

MICROORGANISMS IN PUBLIC WASHROOMS

The data on public washroom contamination shows how often and how easily specific high-contact washroom surfaces can be contaminated.

By Dr. Charles Gerba

Although Americans tend to pride themselves on their personal hygiene and clean toilet facilities, there has been remarkably little research into hygiene practices or microbial contamination of public washrooms. Using recent advances in microbiology, we now have more efficient tools for tracing, documenting, and identifying the presence of microorganisms in the washroom. Our research has focused on a bacterial sampling of public washroom sites that pose the greatest risk of contamination to patrons and employees.

Research indicates that as many as 50 percent of all Americans do not wash their hands before leaving the washroom, thereby increasing the risk of contaminating themselves and others. Microorganisms—bacteria, viruses, and parasites—can enter the body easily through hand-to-mouth or hand-to-food contact. This is of critical importance to food handlers, food service patrons, and hospital employees and patients because these germs, especially coliform bacteria, are usually indicators of fecal contamination, such as *E. coli*.

Even when the bathroom looks clean, it may not be so from the standpoint of microbial contamination. In a recent study, we found, for example, that 15 percent of the toilet seats in quick-serve restaurant washrooms in the Tucson area were contaminated with coliform bacteria.

Although Americans do not appear to suffer widespread epidemics of infection, 9,000 people in this country die of bacterial food poisoning each year. Infectious diseases can be spread at a lower level of microbial contamination than was previously thought. What most people call “stomach flu” is likely to be a mild food poisoning, usually from a common bacterium like salmonella or staphylococcus. And a likely route of transmission is in the washroom—everything from the toilet paper dispenser to the hot water tap.

While anyone can get sick from this kind of contamination, up to 25 percent of the population is at heightened risk of illness and even death. The following groups are particularly susceptible because of compromised or immature immune systems:

- The elderly
- Immunocompromised patients
- Cancer chemotherapy patients
- Pregnant women
- Young children
- People with diabetes

Because the dangers of microbial contamination were not well documented until now, the general public, while “germ conscious,” is not well educated about the subject.

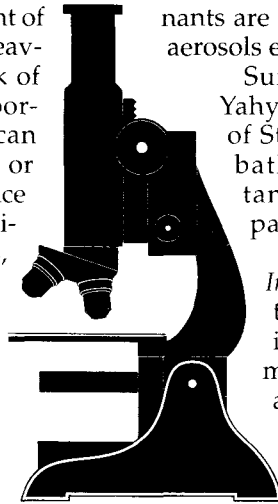
Results of clinical research done over the past few years have been surprising in some cases, and expected in others. The data provides information on areas of potential contamination, or “hot zones,” that can be addressed with specific cleaning protocols or antimicrobial products. These zones include the toilet itself, the floor surrounding it, the sink and counter, and high-touch objects such as handles and levers. Aside from hand-to-object transferral, contaminants are spread throughout the washroom via microbial aerosols ejected from the toilet bowl during flushing.

Surprisingly, in a study of hotel bathrooms by Yahya, Straub et al., toilet seats had lower numbers of *Staphylococcus* sp. and *Pseudomonas* sp. than bathtubs, sinks, and floors. Drains and toilet tanks were especially likely to be laden with pathogenic microorganisms.

A study by Larson, Eke et al., published in *Infection Control* (1987) demonstrated that the quantity of soap used for handwashing significantly influences the microbial counts on hands. The minimum amount of soap needed to produce an antimicrobial effect has not yet been determined, but the researchers found that individuals tended to use the same amount of soap each time they washed their hands.

Thorough handwashing is the best way to remove pathogens, as was demonstrated by Hungarian physician Ignaz Semmelweiss in 1847. Yet as many as 25 percent of people leave the washroom with fecal coliform (usually *E. coli*) on their hands. The next line of defense is the drying process, and researchers, including Blackmore and Prisk (1984) and Knights, Evans, et al. found significant variations in bacterial levels on the hands dried with cotton towels, paper towels, and hot air driers.

Hot air driers, which were installed in public washrooms to reduce the expense and litter of paper towels, are far less “sanitary” than paper or cotton towels. A number of studies of hot air hand driers, including Blackmore and Prisk (1984) and Matthews and Newsom (1987), showed that hot air driers were not effective in reducing the number of bacteria on the hands. In fact, the rubbing of the hands under the hot air device and the propelling of bacteria out of the hot air jets combined to actually increase the number of bacteria in the washroom. An additional complication, according to Blackmore and Prisk, is that hot air driers take longer to dry the hands than towels. Because only one person at a time can use the



drier, others may become impatient and wipe their hands on their clothing or a handkerchief.

Another researcher, comparing bacterial residue on hands after drying with the warm air device, paper towels or a continuous cotton towel, found that the towels were significantly better in removing microorganisms. While the electric devices increased bacteria on the hands by 162 percent, paper towels decreased bacteria levels by 29 percent.

Recently, the University of Arizona Microbiology Department conducted bacterial sampling of quick serve restaurants (QSRs) in the Tucson area. We found that even in food service establishments which have established good sanitation programs, significant contamination is present.

Of the 25 sites that were examined, levels of contamination with coliform bacteria ranged widely. Here are some findings:

<u>Surface</u>	<u>% of sites contaminated</u>
Toilet paper dispenser	15
Toilet seat (underside)	19
Toilet seat (top side)	15
Floor of stall	62
Hot water tap	31
Cold water tap	15
Sanitary napkin receptacle	25

Twenty-five restrooms in QSR's chosen at random were sampled in September 1995 to identify high-contact surfaces that are contaminated with coliform bacteria. The surfaces were wet-swabbed using the Coli-ert system, which is specific in its ability to identify *E. coli*, which is the strongest indicator of fecal contamination.

The data on public washroom contamination shows how often and how easily specific high-contact washroom surfaces can be contaminated. Proper handwashing is the most important step, but because users' health and hygiene habits vary so widely and cannot be controlled, those concerned with public health issues must look to solutions that will reduce the potential for harmful outcomes.

This information is being used to create products to reduce the risk of cross-contamination and, ultimately, to increase protection from pathogenic bacteria. This research is leading to the development of a range of no-touch, antimicrobial and continuous cleaning systems. Among these products are:

- No-touch toilet tissue dispensers
- Antimicrobial soap
- No-touch soap and towel dispensers
- Antimicrobial waste containers and sanitary napkin receptacles
- Continuous cleaning systems for toilets and urinals
- Easy-to-use systems that encourage handwashing

Continued research and evaluation of these solutions in the reduction of risk in contamination of washroom surfaces is necessary. This information can be used to educate and influence decision makers within the industry on the importance and value of new products/solution development in the fight against cross-contamination, and in control of microorganism spread. ■

The author is professor of microbiology at the University of Arizona. This paper was presented at a media briefing sponsored by Scott Paper Company at the ISSA show, October 1995, in Atlanta, Georgia.