SEQUESTRATION OF BACTERIA AND MMPs BY SUPERABSORBENT WOUND DRESSINGS

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Introduction

Superabsorbent dressings are designed to handle high levels of wound exudate, which may contain harmful microorganisms and excess levels of proteases such as matrix metalloproteinases (MMPs). Managing bacteria, their secretions and host proteases is key in reducing the risk of infection and therefore promote timely wound healing.

To remove the risk factors for infection, an effective superabsorbent dressing should:

- Absorb a large amount of exudate
- Sequester MMPs and bacteria
- Retain exudate, MMPs and bacteria.

Purpose

We evaluated the ability of superabsorbent dressings to sequester bacteria and MMPs.

Methods

Six superabsorbent dressings were inoculated daily, with 10^7 CFU/ml of *Staphylococcus aureus* for 7 days. At 1, 3 and 7 days, bacteria which were not retained within the dressings' inner core were:

1. Visualized by imprints on agar.
2. Quantified by disrupting a sample of the inner core and performing standard plate counts.

Dressings were also incubated with two key wound proteases, MMP-2 and MMP-9. After 4 days, the supernatants were collected to quantify the release of MMP via ELISA.

Results

Bacterial growth from dressing imprints revealed that dressing A retained the most amount of bacteria whereas the other dressings did not retain the bacteria they absorbed even after one day of applying bacteria.

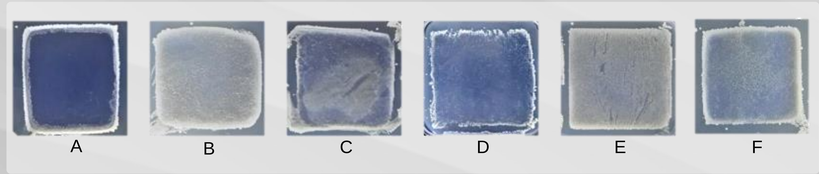

Figure 1. Bacterial growth on agar after three days. The superabsorbent dressings were inoculated with *Staphylococcus aureus* and imprinted on agar to show growth (in white) where bacteria was not retained within the dressing's inner core.

When the bacteria released from the inner core were quantified, superabsorbent A was the only dressing to retain as much bacteria at day 7 as it had at day 1. Whereas all other dressings released more bacteria as they absorbed more fluid, dressing A retained the bacteria it absorbed as the dressing became saturated.

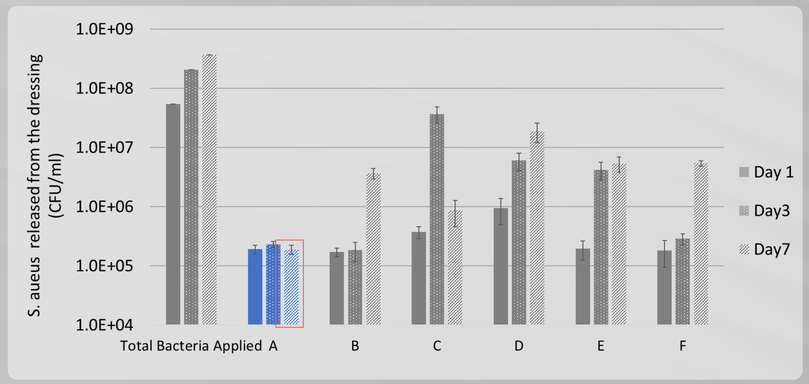

Figure 2. Quantification of bacteria released from the dressing's inner core (n=3). Dressings were inoculated with *Staphylococcus aureus* daily for 7 days. At day 1, 3 and 7 bacteria were quantified from samples of the core.

Results (continued)

All of the superabsorbents, except for dressing E, sequestered and retained >98% of MMP-2 and MMP-9.

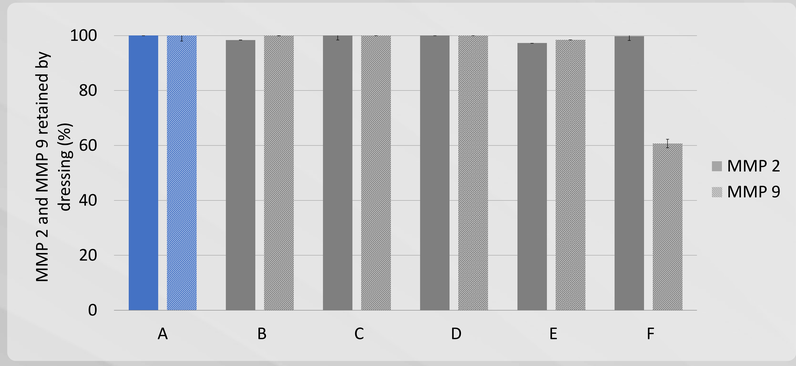

Figure 3. ELISA quantification of MMP2 and MMP9 released from the dressings inner core after 4 days incubation.

Conclusions

To remove the risk factors for infection an effective superabsorbent dressing should:

- Absorb a large amount of exudate
- Sequester MMPs and bacteria
- Retain exudate, MMPs and bacteria.

Our *in vitro* data showed significant variability in the sequestration of bacteria and MMPs by superabsorbent dressings, suggesting different abilities of these dressings in minimising the risk of infection in highly exuding wounds.

Superabsorbent dressing A was superior in its ability to sequester and retain bacteria and MMPs. This shows how dressing A can reduce these risk factors of infection in highly exuding wounds.

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Dressing A- KerraMax Care Superabsorbent Dressing (3M, St Paul), Dressing B- Kliniderm (H&R Healthcare), Dressing C- Vliwasorb Pro (L&R Healthcare), Dressing D- Zetuvit Plus (Hartmann), Dressing E- Mextra (Molnlycke), Dressing F- ConvaMax (ConvaTec)