

MEDICAL INSTITUTE OF OSTRAVA

Independent effectiveness trial of probiotic cleaning products

Research conducted by:

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INTRODUCTION

We have been presented with a new concept in healthcare cleaning, based on the combined action of probiotic bacteria, enzymes and green detergents by the representative in the Czech Republic and Slovakia of the Belgium company Chrisal by Chrisal Slovakia,

Current cleaning systems for the general cleaning of high infection risk facilities always apply chemical detergents and mechanical removal of organic and inorganic dirt. Killing of bacteria and fungi, or the inactivation of viruses, is achieved by means of disinfectants.

The company Chrisal now introduces a new concept of cleaning, using a combined action of surfactants with several strains of *Bacillus* probiotics. These cleaning products create a strong microbial competition in the environment and also interfere with the fast bacterial cell-to-cell communication (quorum sensing) between pathogens. Despite the frequent use of *Bacillus* strains in human food supplements or several industrial processes such as waste water treatment, the use in cleaning is completely new.

After the presentation of the concept on a medical congress on the 28th of November 2007 in Slovakia, it was decided to verify the effectiveness of their probiotic cleaning products following standardised research protocols.

GOAL

1. During a series of contamination trials, determine the cleaning action of the Chrisal products.
2. Determine the influence of the probiotic bacteria on the density of test pathogens on several surfaces.

METHODOLOGY

The following test strains were included in the trial:

- *Staphylococcus aureus* CCM 3953
- *Enterococcus faecalis* CCM 4224
- *Klebsiella pneumoniae* CCM 4415
- *Pseudomonas aeruginosa* CCM 1960
- *Staphylococcus aureus* - Methicillin resistant (MRSA) isolated from a nosocomial infection

Suspensions of these bacteria with densities between 10^8 and 10^9 CFU/ml were inoculated on the following surfaces of 5 x 5 cm and/or 30 x 30 cm:

- PVC (linoleum)
- Ceramic tiles
- glass
- textile

The horizontal test surfaces were first cleaned, rinsed, disinfected, rinsed and finally thoroughly rinsed with a neutral solution of GLOSS XPRESS. The pathogen suspensions (50 µl) were introduced on the surfaces following the standard RKI method for the control of disinfection of floors ([detailed protocol available on request](#)). Positive and negative controls were also included.

The direct effect of the probiotic detergents on the test pathogens was determined *in vitro*. The product used was the PIP Daily Sanitary Cleaner (PIP 60180) in a 1% dilution with warm water (40°C). This solution was subsequently diluted until 0.33%, 0.11% and 0.037% in order to test the effect of the concentration.

During five days, the test surfaces were cleaned daily with their respective cleaning solution. Every day the presence of the test bacteria was tested by means of plate counts.

RESULTS

After 5 days of cleaning with the PIP product, **none of the test strains survived**. All surfaces were colonised by *Bacillus*. Test results on MRSA show that after 5 days of cleaning also MRSA was completely removed from the various surfaces, except for textile. However, we need to draw the attention to the fact that the textile was constantly wet, so we can conclude that the textile needs to be dry in order to achieve a descent probiotic cleaning. (Hence the reason for the development of the PIP Allergy Free spray that applies the probiotic bacteria to textile surfaces without making them wet; *remark added by Chrisal*)

The tests to determine the effect of the concentration show the positive effects only with the 1% dilution, all other tested concentrations resulted in less efficiency.

DISCUSSION

The suspensions of test bacteria used were highly concentrated (10^8 - 10^9), so the bacterial contamination on the surfaces was high. After 5 days, a 1% dilution of the PIP product was sufficient to remove all test bacteria.

The contamination by hospital bacteria in healthcare facilities is on average 10^3 CFU/m², but our results show that the PIP product is able to solve contamination problems at a much higher concentration of about 10^8 - 10^9 hospital bacteria/m².

The best result was measured against gram negative rod shaped bacteria, whereas *Enterococcus faecalis* demonstrated to be the most resistant bacteria from all test strains. This resistance of *Enterococcus faecalis* is also know from test results with disinfectants. Test results on MRSA indicated that even a very high MRSA load can be completely removed after 3 days of PIP cleaning.

The results clearly show a high probiotic bacteria load on the test surfaces, sufficient enough to influence the test bacteria, even after the first cleaning.

A vital difference between probiotic cleaning and chemical cleaning is that chemical cleaning always leaves a small amount of chemical residue which can accumulate and negatively influence the remaining microflora in terms of resistance. The use of only a detergent in an environment which contains pathogens never guarantees the complete removal of those pathogens.

When regularly used, the probiotics in the PIP detergent will colonize the surface. Once the surface is colonized, other bacteria will have no space and food to sustain themselves.

FINAL CONCLUSIONS

1. A surface which suffers from very high bacterial contamination can be microbiologically cleaned by the use of probiotics combined with a detergent.
2. The use of the probiotic PIP products in a dilution of 1% can be used against MRSA.
3. 'Law 195/2005 lawbook' allows the use of common detergents for the cleaning of standard sections. Chrisal offers those detergents combined with non pathogenic sporulating bacteria. When those bacteria colonise the surface, they prevent the pathogenic and subpathogenic microflora from growing again.
4. According to the results of our tests the probiotic PIP cleaning products can be used for the cleaning of surfaces in medical institutions, institutions of social care and in home care.

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Literature

- Exner M., Vacata V., Hornei B., Dietlein E., Gebel J.: Household cleaning and surface disinfection: new insights and strategies. *J Hosp Infect* 2003; 56: 70-75.
- Probiotics In Progress – Das PIP-Prinzip. *Firma text Chrisal Belgien*, 11 p.

- Robert – Koch – Institut: Anforderungen an die Hygiene für Hausreinigung und Flächendesinfektion (Recommendations on Hygiene for Household Cleaning and Surface Disinfection). *Bundesgesundhbl* 2004; 47: 51- 61.
- Sanders M. E., Morelli L., Tompkins T. A.: Sporeformers as Human Probiotics: Bacillus, Sporolactobacillus and Brevibacillus. *Comprehensive reviews in food science and food safety* 2003; 2, 101-110.
- Temmerman R.: For efficient and sustainable probiotic clearing. *Information brochure PIP Healthcare®*, 16s.