

Study suggests surface water contaminated with salmonella more common than thought

February 27 2009

A new University of Georgia study suggests that health agencies investigating Salmonella illnesses should consider untreated surface water as a possible source of contamination.

Researchers, whose results appear in the March issue of the journal *Applied and Environmental Microbiology*, tested water over a one-year period in rivers and streams in a region of south Georgia known for its high rate of sporadic salmonella cases. The team found Salmonella in 79 percent of water samples, with the highest concentrations and the greatest diversity of strains in the summer and after rainfall.

"Streams are not routinely tested for Salmonella, and our finding is an indication that many more could be contaminated than people realize," said Erin Lipp, associate professor in the UGA College of Public Health. "We found our highest numbers in the summer months, and this is also the time when most people get sick."

Lipp, who co-authored the study with former UGA graduate student Bradd Haley and Dana Cole in the Georgia Division of Public Health, said that although contaminated water used to irrigate or wash produce has been linked to several well-publicized outbreaks of salmonellosis in recent years, the environmental factors that influence Salmonella levels in natural waters are not well understood. She said understanding how Salmonella levels change in response to variables such as temperature and rainfall are critical to predicting—and ultimately preventing—the waterborne transmission of the bacteria.

The team studied streams in the upper reaches of the Suwannee River Basin, which begins in south Georgia and flows into central Florida. The study area contains a mix of forested lands, row crops, pasturelands, wetlands and small cities. The researchers chose sampling sites near a variety of those environments but found little variation in Salmonella concentrations by location. The diversity of Salmonella strains, however, was highest near a farm containing cattle and a pivot irrigation system, suggesting that close proximity to livestock and agriculture increase the risk of contamination. The researchers also found a strong and direct correlation between rainfall for the two days preceding sample collection and the concentration of Salmonella, suggesting that runoff contributes to the contamination.

Salmonella can be found in the intestinal tracts of several species of animals and in humans. The bacteria are shed in feces, but Lipp said recent data suggest that they can persist and possibly grow in water if given the right conditions. Her study found that the diversity and concentration of Salmonella increased as temperatures increased. The highest concentrations and greatest diversity of strains were found in August, the warmest month of the year. Lipp adds that her study, which was funded by the National Oceanic and Atmospheric Administration Joint Program on Climate Variability and Human Health, lends support to the idea that Salmonella illnesses could increase as a result of global warming.

Lipp notes that her study area had 58 cases of Salmonella illness per 100,000 people in 2007, the last year for which figures are available, compared to a state average of 22 cases per 100,000 people and a national average of 15 cases per 100,000 people. She said the exact mechanisms by which people in her study area are being exposed to environmental Salmonella are unclear, but the most commonly detected strain in the studied streams was among the top ten associated with human infections in the health district. The porous nature of the soil in

the study area means that surface water and groundwater are prone to mixing, especially after rainfalls, and Lipp said that poorly sited wells might be a factor in many illnesses. Another possibility, especially common among children, is so called incidental exposure by which people become infected with the bacteria when playing in or near contaminated waterways.

"Understanding the environmental factors that contribute to salmonella illnesses can guide our efforts to educate people about how they can avoid being sickened through the proper construction and maintenance of wells, basic hygiene such as hand washing and good food safety practices," Lipp said. "We also have the potential to decrease the likelihood of larger outbreaks related to produce, because in many cases contaminated irrigation water, and not the produce itself, may be the cause of the outbreak."

Source: University of Georgia

Citation: Study suggests surface water contaminated with salmonella more common than thought (2009, February 27) retrieved 19 April 2024 from <https://phys.org/news/2009-02-surface-contaminated-salmonella-common-thought.html>

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