

REVIEW OF PROBIOTIC CLEANERS

We spend up to 90 % of our time indoors, during which we are exposed to chemicals generated by building materials, as well as products for cleaning, personal care, and hygiene (Velazquez et al., 2019). Cleaning imbues the air we breathe and coats the surfaces we touch with a myriad of chemicals (Velazquez et al., 2019). So it's important to choose cleaning products that are effective, does not cause risk to users or building occupants, are environmentally sustainable and ecological. More recently, alternatives to traditional household cleaners and disinfectants have become commercially available probiotic cleaners that include viable bacterial species chosen for their competitive abilities (Velazquez et al., 2019).

Over 49% of Americans who do household cleaning are willing to try probiotic cleaners, and 89% of surface cleaner purchasers in the UK would be interested in such products (Eisberg N, 2020).

Hard surface cleaners, especially those with antibacterial and viral activity, are seeing a surge of interest as a result of the coronavirus pandemic (Eisberg N, 2020). Virus and pathogenic bacteria can stay active on surfaces such as plastic, metal and cardboard for different lifetimes, so there is a focus on cleaning products that stay active on surfaces. Researchers, which aim to assess the antibacterial effectiveness of probiotic cleaning in a dental clinic at the University Dental Hospital Sharjah said: "We found that probiotic cleaning is better than using chemical disinfectants which usually eliminate surface pathogens immediately; however, they are ineffective in preventing recontamination and pathogens regrowth occurring within a few hours after cleaning. Another disadvantage of using chemical disinfectants is that they enhance the selection of antibiotic-resistant strains" (Al-Marzooq et al., 2018).

Advancements in science and studies in microbiome field suggest that the traditional "scorched-earth cleaning" mentality—that surfaces must be completely sterilized—may contribute to long-term human health consequences (Velazquez et al., 2019). Faster microbial evolution occurs in harsh environments. Microorganisms may express resistance to our attempts to remove or destroy them, thus enhancing their pathogenicity and virulence. Microbial communities adapt, reassemble, and persist, and recent theory in microbial ecology suggests that curating microbial communities may be more sustainable than attempting to remove them (Velazquez et al., 2019).

Natural environments harbor a stunningly diverse collection of microbial species. Within these communities, bacteria compete with their neighbors for space and resources. Laboratory experiments have revealed many active mechanisms by which bacteria can impair or kill other microbes (Hibbing M.E. et al., 2010). Probiotic cleaners embrace the theory that microbial competition can be harnessed to effectively control microbial populations in the built environment (Velazquez et al., 2019). Probiotic cleaning solutions aim to kill pathogenic bacteria while leaving a residual coating of non-threatening probiotic bacteria to form a protective biofilm (Velazquez et al., 2019). Those biofilms blocks other bacteria access to favorable habitats, nutritional resources and produce antimicrobial compounds to prevent further microbial accumulation.

In the developed world, around 5–10% of people who check into hospitals and other health-care institutions pick up an infection during their stay, falling ill in the very places that are meant to make them healthier (Yong E.,2017). Just as we have gone overboard in taking unnecessary antibiotics or lathering ourselves in antibacterial sanitizers, we have also gone too far in cleaning our buildings, even our hospitals. That might make things worse. By removing harmless bacteria that would otherwise impede the growth of pathogens, perhaps we have inadvertently constructed a more dangerous ecosystem (Yong E., 2017). Studies have claimed that daily cleaning with the probiotic cleaning hygiene system over sustained periods of time can lead to a reduction of viable bacterial pathogen colony forming units present on hospital surfaces by >89% (Velazquez et al., 2019).

It's no secret that probiotics are beneficial for healthier digestion and overall wellness. The reported beneficial effects of probiotic consumption include improvement of intestinal health, enhancement of the immune response,

reduction of serum cholesterol, cancer prevention and reduction of the risk of various other diseases (Kechagia M. et al., 2013). Probiotics have been incorporated in various products, but using probiotic cleaners in our homes, we can experience that probiotic microbiome in a more natural way, because microbes interact with our nasal membranes, mouths and hands.

Conclusions:

- Probiotic cleaners are effective, safe to use, environmentally sustainable and ecological.
- Completely sterilized surfaces with chemical disinfectants does not prevent recontamination and pathogens regrowth after cleaning.
- Cleaning with harsh chemical cleaners can enhance bacteria pathogenicity and virulence.
- Probiotic cleaners ensure enduring protection.
- Probiotic bacteria can compete with pathogenic bacteria, thus effectively control microbial populations in buildings and our digestion system.
- Probiotics are beneficial for healthier digestion and overall wellness.
- Hospitals and other health-care institutions claim, that daily cleaning with probiotic cleaners, lead to a reduction of pathogenic bacteria on surfaces.

References:

1. Ed Yong. 2017. *For healthier buildings, just add bacteria?* <https://ideas.ted.com/for-healthier-buildings-just-add-bacteria/>
2. Farah Al-Marzooq, Shahad Al Bayat, Farah Sayyar, Hamdah Ishaq, Husain Nasralla, Rayan Koutaich, and Sausan Al Kawas. 2018. *Can probiotic cleaning solutions replace chemical disinfectants in dental clinics?* doi: 10.4103/ejd.ejd_124_18.
3. Maria Kechagia, Dimitrios Basoulis, Stavroula Konstantopoulou, Dimitra Dimitriadi, Konstantina Gyftopoulou, Nikoletta Skarmoutsou, Eleni Maria Fakiri. 2013. *Health Benefits of Probiotics: A Review.* doi: 10.5402/2013/481651.
4. Michael E. Hibbing, Clay Fuqua, Matthew R. Parsek, S. Brook Peterson. 2010. *Bacterial competition: surviving and thriving in the microbial jungle.* doi: 10.1038/nrmicro2259.
5. Neil Eisberg. 2020. *Active cleaning.* DOI:10.1002/cind.845_10.x.
6. Samantha Velazquez Willem Griffiths Leslie Dietz Patrick Horve Susie Nunez Jinglin Hu Jiaxian Shen Mark Fretz Chenyang Bi Ying Xu Kevin G. Van Den Wymelenberg Erica M. Hartmann Suzanne L. Ishaq. 2019. *From one species to another: A review on the interaction between chemistry and microbiology in relation to cleaning in the built environment.* <https://doi.org/10.1111/ina.12596>.