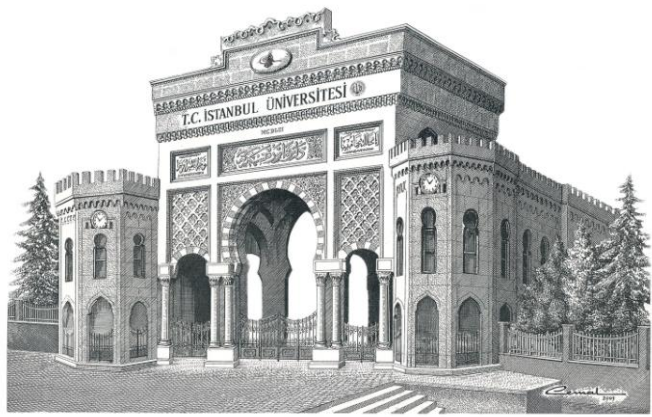


NAFTIFINE-LOADED ELECTROSPUN NANOFIBERS AS TOPICAL DRUG CARRIERS

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INTRODUCTION&AIM

- ✓ Electrospun nanofiber mats offer several desirable features as topical drug delivery systems. They have high surface area-to-volume ratios that provide efficient delivery of both hydrophilic and hydrophobic drugs, and they can provide sustained drug release, which reduces the frequency of topical application to increase patient compliance.
- ✓ This study aims to formulate and characterize naftifine (NFT), which is a highly lipophilic polyene antifungal drug) loaded polyvinyl alcohol (PVA)/ sodium alginate (SA) nanofibers as an alternative formulation approach for its effective cutaneous administration.

Preparation of nanofibers

- ✓ Nanofibers were prepared by electrospinning of 16% PVA and 2% SA in the volume ratio of 8:2.
- ✓ Voltage: 15 kV
- ✓ Feed rate: 1 ml/h.
- ✓ Distance between collection plate and needle tip: 15 cm.
- ✓ Crosslinking Agent: 25% Glutaraldehyde (GTA)

Code	Nanofiber Formulation
N	Plain PVA/SA
GTA	Plain crosslinked PVA/SA
NFT-N	NFT (0.3%w/v) loaded PVA/SA
NFT-GTA	NFT (0.3%w/v) loaded crosslinked PVA/SA

Scanning Electron Microscopy (SEM)

- ✓ The morphology and size of nanofibers were visualized by SEM (FEI-QUANTA FEG 450).
- ✓ The average diameters of the nanofiber mats was in the range of 242.46 ± 63.74 – 527.74 ± 251.12 nm (Fig. 1).

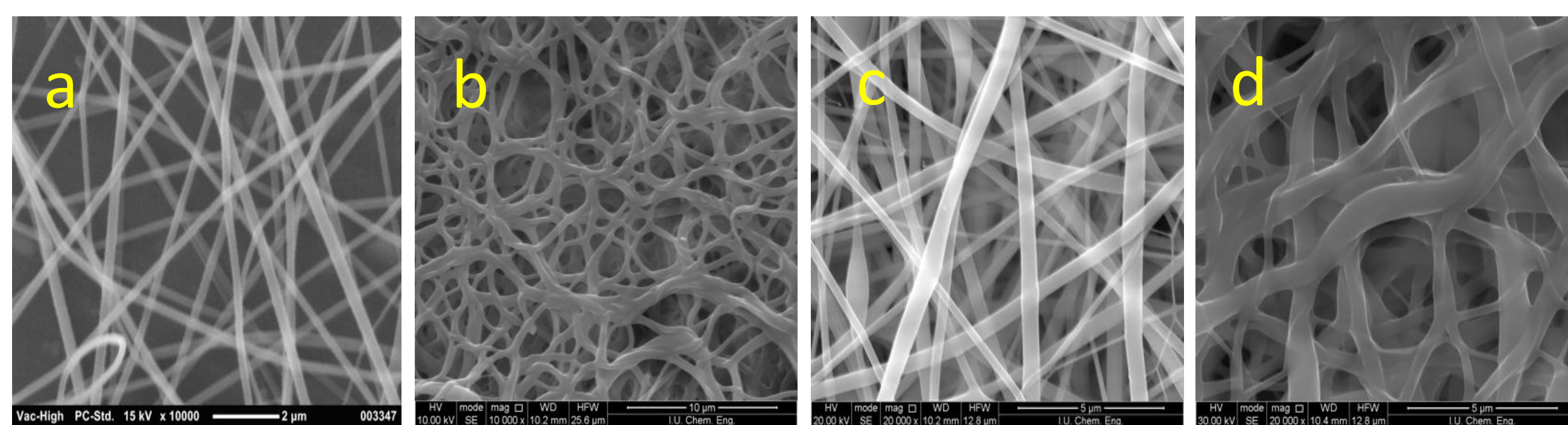


Figure 1: SEM micrographs of a) N b) GTA c) NFT-N d) NFT-GTA.

