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Efficacy of antimicrobial wound dressings against *S. aureus*, *E. coli* and *K. pneumonia* as well as their resistant kinsmen MRSA and NMD-1 strains *in vitro*

Introduction

Bacteria that are resistant to common antibiotics such as the methicillin-resistant *Staphylococcus aureus* (MRSA) or *E. coli* and *K. pneumonia* strains that carry the metallo-beta-lactamase-1 gene (NMD-1) are increasingly isolated from chronic wounds. Therefore, special care has to be taken to treat the wound infection and to prevent the spread of these pathogens. Hence, dressings containing antimicrobial substances or with inherent antimicrobial properties are increasingly used in wound management. These dressings should also provide a general broad antimicrobial activity against both sensitive and resistant bacteria species. Concerns have been raised whether they are indeed effective against MRSA and NMD-1-carrying strains. Here, we have rated the antibacterial activity of various dressings against *S. aureus*, MRSA, *E. coli*, NMD-1-carrying *E. coli*, *K. pneumoniae*, and NMD-1 carrying *K. pneumoniae* using the JIS L 1902 standard test which allows a direct evaluation of the dressing's effects on the micro-organisms

Material & Methods

The determination of antimicrobial activity was performed according to the Japanese Industrial Standard (JIS L 1902: 2002, "Testing method for antibacterial activity of textiles"). Culture medium was inoculated with the test microbes and cultivated for 24 hours at 37° C under aerobic conditions. For experiments, 400 mg samples of the wound dressings* were incubated with each test microbe (200 µL) for 24 hours at 37° C under aerobic conditions. Polyester was used as reference material.

* (FV) Flivasorb® (Lohmann & Rauscher), (VW) Vliwaktiv® (Lohmann & Rauscher), (VWA) Vliwaktiv® Ag (Lohmann & Rauscher), (SA) Suprasorb® A (Lohmann & Rauscher), (SAA) Suprasorb® A + Ag (Lohmann & Rauscher), (SXP) Suprasorb® X + PHMB (Lohmann & Rauscher)

Results

All dressings containing an antimicrobial substance such as PHMB (SXP) or silver (SAA and VWA) exerted a distinct antimicrobial effect against all test strains used that could be rated a strong antimicrobial activity according to JIS L 1902 (log reduction > 3). Furthermore, the alginate dressing (SA) was able to efficiently bind and inhibit bacteria progeny. Similarly, strong antibacterial activity was observed for the SAP-containing dressing (FV) against the gram-negative bacteria (log reduction > 3) while it demonstrated a significant activity against *S. aureus* and MRSA (log reduction = 1.4 and 2.0, respectively). However, no effect on bacterial growth was found for the dressing containing just activated carbon in a viscose matrix w/o silver (VW).

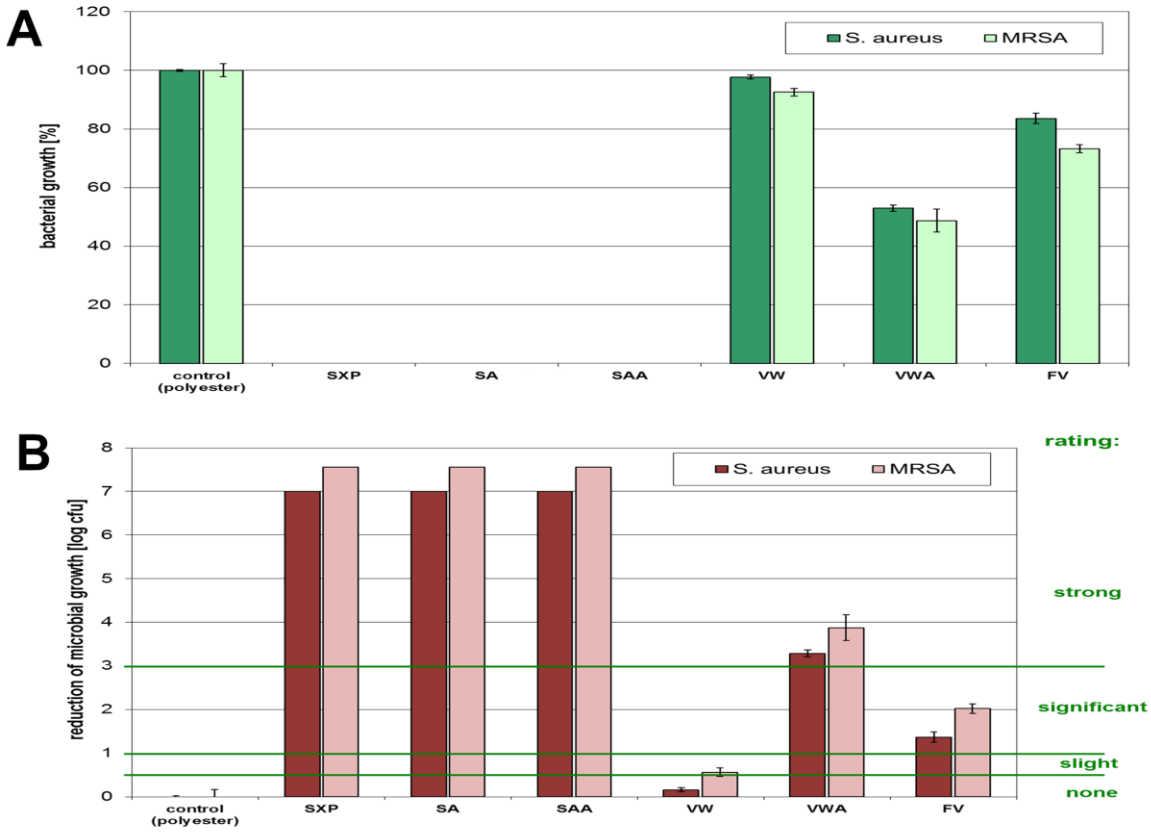

Figure 1: Growth of *S. aureus* and MRSA under the influence of the dressings* over 24 hours (A) and the reduction of bacterial growth achieved in [log cfu] (B).

