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Changing epidemiology of rare disease links sinus irrigation with contaminated tap water, two deaths

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When water containing the *Naegleria fowleri* ameba, a single-celled organism, enters the nose, the organisms may migrate to the brain, causing primary amebic meningoencephalitis, a very rare—but usually fatal—disease. A new study published in *Clinical Infectious Diseases* describes the first reported cases in the United States implicating nasal irrigation using disinfected tap water in these infections. Now available online, the study highlights the changing epidemiology of this uncommon disease, as well as the importance of using appropriately treated water for nasal irrigation.

From 2002 to 2011, 32 *N. fowleri* infections were reported in the U.S., according to the Centers for Disease Control and Prevention (CDC). In this latest study, Jonathan Yoder, MPH, coordinator of waterborne diseases and outbreak surveillance at CDC, reports the work of the Louisiana Department of Health and Hospitals and CDC in investigating two cases in 2011 in Louisiana. Two unrelated patients, a 28-year-old man and a 51-year-old woman, each died within five days of being admitted to the hospital with meningitis-like symptoms. Both had used a neti pot for regular sinus irrigation. Because family members of both patients were certain the patients had no recent history of recreational freshwater contact, which is typically associated with the disease, sinus irrigation using disinfected (chloraminated) tap water was implicated.

"*N. fowleri* was found in water samples from both homes," Yoder said,

but "not found in the treatment plants or distribution systems of the municipal water systems servicing the patients' homes." Although it was never clear how *N. fowleri* were introduced into the plumbing of the patients' houses, once there, the organisms were able to colonize the hot water systems.

In addition, Yoder's team also tested commercially available reconstituted salt packets for use with neti pots and found that these were unable to reduce the number of *N. fowleri* organisms within a four-hour timeframe—far outside the real world conditions of less than a minute that most people spend—showing that simply adding salt mixtures to tap water does not inactivate the organisms fast enough. As a result, Yoder advises that the simplest methods to avoid infection is to purchase water that is labeled as distilled or sterile, or use only water that was previously boiled for 1 minute (at elevations above 6,500 feet, boil for 3 minutes) that has been left to cool, or use water that has gone through a filter with a pore size of 1 micron or smaller.

Many infections from *N. fowleri* occur in warm freshwater locations following localized heat waves. Whether projected climate change could lead to an expansion of the ameba's geographic range is unknown, the authors noted. They recommend that systematic environmental sampling be carried out to document changes in the ecology of *N. fowleri* so that measures to prevent its spread can be improved. It is also important to raise the level of awareness about the disease among physicians treating patients with meningitis-like symptoms, the authors wrote.

Deaths from *N. fowleri* infection, which remain very rare, "are tragic for the families of those infected," Yoder said. "The CDC is working to understand this organism so that we can improve prevention recommendations, identify *N. fowleri* infections, and improve clinical treatment."

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