An *In Vitro* Comparison of MRSA and *P. aeruginosa* Sequestration by Five Superabsorbent Wound Dressings

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Introduction

MRSA and *Pseudomonas aeruginosa* continue to pose a potentially life threatening risk to immunosuppressed patients. This study looks at the ability of 5 SAP dressings to sequester and retain MRSA and *P. aeruginosa* within the dressing core. A wound dressing that sequesters and retains bacteria will improve the infection status of the wound bed removing a barrier to appropriate healing whilst decreasing the risk of transmission throughout the ward.

Aim

To investigate and compare the ability of 5 wound dressings to sequester and retain MRSA and *P. aeruginosa* within the dressing core.

Methods

- Dressings were placed on top of 15 ml of 10^6 cfuml^{-1} bacterial inoculum. The underside of the dressings were re-inoculated 15 ml inoculum daily for 7 days to mimic a highly exuding wound.
- On days 1, 2, 3 and 7 dressings were transferred to 10 cm^2 agar plates and incubated overnight at 37˚C.
- Dressings were removed from the agar plates and photographed for evidence of bacterial transfer from the dressing contact layer. Sections were taken from the inner core of the dressings, remaining viable bacteria were quantified using standard microbiological techniques. Additional samples of the inner core were visualised using Environmental Scanning Electron Microscopy (ESEM).

Results

Overall

- All SAP dressings absorbed 15 ml bacterial inoculum daily for 7 days.

Inner Core Recovery

- The ability of the dressings to retain microorganisms within the inner core varied between dressings.
- A 4 log increase in MRSA retention and a 2 log increase in *P. aeruginosa* retention was observed in Dressing D compared to the gauze control.
- A 1 log increase in MRSA retention was achieved by Dressings A, B, C and E.

Dressing D = KerramaxCare

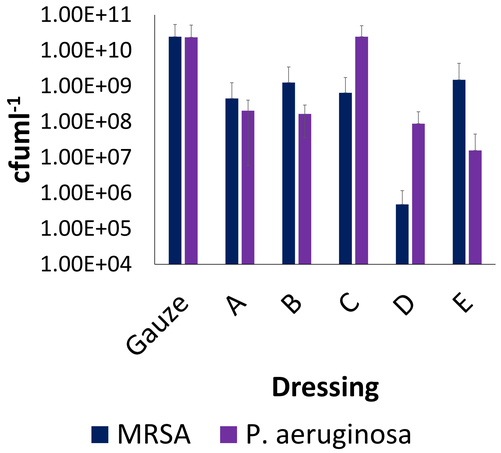

Figure 1. Average quantity of viable bacteria recovered from 1cm^2 samples of wound dressings over a 7 day period.

Transfer Onto Agar

Dressings D and E retained viable MRSA. Dressing C demonstrated improved bacterial retention over the 7 day test period. Dressings A and B transferred MRSA onto the test agar throughout the duration of the study (Figure 2).

Dressings D and E retained viable *P. aeruginosa* so that no visible growth was seen under the test dressings. Dressing B demonstrated improved bacterial retention over the 7 day test period. Dressings A and C transferred *P. aeruginosa* onto the test agar throughout the duration of the study (Figure 3).

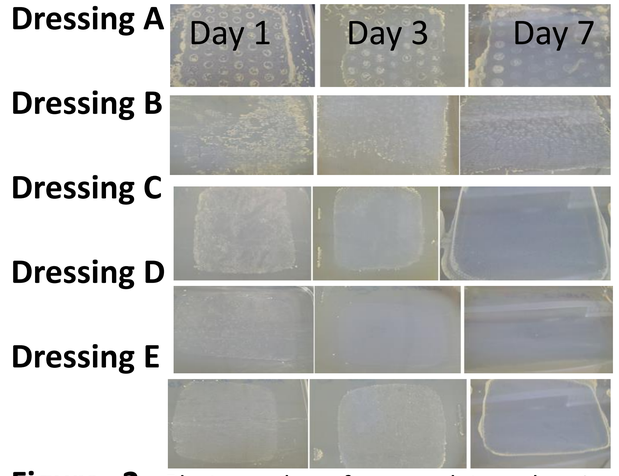

Figure 2. Photographs of agar plates showing MRSA as transferred from the SAP dressing contact layer. Left – Day 1, Middle – Day 3, Right – Day 7.

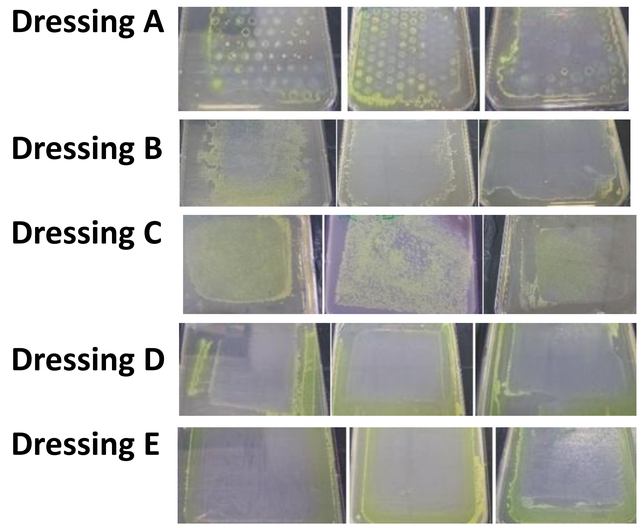

Figure 3. Photographs of agar plates showing *P. aeruginosa* as transferred from the SAP dressing contact layer. Left – Day 1, Middle – Day 3, Right – Day 7.

ESEM

- MRSA was not visible on the external surface of the inner core of Dressing D, suggesting bacteria was locked within the core.
- MRSA was observed under the gelling agent of Dressing A and could be seen extensively on the surface of Dressings B, C, E and the gauze dressing (Figure 3).

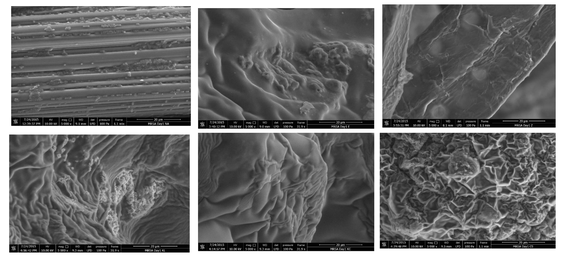

Figure 3. ESEM images. Gauze (Top left), Dressings A and B (top middle and top right) Dressings C, D and E (bottom left, middle and right respectively).

Discussion

- Dressing D retained more MRSA and *P. aeruginosa* than the Gauze control.
- ESEM images confirmed that the dressings that readily released MRSA from the inner core also presented with considerable visible MRSA on the surface of the inner core.
- Throughout the study Dressing D consistently retained greater amounts of MRSA than the other dressings and a comparable amount of *P. aeruginosa* to three other dressings.
- This study did not differentiate between the bacteriostatic and bactericidal properties of the dressings.

Conclusions

Collectively this study suggests that, once retained, less bacteria were released from within the gelling agent of Dressing D compared to the other SAP dressings. Dressing D also retained significantly more MRSA than any of the other test dressings. Clinical use of this dressing may reduce the transmission risk when treating patients with chronic wound infections.

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