Latest hands-free electronic water faucets found to be hindrance, not help, in infection control

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A study of newly installed, hands-free faucets at The Johns Hopkins Hospital, all equipped with the latest electronic-eye sensors to automatically detect hands and dispense preset amounts of water, shows they were more likely to be contaminated with one of the most common and hazardous bacteria in hospitals compared to old-style fixtures with separate handles for hot and cold water.

"Newer is not necessarily better when it comes to infection control in hospitals, especially when it comes to warding off potential hazards from water-borne bacteria, such as Legionella species," says senior study investigator and infectious disease specialist Lisa Maragakis, M.D., M.P.H. "New devices, even faucets, however well intentioned in their make-up and purpose, have the potential for unintended consequences, which is why constant surveillance is needed," says Maragakis, director of hospital epidemiology and infection control at Hopkins Hospital and an assistant professor at the Johns Hopkins University School of Medicine.

Although the high-tech faucets cut daily water consumption by well over half, Johns Hopkins researchers identified Legionella growing in 50 percent of cultured water samples from 20 electronic-eye faucets in or near patient rooms on three different inpatient units, but in only 15 percent of water cultures from 20 traditional, manual faucets in the same patient care areas. Weekly water culture results also showed half the

amount of bacterial growth of any kind in the manual faucets than in the electronic models.

While the precise reasons for the higher bacterial growth in the electronic faucets still need clarification, the researchers say it appears that standard hospital water disinfection methods, which complement treatments by public utilities, did not work well on the complex valve components of the newer faucets. They suspect that the valves simply offer additional surfaces for bacteria to become trapped and grow.

The Johns Hopkins researchers will present their findings at the annual meeting of the Society for Health Care Epidemiology (SHEA) in Dallas on April 2.

Infection control experts behind the latest study, believed to be the first detailed analysis to show how and why these new fixtures pose a problem in preventing Legionella infections in hospitals, say the electronic devices were widely introduced in patient care and public areas of hospitals across the United States, including in The Johns Hopkins Hospital, more than a decade ago. The idea was to prevent bacterial spread from people touching the faucet's water handles with their dirty hands.

As a result of the study, conducted over a seven-week period from December 2008 to January 2009, Johns Hopkins facilities engineers removed all 20 newer faucets from patient care areas and replaced them with manual types. A hundred similar electronic faucets are also being replaced throughout the hospital, and hospital leadership elected to use traditional fixtures – some 1,080 of them – in all patient care areas in the new clinical buildings currently under construction at Johns Hopkins' East Baltimore campus. The new buildings are set to open in 2012.

Lead study investigator Emily Sydnor, M.D., a fellow in infectious

diseases at Johns Hopkins, says Legionella bacteria, commonly found in water supplied from public utilities, rarely cause illness in people with healthy immune systems, but pose a real risk of infection in hospital patients whose immune systems are weakened from cancer chemotherapy, anti-rejection drugs after organ transplant, or from diseases such as HIV/AIDS.

Sydnor says this is why some hospitals, including Johns Hopkins, treat water supplied from public utilities with chlorine dioxide or other methods to keep Legionella levels low.

Indeed, the original goal of the research team, says co-investigator Gregory Bova, senior engineer at Johns Hopkins, was to test the new faucets to determine how often and for how long treated water needed to be flushed through the hospital's taps to keep Legionella and any other bacteria at nearly undetectable levels.

"We were surprised by the initially high bacterial counts," says Bova. Study results showed Legionella bacteria levels between 0 and 3,000 bacterial colony forming units per milliliter of water from electronic faucet samples.

High Legionella and overall bacterial counts were detected in tests of the newer faucets after the hospital's water flow from the city was briefly interrupted for a few hours before and immediately after the study began. The double interruptions produced a fresh influx of Legionella and other bacteria, requiring Bova and his staff to perform additional disinfecting water treatments, prompting the latest study investigation.

As part of the study, Bova and his team disassembled four of the electronic faucets and their component parts, two before the water was treated and two afterward, with swab culture tests showing Legionella and other bacteria on all of the main component valves and other parts,

very few of which, if any, exist in manual faucets.

"Our findings show us that standard hospital water treatment practices are not effective at disinfecting these more complex, electronic-eye faucets of Legionella and other potentially harmful bacteria, even after remediation and additional treatment," says Bova, who has reported his findings to the faucet manufacturer, the Chicago Faucet Co., in Des Plaines, Ill. "We would have to take apart, clean and disinfect the entire faucet assembly, every time, which is simply not practical or cost-effective."

Among the study team's other observations were that the electronic faucets were used continuously, between seven and 110 times per day. Such continuous flushing, says Sydnor, helps suppress bacterial growth.

"It's good for infection control purposes that staff are actually washing their hands so frequently," says Sydnor, "but these faucets may not be the best option to aid our staff in protecting our patients from potential risk of infection."

Bova says actual water usage for the new faucets, which have electronic control settings for precise volumes, averaged over 18 gallons per day, or roughly a quarter of what he estimates was used by the manual faucets, which have no precise volume measurements. He says the electronic variety can actually be programmed to consume as little as a fifth of traditional models, down to as little as a half-gallon per minute.

Researchers say their next steps are to work with manufacturers of electronic and manual faucets to help remedy their flaws and to design components that can be cleaned more easily and save water. They have also notified infection control staff at other hospitals of their latest findings.

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