Entrapment Efficiency

- ✓ A known area of nanofibers was dissolved in the mixture of acetonitrile and distilled water (1:1, v:v) and the drug content in nanofibers was determined by HPLC.
- ✓ The entrapment efficiency of NFT in the mats was approximately 87.4%.

Dynamic Mechanical Analysis

- ✓ Mechanical strength of the nanofibers was measured using dynamic mechanical analyzer (DMA, TA Q800).
- ✓ The relaxation modulus (MPa) of the nanofibers was in the range of 106.0 Mpa–295.2 Mpa.

REFERENCE

1. Ulubayram K, et al., Curr. Pharm. Des., 21: 1930–1943.

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ATR-FTIR Study

- ✓ The chemical structure of the fibers was characterized using ATR-FTIR Spectroscopy (Perkin Elmer Spectrum 100 FT-IR Spectrometer, Shelton, CT, USA) with a wavenumber range of 400–4000 cm^{-1} .
- ✓ The FTIR spectra presented in Fig. 2 revealed that NFT was incorporated into the nanofiber mats.

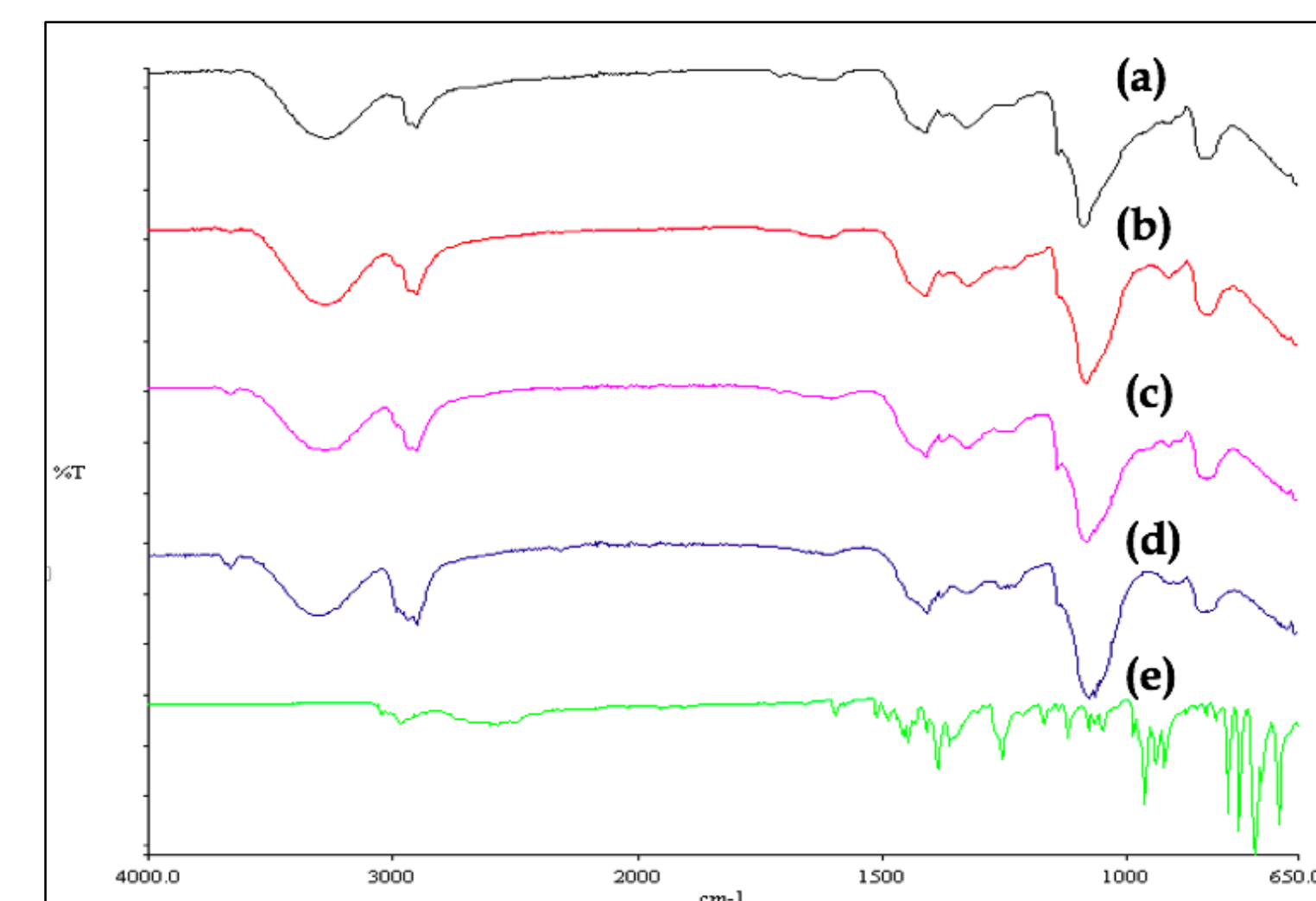


Figure 2: FTIR spectra of a) NFT, b) PVA/SA nanofibers, c) Crosslinked PVA/SA nanofibers, d) NFT-loaded PVA/SA nanofibers, e) NFT-loaded crosslinked nanofibers.

In Vitro Drug Release and Skin Penetration

- ✓ In vitro drug release and in vitro pig skin penetration of NFT was investigated using Franz diffusion cells (diffusion area of 1.76 cm^2 , Permeagear V6A Stirrer, Hellertown, PA, USA) (Fig. 3 & Fig. 4).

