



WOUND HEALING

THE PITFALLS OF ANTIMICROBIAL EFFICACY PROFILES – HOW THE WOUND MICROENVIRONMENT PROMOTES THE LOSS OF EFFICACY IN ANTISEPTICS, ANTIMICROBIAL SOLUTION AND WOUND DRESSINGS

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Background: Antimicrobial therapy is of utmost importance in managing microbial contamination and colonization as well as preventing and treating wound infections and biofilm formation. With surgical site infections still ranging between 15-30% throughout Europe and biofilm formation occurring in 78% of all chronic wounds, comprehensive and accurate antimicrobial therapies are mandatory. Thereby, negative influence and loss of efficacy arising from a wounds specific microenvironment, such as high protein levels, are oftentimes unrecognized.

Objective: To investigate the influence of the protein-rich wound environment on the antimicrobial performance of antiseptics, wound irrigation solutions and antiseptic wound dressings in-vitro.

Materials and Methods: Antiseptics such as octenidin-dihydrochloride (OCT), polyhexamethylene-biguanid (PHMB/Polyhexanide) and PVP-iodine (PVP-I), wound irrigation solutions containing sodium-hypochlorite (NaOCl), hypochlorous acid (HOCl) or PHMB as well as wound dressings impregnated with silver or PHMB were tested. The impact on antiseptic efficacy of a protein-rich wound environment was investigated using standard-based time-kill assays with human wound exudate as well as a complex human biofilm-model (hpBIOM).

Results: While the concept of a 'protein error' in antimicrobials is generally known, only very limited studies analyzed the influence of the wound exudate itself. Generally, the loss in efficacy of established agents when challenged with the human wound environment is considerably high. Thereby the extend varies depending on concentration and formulation of both wound exudate as well as antimicrobial agent. OCT and PHMB showed overall stable results, while several NaOCl/HOCl solutions and nanocrystalline silver dressings demonstrated significant to complete loss of efficacy under challenging conditions.





Conclusion: The results highlight the considerable relevance the individual wound microenvironment can have on the antiseptic therapeutic regimen in terms of exposure times, treatment duration and agent choice. Especially persisting and reoccurring infections or healing stagnation might partly result from efficacy loss due to protein error and indicate the necessity for a strategy change.

