CDC's AMD Initiative

AMD Projects

Innovate • Transform • Protect

CDC's Advanced Molecular Detection (AMD) initiative fosters scientific innovation in genomic sequencing, epidemiology, and bioinformatics to transform public health and protect people from disease threats.

AMD Projects: Detecting Intestinal Diseases

Advancing detection of cyclosporiasis (*C. cayetanensis*) using genomics-based laboratory surveillance and reference diagnostics

Since the 1990s, CDC has conducted several large, multi-state outbreak investigations in which food items were found to be potential sources of the parasite *Cyclospora cayetanensis*. The multi-state outbreak of cyclosporiasis during the summer of 2013 was one of the largest and most complex cyclosporiasis outbreak investigations conducted in the United States. CDC and state officials investigated 631 cases, with 49 hospitalizations, in 25 states. The majority of the cases were reported from Iowa, Nebraska, and Texas. Overall, the majority of cases nationwide could not be linked to a specific food source.

About 2 months after the investigation began it became clear that the cases were not all part of the same outbreak. Federal and state scientists suspected more than one source of infection. Investigators could have reached this conclusion faster if they had laboratory tools that could tell whether different strains of the parasite were present and help determine if cases were linked to each other.

Cyclosporiasis is a foodborne illness. CDC recommends safe food handling techniques for preparing fresh fruits and vegetables.

To improve outbreak response and surveillance, CDC must gather data on the genetic diversity of this parasite. CDC will do this by sequencing the DNA of samples of the parasite that circulate in the US and different parts of the world. CDC also will analyze the DNA of parasites collected from individual outbreak-related cases—as well as cases not known to be linked to an outbreak—to identify potential genotyping markers and develop a new DNA-based surveillance system for cyclosporiasis.

For more information on the parasite ***Cyclospora cayetanensis***, go to http://www.cdc.gov/parasites/cyclosporiasis/.

2016 Update

Before the AMD initiative began in 2014, there was no usable draft genome for *Cyclospora cayetanensis*. To diagnose *C. cayetanensis* as the cause of someone's illness, laboratory scientists had to identify the parasite in a person's stool sample. But these outbreaks often went unsolved because we had no way to comparing the strain of *C. cayetanensis* that infected a person with a strain of *C. cayetanensis* found in a food source.

Using AMD methods, CDC scientists, along with colleagues from the U.S. Food and Drug Administration (FDA), state public health departments, and academic institutions, have developed the first ever process to acquire genomic sequences from *C. cayetanensis.* The complex process involves obtaining a pure sample of *C. cayetanensis* from human stool samples, breaking open the parasite's extremely strong outer wall, extracting the small amount of genetic material available, sequencing that genetic material, and then analyzing the genomic data to allow comparison of various strains. Through this work, CDC and its collaborators have obtained genomic sequences from 19 samples. In addition, they have been developing tools to help analyze the nucleic acid sequences and identify regions in the parasitic genome in which variations occur. Future work will focus on evaluating potential genetic markers for identifying various genotypes of *C. cayetanensis* and improving detection of the parasite in humans and food sources. This work will help us develop a laboratory-based surveillance system for cyclosporiasis that will identify and help us stop outbreaks faster.

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