Antimicrobial dressing efficacy against mature Pseudomonas aeruginosa biofilm on porcine skin explants

Reference

Objective:
A key component of effective management of chronic wounds includes eliminating microbial biofilm. In this study, the effect of topical agents and dressings of various formulations, moisture retention and antimicrobial characteristics against antibiotic tolerant Pseudomonas aeruginosa biofilm were compared to each other, to a vehicle dressing (when available) and untreated controls.

Methods:
The assessments were performed on biofilm attached to dermal tissue using an ex vivo porcine skin explant biofilm model. Its use as a dermal substrate for attachment and the primary source of nutrition provides an alternative cost-effective method that more closely mimics in vivo conditions, with the advantages of an in vitro system, to assess the antimicrobial efficacy of treatments against mature biofilms. This ex vivo porcine skin explant biofilm model has been further validated against data generated from an in vivo pig burn wound model that was used to assess the efficacy of silver dressings against PAO1 biofilms. Five types of antimicrobial agents and four types of moisture dressings were assessed.

Main results:
A single exposure of Cadexomer Iodine dressings showed complete biofilm knockdown after both 24 and 72 hours, whereas all other dressing formulations reduced biofilm between 0.3 and 2 log in 24 or 72 hours with a single exposure.

There was no significant reduction of PAO1 bioburden following exposure to 0.1% PHMB gel (Prontosan®)-saturated cotton gauze for either 24 or 72 hours.

Similar results were found after 24-hour exposure to silver release dressings using an in vivo pig burn wound model, demonstrating correlation between the ex vivo and in vivo models.

Conclusion:
Results of this study indicate that commonly used microbicidal wound dressings vary widely in ability to kill mature biofilm. The efficacy is influenced by time of exposure, number of applications, moisture level and agent formulation (sustained release). Cadexomer iodine was the most effective antimicrobial agent against mature 3-day PAO1 biofilm at 24 and 72-hour exposure, showing complete mature PAO1 biofilm knockdown.

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