InfectoGuard-RSiM2: Engineering a Hybrid Bioactive Patch for Targeted Topical and Intradermal Antimicrobial Therapy in Skin Infections

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Skin and soft tissues infections (SSTIs) remain a major global health concern, due to rising antimicrobial resistance, delayed wound healing, and limited access to effective localized therapies. This study reports the development and evaluation of InfectoGuard-RSiM2, a hybrid bioactive, reabsorbable antimicrobial patch designed to suppress bacterial proliferation while maintaining dermal biocompatibility. The patch integrates compounds from Ganoderma lucidum (Reishi) and Agave Mixiote with silver nitrate, forming a multifunctional matrix capable of sustain release. Antibacterial activity was evaluated using an agar diffusion skin-simulation model based on Muller-Hinton medium with non-pathogenic educational bacterial strains under both topical and intradermal exposure conditions. Clear inhibition zones were observed after 24 hrs confirming effective activity via direct contact and diffusion, and zone expansion at 48 hrs indicated sustain release. Material composition and physicochemical stability were characterize using Fourier Transform Infrared Spectroscopy (FT-IR), Differential Scanning Calorimetry (DSC), and Thermogravimetric Analysis (TGA), confirming structural integrity and thermal stability of the composite material. Biocompatibility was assessed using Human Dermal Fibroblast neonatal (HDFn) cells exposed to both high and graded (1:8), patch extracts showed 80% of cell viability and biomedical applicability. Collectively, these findings indicated that InfectoGuard-RSiM2 effectively inhibits bacterial growth while preserving dermal cell viability, supporting its potential as a sustainable and cost-effective biomaterial platform for localized antimicrobial therapy and advanced wound care applications. Further studies should test additional strains.

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