



Department of Soil, Water and  
Environmental Science

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Falcon Waterfree Technologies  
10900 Wilshire Boulevard, Suite 1500  
Los Angeles, CA 90024

Re: Sanitation and Public Health Issues of Flush Type Urinals vs. Waterfree urinals

Dear Sir or Madam:

I have been asked to assess the potential for the transmission of disease by Waterfree urinals vs. conventional flush urinals. I have been a Professor of Environmental Microbiology in the Departments of Microbiology and Immunology, Epidemiology and Biostatistics, and Soil, Water and Environmental Science at the University of Arizona for the past 22 years. Previous to that I was a faculty member in the Department of Virology and Epidemiology at Baylor College of Medicine in Houston, Texas. I have been involved in studying the environmental transmission of disease causing microorganisms for more than 30 years and have published more than 500 scientific articles in this area. I have served on the Pima County Board of Health, and as a consultant to the World Health Organization, United States Environmental Protection Agency, and the Centers for Disease Control and Prevention. I recently have been a consultant for the World Health Organization to assess potential for the environmental transmission of SARS (severe acute respiratory syndrome) and am currently conducting research on the survival of this type of virus in water and sewage. I was an invited member of the United States Environmental Protection Agency Panel to assess the hazards from recycling of domestic waste (garbage). I am a member of the American Academy of Microbiology. I have been involved in research since 1973 on public restroom hygiene and the transmission of disease by public restrooms. During this time I have conducted numerous surveys on the microbiology of public restrooms and published results of my research in peer review journals. I have also conducted several studies on the occurrence and fate of pathogenic microorganisms in landfills.

I have been asked to render an opinion on the impact of Waterfree urinals on public restroom hygiene. In my assessment I have reviewed both published and unpublished research conducted by myself and others (see list of documents listed at the end of this statement).

In my professional opinion, I believe that the use of Waterfree urinals would result in a significant improvement in public restroom hygiene. Flush type urinals are far more likely to be colonized by bacteria because of the greater presence of moisture, to serve as reservoirs of disease causing microorganisms, and to cause the widespread dissemination of microorganisms in a restroom because of the generation of aerosols during flushing. Flush type urinals are much more likely to harbor disease-causing microorganisms and spread them throughout the environment in the restroom where the public will come into contact with them. The surfaces inside flush type urinals are kept moist by its continual flushing. This moisture encourages the growth and survival of bacteria. This is especially true for microorganisms capable of causing disease in man. In our studies of public restrooms we found coliform bacteria in 30% and *Escherichia coli* bacteria in 20% of the flush type urinals tested. These bacteria are commonly found in feces and are probably growing in the urinals after introduction from other sources in the restroom (aerosols from the toilets). The inside of a flush type urinal is not a sanitary environment. Flushing does not eliminate all of the microorganisms present in the urinal. Our studies in a flush toilet show that a certain residual of microorganisms always remains, even after many flushes, because of the attachment of the microorganisms to the surfaces of the inside of the bowl (Gerba et al, 1975). Flush type urinals have been shown to be a reservoir for disease causing bacteria. For example, *Serratia marcescens* caused an outbreak in a hospital over a two-month period, which was traced to the urinals (Shi et al 2003).

The aerosol created when a flush type urinal is flushed is also a potential significant hazard. All one has to do is stand in front of a urinal and flush it to feel the mist of the droplets being thrown out of the urinal. Present in this aerosol are microorganisms existing in the urinal at the time of the flush. The microorganisms present in the aerosol may be inhaled or fall out from the air and settle on surfaces. Touching of these contaminated surfaces may result in contamination of the hand, and when the hand is brought to the nose and mouth, infection occurs. Flushing appears to be a significant mechanism by which disease causing bacteria and virus contamination of surfaces in public restrooms occurs (Gerba et al 1975; Wallis et al 1985).

The development of a significant biofilm is certainly a much greater problem in a flush type urinal, which is continually supplied with moisture. The amount of moisture is very important in the development of biofilms.

In contrast to flush type urinals, I believe that Waterfree urinals offer a major improvement in the sanitation of public restrooms. Flushing is eliminated, which greatly reduces the almost continuous production of microbial aerosols, and the surface and sides of the urinals are drier, which reduces the survival of human disease causing microorganisms and prevents their growth. The flush handle is also eliminated which would prevent hand-to-flush handle transfer of pathogens from one individual to another during use of the urinal.

I also believe that there is not any difference in risk to maintenance workers from infectious microorganisms that may be present in Waterfree urinals than flush type urinals. As with all

restroom maintenance activities, workers should use rubber gloves when handling any type of foreign matter or cleaning of any kind of restroom fixture, including Waterfree and flush type urinals. In fact, the cleaning and handling of foreign materials in restroom sinks (where based on our studies you are more likely to come into contact with pathogens of fecal origin)(Kennedy et al 1995) and toilets (Gerba et al 1975) presents a far greater risk of exposure to infectious material.

I also conclude that the liquid in the cartridge trap is more than adequate to prevent sewer gases and associated microorganisms from entering the restrooms. This serves as a physical barrier to the movement of air from the sewer and that is all that is needed. In fact, I find no indication in the literature that release of sewer gases through plumbing fixtures has ever caused an outbreak of infectious disease. In any case, the waterfree urinal cartridges are designed with a trapping depth (2-3/8") that is consistent with the requirements of current plumbing codes (2-4" trapping depth), and thus afford the same level of protection as the water traps contained in traditional flush type urinals.

I would also conclude that there is no significant risk from infectious microorganisms that might be present in the cartridges after land disposal in landfills. The presence of any pathogen would be dwarfed by the enormous numbers of pathogens in disposal diapers, discarded sanitary napkins, food and pet feces present in domestic wastes (Gerba 1996; Papp 1998). Pathogens in these materials will all eventually die in the landfill and the required lining of modern landfills prevents any chance of groundwater contamination (Suflita et al 1992).

In summary, I believe Waterfree urinals could greatly improve the hygiene of public restrooms, and that there is no significant risk from infectious microorganisms by the disposal of spent cartridges from the Waterfree urinals in landfills.

Very truly yours,



Charles P. Gerba, Ph.D.  
Professor

**Documents cited and reviewed:**

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Kennedy, D. I., C. E. Enriquez and C. P. Gerba. 1995. Enteric bacterial contamination of public restrooms. Report. Departments of Soil, Water, and Environmental Science, and Microbiology and Immunology, University of Arizona, Tucson, AZ.

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