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# Anthrax spores may survive water treatment

Anthrax spores may survive traditional drinking water disinfection methods and can attach themselves to the inside surface of water pipes, suggesting water treatment facilities should be prepared to employ alternate disinfection methods in the unlikely event of the release of anthrax in the water supply. Researchers report their findings today at the 2006 ASM Biodefense Research Meeting.

"The purpose of this study was to determine the fate of anthrax spores in a drinking water system that uses chlorine as a disinfectant. Though researchers have some knowledge of how other waterborne pathogens may survive or die in drinking water systems, little is understood about the fate of anthrax spores in chlorinated water systems," says Jon Calomiris of the Air Force Research Laboratory at Aberdeen Proving Ground in Edgewood, Maryland, who conducted the study.

Calomiris investigated the ability of anthrax spores to survive in water with a concentration of 1 milligram of chlorine per liter (typical tap water has a concentration of 1 to 2 milligrams per liter). After 60 minutes in the water, there was no significant decrease in the number of viable spores.

"Under those same conditions, one minute exposure could kill 99.99 percent of other waterborne pathogens that do not exist as spores," says Calomiris.

Higher concentrations of chlorine were much more effective. At 5mg/L (a concentration that might be used by treatment systems during periods when drinking water is turbid) 97 percent of spores were killed after one hour. At 10mg/L (similar to a highly chlorinated swimming pool) 99.99 percent were killed, but the chlorine concentration would be too high for the water to be drinkable.

Calomiris also tested the ability of spores to attach to the inside of pipes, by running contaminated water in a continuous loop through sections of pipe made of either copper, CPVC or galvanized iron (a material no longer used for home plumbing but existing in older construction). After 6 hours anywhere from 20 to 40 percent of spores had attached themselves to the surface of the copper and CPVC pipes, 95 percent attached to the iron pipes. When biofilms were present on the interior of copper pipes attachment increased to 80 percent.

"The data seem to suggest that anthrax spores can tolerate water treatment, can attach to pipes or biofilms within the pipes, and could pass through pipe systems to reach the consumer tap," says Calomiris.

In the unlikely event of the release of anthrax spores into the water supply, alternate decontamination protocols (such as exposure to higher concentrations of chlorine or an alternate disinfectant for an extended period of time) may be needed as regular treatment methods may not be effective, he says.

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Further information on the ASM Biodefense Research Meeting can be found online at www.asmbiodefense.org.

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