

Restrooms: Not as unhealthy as you might think

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Microbial succession in a sterilized restroom begins with bacteria from the gut and the vagina, and is followed shortly by microbes from the skin. Restrooms are dominated by a stable community structure of skin and outdoor associated bacteria, with few pathogenic bacteria making them similar to other built environments such as your home. The research is published ahead of print in *Applied and Environmental Microbiology*.

In the study, the investigators characterized the structure, function, and abundance of the microbial community, on floors, toilet seats, and soap dispensers, following decontamination of each surface. They analyzed the surfaces hourly at first, and then daily, for up to eight weeks. "We hypothesized that while enteric bacteria would be dispersed rapidly due to toilet flushing, they would not survive long, as most are not good competitors in cold, dry, oxygen-rich environments," says corresponding author Jack A. Gilbert of San Diego State University. "As such, we expected the skin microbes to take over—which is exactly what we found."

"Reproduceable successional ecology is remarkable," says Gilbert, who has conducted similar studies of the [home](#), and the [hospital](#). "Most systems have the potential to have multiple outcomes. The restroom surfaces, though, were remarkably stable, always ending up at the same endpoint."

Indeed, the communities associated with each surface became more

similar in species and abundance within five hours following initial sterilization, and the resulting late-successional surface [community structure](#) remained stable for the remainder of the 8 weeks' sampling. Floor communities showed a rapid reduction in abundance of Firmicutes and Bacteroidetes, while the relative abundance of Proteobacteria, Cyanobacteria, and Actinobacteria declined over the course of a day. Cyanobacteria are likely derived from dietary plant biomass or from plant material tracked in from outdoors.

Toilet seat samples, alone, clustered according to restroom gender, with *Lactobacillus* and *Anaerococcus*—vaginal flora—dominating ladies' room toilet seats, while the gut-associated *Roseburia* and *Blautia*, were more copious on [toilet seats](#) in men's rooms.

Ultimately, skin and outdoor-associated taxa comprised 68-98 percent of cultured communities, with fecal taxa representing just 0-15 percent of these. And out-door-associated taxa predominated in restrooms prior to sterilization, as well as in long-term post-sterilization communities, suggesting that over the long term, human-associated bacteria need to be dispersed in restrooms in order to be maintained there.

Overall, the research suggests that the restroom is no more healthy or unhealthy than your home, says Gilbert."A key criterion of of healthy or unhealthy might be the presence or relative abundance of pathogens. While we found cassettes associated with methicillin-resistant *Staphylococcus aureus* (MRSA) the predominant Staph organisms didn't harbor those genes, so MRSA may be there but it is very rare." Restrooms, he says, are not necessarily unhealthy, but classifying them as healthy would not necessarily be accurate.

The research, he says, is very important for understanding the environmental ecology of the built environment, and will likely help in building restrooms and buildings generally that are healthier for humans.

Provided by American Society for Microbiology

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