Are there topical alternatives to silver in the management of wound bioburden?

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Abstract
Introduction
Silver has a well-established ability to reduce bioburden. However some reports have raised concerns over the efficacy of silver-containing products. Recently, a range of alternative antimicrobial dressings have emerged which do not contain a recognized antimicrobial. This study compared the antimicrobial efficacy of two silver-containing dressings; ACTISORB® Silver 220 (a silver impregnated activated charcoal dressing) and SILVERCEL® NON-ADHERENT (a silver non-adherent alginate dressing), Cutimed Sorbact, an antimicrobial bacterial binding dressing, and Medihoney Calcium Alginate Dressing against clinically significant organisms S. aureus and P. aeruginosa in vitro.

Method
The antimicrobial efficacies of the dressings were evaluated in triplicate by log₁₀ reduction assay, which exposes a small sample of dressing to a bacterial culture. Samples of culture were removed at various time points over 24 hours and total viable counts (TVC) determined.

Results
Both ACTISORB® Silver 220 and SILVERCEL® NON-ADHERENT were highly active against both bacterial strains tested, with a 2.5 log₁₀ reduction in TVC observed within 3 hours. In contrast, Cutimed Sorbact had only a minor effect on TVC, with log₁₀ reductions of 0.2 log₁₀ units observed for both bacterial strains tested: Medihoney Calcium Alginate Dressing achieved 1-1.5 log₁₀ reduction of bacteria within 3 hours, reducing TVC to detection limits within 24 hours.

Discussions and Conclusion
The two silver dressings showed high antimicrobial efficacy, reducing TVC by 2.5 log₁₀ units within 3 hours. Equivalent antimicrobial efficacy was not achieved by either of the alternative antimicrobial dressings. These results should be considered when determining the appropriate dressing to use on wounds at risk of high bioburden.

Introduction
There is extensive evidence to support the use of silver-containing dressings to control bioburden, and so prevent the establishment of infection in chronic wounds [1]. A Cochrane Systematic Review, published in 2010, questioned the efficacy of such dressings however the appropriateness of the endpoints used to assess silver efficacy in this review were subsequently challenged [2] – specifically the inclusion of healing as a primary endpoint as opposed to resolution of signs/symptoms of infection.

This may have left healthcare practitioners unsure as to when silver containing dressings are appropriate to be used, and instead some have turned to ‘alternative’ antimicrobial dressings which do not contain silver.

This study is an in vitro comparison of the antimicrobial efficacy of two silver-containing dressings and two ‘alternative’ antimicrobial dressings, one of which contains a non-recognized antimicrobial (honey) and one of which contains no antimicrobial but immobilises bacteria through bacterial binding.

Methods
- Test organisms: Staphylococcus aureus ATCC 6538 and Pseudomonas aeruginosa ATCC 27312
- Assay conditions: Assay conducted in 0.1% Bacto™ Peptone (BD Worldwide, Oxford, UK) at 37°C with aerobic incubation.
- Dressings tested in triplicate. Samples taken at 0, 1, 3 & 24 hours, residual antimicrobial activity neutralised and remaining bacteria serially diluted with enumeration onto trypticase soy agar.
- Log reductions were calculated compared to a gauze control

Bacterial log₁₀ reduction assay

10ml bacterial suspension
10⁶cfu/ml

2.5x2.5cm dressing
Shaking incubator/water bath
Inc. 0-24 hours
37°C, 150 rpm

Remove sample, dilute, plate onto agar
Incubate 24hrs
37°C

Count colonies

Results
Efficacy of antimicrobial dressings against (A) P. aeruginosa and (B) S. aureus in the Log₁₀ reduction assay

Conclusions
Of the five antimicrobial dressings tested, only the two which contained silver demonstrated rapid bacterial activity against S. aureus and P. aeruginosa in this in vitro assay. The silver containing dressings reduced bacterial populations to near detection limits within 3 hours of exposure. Of the two other antimicrobial dressings tested, only Medihoney Calcium Alginate Dressing had any sustained effect on bacteria TVC, however this effect was slower, requiring 24 hour exposure to achieve the same results.

Chronic wounds which are considered to have high bioburden or bacterial contamination are known to be at increased risk of infection. These in vitro results suggest that for such wounds, a silver-containing dressing may be more effective at rapidly controlling bioburden than one containing an ‘alternative’ antimicrobial. It is possible that a dressing such as Medihoney Calcium Alginate Dressing, which takes such a prolonged time to reduce bacterial load in a batch culture assay containing a static bacterial population may struggle to achieve the same effect under the more challenging conditions found clinically. This is also true for Cutimed Sorbact which failed to achieve any overall reduction in bacterial load in this assay.

References

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