

Scientists track source of Haitian cholera outbreak

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Employing technology that reads the entire DNA code, researchers led by the Translational Genomics Research Institute (TGen) and the Technical University of Denmark (DTU) have pinpointed the source of a cholera outbreak in Haiti that killed more than 6,000 people and sickened 300,000.

Using whole genome sequencing, which spells out the billions of chemical bases in DNA, TGen and DTU provided the strongest evidence yet that peacekeepers from Nepal, where [cholera](#) is widespread, brought the disease to Haiti, which already was reeling from a devastating earthquake in January 2010 that killed more than 300,000.

In a study titled "[Population genetics](#) of *Vibrio Cholerae* from Nepal: An identical clone in Nepal and the Haitian outbreak," researchers confirm the source of the cholera, and suggest how to prevent future outbreaks when international aid is rushed to [disaster areas](#).

The study appears Tuesday August 23rd in *mBio*, a new online-only, open-access journal published by the American Society of Microbiology in partnership with the American Academy of Microbiology.

"The great similarity of Haitian cholera with Nepalese cholera is based upon the highest resolution DNA methods available, and point to a probable source of this devastating disease outbreak," said Dr. Paul Keim, Director of the TGen Pathogen Genomics Division and senior [molecular biologist](#) on the study. Dr. Keim assisted the FBI in tracking

down the source of the 2001 anthrax letters case, which killed five people. He said similar genetic tracking techniques were used in investigating the Haitian [cholera outbreak](#).

According to Dr. Keim, methods pioneered during the anthrax letter forensic investigation and today's greatly diminished costs for whole genome sequencing make it possible to apply this powerful technology to new and critical public health challenges. Dr. Keim is a Regents Professor at Northern Arizona University (NAU), whose Center for Microbial Genetics and Genomics also contributed to the study.

Dr. Keim praised TGen's collaborators at the National Public Health Laboratory in Nepal, and at the National Food Institute in Denmark, where the study's senior author, Dr. Frank M. Aarestrup, is head of the Antimicrobial Resistance and Molecular Epidemiology Unit.

"This study highlights how rapidly infectious diseases might be transmitted globally through international travel, and how [public health](#) officials need to use advanced molecular tools, along with standard epidemiological analyses, to quickly and accurately determine sources of outbreaks," said Dr. Aarestrup, who also is head of both the World Health Organization's Collaborating Centre for Antimicrobial Resistance among Foodborne Pathogens and of the European Union (EU) Reference Laboratory for Antimicrobial Resistance.

Dr. Lance Price, an associate professor at TGen and co-author of the new study, said the investigation into the source of Haitian cholera could help prevent such outbreaks in the future.

"This effort validates the power of advanced molecular tools in investigating outbreaks of this nature," Dr. Price said. "The goal now should be finding ways to prevent such outbreaks, perhaps through screening prior to deployment. This study is not about placing blame, it's

about preventing such disasters in the future."

Researchers confirmed the source of the outbreak by comparing the DNA of 24 cholera samples (the bacterium *Vibrio cholera*) from five different districts in Nepal with 10 samples of cholera from Haiti. All 24 samples from Nepal matched the samples from Haiti. Some of the samples, the report said, "were almost identical."

Dr. Price said the TGen findings makes a very strong case for the source of the cholera, and aligns with a recent report by the U.S. Centers for Disease Control and Prevention, which said "evidence strongly suggests" that the Nepalese soldiers were the source of the outbreak. The CDC study was based on the fact that the first cholera infections in Haiti were downstream from the Nepalese, and occurred shortly after the soldiers' arrival.

"Our studies are complementary and together make a definitive case for a Nepalese origin to the outbreak," Dr. Price said.

Provided by The Translational Genomics Research Institute

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