**Curcumin-Loaded Biopolymer Nanofiber-Based Dressing for Diabetic Wound Management**

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**Background and aims.** Diabetes mellitus is a chronic metabolic disorder that affects multiple organs and is often associated with impaired wound healing, particularly in the lower extremities, which can progress to chronic wounds and eventually lower limb amputation. The increase in the global prevalence of diabetes has driven the need for advanced wound care solutions that can effectively mimic the native extracellular matrix, reduce inflammation, and prevent microbial infections. This study emphasises the development of a bioactive polymeric nanofiber dressing for diabetic wound management.

**Methods.** Polymeric nanofibers were fabricated by blending polyvinyl alcohol (PVA) with a polysaccharide extracted from *Azadirachta indica* gum, incorporating curcumin (CUR) as the bioactive agent. The nanofibers were prepared using electrospinning. Morphological analysis was conducted using FESEM, and surface wettability was assessed through OCA. Mechanical properties were evaluated via tensile testing. Anti-inflammatory, antimicrobial activities, and in vitro release of CUR from the nanofiber were also evaluated. Biocompatibility was assessed through hemocompatibility and cytocompatibility.

**Results.** The prepared nanofiber showed a uniform fiber diameter, along with optimum OCA and mechanical strength required for tissue regeneration. In vitro release studies showed sustained release of the CUR from the CUR-loaded nanofiber, indicating it can successively deliver CUR to the wound site. The nanofiber also showed antimicrobial and anti-inflammatory properties, contributing to tissue regeneration by modulating cytokine levels, reducing oxidative stress, and reducing the risk of secondary infection in diabetic wounds. Hemocompatibility assessments confirmed the biocompatibility of the nanofiber, while cytotoxicity studies indicated that the gum polysaccharide promotes cell adhesion and proliferation.

**Conclusion/Discussion.** Prepared nanofibers showed a morphology closely mimicking the native ECM. The incorporation of CUR with *Azadirachta indica* gum polysaccharide within the nanofiber matrix demonstrated synergistic bioactivity, effectively inhibiting bacterial growth and supporting tissue regeneration. These findings suggest that the developed nanofiber dressing is a promising candidate for diabetic wound healing applications.

**References:**

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