COMMENTARY

Electronic-Eye Faucets—Curse or Blessing?

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(See the article by Sydnor et al, on pages 235–240.)

Hands-free, electronic-eye, automatic faucets are installed in healthcare settings for convenience and reduction of water consumption, and thus they contribute to cost control. As it has been shown that faucet handles may be sources of microorganism cross-transmission,[1] automatic faucets are also thought to reduce pathogen transmission because no surface needs to be touched for hand washing. Despite this widespread belief, electronic faucets have been repeatedly reported as a source for potentially harmful bacteria, such as *Pseudomonas aeruginosa*, other nonfermentative gram-negative organisms, and *Legionella* species.[2-4]

In this issue of the journal, Sydnor et al[5] report that electronic-eye faucets in use at Johns Hopkins Hospital were more likely to be contaminated with *Legionella* species, a pathogen that causes severe pneumonia in immunocompromised patients, than manual faucets. Following disruption of the city water supply, almost all electronic-eye faucets grew *Legionella* species from at least 1 water sample. Standard hospital water-treatment practices were not effective at disinfecting the faucets. Even remediation with 5-ppm chlorine dioxide was not able to remove all bacteria, although there was a reduction in the frequency of pathogen detection in the samples, and no significant difference could be detected any longer between electronic and manual faucets. Of note, significantly more *Legionella* species were found on various parts of the electronic-eye faucets before remediation with high-dose chlorine dioxide.

It is not clear why electronic rather than mechanical faucets are more readily contaminated with bacteria. Previously hypothesized reasons include low water flow, retrograde contamination from the faucet outlet, tepid water temperature, and bacterial colonization of the internal magnetic valves.[2,4,6] The more complex structure of the faucet may also offer niches for bacterial growth, and the design and materials may facilitate biofilm formation. However, more information is needed because the study cannot explain the detailed pathogenesis of faucet colonization. The double interruption of the city water supply most likely produced a fresh influx of *Legionella* species and other bacteria. Without this unfortunate incident, the authors might not have detected significant differences in colonization and water contamination between the 2 faucet types. In particular, the authors found that complete restoration of the integrity of the water supply following its rupture was not possible. This is an important finding because it shows the importance of baseline contamination of the water supply and highlights the problem of stagnant water. Importantly, misuse or underutilization was not evidenced, as the scheduled hygiene flush was never triggered on any electronic faucet during the evaluation period because of frequent use.

The study does not report the clinical significance of the findings, as no pneumonia due to *Legionella pneumophila* was detected during the study period, and no information is provided as to whether the hospital had a significant problem with this pathogen in the past—assuming that the electronic-eye faucets have been in place for a few years. Because more *Legionella anisa* than *L. pneumophila* was isolated from electronic faucets, the clinical significance of the results is even more difficult to interpret.

Unlike common practice for tap water quality control, the authors collected 500 mL of first-draw water for microbiological testing. Although at first glance the technique may seem inadequate, the procedure makes sense because water flow from electronic-eye faucets is activated by positioning the hands below the outlet, and it is the first-draw water that hits the hands and potentially generates aerosols.

As a consequence of the study findings, all electronic-eye faucets were replaced with manual faucets in the authors' institution. Although the study confirms previous reports of electronic faucet contamination with nonfermentative gram-negative bacteria and unequivocally provides information about the extent of *Legionella* species colonization, there is insufficient evidence to recommend the removal of electronic-eye faucets from all healthcare institutions. Nevertheless, the

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results are of concern, and the placement of such devices in high-risk areas, such as geriatric units and units caring for immunocompromised patients, should be reconsidered. In any case, regular controls of water quality should be made mandatory to avoid any potential contamination due to underutilization and stagnant water. In particular, when electronic faucets are in use in institutions where alcohol-based hand rubbing—correctly considered as the standard of patient care[7,8]—has become the preferred hand hygiene action, there is a subsequent decrease in the use of faucets for hand washing.

New technologies are not necessarily better, even if developed with the best intentions to prevent harm to others. The study by Sydnor and colleagues exemplifies the importance of reevaluating technology in clinical practice, as not every incident can be anticipated—in this case, the interruption of the city water supply. Manufacturers should be challenged to take these findings seriously, to propose solutions to the problem, and to test for similar conditions of contaminating *Legionella* species and other pathogens in laboratory settings before marketing, in particular when targeting use in healthcare facilities. Whether electronic-eye faucets are a curse or a blessing still needs to be elucidated. However, that a device generally perceived to prevent rather than promote microorganism transmission is now found to do the opposite is a wake-up call to take a closer look at established procedures and practices.

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