A comparison of bacterial sequestration within three types of wound dressing

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Introduction

There is an extensive range of chronic wound dressing materials on the market. It is important to choose the most appropriate dressing as chronic wounds can vary significantly. Dressings vary in their ability to handle fluid, maintain a moist wound environment, sequester and retain microorganisms and proteases, kill or prevent replication of microorganisms and support or even accelerate wound healing. The dressing of choice should be selected based on these factors, and robust scientific data demonstrating how dressings perform in differing clinical scenarios, to support clinicians to make an informed choice about the dressing they select. This study compared the ability of a foam dressing, a SAP dressing and a DACC dressing, to sequester and retain bacteria over a 7 day challenge period.

Methodology

A gauze control dressing plus a SAP, a foam and a DACC dressing were assessed throughout this study. The inoculation volume was calculated following a free swell absorptive capacity assessment according to an adapted ISO13726-1 method. Based on data from the free swell study, dressings were inoculated daily for 7 days with 17.9 mL methicillin-resistant *Staphylococcus aureus* inoculum ($1.0 \times 10^6 \pm 5.0 \times 10^5$ $CFUmL^{-1}$). Dressing were maintained at 37°C ± 2°C throughout the study. On days 1, 3 and 7, dressing samples (n=3) were removed from the inoculum, held for 10 seconds, and then transferred to square 10 x 10 cm agar plates. Agar plates and dressings were incubated for 24 hours at 37°C ± 2°C. Following incubation dressings were removed and agar plates were photographed. Concurrent samples were processed for viable material within the dressing. Sections of the dressing core (1 cm^2) were recovered into recovery media and viable organisms were recovered via sonication and serial dilutions.

Results

Visually, minimal bacterial growth was observed on agar in response to bacterial transfer from the SAP and foam contact layers onto the agar plate on Day 1. There was evidence of a thin layer of growth resulting from the DACC dressing contact layer and there was a consistent growth layer in response to the gauze control. By Day 7 the SAP dressing continued to handle the contaminated fluid such that there were clearance zones on the agar, however bacterial lawns (an opaque layer of tiny colonies) were visible under the foam and the DACC dressing. The control gauze dressing transferred bacteria onto the agar at all time points.

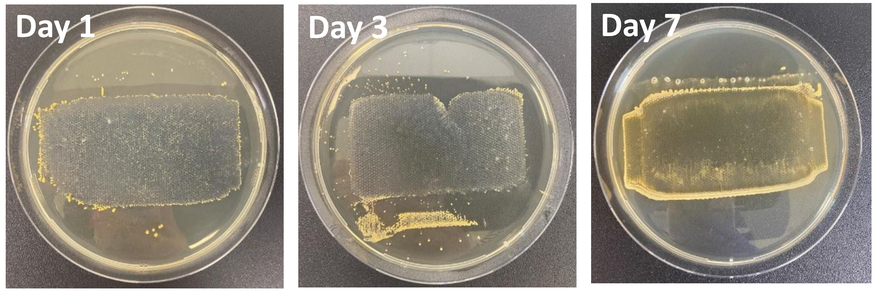

Figure 1. Photographs of agar following 24 hour incubation with the *SAP dressing at Day 1, 3 and 7.

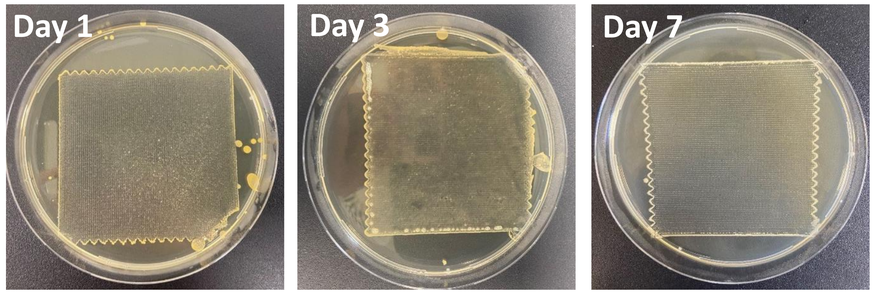

Figure 2. Photographs of agar following 24 hour incubation with the DACC dressing at Day 1, 3 and 7.

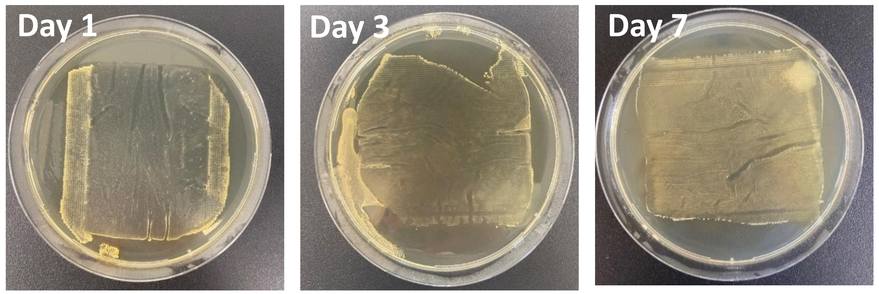

Figure 3. Photographs of agar following 24 hour incubation with the foam dressing at Day 1, 3 and 7.

Results

The quantity of bacteria recovered from the three dressing types was equivalent at Day 1 and Day 3 for all dressings, however the quantity of bacteria recovered from the SAP product was significantly greater than the foam and the DACC product on Day 7 (Table 1).

Test item	Average recovery ± SD ($Log_{10}CFUmL^{-1}$)		
	Day 1	Day 3	Day 7
SAP dressing	7.56 ± 0.33	8.36 ± 0.38	7.68 ± 0.24
DACC dressing	7.64 ± 0.17	7.66 ± 0.90	5.91 ± 0.69
Foam dressing	7.86 ± 0.29	8.05 ± 0.16	5.87 ± 0.50

Table 1. Average recovery of viable methicillin-resistant Staphylococcus aureus from three types of wound dressing at Day 1, 3 and 7.

Discussion and Conclusions

There is a considerable choice of available dressings on the market. Matching dressing choice to wound aetiology is critical to the successful treatment of chronically stalled wounds. In the clinical scenario mirrored by this study, the exudate level was high and contained viable microorganisms mimicking a highly exuding infected wound. In this scenario the SAP dressing outperformed the foam dressing and DACC dressing in terms of handling contaminated simulated wound exudates specifically in terms of the ability to prevent transfer of the microorganisms from the dressing back onto the wound. Additional future work could further develop the method by mimicking an assessment of the dressing under a pressure equivalent to 40mmHg, indicative of bandaging in relation to chronic wound care.

*SAP product = DryMax® Super

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