

The Evaluation of Absorbent Silver Containing Dressings *In-Vitro*

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ABSTRACT

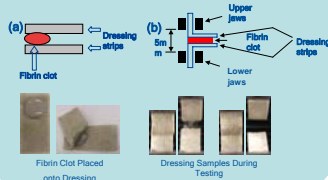
Absorbent silver containing dressings are commonly used in clinical practice in order to manage exudate as well as control the bacterial bioburden in the wound. However, while many of these silver dressings can provide antimicrobial efficacy, few provide all of the ideal physical characteristics required. In this study we have utilized a number of *in vitro* methods to assess both the physical and antimicrobial properties of a new non-adherent antimicrobial dressing with silver in comparison with a number of commercially available dressings.

Antimicrobial efficacy was assessed using zone of inhibition and Log₁₀ reduction assays against common chronic wound pathogens. The availability of silver for antimicrobial efficacy was determined by measuring silver release from the wound dressing into simulated wound fluid, changed each day, and re-challenged for 7 days. The physical parameters assessed include absorbency as determined following BP1993 Addendum (1995) Alginate Dressing; strength when wet and measurement of dressing adherence to a simulated wound surface assessed using a new *in vitro* model.

Results have demonstrated that the new non-adherent antimicrobial dressing with silver was efficacious against common wound pathogens including antibiotic-resistant strains. In addition, its absorbent capacity was found to be comparable to other commercially available dressings. Furthermore, it was found to have superior strength when wet as well as lower adherence to a simulated wound surface. These *in vitro* studies suggest that this new non-adherent antimicrobial dressing with silver can be easily removed from the wound in one-piece potentially minimising trauma and pain for the patient.

NEW *in vitro* adherence model

Sandwich a fibrin clot between two pieces of dressing material. Incubate for 24 hours at 37°C. Measure the force required to separate the dressing from the clot using the Instron tensile tester.



METHODS

Absorbency, absorbent capacity, BP 1993, Addendum (1995) For Alginate Dressings

Weight test dressing, add a weight equal to 40 times the dressing weight of calcium chloride / sodium chloride solution. Incubate at 37°C for 30 minutes. Remove dressing and allow to drain for 10 seconds, reweigh test dressing.

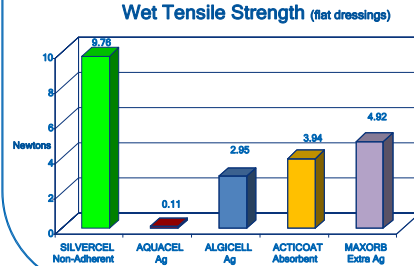
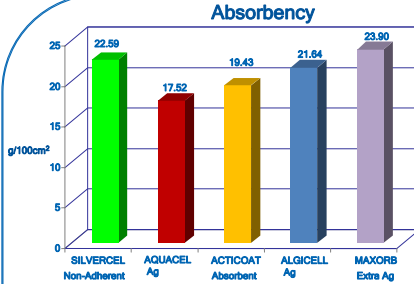
Silver release
Immerse dressing in simulated wound fluid (SWF). Sample fluid and transfer test dressing to fresh SWF twice daily. Analyse silver levels by Atomic Absorption (AA) Spectroscopy.

Wet Tensile Strength
Cut sample from the width and the length of the dressing. Immerse in calcium chloride / sodium chloride solution for 15 minutes. Remove sample and allow to drain. Place in the Instron tensile tester and pull apart to measure the force required to break the dressing.

Antimicrobial activity
Zone of inhibition test, Pre-wet dressing in simulated wound fluid. Place dressing on bacterial lawn. Incubate for 24 hours at 37°C. Measure zone of inhibition.

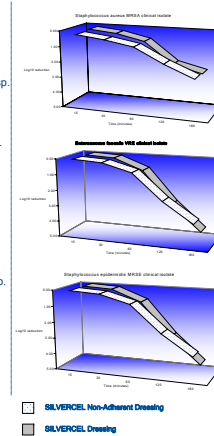
Log10 reduction test, Place dressing in a quantified bacterial suspension. Sample bacterial suspension at frequent time points over the duration of the test, 3 hours. Reduction of viable bacterial number calculated.

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Antimicrobial activity

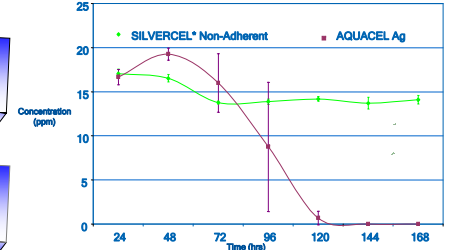
- | | |
|----------------------------|-------------------------------|
| <i>Acinetobacter</i> sp. | <i>Klebsiella</i> sp. |
| <i>Aeromonas</i> sp. | <i>Micrococcus</i> sp. |
| <i>Aspergillus</i> sp. | <i>Morganella</i> sp. |
| <i>Bacteroides</i> sp. | <i>Peptostreptococcus</i> sp. |
| <i>Bacillus</i> sp. | <i>Porphyromonas</i> sp. |
| <i>Branhamella</i> sp. | <i>Prevotella</i> sp. |
| <i>Burkholderia</i> sp. | <i>Propionibacterium</i> sp. |
| <i>Candida</i> sp. | <i>Proteus</i> sp. |
| <i>Citrobacter</i> sp. | <i>Providencia</i> sp. |
| <i>Clostridium</i> sp. | <i>Pseudomonas</i> sp. |
| <i>Comomonas</i> sp. | <i>Salmonella</i> sp. |
| <i>Corynebacterium</i> sp. | <i>Serratia</i> sp. |
| <i>Enterobacter</i> sp. | <i>Staphylococcus</i> sp. |
| <i>Enterococcus</i> sp. | <i>Stenotrophomonas</i> sp. |
| <i>Escherichia</i> sp. | <i>Streptococcus</i> sp. |
| <i>Eubacterium</i> sp. | <i>Veillonella</i> sp. |



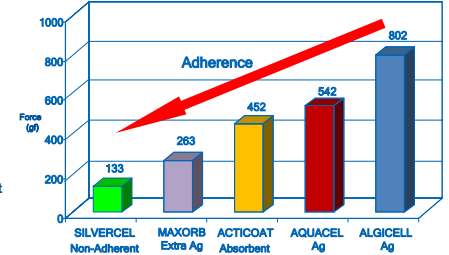
SILVERCEL Non-Adherent showed a measurable zone of inhibition against all micro-organisms listed

SILVERCEL Non-Adherent shows comparable antimicrobial activity to SILVERCEL

Silver Release



In-Vitro Adherence



Conclusions

- ✓ Non-Adherent
- ✓ Superior Integrity
- ✓ Highly Absorbent
- ✓ Potent Antimicrobial
- ✓ Sustained Silver Release

SILVERCEL* Non-Adherent Antimicrobial Dressing with Silver was comparable with or superior to other commercially available dressings indicated for use on similar wound types for absorbency and wet tensile strength.

Maintaining the existing alginate/carboxymethylcellulose properties of SILVERCEL* ensures its suitability for use on moderately to highly exuding wounds.

SILVERCEL Non-Adherent, with its unique, non-adherent wound contact layer, showed the least potential for adherence, *in vitro*.

SILVERCEL* Non-Adherent is more...

Up to 29% more absorbent
& 75% less adherent
..... than AQUACEL Ag