EP-124

쥐의 만성 공동 상처 모델에서 항바이오필름 화학 작용제의 예비 평가

Preliminary Assessment of
Anti-Biofilm Chemical Agents
in a Rat Model of Chronic Cavity Wounds

가톨릭대학교
성형외과학교실

심진솔, 심형섭*

Purpose: Biofilm formation is a major factor contributing to delayed healing in complex chronic wounds, particularly in cavity-type lesions where conventional topical therapies have limited penetration. This study aimed to establish a bead-induced chronic cavity wound model in rats and to perform a pilot evaluation of several candidate chemical agents with potential anti-biofilm and antimicrobial activity.

Methods: A chronic cavity wound model was created by subcutaneous implantation of small beads in the dorsal region of rats to generate persistent cavities prone to biofilm formation. The wounds were inoculated with common wound pathogens and allowed to develop biofilm structures. Candidate agents including high-concentration ethanol, a poloxamer-based surfactant, synthetic antimicrobial peptides, and selected antimicrobial agents were applied individually to the cavity wounds. Antimicrobial efficacy was assessed using bacterial viability assays, colony-forming unit (CFU) quantification, and preliminary histological evaluation.

Results: All tested agents demonstrated varying levels of antimicrobial activity against biofilm-associated bacteria. High-concentration ethanol showed the most pronounced reduction in bacterial viability, suggesting strong biofilm dissolution capability.
Surfactant treatment demonstrated moderate reductions in bacterial viability, indicating potential biofilm destabilization effects.
Antimicrobial peptides and conventional antimicrobial agents showed variable bactericidal activity within the biofilm environment.

Conclusion: This pilot study demonstrates the feasibility of a bead-induced rat chronic cavity wound model for evaluating anti-biofilm therapies. The results suggest that several candidate chemical agents possess measurable antimicrobial or biofilm-disrupting effects and may serve as potential components of a chemical debridement strategy for complex chronic wounds.

Pilot Evaluation of Candidate Chemical Agents in a Rat Bead-Induced Chronic Cavity Wound Model

Agent category	Candidate material	Proposed mechanism	Anti-biofilm effect	Bacterial viability reduction	Remarks
Alcohol	High-concentration ethanol (70–100%)	Rapid protein denaturation and biofilm dissolution	Strong	Marked reduction	Rapid action but potential tissue toxicity
Surfactant	Poloxamer / propylbetaine-based surfactant	Disruption of biofilm matrix and improved penetration	Moderate	Moderate reduction	May facilitate penetration of other agents
Antimicrobial peptide	Synthetic AMP	Direct bactericidal activity and biofilm membrane disruption	Moderate	Variable reduction	Potential synergistic effect with antibiotics
Antibiotic	Rifampin / doxycycline / triclosan	Antibacterial activity against biofilm-associated bacteria	Variable	Variable reduction	Possible role in preventing biofilm reformation

Table 1. Summary of candidate chemical agents evaluated for anti-biofilm activity, including their proposed mechanisms, relative anti-biofilm effects, and impact on bacterial viability. High-concentration ethanol demonstrates strong biofilm disruption and marked bacterial reduction, whereas other agents show moderate to variable efficacy.

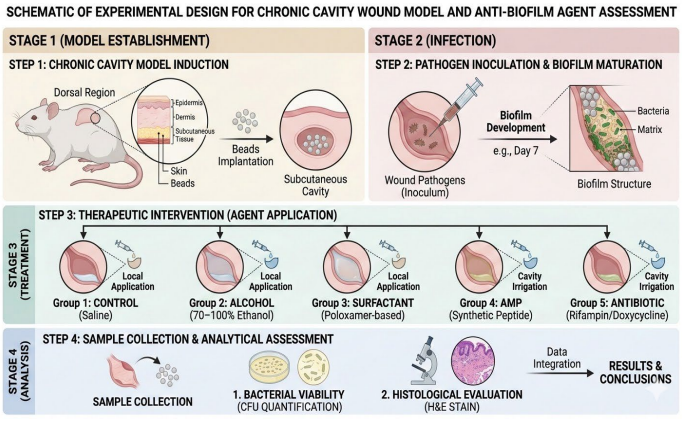

Fig 1. Schematic illustration of the experimental design for the bead-induced chronic cavity wound model and anti-biofilm agent assessment. The model establishment includes subcutaneous bead implantation to create a chronic cavity, followed by pathogen inoculation and biofilm maturation. Therapeutic interventions with candidate chemical agents are applied, and outcomes are evaluated through bacterial viability assays and histological analysis.