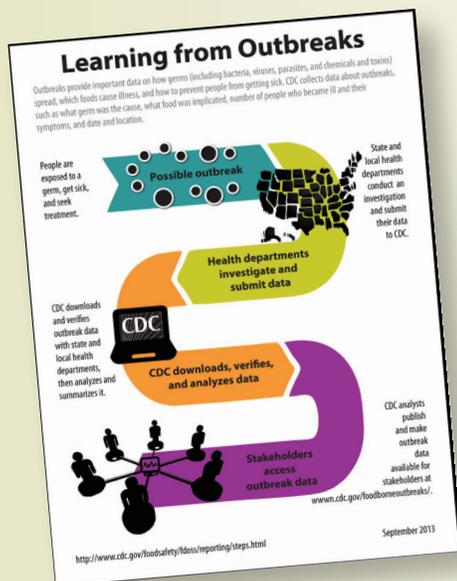




Accomplishments 2013

The National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) works to improve public health at home and around the world by protecting people from

- Foodborne and waterborne illnesses
- Deadly diseases like Ebola, anthrax, and rabies
- Infections spread by animals, mosquitoes, ticks, and fleas
- Infections in healthcare facilities or drug-resistant threats
- Illnesses that cross borders and affect refugees, immigrants, and travelers

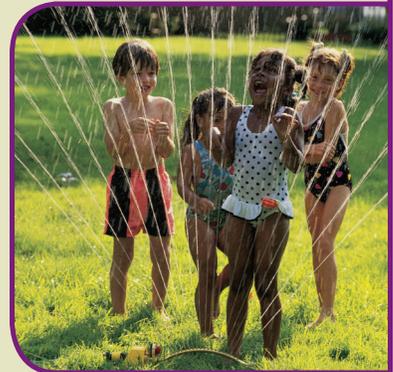


Responding to outbreaks in the United States and across the globe

In fiscal year 2013 (FY 2013), NCEZID regularly received requests from states and other countries to assist in the investigation of local, national, and international outbreaks of infectious diseases, known as Epi-Aids (see examples in the boxes on the bottom of pages 2–7). In addition to participating in more than 35 Epi-Aids, NCEZID supported health departments' response to a variety of outbreaks through epidemiologic investigations, phone consultations, and technical assistance. CDC maintains an up-to-date list of current outbreaks on its [website](#).

Protecting public water systems and the public from *Naegleria fowleri* (brain-eating ameba) infections

After the death of a child staying in St. Bernard Parish, Louisiana, NCEZID laboratories confirmed the presence of the brain-eating ameba *Naegleria fowleri* in the parish's treated public water system. NCEZID worked with state public health officials and the US Environmental Protection Agency to develop a plan to rid the system of the ameba and communicate with residents about steps they can take to protect themselves. This effort included making accessible the investigational drug miltefosine for treatment of *Naegleria* infections. This drug likely helped save the lives of two children in 2013.



This is the first time in the United States that *Naegleria fowleri* has caused a death associated with a contaminated treated public water system. The disease caused by the ameba is rare and devastating, killing more than 99% of those infected.



Eliminating healthcare-associated infections (HAIs)



In 2013, CDC showed a

- 44% reduction in central line-associated bloodstream infections
- 20% reduction in surgical site infections

Why it's important:

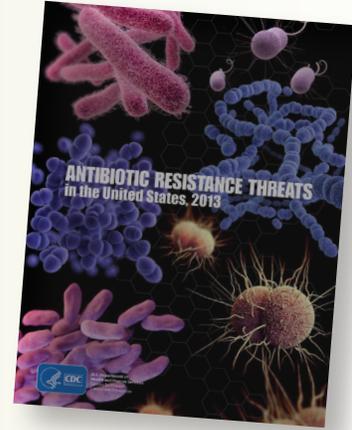
- 1 in 20 hospitalized patients develop [HAIs](#), and more than 1 million infections occur each year across healthcare settings. In hospitals alone, HAIs result in billions of dollars of excess healthcare costs and contribute to the deaths of thousands of patients every year.
- CDC provides state-level information to alert states about facilities with significantly more infections and drive quality improvement and prevention programs.
- CDC measures progress in meeting HAI prevention goals set by the US Department of Health and Human Services.

