

DANGER ON TAP IN HOSPITALS

LITTLE ROCK, ARK—Hospital water is one of the most frequently overlooked sources of nosocomial infection—and is potentially one of the most easily controlled. After analyzing the available data, Elias J. Anaissie, MD, Professor of Medicine at the University of Arkansas for Medical Sciences in Little Rock, and colleagues concluded that high-risk patients should avoid exposure to hospital water altogether and use sterile water instead.[1]

HOW BIG IS THE PROBLEM?

After conducting an extensive literature search, the investigators identified 43 outbreaks of waterborne nosocomial infections in which organisms other than *Legionella* species were implicated. *Pseudomonas aeruginosa* was the organism most often held responsible for the infections, but other pathogens included *Stenotrophomonas maltophilia*, various mycobacterial species, and molds such as *Fusarium* and *Aspergillus* species.[2-5] Dr. Anaissie and colleagues believe that these outbreaks underestimate the incidence of nosocomial waterborne infections because they identified a number of additional outbreaks in which waterborne pathogens were implicated—but a specific link to the water supply was not appropriately sought.

Thus, the true extent of nosocomial waterborne infections remains unknown. However, the investigators found that they could estimate its minimal mortality rate by focusing solely on *P aeruginosa* pneumonia. Pneumonia accounts for 20% to 45% of all nosocomial infections, and 20% of these pneumonias are caused by *P aeruginosa*, an organism that can persist in hospital water systems for extended periods. In a seven-month prospective study in a surgical intensive care unit (ICU), Trautmann et al[6] found that five of 17 patients (29%) were infected with *P aeruginosa* genotypes that were detected in all of the unit's water outlets.

Thus, if approximately 23,000 Americans die of nosocomial pneumonia each year, then an estimated 4,600 of these deaths can be attributed to *P aeruginosa*. If approximately 30% of these infections are waterborne—as was the case in the Trautmann study—the annual mortality rate from waterborne *P aeruginosa* nosocomial pneumonia in the United States is about 1,400 deaths annually.

The investigators stress that this estimate is conservative, due to underreporting. “The mortality rate is more like 5,000 deaths per year,” said Dr. Anaissie, who is also Director of Supportive Care at the Myeloma Institute for Research and Treatment at the Arkansas Cancer Research Center. “This is a very serious issue that is underestimated.”

BIOFILM A CULPRIT

What causes poor water quality in hospitals? Primarily, the buildup of biofilm and corrosion of distribution lines and tank surfaces because of aging or design flaws. Patients risk exposure to waterborne microorganisms through showering, bathing, and drinking water (or ice). Exposure can also occur through contact with medical equipment that has been rinsed with tap water.

Even small numbers of organisms in water can cause an infection. For example, one oocyst of *Cryptosporidium parvum* per 1,000 L of drinking water could result in 6,000 infections annually in a city the size of New York.[1]

According to Dr. Anaissie, the problem will worsen. “The incidence of waterborne infection will increase as the population that is immunocompromised (and thus at risk for nosocomial infections) increases.”

AN EASY SOLUTION

After the 1976 outbreak of Legionnaire's disease and the publicity it received, the Centers for Disease Control and Prevention (CDC) developed recommendations for the prevention of nosocomial pneumonia and legionellosis that include routine maintenance of the hospital water supply system. It also suggests that the use of sterile water should be considered for immunocompromised patients, and it offers more specific guidelines for patients at particularly high risk, such as stem cell transplant recipients.

However, Dr. Anaissie and colleagues go beyond the CDC's recommendations and advise limiting *all* high-risk patients' exposure to tap water. Hospitals that care for immunocompromised patients should maintain high standards of drinking water quality and should take immediate measures to prevent waterborne infections. Such measures are likely to be successful, given the large reductions in waterborne infections observed when these guidelines are applied.

For example, the investigators note that sterile water can be made simply by boiling tap water for three minutes. It can also be purchased for a minimal cost. Instead of showering, patients can use disposable sterile sponges for bathing. Dr. Anaissie said that alternative water use could be made more acceptable to hospital staff with education and the creation of CDC guidelines for hospital water.

An outbreak of waterborne nosocomial infection raises the question of whether poor infection control practices by hospital staff are responsible. However, studies have shown that even after infection control practices are improved, a significant rate of nosocomial infections persists. Thus, Dr. Anaissie and colleagues suggest that infection control practices, although important, are insufficient on their own to prevent waterborne infections.

The investigators do not, however, believe that intensive examination of water distribution systems for organisms other than *Legionella* species is appropriate at this time; there is insufficient information to fully understand the link between water colonization and infection. Instead, they recommend heightened surveillance for nosocomial infections on all hospital wards.

—Gale Jurasek

References

1. Anaissie EJ, Penzak SR, Dignani C. The hospital water supply as a source of nosocomial infections: a plea for action. *Arch Intern Med.* 2002;162:1483-1492.
2. Anaissie EJ, Kuchar RT, Rex JH, et al. Fusariosis associated with pathogenic *Fusarium* species colonization of a hospital water system: a new paradigm for the epidemiology of opportunistic mold infections. *Clin Infect Dis.* 2001;33:1871-1878.
3. Anaissie EJ, Stratton SL, Dignani MC, et al. Pathogenic *Aspergillus* species recovered from a hospital water system: a 3-year prospective study. *Clin Infect Dis.* 2002;34:780-789.
4. Anaissie EJ, Costa SF. Nosocomial aspergillosis is waterborne. *Clin Infect Dis.* 2001;33:1546-1548.
5. Anaissie EJ, Stratton SL, Dignani MC, et al. Cleaning patient shower facilities: a novel approach to reducing patient exposure to aerosolized *Aspergillus* spp. and other opportunistic moulds. *Clin Infect Dis.* In press.
6. Trautmann M, Michalsky T, Wiedeck H, et al. Tap water colonization with *Pseudomonas aeruginosa* in a surgical intensive care unit (ICU) and relation to *Pseudomonas* infections of ICU patients. *Infect Control Hosp Epidemiol.* 2001;22:49-52.