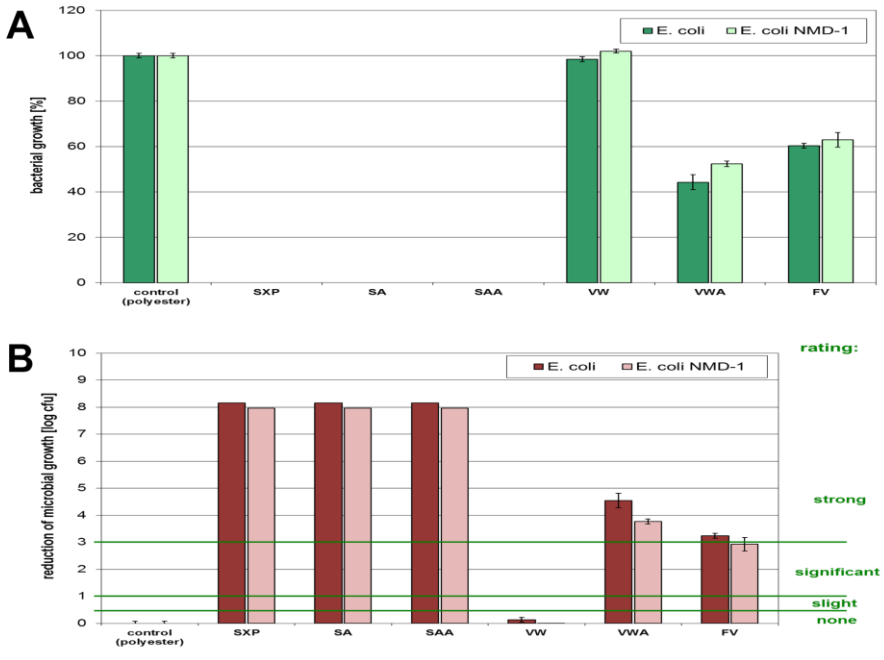

Figure 2: Growth of *E. coli* and NMD-1 *E. coli* under the influence of the dressings* over 24 hours (A) and the reduction of bacterial growth achieved in [log cfu] (B).

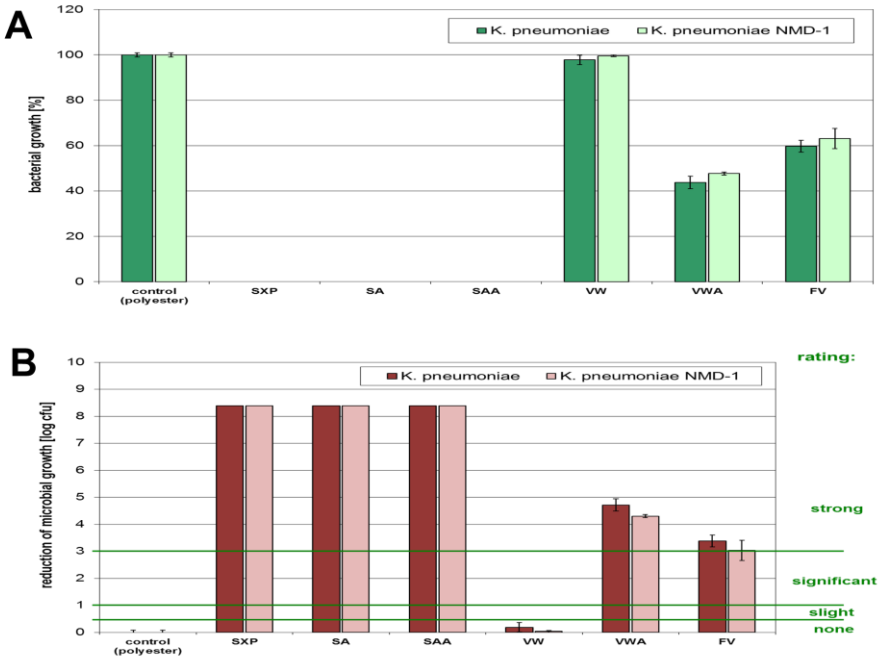

Figure 3: Growth of *K. pneumoniae* and NMD-1 *K. pneumoniae* under the influence of the dressings* over 24 hours (A) and the reduction of bacterial growth achieved in [log cfu] (B).

Conclusion

It could be shown that dressings with an inherent antibacterial activity such as alginate or SAP-containing dressings or dressings with an antimicrobial substance such as PHMB or silver are equally effective against sensitive strains of *S. aureus*, *E. coli* and *K. pneumoniae* as well as their resistant kinsmen MRSA and NMD-1 strains. Hence, it seems to be safe to use these dressings in the treatment of infected chronic wounds.

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Thank you for your attention!