Advanced Medical Solutions

**Authors:**
Cerys Griffiths, Alexis Harding, Alex Lawton, Lynne Salmon.

# The Antimicrobial Performance of a Novel Non-Woven PHMB Dressing of its Speed of Kill (SOK) performance from 15 minutes up to a 14-day period

## Introduction

A high absorbing gelling fiber dressing composed of carboxymethylcellulose (CMC) fibers and Polyhexamethylene Biguanide (PHMB) has been developed by Advanced Medical Solutions Ltd (AMS). The product is indicated for moderately to highly exuding wounds due to its significant absorbency capabilities, whereby the product can absorb high amounts of fluid whilst retaining its integrity by gelling.

The ability of the dressing to have antimicrobial efficacy within a short amount of time (15 minutes) and its ability to remain effective over an extended period i.e. 14 days is crucial in providing beneficial outcomes in a clinical environment. With more than **60%** of all chronic wounds becoming infected, it is essential they are treated quickly and safely to ensure fast patient recovery time[1].

The data outlined in the poster demonstrates the speed of kill properties of the PHMB gelling fiber dressing at 15mins to 4hrs, along with comparison data at time points between 30mins to 4hrs of three non-woven fiber competitor dressings containing silver. The extended wear time of the PHMB gelling fiber was demonstrated with an assessment of the dressing at 14 days.

## Method

Antimicrobial efficacy testing:

- The antimicrobial activity of the PHMB gelling fiber dressing and silver containing competitor dressings were assessed using a standard log reduction test, performed in accordance with AATCC TM-100 guidelines.
- The assessment was performed at numerous timepoints to demonstrate the product's speed of kill properties as well as its antimicrobial efficacy at extended timepoints past the indicated 7 days. A wide range of clinically relevant microorganisms were used including *Methicillin resistant Staphylo-coccus aureus* (MRSA), *Pseudomonas aeruginosa, Cryptococcus neoformans* (yeast) and a mould.
- The dressings were subject to conditions to ensure clinical relevance such as re-challenging the product at numerous timepoints over the test period as well as incubating samples at body temperature.
- The dressings were inoculated with a known bacterial load that represented conditions of a chronic wound[2].
- The dressings were processed to determine the total number of viable microorganisms remaining on the product, and log reduction value determined from the T0hr control dressing (containing no antimicrobial agent). The incubation timepoints were 15mins, 30mins, 1hr, 2hr, 4hr, 24hr, 48hr, 168hr, 336hrs. Tables 1-2 and graphs 1-4 document the log reductions and total viable count data.

**References:**

Dressing A = AMS PHMB gelling fiber; Dressing B = Aquacel® Advantage Ag; Dressing C = Durafiber® Ag; Dressing D = Exufiber® Ag

Data on file: LD058-21, LD117-22, LD160-22, LD001-23

1. S. Kadam, S. Nadkarni, J. Lele, J. Sakhalkar, P. Mokashi and K.S Kaushik, Biotechnol, 2019, 7, 418, doi: 10.3389/fbioe.2019.00418

2. S.L Percival, W. Slone, S. Linton, T. Okel, L. Corum, J.G Thomas, Int Wound J, 2011, 3, 237–243, doi.wiley.com/10.1111/j.1742-481X.2011.00774.

AMS PHMB gelling fiber is not yet FDA cleared or CE marked.

Durafiber ®is a registered trademark of Smith and Nephew Medical Limited; Exufiber® is a registered trademark of Molnlycke Health Care AB; Aquacel® is a registered trademark of ConvaTec Inc

## Results

Table 1 – Log reduction data for the 4 test dressings (A-D) at 15mins – 2hrs: Dressing A = PHMB gelling fiber dressing

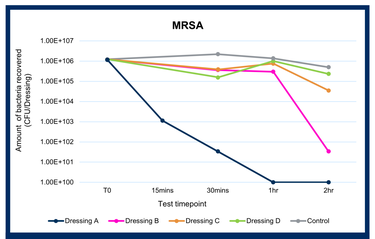
| Test Timepoint | 15mins | 30mins | | | | 1hr | | | | 2hr | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Microorganism** | A | A | B | C | D | A | B | C | D | A | B | C | D |
| MRSA | 3.63 | 4.55 | 0.52 | 0.50 | 0.89 | >6.08 | 0.60 | 0.20 | 0.08 | >6.08 | 4.55 | 1.54 | 0.71 |
| MRSE | 3.91 | >7.27 | 0.97 | 0.87 | 1.04 | >7.27 | 1.44 | 0.97 | 0.97 | >7.27 | 4.07 | 4.07 | 1.57 |
| *Pseudomonas aeruginosa* | >6.45 | >6.48 | 1.68 | 2.89 | 0.75 | >6.48 | >6.48 | >6.48 | 1.13 | >6.48 | >6.48 | >6.48 | >6.45 |

