

AMD Projects

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CDC's Advanced Molecular Detection and Response to Infectious Disease Outbreaks (AMD) initiative fosters scientific innovation to transform public health and protect people from disease threats.

AMD Projects: Attacking Legionnaires' Disease

Rapid molecular detection of *Legionella* for outbreak response

First discovered in 1976 at an American Legion convention in Philadelphia, Pennsylvania, Legionnaires' disease continues to cause outbreaks in the United States. Even though it is a leading cause of potable waterborne outbreaks in this country, reliable, rapid, and consistent analysis techniques have not been developed.

Available techniques to determine the most likely source of transmission require matching clinical and environmental samples and can be used for only 1 of 60 species of *Legionella*. Right now, it can take more than 3 weeks to isolate and characterize the bacterium, if a specimen is even collected from a patient. These hurdles leave many cases and outbreaks uncharacterized. State and local health departments rely on CDC laboratories because they do not have the specialized skills and extensive resources required to analyze *Legionella* specimens.

CDC is creating a database of *Legionella* genomes that will improve capacity for identifying outbreak-causing strains so that isolating the bacteria from samples may no longer be necessary. 



Most people with Legionnaires' disease will have pneumonia (lung infection) since the Legionella bacteria grow and thrive in the lungs. Pneumonia is confirmed either by chest x-ray or on physical exam.



These new laboratory techniques will revolutionize how assessments are made about the source of disease transmission, which is the cornerstone of controlling *Legionella* outbreaks. Rapid identification of a source will allow faster implementation of prevention efforts. This project will help streamline standard operating procedures for state and local laboratories, assisting state health departments in investigating their own outbreaks, and leading to quicker public health response.

For more information on Unexplained Respiratory Disease Outbreaks, please visit the CDC website, <http://emergency.cdc.gov/urdo>.



2015 Update

Since the project began, investigators used advanced molecular detection (AMD) technologies to develop and implement a new system, called a whole genome pipeline (WGP), to quickly analyze any strain of *Legionella* at the genetic level. The WGP provides researchers with far more information than traditional methods, where only small areas of a genome can be characterized at one time. The WGP was first used on an outbreak from 2012 where traditional testing methods found the strain that caused the infections was *Legionella pneumophila* serogroup 5. The pipeline found that this particular strain was likely the same strain that infected individuals in the same area from 30 years ago. Since the strains from 1982 and 2012 were so similar, it is likely that the bacteria survived and adapted over time within the water system.

Investigators will continue to use the WGP to compare outbreak strains from today with those of the past to better understand how these bacteria are able to survive and evolve. Ultimately, the goal of this project is to implement this technique prospectively during all *Legionella* outbreaks.