An *in-vitro* assessment of the effect of intimate contact on bacterial colonization under a CMC dressing

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Introduction

Carboxymethyl Cellulose (CMC) dressings are often used as a primary dressing to fill the gap between a secondary dressing and a wound or to pack deep wounds.

It is important that these dressings conform to the wound bed to eliminate dead space that promotes bacterial formation. This is achieved by the gelling action when the dressing comes into contact with wound fluid.

This test evaluates contact properties of two dressings (A&B*) to understand their ability to have intimate contact to the wound bed.

Method

Visualization of wound contact

A porcine model was used to observe the contact between the dressings and a simulated wound environment. The model was supported at either end on a plastic stand and allowed to dip slightly in the centre in order to allow assessment of the dressing's ability to conform to the wound bed. Dressings were soaked in an excess of Solution A to simulate their state upon exudate absorption, and applied to the model. Photographs were taken to image the contact between the dressing and the model.

Assessing Bacterial Growth

A strain of MSSA was prepared by immersing a loop holding a single bacterial colony into 10ml of broth, and incubating at 37°C with shaking to aerate overnight.

The overnight culture was prepared for spreading using a 1:100 dilution. 200µl of the diluted culture was then spread onto agar plates and a dressing sample placed on top, avoiding any dragging of the dressing over the bacterial lawn. The plates were incubated at 37°C overnight.

At a 24 hour time point, the dressings were carefully removed from the plate, and the area underneath observed for any visible bacteria growth. Photographs of the plates were taken and recorded.

Results

Visualization of wound contact

On imaging, a clear difference can be seen between Dressing A and Dressing B (see figure 1).

Dressing A can be seen to conform exactly to the shape of the simulated porcine wound bed- with the gelled dressing contacting the wound bed at all points. Dressing B shows distinct air pockets between the dressing and the wound bed. These pockets correlate with the position of stitching present in the dressing structure.

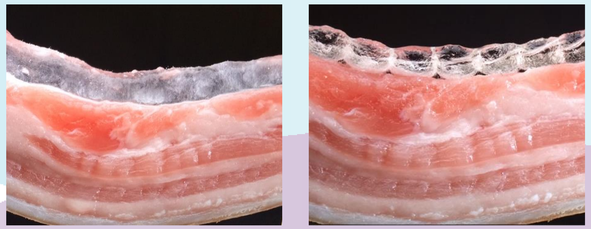

Figure 1- Dressing A (left), and Dressing B (right) on a porcine simulated wound. Dressing A shows complete conformation to the wound bed. Air pockets can be seen where stitching is present on dressing B.

Assessing Bacterial Growth

Very little bacterial ingress can be seen beneath Dressing A at the 24 hour time point (figure 2). Inhibition of bacterial growth can be seen in where Dressing B has been in contact with the plate. Lines of bacterial growth can be seen in the location of the stitching on Dressing B, where there has been shown to be reduced contact between the dressing and the surface it rests on (see porcine model in figure 1). This reduced contact has allowed pockets for bacterial growth resulting in the clear lines of bacteria seen within figure 2.

This infers that direct contact of the dressing to the plate (simulated wound) has the ability to prevent bacterial growth by reducing the space available for proliferation, or by direct fluid absorption.

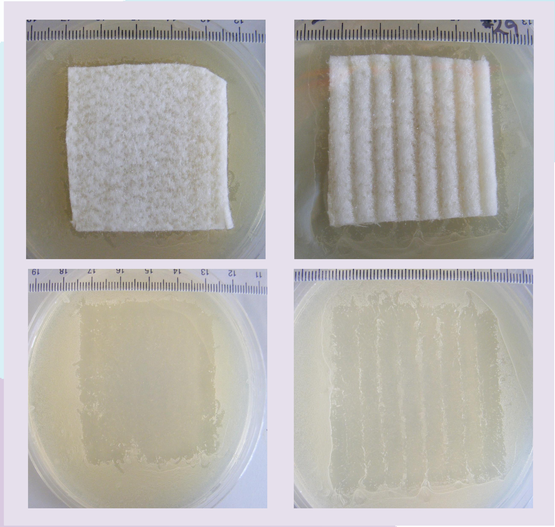

Figure 2- Dressing A (top left), and Dressing B (top right) on a bacterial lawn following 24hr incubation.
Upon removal no growth is seen beneath Dressing A (bottom left). Distinct bacterial lines can be seen beneath Dressing B (bottom right).

The intimate contact seen beneath Dressing A was shown to inhibit more bacterial growth.

Conclusion

Dressing A was seen to have intimate contact with the porcine wound bed. In bacterial testing the dressing was also shown to inhibit bacterial growth.

Dressing B was seen to allow small pockets of air between the porcine model and the dressing. In bacterial testing, bacterial growth was inhibited in areas of contact, however bacterial proliferation was noted beneath the stitched areas of the dressing.

This would suggest that intimate wound contact is required in order to prevent bacterial growth beneath a dressing

*Dressing A- KerraCel (Crawford Healthcare Inc.), Dressing B-Aquacel Extra (ConvaTec Inc.)