

MULTIFUNCTIONAL POLYMERIC PATCHES FOR SKIN REGENERATION AND CONTROLLED DRUG DELIVERY

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Multifunctional polymeric patches represent a cutting-edge approach for promoting skin regeneration while enabling controlled drug delivery. In this work, a multilayered patch was developed via electrospinning, incorporating both regenerative and antimicrobial functionalities. Bioactive agents such as collagen and keratin were encapsulated in specific layers to promote skin tissue repair, while methylglyoxal (MGO), a potent antimicrobial compound, was incorporated to inhibit bacterial growth commonly found in chronic wounds. The multilayer architecture enabled spatial and temporal control over therapeutic release.

To validate the patch's performance, a comprehensive evaluation was conducted. Antimicrobial activity of each layer and the complete patch was assessed following the JIS Z 2801 (Japanese Industrial Standard, 2000) to ensure efficacy against wound-related bacteria. Biocompatibility was examined through in vitro cell culture assays in accordance with ISO 10993-5, allowing for the determination of cytotoxic effects of the materials and released agents. Additionally, the sequential release kinetics of the therapeutic compounds under physiological conditions were determined to confirm the system's capacity for controlled and sustained delivery.

The results underscore the potential of this multilayer electrospun patch as an advanced transdermal therapeutic platform for the treatment of chronic wounds, combining targeted antimicrobial protection with enhanced regenerative support.

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