

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 hydro-alginate antimicrobial dressing with silver, SILVERCEL NON-ADHERENT™, 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 twice daily 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 hydro-alginate 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 hydro-alginate antimicrobial dressing with silver can be easily removed from the wound in one-piece potentially minimising trauma and pain for the patient.

Conclusion

The Non-Adherent Hydro-Alginate Antimicrobial Dressing with Silver (SILVERCEL NON-ADHERENT) was comparable with or superior to other commercially available dressings indicated for use on similar wound types (i.e chronic wounds including venous leg ulcers, pressure ulcers and diabetic foot ulcers, and acute wounds including surgical and traumatic wounds) when measuring the absorbent capacity and wet tensile strength of the dressings.

The established properties of alginate and carboxymethylcellulose ensures this dressings suitability for use on moderately to highly exuding wounds.

This Hydro-Alginate Antimicrobial Dressing with Silver with its unique, non-adherent wound contact layer, showed the least potential for adherence, *in vitro*.

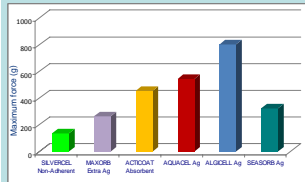
Adherence

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.



SILVERCEL NON-ADHERENT Dressing is between 50 and 80% less adherent than Hydrofiber or alginate dressings

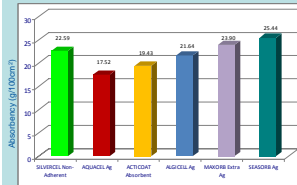
Absorbency

Absorbent capacity measured by BP 1993, Addendum (1995) For Alginate Dressings.

Wet 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.



SILVERCEL NON-ADHERENT Dressing is less absorbent than SeaSorb Ag, comparable absorbency to Maxorb Extra Ag, Algicel Ag and Acticoat Absorbent and has greater absorbency than Aquacel Ag

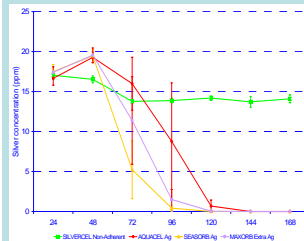
Silver release

Silver levels measured by Atomic Absorption (AA) Spectroscopy.

Immerse dressing in simulated wound fluid (SWF) which contains sodium chloride, calcium chloride and protein (albumin).

Sample fluid and transfer test dressing to fresh SWF twice daily.

Analyse silver levels by AA Spectroscopy.

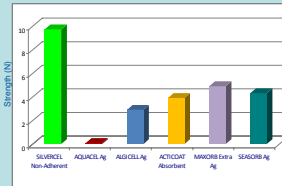


SILVERCEL NON-ADHERENT Dressing demonstrates sustained silver release compared to ionic silver dressings

Wet tensile strength

Force required to break dressings using Instron tensile tester.

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.

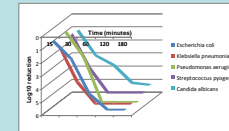


SILVERCEL NON-ADHERENT Dressing has the highest wet tensile strength in both flat dressing and rope presentations (rope data for SILVERCEL NON-ADHERENT, Aquacel Ag and Acticoat Absorbent were presented at the European Pressure Ulcer Advisory Panel meeting, Amsterdam, September 2009)

Antimicrobial Activity

Log10 reduction test

Dressings placed in a quantified suspension of bacteria. Reduction in the bacterial number is measured.



Zone of inhibition

Dressings are applied to bacterial lawn. Zone of inhibition measured.

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

SILVERCEL NON-ADHERENT Dressing demonstrates broad spectrum antimicrobial activity

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