



PROBIOTICS FOR HOSPITAL HYGIENE – SUMMARY OF SCIENTIFIC PAPER

“Comparative analysis of surface sanitization protocols on the bacterial community structures in the hospital environment”

The result of a study conducted by the University Hospital Jena and the Charité Berlin demonstrates the positive effect of probiotic cleaning in a real clinical setting. A research team had investigated the influence of so-called «**cleaning regimes**» on the quantity, diversity and resistance of bacteria found on surfaces in hospital rooms. Specifically, they investigated how bacteria brought in by patients spread in the hospital room, how different cleaning agents work against them, and whether they promote healthy bacterial diversity or destroy it – the latter favoring resistance to antibiotics in the long run.

Objectives:

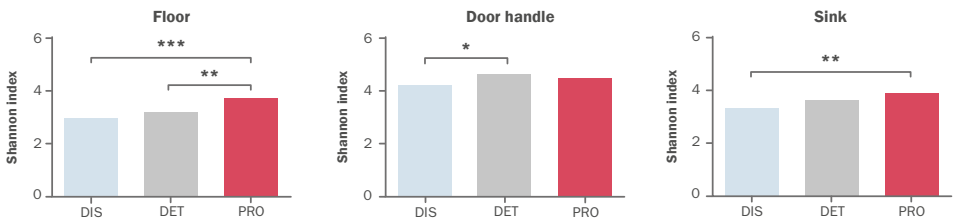
This study investigates the effects of different sanitization strategies on the environmental microbiome in the clinical setting, as well as the effect on presence of antimicrobial resistance genes.

Methods:

Three cleaning regimes (disinfectants, detergents and probiotics) were applied subsequently in 9 independent patient rooms at the Charité-Universitätsmedizin Hospital in Berlin. The surfaces were cleaned daily using specific products: Incidin Pro 0.5% (ECOLAB) for disinfection; Brial Top 0.5% (ECOLAB) as conventional detergent; and **SYNBIO Interior** 0.5% (HeiQ Chrisal) as probiotic detergent. Weekly sampling procedures included 3 different environmental sites: floor, doorhandle, and sink. Characterization of the environmental microbiota and detection of antibiotic resistance genes (ARGs) were performed by 16S rRNA sequencing and multiplex Taq-Man qPCR assays, respectively.

Results:

- Probiotic sanitization showed a displacement of intrinsic environmental microbiota, an effect traditional disinfection measures do not have
- The cleaning effect (“decolonizing effect”) of disinfectant surface sanitization only lasts 30 minutes
- Probiotic cleaning resulted in the **highest microbiome diversity and higher stability** (a high diversity is always protective and positive)



- Probiotic cleaning resulted in **a reduced abundance of pathogenic organisms** such as Pseudomonas and Sta phylococcus aureus, not only in absolute counts, but also in their relative abundance
- During probiotic cleaning, the data showed a **significant reduction of the total ARGs (Antimicrobial Resistance Gene) counts** in the sink samples, when compared to traditional disinfection strategies

- On application of probiotic cleaning protocols, in particular the *mecA* prevalence could be significantly reduced
 - The *mecA* gene is responsible for methicillin resistance and widely disseminated in *S. aureus* populations
 - The reduction of *mecA* might be partially explained by the **probiotics-triggered competitive exclusion principle**, as the significant reduction of biomass in the sink samples might also translate in a decrease of the total *S. aureus* counts and thus correlate with the reduced *mecA* detection in these samples

Conclusion:

The data presented in this study makes a strong case for reconsidering the use of conventional disinfectants and promoting stable bacterial diversity through the targeted use of probiotic sanitization, thereby counteracting dangerous pathogens.

The traditional disinfection protocols did not result in a better pathogen reduction compared to conventional and probiotic cleaning. Furthermore, cleaning with SYN BIO Interior created a more diverse surface microbiome with a significantly lower share of pathogens like *Pseudomonas* and *Staphylococcus*. Additionally, a strong reduction of antimicrobial resistance genes, such as *mecA*, was measured.

This study confirms the value of probiotic cleaning in the fight against resistant superbugs.



“When disinfectants are applied to surfaces, it is increasingly questioned whether the disinfecting effect might be very limited in time and whether it might even promote the spread of resistance.”

PD Dr. Rasmus Leistner from the Institute of Hygiene and Environmental Medicine at Charité - Universitätsmedizin Berlin on the background of the study

“We observe a significant shift in the environmental microbiota in hospital rooms after applying a probiotic cleaning strategy. The resulting microbial ecosystem structures are more complex and stable.”

Dr. Tilman Klassert, first author of the study, from the Host Septomics group at Jena University Hospital

“The most interesting effect produced by the probiotic purification regime was a significant reduction in particular of those antibiotic resistance genes found in multidrug-resistant MRSA bacteria.”

Prof. Dr. Hortense Slevogt, Jena research group leader