(> indicates total eradication)

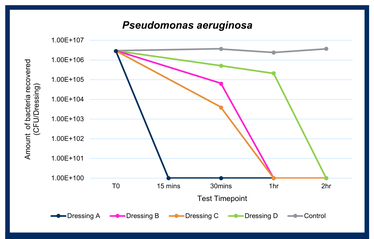
Table 2 – Log reduction data for the 4 test dressings (A-D) at 4hrs – 14 days: Dressing A = PHMB gelling fiber dressing

| Test Timepoint | 4hr | | | | 24hr | | | | 48hr | | | | 168hr | | | | 336hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Microorganism** | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D | A |
| MRSA | >6.90 | >6.60 | >6.22 | 1.76 | >6.90 | >6.60 | 5.04 | >6.57 | >6.90 | >6.60 | >6.57 | 3.48 | >6.90 | >6.60 | >6.57 | 3.77 | >6.60 |
| MRSE | 4.93 | >7.40 | 5.11 | 2.58 | >7.30 | >7.40 | 5.11 | 5.18 | >7.30 | >7.40 | >7.01 | 4.58 | >7.30 | >7.40 | >7.01 | >6.96 | >7.30 |
| *Pseudomonas aeruginosa* | >6.60 | >6.90 | >6.29 | >6.45 | >6.60 | >6.90 | >6.15 | >6.15 | >6.60 | >6.90 | >6.16 | >6.15 | 4.60 | >6.90 | >6.15 | 3.48 | >6.70 |

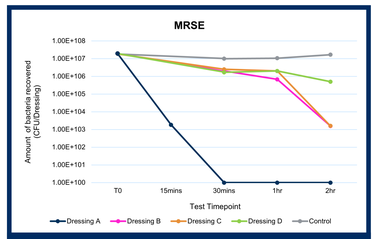
(> indicates total eradication)



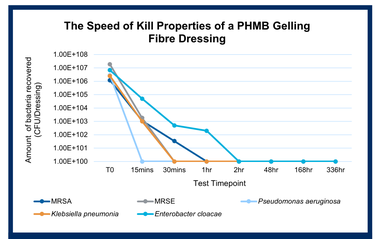

**Graph 1** – Graph demonstrating the amount of MRSA remaining on the PHMB and Silver dressings at each timepoint. A dressing containing no antimicrobial agent was also processed as the control. Dressing A = PHMB gelling fiber dressing (see references section for other dressing types).




**Graph 2** – Graph demonstrating the amount of *Pseudomonas aeruginosa* remaining on the PHMB and Silver dressings after each timepoint. Dressing A = PHMB gelling fiber dressing (see references section for other dressing types).




**Graph 3 –** Documents the rapid reduction of MRSE with use of a PHMB gelling fiber dressing (Dressing A).




**Graph 4 –** Illustrates the speed and maintained rate of reduction of microorganisms with use of a PHMB dressing. (Dressing A).

## Discussion

The speed of kill data documented in this poster shows the effective performance of the PHMB gelling fiber dressing in reducing microbial load compared to the silver dressings tested. Within 15 minutes the rapid performing PHMB gelling fiber dressing completely eradicated *Pseudomonas aeruginosa,* and within 30 minutes achieved total eradication of MRSE with a greater than 4 log reduction of MRSA. The data demonstrates the promising performance of the PHMB gelling fiber over the silver containing dressings which rarely achieved a greater than 1 log reduction when utilising this test method.

The PHMB gelling fiber dressing has also proven to be effective across a period of 336hrs (14 days) with all microorganisms achieving complete eradication within 2 hours which was sustained for 336hrs. Aside from the data presented in this poster, total eradication was achieved and sustained for all microorganisms including a yeast and a mould at the 14-day timepoint. This data is significant as it ensures the PHMB gelling fiber remains effective over an extended period. This could allow for a reduced number of dressing changes, and a reduction in the associated pain to patients during frequent dressing removals.

In conclusion, the PHMB gelling fiber exhibits exceptionally fast antimicrobial action and is able to sustain this antimicrobial action for up to 14 days, which can assist in the reduction of dressing changes.

## Conclusion

- PHMB gelling fiber dressing demonstrates excellent speed of kill action on a range of microorganisms especially gram positive and negative bacteria.
- Full eradication of *Pseudomonas aeruginosa* was achieved within 15 minutes using the PHMB gelling fiber.
- Full eradication of all microorganisms tested within 2hrs using the PHMB gelling fiber.
- Sustained antimicrobial efficacy over extended timepoint of 336hrs, total eradication of all microorganisms.

**Follow us on LinkedIn**

**Road One Winsford Industrial Estate, Winsford, CW7 3RT, UK**

**woundcare@admedsol.com**

**admedsol.com**