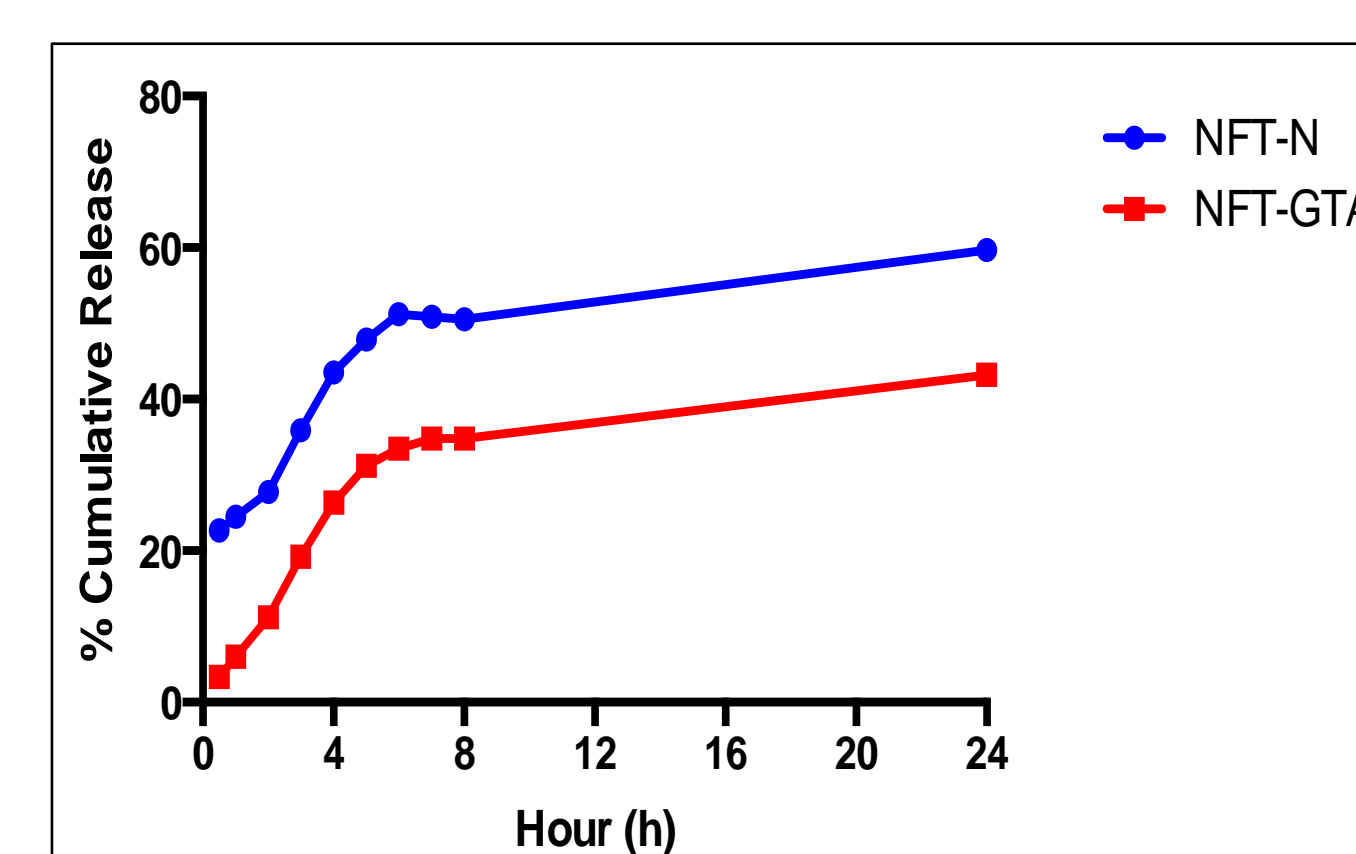


Figure 3. Release profiles of NFT from nanofiber formulations.

