

Topical antimicrobial wound solutions were ineffective against biofilms when used for short durations *in vivo* that reflect clinical use

Sharp debridement is the gold standard as part of multifaceted treatment strategies



Study overview

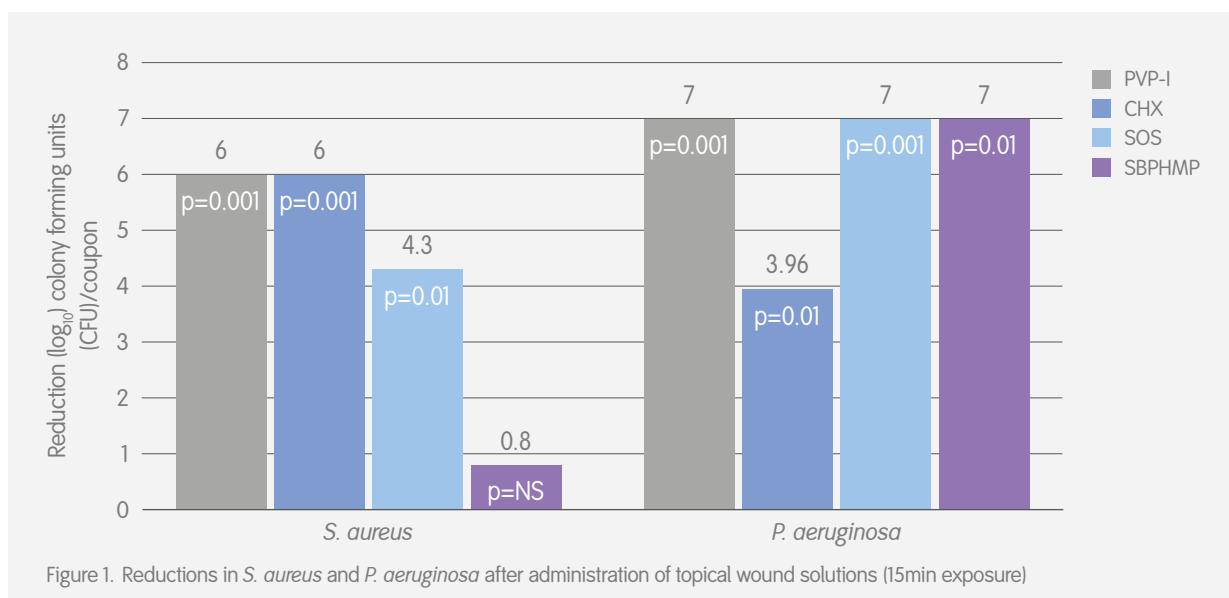
- Effects of topical antimicrobial wound solutions against mature biofilms were tested under different conditions
 - *In vitro* – melaleuca oil (SBMO; Woundaid™), surfactant based polyhexamethylene biguanide (SBPHMB; Prontosan™), chlorhexidine and cetrimide (CHX), povidone iodine (PVP-I; Betadine™) and sodium hypochlorite, hypochlorous acid, sodium chloride and oxidized water (SOS; Microcyn™) were tested against mature biofilms (3 days old) of *Staphylococcus aureus* and *Pseudomonas aeruginosa* for 15min and 24hr (controls, untreated coupons and saline)
 - *Ex vivo* – SOS was tested in a porcine skin explant model using negative pressure wound therapy (NPWT) with instillation; 12 cycles of 10min soak/dwell time were applied over 24hr against 3-day mature *P. aeruginosa* biofilms (control, NPWT alone and NPWT with saline instillation)
 - *In vivo* – SBMO was used for 15min, daily, for 7 days on chronic non-healing diabetic foot ulcers (DFUs) complicated with biofilm in 10 patients not taking antimicrobial therapy



