Electrospun Antibacterial Polyurethane-Cellulose Acetate-Zein Composite Mats containing Streptomycin for Wound Dressing Applications

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In this study, an antibacterial electrospun scaffold was prepared by physically blending Polyurethane (PU) with two biopolymers such as Cellulose acetate (CA) and Zein. To prevent common clinical infections, an antimicrobial agent, streptomycin was incorporated into the electrospun fibers. In this study, PU was used as the foundation polymer, was blended with CA and zein to achieve desirable properties such as better hydrophilicity, excellent cell attachment, proliferation and blood clotting ability. The antimicrobial agent streptomycin was incorporated into the e-spun nanofibers, and its antimicrobial ability against the gram negative and gram positive bacteria were examined. The in vitro antimicrobial activity of the nanofiber membranes were evaluated for to use as wound dressings. Thus obtained composed mat was characterized with various methods. The interaction between fibroblasts and the PU-CA and PU-CA-zein-drug scaffolds such as viability, proliferation, and attachment were characterized. The results indicated that cells interacted favorably with the composite scaffold. Moreover, the composite mat showed good bactericidal activity against both of gram positive and gram negative bacteria. PU-CA-zein-drug composite nanoscaffold showed enhanced blood clotting ability in comparison with pristine PU nanofibers. The presence of CA and zein in the nanofiber membrane improved its hydrophilicity and permeability to air and moisture. CA and zein not only increased the liquid uptake but also created a moist environment for the wound, which can accelerate wound recovery. Our results suggest that this composite mat could be an ideal biomaterial for wound dressing applications.

References:

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