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ORIGINAL ARTICLE

Multifunctional polymeric nanofibrous scaffolds enriched with azilsartan medoxomil for enhanced wound healing

Alka[1] · Nidhi Mishra[1] · Priya Singh[1,2] · Neelu Singh[1] · Kalpana Rathore[3] · Vivek Verma[3,4,5,6] · Sheel Ratna[7] · Raquibun Nisha[1] · Abhishek Verma[1] · Shubhini A. Saraf[1,8]

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Abstract

A prolonged and compromised wound healing process poses a significant clinical challenge, necessitating innovative solutions. This research investigates the potential application of nanotechnology-based formulations, specifically nanofiber (NF) scaffolds, in addressing this issue. The study focuses on the development and characterization of multifunctional nanofibrous scaffolds (AZL-CS/PVA-NF) composed of azilsartan medoxomil (AZL) enriched chitosan/polyvinyl alcohol (CS/PVA) through electrospinning. The scaffolds underwent comprehensive characterization both in vitro and in vivo. The mean diameter and tensile strength of AZL-CS/PVA-NF were determined to be 240.42 ± 3.55 nm and 18.05 ± 1.18 MPa, respectively. A notable drug release rate of 93.86 ± 2.04%, was observed from AZL-CS/PVA-NF over 48 h at pH 7.4. Moreover, AZL-CS/PVA-NF exhibited potent antimicrobial efficacy for Staphylococcus aureus and *Pseudomonas aeruginosa*. The expression levels of Akt and CD31 were significantly elevated, while Stat3 showed a decrease, indicating a heightened tissue regeneration rate with AZL-CS/PVA-NF compared to other treatment groups. In vivo ELISA findings revealed reduced inflammatory markers (IL-6, IL-1β, TNF-α) within treated skin tissue, implying a beneficial effect on injury repair. The comprehensive findings of the present endeavour underscore the superior wound healing activity of the developed AZL-CS/PVA-NF scaffolds in a Wistar rat full-thickness excision wound model. This indicates their potential as novel carriers for drugs and dressings in the field of wound care.

Keywords Wound healing · Drug delivery · Topical · Electrospun nanofiber scaffolds · Extracellular matrix mimicking

Highlights
- Repurposing Angiotensin II Receptor Blockers (ARBs) Analogue for Wound Healing.
- Novel AZL-Enriched CS/PVA Nanofiber Scaffolds.
- Optimized Blend Rheology for Drug Delivery Potential.

✉ Shubhini A. Saraf
shubhini.saraf@gmail.com

[1] Department of Pharmaceutical Sciences, Babasaheb Bhimrao Ambedkar University Lucknow (A Central University), Uttar Pradesh, Vidya Vihar, Raebareli Road, Lucknow 226025, Uttar Pradesh, India

[2] School of Pharmacy, GITAM (Deemed-to-Be) University, Rudraram, Patancheru Mandal, Hyderabad, 502329, Telangana, India

[3] Department of Materials Science and Engineering, Indian Institute of Technology, Kanpur 208016, Uttar Pradesh, India

[4] Centre for Environmental Science and Engineering, Indian Institute of Technology Kanpur 208016, Uttar Pradesh, India

[5] Samtel Centre for Display Technologies, Indian Institute of Technology Kanpur 208016, Uttar Pradesh, India

[6] National Centre for Flexible Electronics, Indian Institute of Technology Kanpur 208016, Uttar Pradesh, India

[7] Department of Environmental Microbiology, Babasaheb Bhimrao Ambedkar University Lucknow (A Central University), Uttar Pradesh, Vidya Vihar, Raebareli Road, Lucknow 226025, Uttar Pradesh, India

[8] National Institute of Pharmaceutical Education and Research (NIPER), Raebareli, Bijnor-Sisendi Road, Sarojini Nagar, Near CRPF Base Camp, Lucknow 226025, Uttar Pradesh, India

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