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Our Ref.
Dr.Pi/mo

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Expert Opinion

Anti-Microbial Efficacy of "Bioni Hygienic" Interior Coating with Nano Properties

Client: Bioni CS, Mr. Markus Haeberte, Sales Director
Lessingstrasse 21, 46149 Oberhausen

Object

The object of the examination is the quantitative determination of the anti-microbial properties of the abovementioned coating.

Methodology

In order to determine the quantitative efficacy, the wells of a 24-well microtiter plate were filled with approx. 500µl of the product under examination, or with distilled water.

Staphylococcus aureus (ATCC: 6538) and enterococcus faecium (ATCC: 6057) were chosen as the test organisms.

These two organisms were selected as they can both be recultivated even after long drying periods (in excess of three days).

No investigations were conducted using wet germs (e.g. *Pseudomonas aeruginosa*) or gram-negative germs of the intestinal flora (e.g. *E. coli*) as experience has shown that these microorganisms are very sensitive to drying out.

After the product under examination or the distilled water had been deposited in the bottom of the wells in the microtiter plates, these were then placed in a laminar airflow box where they were dried for 20 hours.

This drying period had been confirmed as sufficient during previous tests.

After the drying period, the test organisms were applied using a pipette; 50 micro litres of the appropriate germ suspension was applied in each case.

Attempts were made, at predetermined intervals, to recultivate the germs from the individual wells in the microtiter plates. To this end, sterile glass pearls were placed into the wells in order to mix the deposit with 1 ml of CSL for 5 minutes on a laboratory shaker.

Subsequently, 0.5 ml of this suspension was drawn off and a dilution assay was produced in three decimal logarithmic stages, in order to determine quantities.

Dilution was also carried out in CSL.

Finally, 100 micro litres were placed on nutrient agar (CSA) using spatulas.

After an incubation period of 48 hours at 37° C, a visual determination of the colony-forming units (CFU) was made.

With reference to the respective drying times after taking averages of the six calculated individual values the differences between the control (distilled water) and the product under investigation were calculated according to the following formula:

$$\log \text{ control} - \log \text{ product} = \log \text{ RF}$$

Materials Under Examination

- Bioni Hygienic with nano properties (Bioni CS GmbH, Oberhausen) = product under investigation
- Distilled water

Results

The results of the investigations carried out are given in tables 1 to 7 for the test organism enterococcus faecium and in tables 8 to 14 for the test organism staphylococcus aureus (please see appendices for original data).

In order to improve clarity, the data summarised in the tables has been presented again in graphic form. The results obtained with the test organism enterococcus faecium are shown in diagram 1, while those obtained with the test organism staphylococcus aureus are shown in diagram 2.

