

# On Tap

## Handwashing: A Simple and Effective Barrier to Disease Transmission

By Kelly A. Reynolds, Ph.D.

A variety of human pathogens are known to be present and transmitted via water. The World Health Organization reports that 16.4 million deaths worldwide were due to infectious and parasitic diseases in 1993. Of these, estimates of up to 80 percent were thought to be linked to contaminated water, totaling over 35,000 deaths a day.<sup>1</sup>

However, the database is limited regarding waterborne outbreak information. Experts agree that reported illness numbers are only the tip of the iceberg relative to actual disease rates. In fact, no causative agent was identified in 43 percent of the microbial water-borne outbreaks in the United States between 1980 and 1990.<sup>2</sup> Where identified, the primary causative agents were:

- *Cryptosporidium*—20 percent,
- Viruses—15 percent,
- *Giardia*—11 percent,
- Bacteria—10 percent, and
- Miscellaneous pathogens—1 percent.

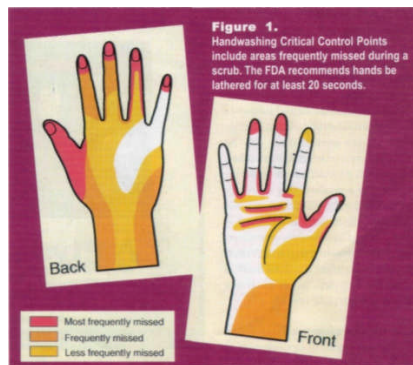
Many waterborne pathogens are enteric, meaning they're primarily passed via the fecal/oral route. Once an enteric pathogen is ingested, it multiplies in the digestive tract and is excreted in feces of infected individuals.

Knowing pathogens are present in water, questions often arise from water treatment service personnel, water store operators and other water industry employees as to the risk of occupational exposure to these disease-causing organisms. The potential risk for infection to water industry employees may be much higher than to consumers, since their work may involve handling filters specifically designed for, or incidental to, pathogen removal. Therefore, water treatment personnel could be exposed to the equivalent volume of water that previously passed through the filtering device. During service operations, hands may easily become contaminated. We do know contaminated hands play a major role in the transmission of infectious disease.

### The barrier approach

According to the National Institute of Water Conditioning & Purification

Health, one in four food-borne illnesses—among many other diseases—are



caused by unwashed or inadequately washed hands. Therefore, handwashing is considered to be the simplest and most effective step in preventing the spread of infectious diseases. Good hygiene includes washing hands after bathroom use and contact with potentially contaminated surfaces, as well as prior to eating.

Though you may think you're conscientious about handwashing, hundreds of scientific studies have been conducted to evaluate handwashing practices and most have surprising results. A recent study published in *the American Journal of Infection Control* titled, "Who washes hands after using the bathroom?"<sup>7</sup> reports that adults including healthcare workers have a compliance rate of only 50 percent.<sup>3</sup> Another study from the *Annals of the Royal College of Surgeons of England* found that only 41 percent of clinicians washed their hands between patient examination.<sup>4</sup> Considering that healthcare workers have such unacceptably low compliance ratios, one must wonder if other occupational categories are equally non-compliant.

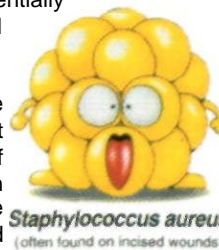
Clearly, it's not enough to educate personnel on proper handwashing techniques. Appropriate materials must also be supplied for practical use in the field. This was proven by another study published in the *American Journal of Infection Control*, where groups of children educated on the importance of handwashing practices quickly went back to previous habits, while those given the same educational information plus hand wipes continued to increase their

handwashing frequency.<sup>5</sup>

### Proper technique

The U.S. Food and Drug Administration recommends hands be lathered for 20 seconds, including the front and back, wrists and between fingers, under hot water, rinsed thoroughly and dried with a paper towel or air dryer. Faucets should be turned off with the paper towel to prevent recontamination. Although it sounds simple, try timing yourself for 20 seconds during your next handwashing. Chances are you'll realize that 20 seconds hasn't been your practice in the past. Figure 1 illustrates areas frequently missed during handwashing.

