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: a Silver Impregnated Activated Charcoal Dressing (SIAC) and a Silver Non-Adherent Alginate Dressing (SNA), against clinically significant organisms S. aureus (SA) and P. aeruginosa (PA) 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 SIAC and SNA were highly active against both bacterial strains tested, with a ≥4.5 log10 reduction in TVC observed within 3 hours. In contrast, the ABB and GVMB had only a minor effect on TVC, with log10 reductions of ≤2 log10 units observed for both bacterial strains tested. HCA achieved 1-1.5 log10 reduction of bacteria within 3 hours, reducing TVC to detection limits within 24 hours.

Conclusions

The two silver dressings showed high antimicrobial efficacy, reducing TVC by ≥4.5 log10 reductions units within 3 hours. Equivalent antimicrobial efficacy was not achieved by any of the alternative antimicrobial dressings. These results should be considered when determining the appropriate dressing to use on wounds at risk of high bioburden.

Bacterial Log10 Reduction Assay

10μl bacterial suspension 1% w/v

2.5x2.5cm Dressing

1 hour aerobic incubation

2 μl smiley

Control

Inoculated, dried, plated and agar

Incubate 24 hrs

37ºC, 150 rpm

Incubate 0-24 hours

Inoculate 24 hrs

Count colonies

Results — Antimicrobial Efficacy

Efficacy of antimicrobial dressings against P. aeruginosa

ATCC 27312 in the log10 reduction assay

Efficacy of antimicrobial dressings against S. aureus

ATCC 6538 in the log10 reduction assay

Table: Log10 reduction (CFU/mL)

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<th>SNA</th>
<th>ABB</th>
<th>HCA</th>
<th>GVMB</th>
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</table>

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.4 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 — 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 three ‘alternative’ antimicrobial dressings, two of which contain non-recognized antimicrobials. It is likely that a dressing such as HCA, which takes such a prolonged time to reduce bacterial load in a batch culture assay containing a static bacterial population, may struggle to achieve a similar effect under the more challenging conditions found clinically.

In contrast, the ABB and GVMB had only a minor effect on TVC, with log10 reductions of ≤2 log10 units observed for both bacterial strains tested.

HCA achieved 1.5 log10 reduction of bacteria within 3 hours, reducing TVC to detection limits within 24 hours.

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 three other antimicrobial dressings tested, only HCA had any sustained effect on bacteria TVC; however, this effect was slower, requiring 24-hour exposure to achieve the same results.

The three other antimicrobial dressings may be more effective at rapidly controlling bioburden than one containing an ‘alternative’ antimicrobial. It is likely that a dressing such as HCA, which takes such a prolonged time to reduce bacterial load in a batch culture assay containing a static bacterial population, may struggle to achieve a similar effect under the more challenging conditions found clinically.

References


*ATCC® BAA-230, SILVERICEL® Non-adherent Dressing (Systranico, an Acelity company, Gargrave, UK), Cuthbert® Sorbent (BSN Medical, Hull, UK), Medison® Calcium Alginate (Zoetics Science, Princeton, NJ, USA). Hydrofera Blue (Hollister Woundcare, Aurora, Ontario, Canada).