New technique may help quell cholera outbreak

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A new technique honed by University of Florida scientists can track rapid molecular changes that occur in cholera strains during epidemics and researchers hope the genetic analysis will help stamp out such outbreaks.

The results of the UF study are published this month in the journal *Emerging* Infectious Diseases.

“Cholera spreads quickly through contaminated food and water and can survive in the environment,” said Judy Johnson, one of the paper’s authors, a UF College of Medicine professor and member of the Emerging Pathogens Institute. “Tracking the spread in real-time, at a community level, is essential in helping identify sources of contamination so that they can be eliminated, stopping the spread of disease before it gets worse.”

In October, UF researchers went to Haiti during the cholera outbreak to collect stool samples from 19 patients suffering from severe diarrhea at St. Marc’s Hospital in the Léogâne region. People infected with the cholera bacterium, a waterborne organism that attacks the small intestine, often experience rapid dehydration that can lead to death if untreated.

The samples were examined at the Emerging Pathogens Institute, where researchers used a molecular typing, or fingerprinting, technique that follows rapidly changing areas of the cholera genome. Most molecular

fingerprinting methods have difficulty detecting differences in the type of cholera bacterium found in the patient samples.

The researchers examined 187 bacterial colony selections and showed that even in individual patients, the DNA sequences were beginning to diversify. It's a remarkable finding, they say, because although all the isolates can be traced back to a single cholera clone introduced into Haiti, the molecular signature is changing as the epidemic progresses.

Following strains with these unique signatures allows researchers to see, almost in real time, how the disease is spreading, whether through contamination of surface water, food or from human travel.

This molecular typing technique also is useful in demonstrating where strains persist in the environment. In countries such as Bangladesh and India, where cholera is endemic, strains of the bacteria with notably different genetic profiles typically exist only miles apart from each other, with multiple unique strains often found within a single infected person.

"Although there are changes happening in the Haitian strains, we have also confirmed that there's little diversity in them," said Afsar Ali, a faculty member in the UF Emerging Pathogens Institute and the College of Public Health and Health Professions, who was lead author of the paper. "This is significant because it means there was a single introduction of a cholera strain into the country."

The UF researchers have drawn no conclusions that cholera came into Haiti through Nepali United Nations peacekeepers stationed in the country, as suggested in some media reports.

"It appears that the first several cases of cholera had resulted from people drinking contaminated river water, and water should be

considered the major driver of the cholera epidemic in Haiti," Ali said. "However, it's yet to be validated that the introduction of the cholera germ in the water happened via human fecal excretion."

More than 4,500 Haitians have died during the current cholera outbreak, the World Health Organization reported in late February. Many of the initial cases were clustered along a 20-mile stretch of the Artibonite River, though more have occurred in urban centers where the January 2010 earthquake damaged water sanitation systems. Health experts predict more than 750,000 Haitians will be infected with the disease by year's end.

Emerging Pathogens Institute researchers developed mathematical models to help public health officials understand the spread and control of cholera, suggesting that human-to-human disease transmission is the primary reason cholera has infected many in Haiti.

Provided by University of Florida