ADVANCING WOUND HEALING: DEVELOPMENT AND EVALUATION OF POLYACRYLAMIDE/CHITOSAN NANOFIBER SCAFFOLDS

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Abstract:

This research investigated the development of environmentally friendly and biocompatible nanofiber scaffolds for tissue regeneration applications. The study combined chitosan, a natural biopolymer known for its antimicrobial and biodegradable properties, with polyacrylamide, a synthetic polymer that enhances structural strength. Nanofibers with specific morphological and mechanical characteristics were produced using electrospinning techniques. The research evaluated how various electrospinning parameters affected the nanofibers' architectural structure, porosity, and mechanical durability. Advanced analytical methods, including Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA), and scanning electron microscopy (SEM), were utilized to analyze the chemical composition, thermal stability, and morphological features of the resulting scaffolds. The cytocompatibility and bioactivity of the scaffolds in human cellular environments were assessed through in vitro biocompatibility tests. The aim is to enhance the mechanical properties, biodegradability, and antimicrobial efficacy of the scaffolds by optimizing the chitosan-to-polyacrylamide ratio and electrospinning parameters. This study has the potential to make significant contributions to the creation of innovative and sustainable materials for tissue engineering and regenerative medicine applications.

Keywords: Nanofibers, Electrospinning, Tissue regeneration, Scaffolds, Biocompatibility, Antimicrobial properties, Sustainable materials, Regenerative medicine