Waterless Urinals; Research & Myths

When the indoor, flushing, bathroom fixture was introduced in 1820, some Victorians were disgusted at the thought of bringing an unsanitary 'privy' into their homes. Although chamber pots were used, they were taken out, emptied, and cleaned daily.

Figure 1 - Bacterial & viral aerosol created by toilet fixture flushing.[1]

Since then, flush water closets and urinals have become standard in residential and commercial facilities throughout the developed world. The utilization of flowing water to flush waste away, rinse the fixtures' interior, and trap odors makes it seem self-evident that their design and operation contributes to sanitation and public health. And, for the most part, this is true.

With the introduction of the waterless urinal, 18 years ago, there have been persistent concerns regarding the 'lack of sanitation' inherent in a fixture that is not "thoroughly washed at each discharge".[2] This article of faith is based on long-held assumptions that are not supported by scientific evidence.

It is commonly assumed that flush-water is essential since it washes/cleans fixture surfaces thus sanitizing surfaces and reducing odors.

Assumption #1: Fixture flush water carries away body waste and its inherent, unsanitary organisms.

This seems patently obvious. However, the facts are, that although flush water carries away the bulk waste, the mechanical action of flushing creates an aerosol containing fecal and/or urinary organisms and distributes them to every surface in a restroom; see Figure 1. In addition, Dr. Charles P. Gerba, University of Arizona, Tucson, found that after an initial flush had eliminated the majority of organisms from the fixture water,

> "after repeated flushes, instead of diminishing, there was often an increase in the number of residual organisms detected in the bowl. In the case of both bacteria and viruses, the number of organisms in the bowl reached a plateau below which their number could not be reduced, even after repeated flushing. From this evidence, it appeared that significant numbers of bacteria and viruses were being adsorbed to the toilet porcelain and then eluted during the flushing action".[3]

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[1] J. Barker, M. V. Jones. 2005. *The potential spread of infection caused by aerosol contamination of surfaces after flushing a domestic toilet.* Journal of Applied Microbiology, 99:339–347.

[2] International Association of Plumbing and Mechanical Officials (IAPMO). 2006. *Uniform Plumbing Code*, Ch. 4:405.2 Prohibited Urinals

[3] Gerba, C. P., C. Wallis, & J.L. Melnick. 1975. *Microbial hazards of household toilets. Droplet production and the fate of residual organisms.* Applied Microbiology 30:229-237.

Restroom fixture flush-water aerosol has been cited in the transmission of SARS[4], salmonellosis[5], and a two-month hospital outbreak of *Serratia marcescens,*[6] which was traced to flush urinals.

The University of California[7] found that:

> "A water-free urinal differs from a water-flushing urinal in that it does not use water to rinse the porcelain surface of the urinal bowl between each use. The research team sampled and counted organisms from the interior porcelain surfaces of both the … water-free urinal and an existing 3.0-gpf water-flushing urinal in the same restroom. The collected data indicated that the cell count per area of measure was lower for the … water-free urinal than for the flush urinal."

Assumption #2: Fixture flush water is necessary to prevent odors.

The 2003 UCLA study[7] also states:

> "Ammonia (Odor) Development: The research team measured ammonia concentrations at three locations at each of the two urinals:
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> (a) inside and immediately above the bottom of the urinal (or just above the waterline for the water-flushing urinal),
>
> (b) six inches in front of the urinal at the level of the bowl lip, and
>
> (c) at ceiling height at the nearest air return vent in the rest room.
>
> Study results indicated that there was no statistically significant difference between the … water-free or the water-flushing urinals in the amount of ammonia gas measured inside the urinal bowl or at then bowl lip. No ammonia gas was measured at the return vent for either urinal. Furthermore, none of the sampling data indicated ammonia gas levels that even approached the lower threshold for human detection of 20 parts per-million. Therefore, odors perceptual to humans were absent from the vicinity of both urinals."

It is essential to remember that restroom fixture cleaning is the most important means to controlling odor.

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[4] Ignatius T. C. Yu, et al. 2004, April 24. *Evidence of Airborne Transmission of the Severe Acute Respiratory Syndrome Virus*, New England Journal of Medicine 350:1731-1739

[5] Barker, J. and Bloomfield, S.F. 2000. *Survival of Salmonella in bathrooms and toilets in domestic homes following salmonellosis*. Journal of Applied Microbiology, 89:137-144

[6] Shi, Zhi-You, et al. 1997. *Use of pulsed-field gel electrophoresis to investigate an outbreak of Serratia marcescens*. Journal of Clinical Microbiology 1997 January; 35(1): 325–327.

[7] Dept. of Civil and Environmental Engineering, University of California, LA. 2003. *UCLA Water-free Urinal Study*,

Assumption #3: IAPMO, the UPC authors do not support waterless urinals

This may have been true in the past, but the authors of the UPC, IAPMO, appear to have abandoned their prior objections to the installation of waterless urinals as evidenced by the proposed changes to the 2009 UPC. They now are proposing that Section 405.2 be revised to read:

> 405.2 Prohibited Urinals. ~~Floor-type and wall-hung type t~~ Trough urinals and urinals with an invisible seal shall be prohibited. ~~Urinals that have an invisible seal or that have an unventilated space or wall that is not thoroughly washed at each discharge shall be prohibited.~~

They will also add the following standards to the 2009 revision:

Table 14-1

Standard Number	Standard Title	Application	Referenced Sections
IAPMO Z124.9-2004	Plastic Urinal Fixtures	Fixtures	401.1
ASME A112.19.19-2006	Vitreous China Nonwater Urinals	Fixtures	402.3.1

In addition to having their own waterless urinal standard, IAPMO lists/certifies waterless urinals[8] including those made by Caroma, Ecotech Water LLC, Falcon, Kohler, and Zurn.

In light of the current state of knowledge, Authorities-Having-Jurisdiction refusing to permit listed waterless urinals is likely to become a situation of the past.

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[8] http://pld.iapmo.org/applicants.asp, IAPMO Plumbing Research Directory

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