Responding to outbreaks: Michigan

CDC responded to an outbreak of [Clostridium difficile](#) (called *C. difficile*) infections in an outpatient dialysis center in Michigan. *C. difficile* infection, which causes deadly diarrhea, can occur when patients get antibiotics and medical care. Although many HAIs are declining, *C. difficile* infections remain at historically high levels. Hospitals following CDC infection control recommendations lowered *C. difficile* infection rates by 20% in less than 2 years.

Sounding the alarm about the threat of antibiotic resistance

NCEZID released [Antibiotic Resistance Threats in the United States, 2013](#), the first comprehensive analysis of the 18 most serious drug-resistant threats that each year sicken more than 2 million people and kill at least 23,000. For the first time, the threats are ranked in categories: urgent, serious, and concerning.



Why it's important:

- Drug-resistant infections are a threat to human health and economic health.
- Antibiotic use leads to resistance. Half of antibiotic use in humans and much of the antibiotics given to animals are unnecessary.
- Antibiotic resistance is a quickly growing, extremely dangerous problem. We need to act now, or our supply of antibiotics will be threatened.

Containing a deadly and unprecedented outbreak of fungal meningitis

In fall 2012, a small cluster of [fungal infections](#) linked to steroid injections began appearing in some areas around the country. This would turn into one of the largest outbreaks of healthcare-associated infections in US history. By October 19, 2012, about 99% of the nearly 14,000 potentially exposed people had been notified, thanks to fast action by CDC and local, state, and other federal public health agencies. NCEZID laboratories developed a new diagnostic assay for testing specimens in 2 days, identified other microorganisms from sealed medication vials, and helped show how these infections cause tissue, joint, and central nervous system damage in patients. NCEZID investigators also worked with outside medical experts to develop new clinical treatment and patient management guidance.



Why it's important:

- Although the 20-state outbreak tragically caused more than 750 illnesses and 64 deaths, the rapid mobilization of public health agencies prevented even more cases of illness and saved more than 100 lives.
- To help prevent similar outbreaks from happening again, NCEZID is working closely with the US Food and Drug Administration, states, industry, and others to improve the safety of products from compounding pharmacies.

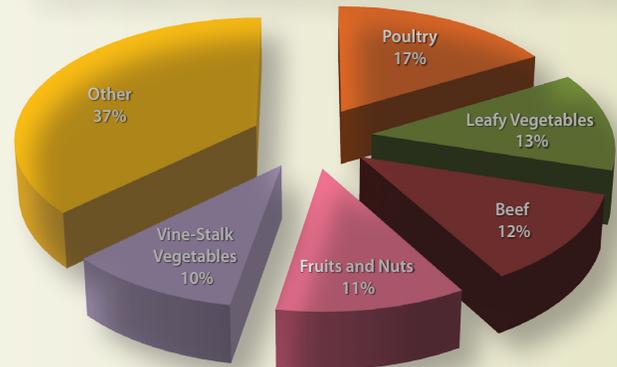
Responding to outbreaks: Colorado

Outbreak of the deadly superbug CRE (carbapenem-resistant Enterobacteriaceae). CRE is the so-called nightmare bacteria because it is resistant to nearly all antibiotics, can spread easily between patients, and has the power to give its resistance to other germs. Half of patients who get a CRE bloodstream infection will die. By following CDC infection control guidelines, hospitals and other medical facilities can halt infections before they become widespread.

Revealing which foods cause foodborne illness

In January 2013, NCEZID published its first-ever [estimates of food sources](#) associated with foodborne illnesses in the United States. Produce, including leafy green and vine-stalk vegetables as well as fruits and nuts, accounts for about half of all foodborne illness, with norovirus being the most common cause. The analysis also showed that meat and poultry are the food sources most often linked to deaths caused by food poisoning, mostly due to *Salmonella* and *Listeria*.

Foods Linked to Outbreak-Associated Illnesses, 1998–2008



Why it's important:

- Regulators and industry need these data to more precisely target and implement effective measures for preventing food contamination.
- Consumers can use this information to better apply safe food practices.

Innovating solutions for sanitation in Kenya



NCEZID is piloting a unique sanitation project that uses concentrated solar energy to sterilize waste so it can be safely used for fertilizer or fuel. NCEZID is partnering with CDC Kenya and a non-governmental organization called Sanivation to run the project, which is located in the Kakuma refugee camp in northern Kenya that houses more than 100,000 refugees.

Why it's important:

- Solar sanitation is an inexpensive, innovative, and effective form of waste treatment. Sustainable sanitation is essential for preventing the spread of infectious diseases within crowded refugee camp populations.
- Refugee camps are often crowded and lack adequate safe drinking water and hygiene. Water and hygiene-related diseases, such as cholera and dysentery, are some of the primary causes of illness and death in such settings, especially among young children.