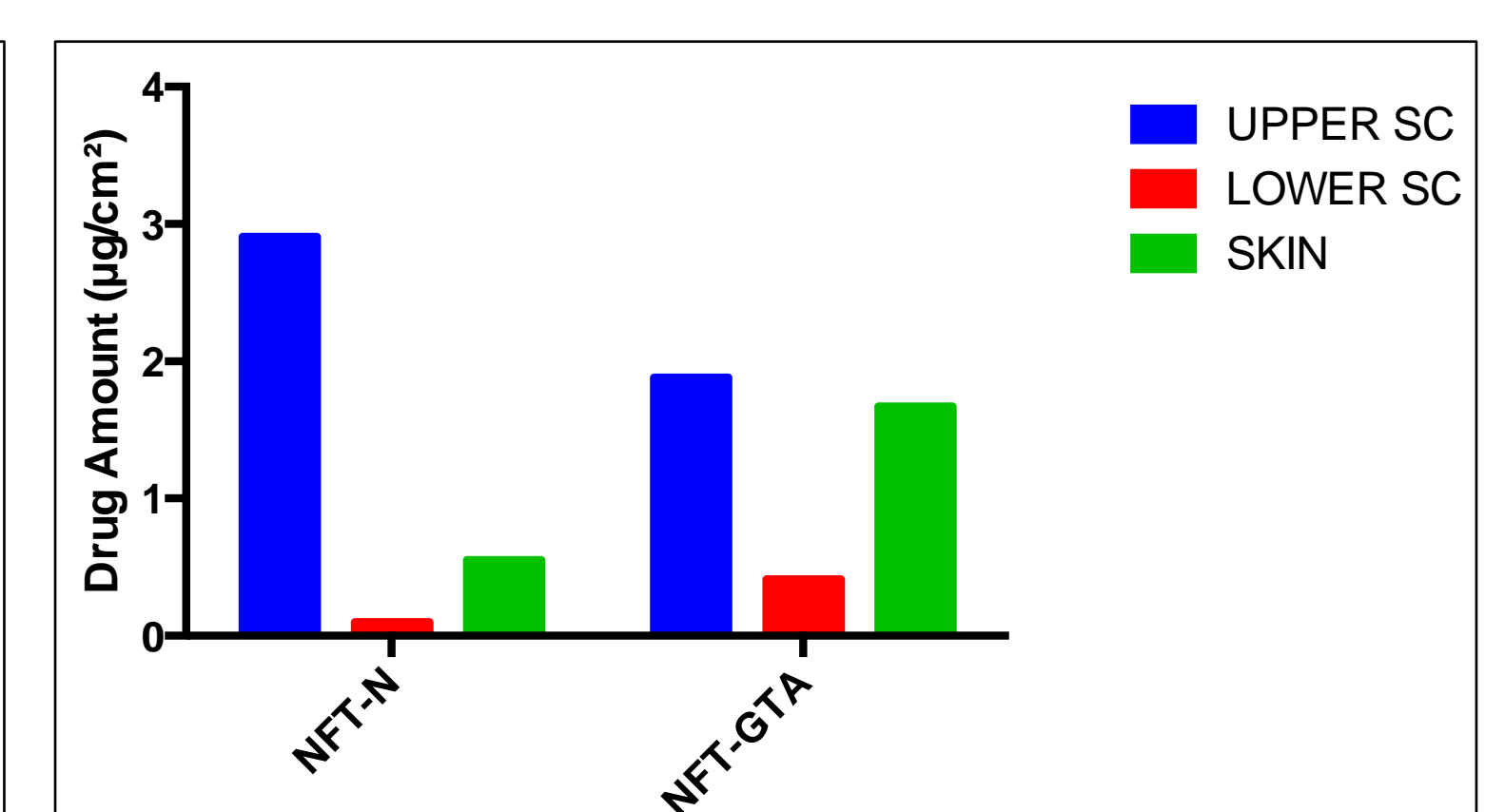


Figure 4. In vitro NFT penetration into the skin from nanofiber formulations.

Evaluation of Cytotoxicity

- ✓ MTT test performed with mouse embryonic fibroblast cell line confirmed more than 90% viability, which is an acceptable rate for a biocompatible material (Fig. 5).

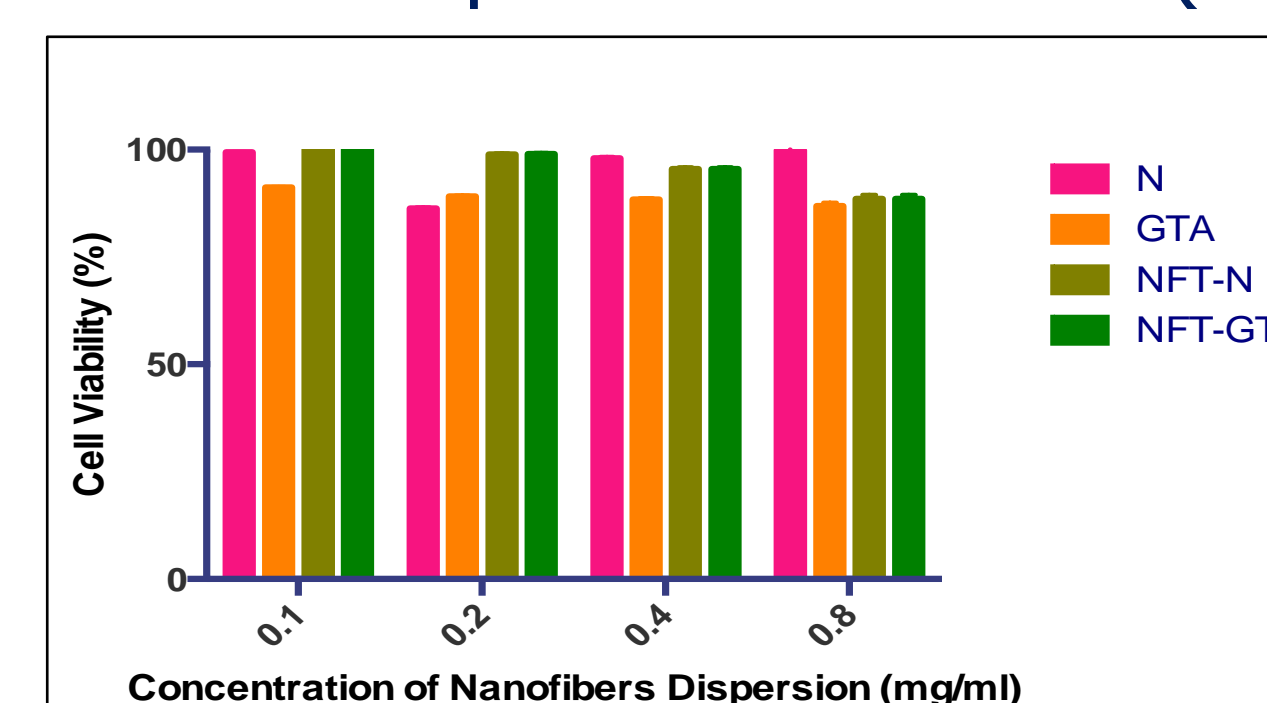


Figure 5. The percentage of viable cells after treatment with different nanofiber formulations.

CONCLUSION

- ✓ NFT loaded PVA/SA nanofibers provided localized drug delivery to the skin and their biocompatibility was shown. Further studies are needed to evaluate the skin penetration and antifungal activity of this material in comparison to conventional topical formulation of NFT.