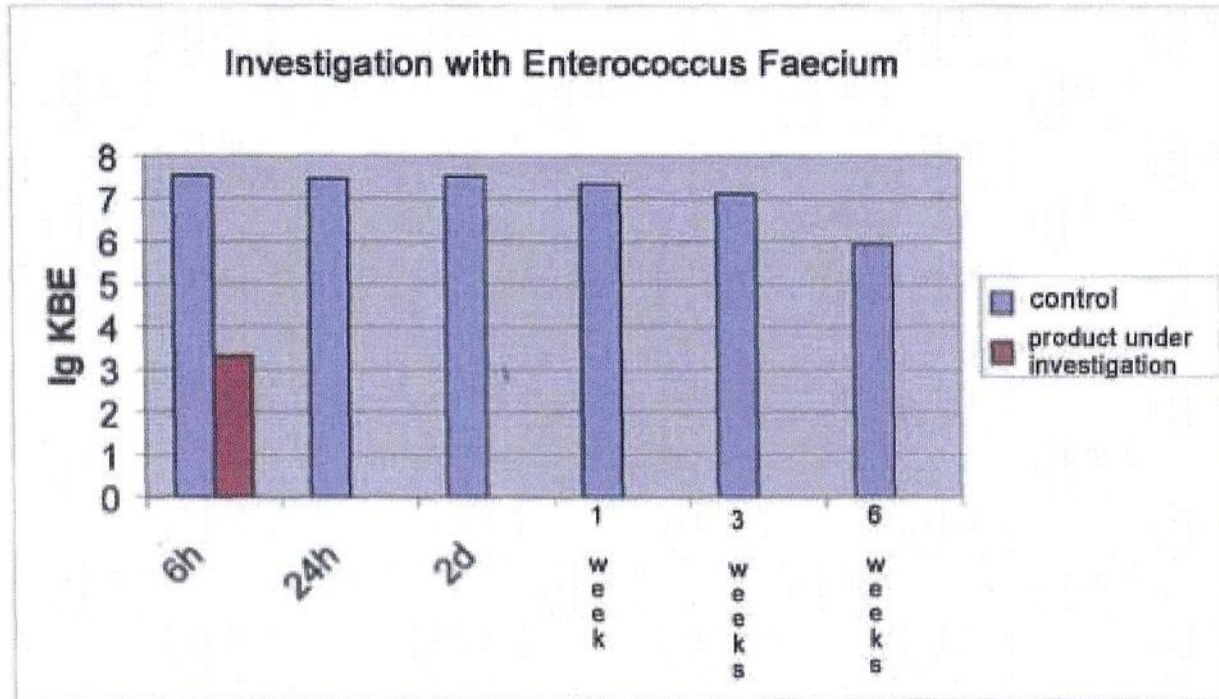


Diagram 1: Results with the test organism enterococcus faecium

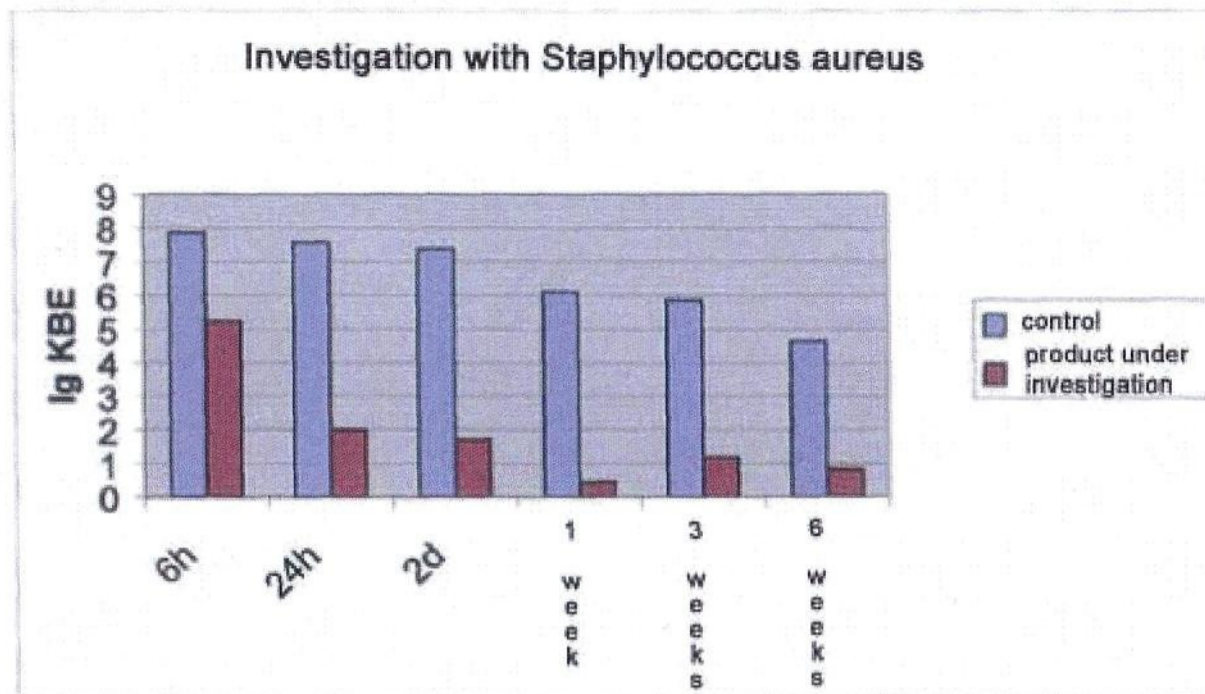


Diagram 2: Results with the test organism staphylococcus aureus

The graphs show that the test organism enterococcus faecium was completely eliminated within a 24-hour period. During the later periods of investigation, re-examinations were carried out in order to ensure that this was not an artefact.

A distinct bactericidal effect was also seen with the test organism staphylococcus aureus.


The reduction in germs after 24 hours was in excess of 5 lg levels (see table 8 in the appendix) and remained at this high level.

After 7 weeks any further investigation would not have been meaningful, as the control had declined significantly.

Assessment

The product under investigation shows a distinct antibacterial efficacy with regard to the selected test organisms enterococcus faecium and staphylococcus aureus. For both test organisms, a reduction in germs of 5 lg levels was noted after 24 hours.

Since enterococcus faecium and staphylococcus aureus belong to the most environmentally resistant non-sporulating pathogenic bacteria which play a significant part in nosocomial infection, it can be assumed that the product under investigation is also effective against a large number of other pathogens.


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Appendices

Please Note:

The results of the investigation relate exclusively to the abovementioned test object. Reproductions of excerpts of this report are to be published only with the written approval of Institute for Hospital Hygiene and Infection Control GbR, Gießen Germany.