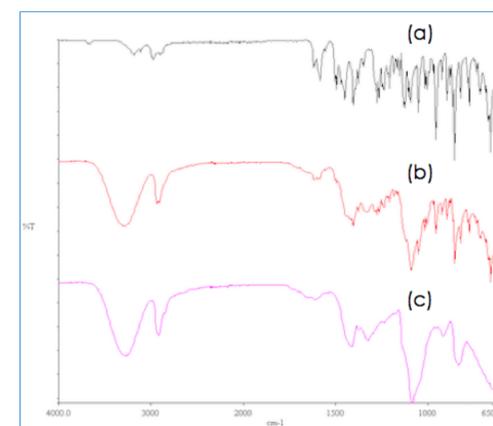


Figure. 2: FTIR spectra of a) VCZ b) PVA/SA nanofibers c) VCZ-loaded PVA/SA nanofibers

- ✓ The characteristic peaks of VCZ were absent in the FTIR spectrum of drug loaded PVA/SA nanofibers, suggesting that the drug was loaded into the nanofibers.

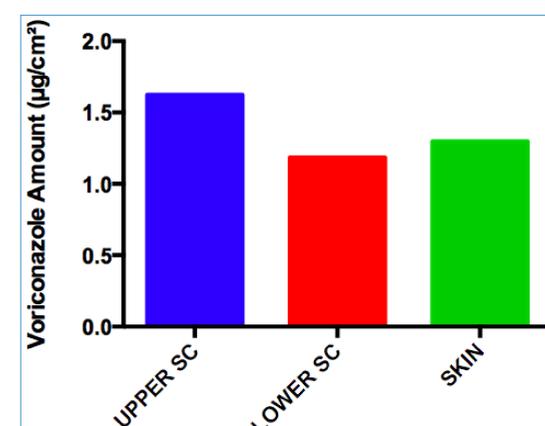


Figure. 3: In vitro drug penetration amounts to the skin

- ✓ The relaxation modulus (MPa) of PVA/SA nanofibers and VCZ-loaded nanofibers respectively: 106,0 MPa and 281,2 MPa.
- ✓ According to the MTT results; cells cultured with the PVA/SA nanofibers and VCZ-loaded nanofibers exhibited no significant differences in cell viability to those of the negative control.