Responding to outbreaks: US, multistate

Human rabies transmitted during organ transplantation. A patient who died of rabies in Maryland contracted the infection more than a year after going through organ transplantation. The patient was 1 of 4 people who had received an organ from the same donor. CDC laboratories tested tissue samples from the donor and from the Maryland recipient to confirm transmission of rabies. Both the recipient and donor had the same raccoon type of rabies virus. The other 3 organ recipients received rabies vaccinations after confirmation of rabies. Fortunately, they all survived.

Improving refugee health

At least one-third of the world's population is infected with intestinal parasites. This health problem has been common among refugees newly arriving to the United States, which on average takes in about 50,000 refugees each year. With the goal of improving refugee health, NCEZID began a pilot program in several countries in 2011–2012 to treat refugees at high risk for certain types of parasitic infection. Because the pilot was highly successful, NCEZID expanded the program in 2013 to provide this treatment for US-bound refugee populations in Thailand, Malaysia, Nepal, Ethiopia, and Kenya.

Why it's important:

- Treating high-risk refugee populations for intestinal parasites before they leave for the United States has dramatically decreased the occurrence of common parasitic infections in refugees.
- This project saves lives and saves money. It improves the health of US-bound refugees and benefits state and local health departments by reducing the need to test refugees who were treated for parasitic infections before coming to the United States.



Tracing a new virus to ticks

For the first time, NCEZID scientists have traced the recently discovered [Heartland virus](#) that infected two men from northwestern Missouri to populations of lone star ticks in the region. Both men were hospitalized with flu-like illness with fever, feeling tired, and diarrhea. No specific treatment is available for Heartland virus disease.

Why it's important:

- Provides strong evidence that the virus is persisting from season to season in tick populations and that the ticks play an important role in disease transmission.
- Studies like this will help us stay one step ahead of what could become another serious health threat carried by ticks.

Responding to outbreaks: US, multistate

[Listeria](#) infections associated with contaminated cheese. CDC collaborated in a 5-state outbreak investigation that identified specialty cheeses to be the likely cause. The *Listeria* infections killed 1 person, caused a miscarriage, and hospitalized 4 others. Rapid detective work prevented many additional illnesses. After CDC was contacted by Minnesota public health officials, it took just 6 days to identify the source of the outbreak and to issue a nationwide recall.

Laying a new pipeline to rapidly identify infectious disease

MicrobeNet, a CDC reference database for identification of infectious pathogens, went live on January 1, 2013. It's designed to link CDC laboratory subject matter expertise with state and local laboratories, and as of October 2013, the system has processed approximately 1,000 searches for state health labs. Most searches have been for rare or unusual pathogens, which often are difficult to grow and identify.



Why it's important:

- Because MicrobeNet enables multiple analyses of a new or rapidly emerging pathogen to be performed in state and local labs, it dramatically decreases reporting time from weeks to hours or days.
- Laboratory scientists throughout the world can run diagnostic tests and match results against unique or rare isolates in CDC's reference collections.



Identifying a new poxvirus

NCEZID collaborated with public health officials in the Republic of Georgia to investigate the discovery of a new poxvirus that caused infection in shepherds in Akhmeta, Georgia. Testing by NCEZID's Poxvirus Laboratory found a new poxvirus belonging to the same genus (*Orthopoxvirus*) as smallpox.

Why it's important:

- It's a clear-cut demonstration of how collaboration helps us to quickly detect and respond to emerging diseases.
- New diagnostic tests need to be developed so we can understand the potential impact of this new poxvirus on human and animal health.

Responding to global outbreaks

Uganda—Ebola hemorrhagic fever infection (Luwero District of central Uganda) and **Marburg virus infection** (Kabale, Ibanda, Mbarara, and Kampala Districts). Samples of both viruses were tested at the Uganda Virus Research Institute in Entebbe. NCEZID helped build and staff the Institute to help in the diagnosis of these and other deadly infectious diseases.

Puerto Rico, multiple countries worldwide—One of the largest ever outbreaks of dengue virus infections, a debilitating and sometimes deadly disease caused by the bite of an infected mosquito, occurred in Puerto Rico in 2013. Also, in 2013, outbreaks of dengue in Luanda, Angola, and Mombasa, Kenya were reported. Although dengue is more common in tropical climates, locally transmitted cases of dengue were reported in Florida and Texas in 2013.

