Endotoxin-binding capacity of an antimicrobial silver containing, activated charcoal wound dressing – Vliwaktiv® Ag

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Introduction:

Bacteria and their endotoxins as well as the increasing biofilm could impair the wound healing (1-4). Activated charcoal wound dressings are widely used in the treatment of infected wounds due their binding of odour and bacteria. The combination of an anti-microbial compound with an activated charcoal dressing is an advantage for the treatment. Beside the anti-microbial properties of this type of dressings the aim of the in-vitro study was to show the endotoxin-binding from gram-negative bacteria by a new wound dressing with a very low silver release (5).

Material and Methods

After 0.5, 3 and 24 h incubation the endotoxin level (E. coli, final conc. 3,22 x 10^4 EU/ml, EU = endotoxin unit) was determined by Limulus amoebocyte lysate (LAL) assay (6). For statistical analysis a Mann-Whitney U-test was used and $p < 0.05$ were considered significant.

Following samples were tested: Vliwaktiv® Ag, Vliwaktiv® (only activated charcoal dressing, different construction in comparison to Vliwaktiv® Ag), Gazin® (cotton dressing), Actisorb® Silver 220 (positive reference standard), PBS-puffer (negative control).

Purpose

The activated charcoal dressings, Vliwaktiv® Ag, Vliwaktiv® and Actisorb® Silver 220 show a time-dependent, comparable capacity of endotoxin binding after 0.5, 3 and 24 h in contrast to the cotton dressing (Gazin®) and the PBS-control ($p < 0.05$; Mann-Whitney U-test). After 30 min 5-8 x 10^3 EU/cm² were bound, after 3 h contact 7-10 x 10^3 EU/cm² and after 24 h 12-13 x 10^3 EU/cm².

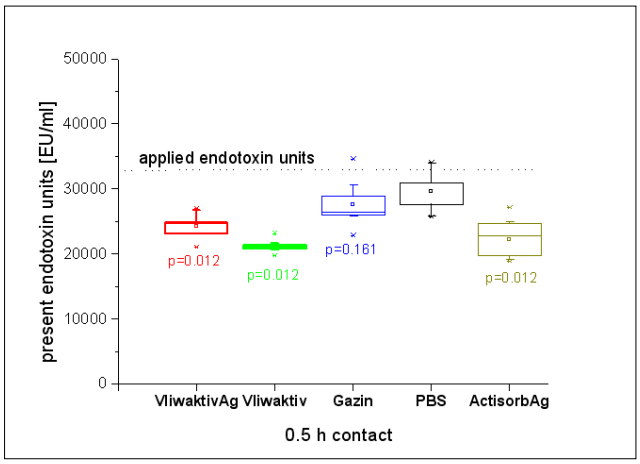

Fig. 1:
Box-and-Whisker-Plot of the present amount of endotoxin [EU/ml] in the eluate of the wound dressing and in the control (PBS) after 0,5 h contact with the endotoxin solution (used final concentration 3,22 x 10^4 EU/ml, dotted line, p-values in comparison to PBS, n=8).

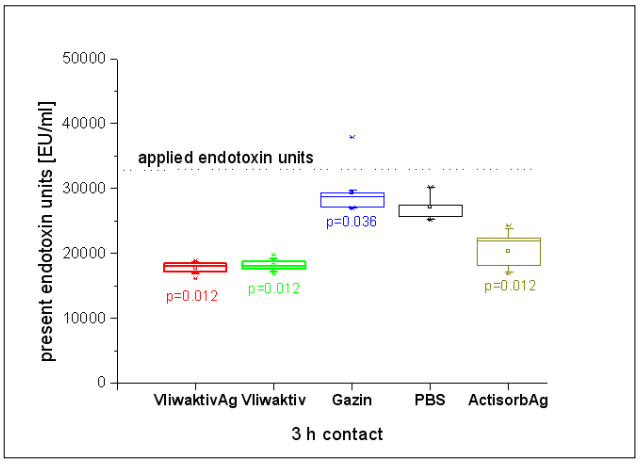

Fig. 2:
Box-and-Whisker-Plot of the present amount of endotoxin [EU/ml] in the eluate of the wound dressing and in the control (PBS) after 3 h contact with the endotoxin solution (used final concentration 3,22 x 10^4 EU/ml, dotted line, p-values in comparison to PBS, n=8).

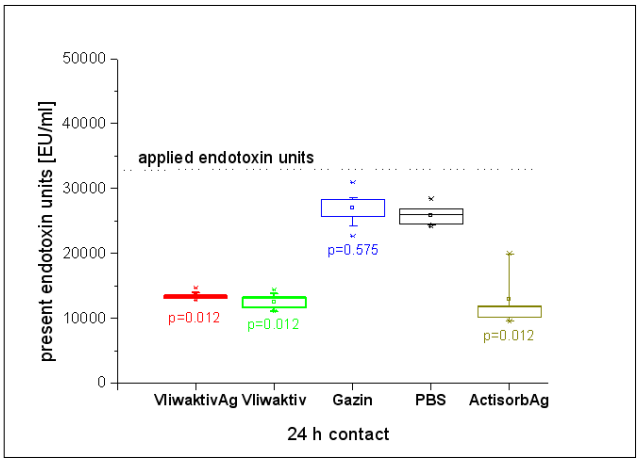

Fig. 3:
Box-and-Whisker-Plot of the present amount of endotoxin [EU/ml] in the eluate of the wound dressing and in the control (PBS) after 24 h contact with the endotoxin solution (used final concentration 3,22 x 10^4 EU/ml, dotted line, p-values in comparison to PBS, n=8).

Discussion:

Critical bacterial colonisation or bacteria in infected wounds has to be removed by anti-microbials and/or wound dressings to start the wound healing process again (1, 4). The existing endotoxins, the bacteria and their negative influence on wound healing (1-4) could be prevented by an activated charcoal inner layer with anti-microbial low-releasing silver-fibers (5). Systemic silver side effects may be improbable (4). Therefore these combinations are an ideal wound dressing for wounds infected or with critical colonisation in the phase-adapted Modern Wound Management.

References

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