COMPARISON OF THE ANTIBACTERIAL EFFECTS ON *PSEUDOMONAS AERUGINOSA* AND A *STAPHYLOCOCCUS AUREUS* BIOFILM OF A CLASS 3 PHMB FOAM* AND A CLASS 2B PHMB FOAM**

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Introduction

Chronic wounds are often colonized by different microorganisms, the most prominent being *Staphylococcus aureus* and *Pseudomonas aeruginosa*. PHMB-containing dressings have been shown to effectively inhibit bacterial progeny. However, bacteria do not act alone and the concept of biofilm formation and presence is now widely accepted. Therefore, current research targets antibiofilm strategies to restore an optimal wound-healing environment. A combined treatment approach involving debridement and the addition of antibacterial agents may then provide the highest success rates. Here, the efficacy of a new PHMB-containing PU foam* (class III, MDD 93/42/EEC) against a *Staphylococcus aureus* biofilm was evaluated *in vitro* and compared to a class IIb (MDD 93/42/EEC) PHMB foam**. Moreover, antibacterial activity was evaluated in a direct contact method as well as by an extraction-based method against *Staphylococcus aureus* and *Pseusomonas aeruginosa*.

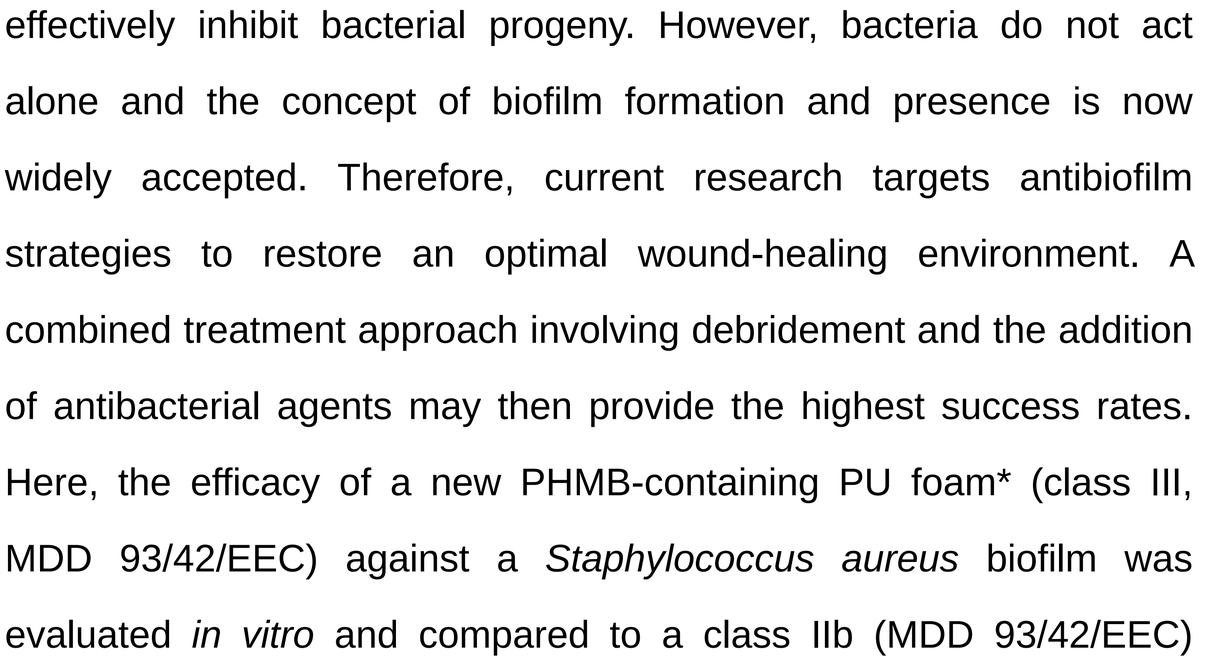

Figure 1: Growth of *S. aureus* and *P. aeruginosa* under the influence of the dressings over 24 hours (left) and the reduction of bacterial growth achieved in [log cfu] (right). The antibacterial activity was rated according to the JIS L 1902:2002.

Material & Methods

Antibacterial activity against *S. aureus* and *P. aeruginosa* was tested according to JISL1902:2002. In addition, extracts from the dressings were obtained (extraction ratio: 1g:50mL, extraction conditions: 24h at 37°C). Effect of the extracts on microbial growth was monitored by microplate laser nephelometry (MLN). *S.aureus* biofilm was cultivated on glass plates, covered with dressings, and incubated for 24h at 37°C. Biomass was evaluated directly after dressing removal using the alamar blue assay.

*Suprasorb P + PHMB (Lohmann & Rauscher); ** DracoFoam Infekt (Dr. Ausbüttel & Co. GmbH)
***Debrisoft (Lohmann & Rauscher)