Awarding vital funding to states

In 2013, funds from CDC's infectious disease centers were awarded to track, respond to, and evaluate programs aimed at addressing infectious disease problems, including foodborne disease, healthcare-associated infections, vector-borne disease, and other problems:

- **\$89.5 million** through the [Epidemiology and Laboratory Capacity for Infectious Diseases Cooperative](#) (ELC)
 - » To secure an excellent public health workforce, robust surveillance systems, and modern laboratory facilities and information networks and to support disease-specific infectious disease programs in states.
 - » Supports 50 state health departments, 6 local health departments, and 8 territories or US affiliates.
- **\$30 million** through the [Emerging Infections Program](#)
 - » To conduct gold standard surveillance and epidemiological research to evaluate the impact of prevention programs and policies.
 - » Supports 10 state health departments and their partners.

Speeding up laboratory reporting

Once labs detect often dangerous infections, it's crucial for them to quickly send the correct information to health departments so they may conduct investigations and identify disease outbreaks. When labs transmit these data electronically (rather than sending in paper reports), it streamlines the process, resulting in faster and more complete disease detection. Approximately 10,400 labs provide reportable data about diseases and conditions to public health agencies nationwide. A new [study](#) showed that CDC's funding to advance electronic laboratory reporting, or ELR, from clinical and public health laboratories to public health agencies is helping increase national implementation of this technology.

Why it's important:

- The number of state and local health departments receiving electronic reports from laboratories has more than doubled since 2005.
- Large national and public health labs achieving full reporting through ELR is a high priority.
- The Centers for Medicare & Medicaid Services is advancing ELR implementation by providing incentives to those hospital labs that use ELR.

Responding to outbreaks: US and Mexico

CDC participated in a multi-jurisdictional contact investigation involving a man with **extensively drug-resistant tuberculosis (XDR TB)** who was detained at the US-Mexico border. Because it is resistant to almost all drugs, XDR TB is extremely dangerous and hard to treat. This particular strain of XDR TB had only been seen once before in the United States. NCEZID worked closely with partners at the US Department of Homeland Security and the World Health Organization to prevent further spread of XDR TB.

What's ahead for NCEZID in 2014: Advanced Molecular Detection (AMD)

The [Advanced Molecular Detection](#) (AMD) initiative proposed in the President's 2014 Budget would significantly boost CDC's current diagnostic and bioinformatics capabilities to find and stop deadly infectious disease outbreaks.

What is AMD?

AMD combines two powerful technologies that could accelerate our response to outbreaks of infectious disease. AMD requires two classes of tools: **sequencing machines** that can read the DNA or RNA code of a microbe and **supercomputers** that have the capacity to manage massive amounts of information with the software to intelligently detect patterns. Just as important, CDC and states must have the **expertise** and ability to use the technology.

Genetic sequencing of deadly germs combined with advanced computing capability could revolutionize how NCEZID investigates and controls outbreaks.

Why AMD and why now?

We need to keep up. In 2011, an expert panel in the fields of bioinformatics and laboratory information technology found that CDC was at risk of not being able to meet its basic mission unless it kept pace with ongoing advances in technology to diagnose and characterize infectious agents.

CDC has used molecular detection tools such as polymerase chain reaction and pulsed-field gel electrophoresis for decades. The difference is that these tools examine *pieces* of DNA from microbes. AMD makes it possible to look at the *complete* genetic makeup of pathogens. Another reason is that increasingly, faster, less expensive, and labor-intensive tests that do not use cultures are being used to diagnose infectious disease. When fully realized, AMD technology and staff expertise will help ensure that CDC remains at the forefront of infectious disease detection and control.

What difference will AMD make?

AMD will help us do our work faster and better. AMD means that CDC could work with partners to

- More rapidly and accurately diagnose infectious diseases and control outbreaks.
- Develop and adapt new genomic tools for public health use.
- Better predict patterns of transmission in real-time.
- More effectively tackle antibiotic resistance.
- Better target interventions, like vaccines.
- Reduce diagnostic costs in the future.
- Find a microbe's match among the thousands of reference samples in its world-class microbe library.
- Ensure capacities for state public health laboratories.



Recent Tweet from
Scott J. Becker,

Executive Director, Association of
Public Health Laboratories

Up soon-I share w #APHL
why the @CDCgov Adv
Molecular Detection
initiative is a MUST to get
ahead of the microbes.

www.cdc.gov/amd/