Fingernails are real hot spots for bacterial contamination. Thus, hands should be rubbed together to produce a lather covering all surfaces, including fingernails. If you have long nails or wear rings, pay special attention to these cracks and crevices where bacteria can hide. Although gloves are recommended as another effective barrier to contamination of hands, they may contain micro-tears and not provide complete protection.



Soap Type	Percent Bacterial Reduction
Non-antibacterial lotion soap	99.00
Antibacterial lotion soap	99.68
Alcohol gel sanitizer	99.99

Source: Paulson et al. 1994, 1999

Thus, basic handwashing remains a vital part of infection control practices.

### Best available cleansers

Today, we're inundated with new products for handwashing and consumers often wonder about the need for antibacterial soaps or the effectiveness of waterless gels. Non-antibacterial soaps remove transient microbes by mechanical disruption whereas antimicrobial soaps have true degerming properties and some even have a persistent effect. Alcohol gels—defined as gel with alcohol content

exceeding 50 percent—reduce microbial counts immediately on contact.

Numerous scientifically controlled studies have evaluated the relative effectiveness of a variety of products on the market. The research consistently shows that handwashing is an important and effective control measure to prevent the spread of germs to and from hands, and compliance with proper handwashing regimens can break the cycle of a major route of microbial disease transmission. Specifically, reductions of bacteria on hands were most noted with lotion soaps with an alcohol gel sanitizer, followed by alcohol and antimicrobial soap alone and least with non-antimicrobial lotion soap (see Table I).<sup>6,7</sup>

Another study demonstrated there's little hazard in routine handwashing with previously used soap bars and that, in lieu of other cleaners, this was a recommended option for handwashing to prevent the spread of disease.<sup>8</sup> Alcoholic solutions were found to be effective, reducing bacterial counts by 88.2 percent, compared to a reduction of 49.6 percent for soap and water alone. In addition, waterless, alcohol-based solutions improved handwashing compliance due to the ease and rapidity of the method.<sup>9</sup>

### Advice to service personnel

Because source waters are known to transmit infectious agents and since water treatment filters often represent large volumes of water that have been passed through the filter medium, in effect concentrating any pathogens present, spent filters should be considered potential sources of disease-causing agents and handled as such.

Waterless handwashing products such as alcohol-based foams or gels provide good antiseptic activity, at least equivalent to the handwashing products requiring water. However, for gross contamination events where visible matter is present on the hands, the absence of rinsing away this matter may compromise the effectiveness of the disinfectant.

### Conclusion

The Occupational Safety and Health Administration (OSHA) has administered guidelines for healthcare professionals regarding avoidance of pathogens in blood in a healthcare setting.<sup>10</sup> These recommendations provide an appropriate point of reference for avoidance of infectious agents in any potential carrier environment—including water—and includes simple practices of hygiene such as wearing protective clothing and effective handwashing. Paragraph (d)(2)(H) of the OSHA Standards for Infection Control states that when handwashing facilities are not feasible, antiseptic hand cleansers or towelettes may be used but hands should be washed with soap and running water as soon as possible. □

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### Acknowledgement

All illustrations of bacteria transported to food through cross contamination via hands were courtesy of Saraya Co., Ltd. The Critical Control Points of handwashing are referenced in an article by L.T. Taylor, *Nursing Times*, 74:54,1978.

### About the author

Dr. Kelly A. Reynolds is a research scientist and microbiologist at the University of Arizona with a focus on the development of methods for detecting human pathogens in drinking water. She is also a member of the WC&P Technical Review Committee.

If you have questions concerning this column, or if there's a topic you would like addressed, please let us know. Contact "On Tap," at: WC&P Magazine, 2800 E. Fort Lowell Rd., Tucson, AZ 85716 USA; (520) 323-6144, (520) 323-7412 (fax); email: [publicom@azstarnet.com](mailto:publicom@azstarnet.com)