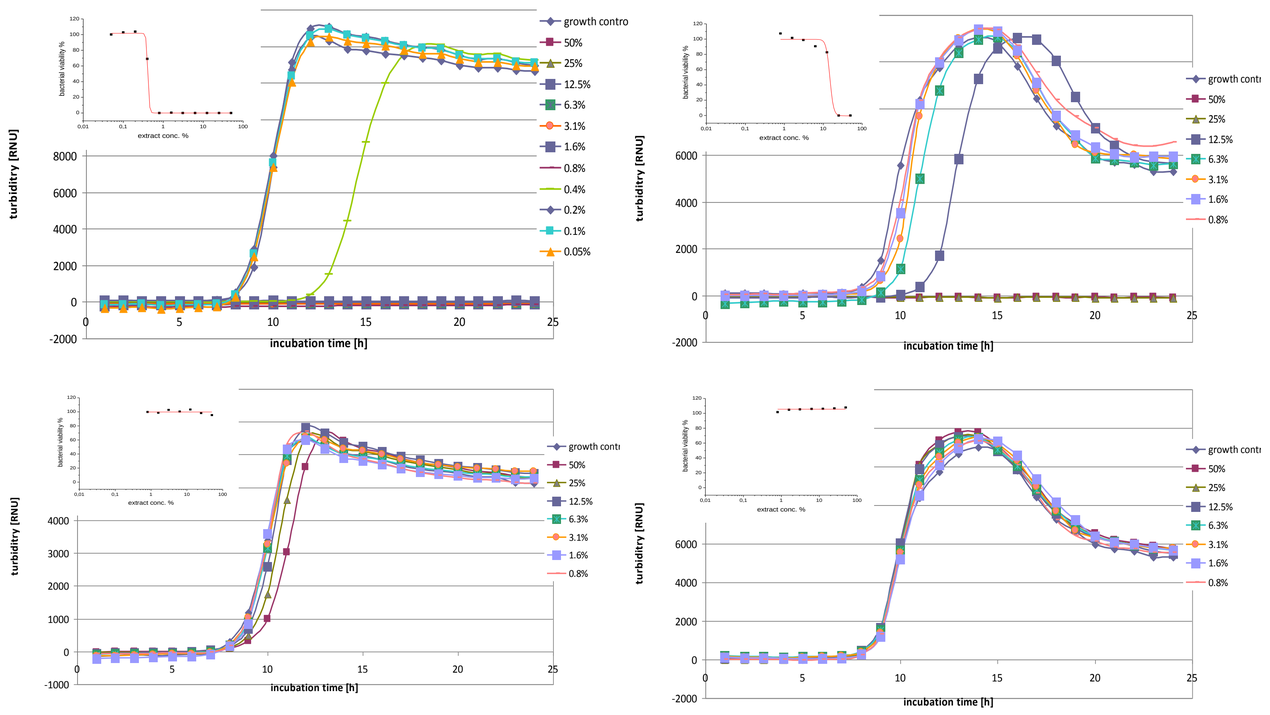

Figure 2: Growth of *S. aureus* (left) and *P. aeruginosa* (right) under the influence of PHMB-containing PU foam* extracts (top) and PHMB foam** extracts (bottom) over 24h monitored by MLN. Inserts show the respective dose-response curves.

Results

The new PHMB-containing PU foam* displayed complete inhibition of both, *S. aureus* and *P. aeruginosa* (figure 1) in the direct contact test JIS L 1902:2008. This is rated as a strong antibacterial activity (log-reduction>3) while the PHMB foam** only exhibited a slight antibacterial effect (log reduction approx. 0.8). Additionally, the extract of the PHMB-containing PU foam* demonstrated a distinct inhibition of bacterial growth (IC_{50}-S.aureus: 0.41% and IC_{50}-P.aeruginosa: 14.8%). In contrast, no antimicrobial active amounts of PHMB were released from the PHMB foam** (figure 2). After previous treatment with the wound debrider Debrisoft, the new class III PHMB-releasing PU foam* efficiently reduced the *S. aureus* biofilm and significantly less viable bacteria were observed (figure 3). The class III PHMB-releasing PU foam* exhibited a significantly higher reduction of biofilm compared to the class IIb PHMB foam** after debridment.

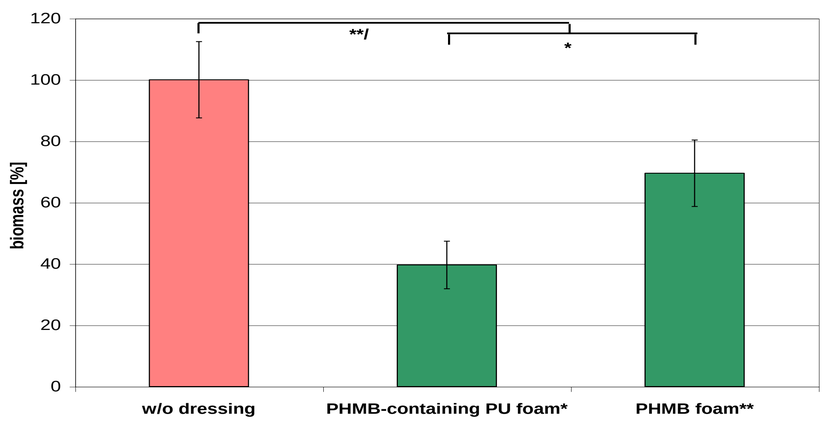

Figure 3: Decrease of S. aureus biomass on the glass plates during incubation with the antimicrobial wound dressings for 24 hours at 37° C after debridement***.

Conclusion

It was found that the new class III PHMB-containing PU foam* exhibits a strong antibacterial activity against prominent microorganisms in chronic wounds in contrast to the class IIb PHMB foam**. Moreover, it could be shown that the class III dressing* is able to release its antimicrobial agent in active quantities and further to reduce biofilm in vitro after debridement with Debrisoft *in vitro*. Hence, it can be expected to exert beneficial effects in stagnating wounds and promote healing in combination with debridement (“break the biofilm, then treat antiseptically”).

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