

Study Title: **REDUCING HEALTH CARE-ASSOCIATED INFECTION INCIDENTS WITH A PROBIOTIC-BASED SANITATION SYSTEM:** A multi-center, prospective, intervention study

Study Registration Number: **ISRCTN58986947**

Study Setup: From 1/1/2016 - 6/30/2017 Probiotic cleaning products were applied (as a crucial part of the PCHS cleaning system) in 6 medium to large hospitals in Italy. Comparisons were made against chlorine-based chemical cleaning/disinfection products. Measurements were taken of the number of **pathogens on the surfaces**, the number of **hospital-acquired infections (HAIs)** and the levels of **antibiotic resistance**.

Results: 11,842 patients and 24,875 surface samples were analyzed, providing the following results:

1. Surface pathogens

The following pathogens were analyzed: Staphylococcus spp, Enterobacteriaceae spp, Pseudomonas spp, Acinetobacter spp, Clostridium difficile and Candida spp. Probiotic cleaning **reduced the risk of the above pathogens on surfaces by 83%**.

2. Antibiotic resistance

All surface pathogens were screened for antibiotic resistance. Additionally, the Bacillus probiotics within the product, as well as 120 Bacillus isolates from hospital surfaces were analyzed for antibiotic resistance by microarray. **No acquired antibiotic resistance was found among the probiotic Bacillus species**, meaning that the probiotics do NOT develop or transfer resistance. Furthermore, up to **2 log (=100x) fewer antibiotic resistance genes were detected among the pathogens**.

3. Hospital acquired infections (HAIs)

Of the 11,842 patients, 284 patients contracted a hospital infection during conventional cleaning, while only 128 did during probiotic cleaning. With all variables considered, the **probiotic cleaning resulted in 54.8% fewer hospital acquired infections**.

Conclusion: The study by Caselli, et. al., proves that the use of probiotic cleaning in hospitals **lowers the risk of pathogens on surfaces, lowers the number of antibiotic resistance genes and lowers the amount of hospital-acquired infections (HAIs) by at least 54.8%**

Previous studies and the European Union Ecolabel already demonstrate and confirm that **Prötekt** probiotic cleaning products are effective, safe, and environmentally beneficial.

RESEARCH ARTICLE Reducing healthcare-associated infections incidence by a probiotic-based sanitation system: A multicentre, prospective, intervention study

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OPEN ACCESS

Caselli E, Brusatero S, Cococagna M, Ardoña L, Bertolotti F, Antonelli P, et al. (2018) Reducing healthcare-associated infections incidence by a probiotic-based sanitation system: A multicentre, prospective, intervention study. PLOS ONE 13(7): e0199816. <https://doi.org/10.1371/journal.pone.0199816>

Editor: John Daily, University of Calgary, CANADA

Received: February 8, 2018

Accepted: June 11, 2018

Published: July 12, 2018

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files, including data held in the public repository [BioRxiv](https://doi.org/10.6026/1365-1821.x1800001) (<https://doi.org/10.6026/1365-1821.x1800001>). Accession No. S182575.

Funding: The authors declare that they received unrestricted funding from Ospeda Sciri (via Venetia) 12, 41121 Ferris, Italy; however, this does not influence in any way the design and conduct of the study, collection, management, analysis, and interpretation of the data, preparation,

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Abstract

Healthcare Associated Infections (HAI) are a global concern, further threatened by the increasing drug resistance of HAI-associated pathogens. On the other hand, persistent contamination of hospital surfaces contributes to HAI transmission, and it is not effectively controlled by conventional cleaning, which does not prevent recolonisation, has a high environmental impact and can favour selection of drug-resistant microbial strains. In the search for effective approaches, an eco-sustainable probiotic-based cleaning system (Probiotic Cleaning Hygiene System, PCHS) was recently shown to stably abate surface pathogens, without selecting antibiotic-resistant species. The aim of this study was to determine whether PCHS application could impact on HAI incidence. A multicentre, pre-post interventional study was performed for 18 months in the Internal Medicine wards of six Italian public hospitals (January 1st 2016–June 30th 2017). The intervention consisted of the substitution of conventional sanitation with PCHS, maintaining unaltered any other procedure influencing HAI control. HAI incidence in the pre and post-intervention period was the main outcome measure. Surface bioburden was also analyzed in parallel. Globally, 11,842 patients and 24,875 environmental samples were surveyed. PCHS was associated with a significant decrease of HAI cumulative incidence from a global 4.8% (284 patients with HAI over 5,930 total patients) to 2.3% (128 patients with HAI over 5,531 total patients) (OR = 0.44, CI 95% 0.35–0.54) (P<0.0001). Concurrently, PCHS was associated with a stable decrease of