Key results

In vitro study – biofilm model

- PVP-I showed complete and efficient killing of both *S. aureus* and *P. aeruginosa* after 15min (Figure 1)
 - SBMO was ineffective against both species
- Use of topical antimicrobial solutions for 24hr resulted in complete and efficient killing of biofilms, except for SBMO, which did not eradicate *S. aureus* but achieved >2.5 log reduction ($p < 0.01$)



Continued P2 >>

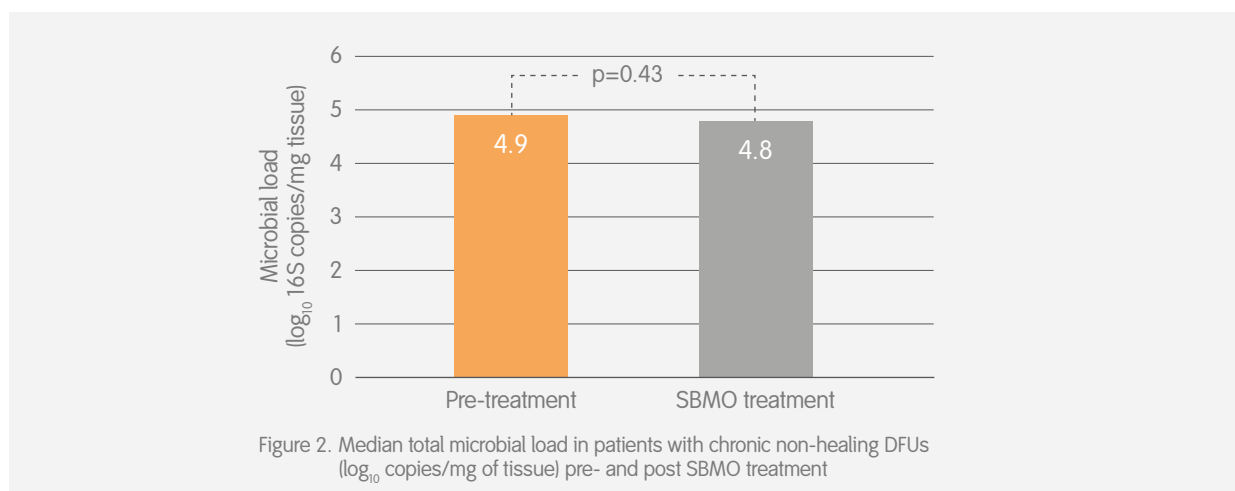
Evidence in focus (continued)

Ex vivo study – porcine skin explant model

- *P. aeruginosa* levels were similar after treatment with NPWT alone and NPWT instillation with saline ($6.9\log_{10}$ CFU/mL); there was little difference using SOS as the instillation solution ($6.8\log_{10}$ CFU/mL after 10min exposure time)

In vivo study – DFUs complicated with biofilm

- Use of SBMO had little effect on total microbial load in patients with DFUs when following a clinically relevant protocol for this product (Figure 2)
- Relative abundance of *P. aeruginosa* and *S. aureus* increased in all but one patient
- Microorganisms prior to treatment were rich and diverse, yet there were no significant changes to community richness, diversity or composition of DFUs post treatment with SBMO



Conclusion

Performance of these topical antimicrobial wound solutions was poor against mature biofilms using short exposure times that reflect clinical use.



Considerations

- The polycarbonate coupons used in the formation of mature biofilms in this *in vitro* study do not reflect the complexity of human tissue and the host immune response
- These *in vitro* studies used single species biofilms whereas most chronic wounds would be contaminated with multiple bacterial species
- The method used to measure total bacterial load *in vivo* does not differentiate between live and dead bacteria and therefore log reductions represent the minimum response



Study citation

*Johani K, Malone M, Jensen SO, et al. Evaluation of short exposure times of antimicrobial wound solutions against microbial biofilms: from *in vitro* to *in vivo*. *J Antimicrob Chemother*. 2018;73:494-502

Available at: [Journal of Antimicrobial Chemotherapy](#)

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