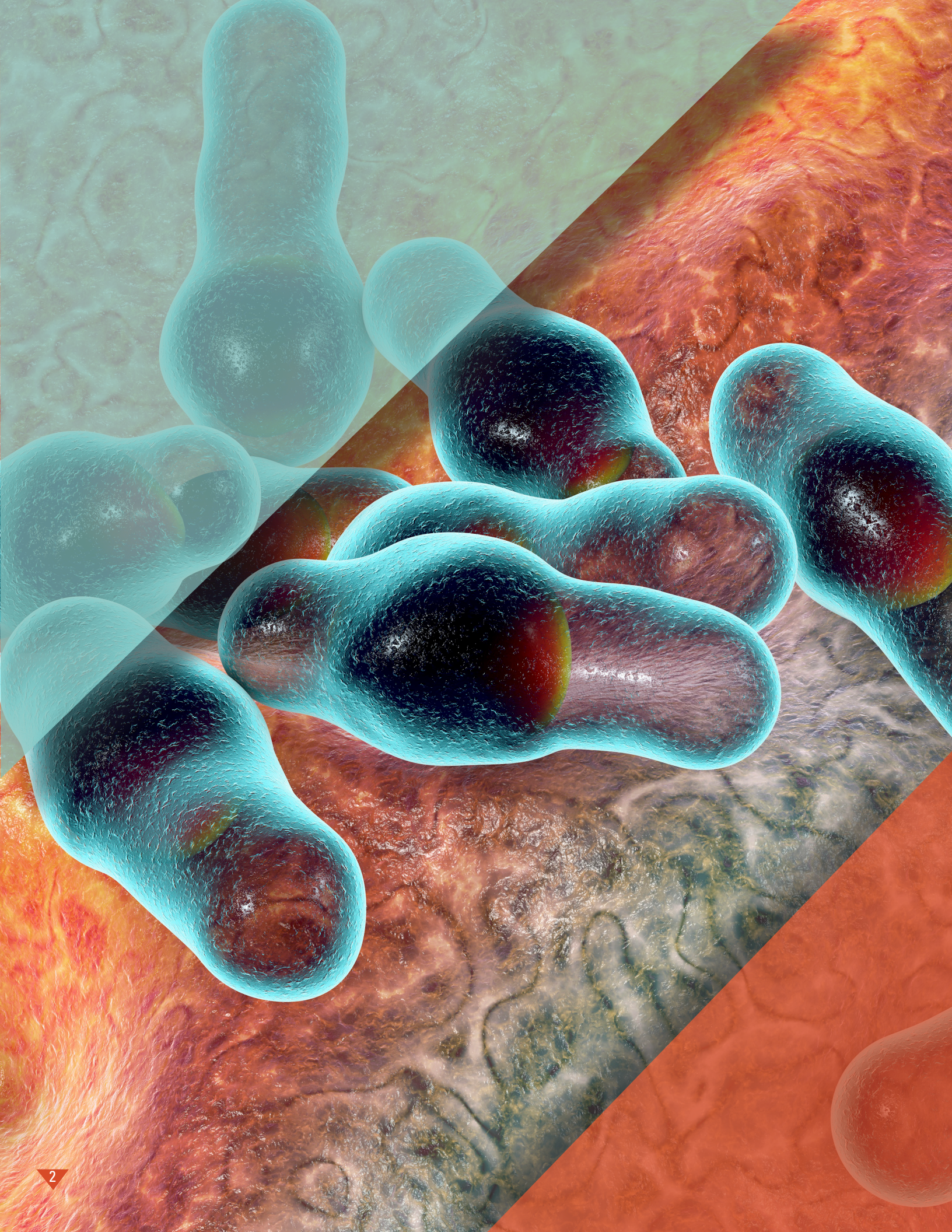


# NCEZID ACCOMPLISHMENTS 20 22

National Center for  
Emerging and Zoonotic  
Infectious Diseases





**CDC's** National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) works to protect people in the United States and around the world by preventing, detecting, and responding to outbreaks and emergences of infectious diseases.

In 2022, NCEZID—in collaboration with partners—expanded the coverage and scope of its infectious disease surveillance platforms, detected and tracked rare and deadly threats, and responded to various outbreaks ranging from foodborne disease outbreaks to mpox.

This report compiles a series of stories and highlights from NCEZID's work in 2022. These and many more accomplishments reflect the power of partnerships in our work and lay the groundwork to increase our impact in 2023 and beyond.



## Mpox: Expanded with startling speed, became a global emergency

During 2022, partners and teams from CDC's National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) and from across CDC worked tirelessly to contain the spread of **mpox** in the United States. Following the first reported case in mid-May, the U.S. outbreak eventually swelled to roughly 30,000 cases and 20 total deaths in 2022. Although the outbreak presented new challenges, we were ready with decades of experience studying **poxviruses** and responding to global outbreaks.

Within months of the first U.S. case, global cases soared in more than 100 countries—including cases in nearly every U.S. state—making it the largest mpox outbreak in history. This led the World Health Organization and the U.S. Department of Health and Human Services to declare mpox a public health emergency. CDC's efforts—with NCEZID experts at all levels of the response—intensified into August of 2022, after which case counts began declining.

## Leading the response

CDC's efforts against mpox long preceded the 2022 outbreak. Thanks to a long-term focus on **preparedness** and poxvirus research, clinicians and patients had reliable, validated assays to test for poxviruses and a better vaccine to prevent mpox with fewer side effects. Moreover, CDC was able to quickly detect and activate emergency response functions.

The mpox emergency response also drove home the power of partnerships. NCEZID and CDC colleagues provided strong leadership across all facets of the response, while working closely with partner organizations and health departments across the country. The 2022 outbreak disproportionately affected gay, bisexual, and other men who have sex with men. Community organizations, including partners in the LGBTQ+ community, played a critical role in raising awareness about the outbreak and sharing accurate information about vaccination and other ways people can protect themselves and prevent the spread of mpox.

As the response evolved, CDC provided technical assistance and guidance to **health departments** and **clinicians**, provided outreach to groups most affected by the outbreak, and facilitated access to vaccines and therapeutics. This global emergency underscored the many ways CDC, state and local health departments, and community-based organizations can effectively respond to evolving diseases together.



## Preparedness pays off

For years, NCEZID focused on improving the nation's preparedness for public health emergencies caused by biothreats like **anthrax**, **plague**, and **smallpox**. This preparedness paid off. In 2005, NCEZID's laboratory response experts partnered with leading poxvirus scientists to equip the **Laboratory Response Network** (LRN) with an FDA-cleared laboratory test that can detect non-variola orthopoxviruses, the family of viruses that includes mpox. CDC's LRN consists of more than 110 laboratories across the country that can respond quickly to biological and chemical threats and other public health emergencies. Those steps to strengthen preparedness 17 years ago resulted in the LRN's detection of the first mpox case in the United States on May 17, 2022. It also meant LRN laboratories across the network were equipped on day one of the outbreak with tests that provided actionable results to public health officials and clinicians.

As mpox cases increased, NCEZID and other CDC scientists worked rapidly with FDA to expand testing through large commercial laboratories. In combination with LRN laboratories, this increased nationwide access and capacity to approximately 80,000 tests per week. These actions made it easier for clinicians to diagnose patients with mpox, which enabled timely isolation and treatment, vaccinations, and other public health actions to prevent the spread of disease. Continued efforts to strengthen the nation's public health infrastructure, including public health laboratories, are critical to ensure the nation can rapidly respond to outbreaks of emerging infectious diseases and other public health emergencies.

*Jennifer McQuiston, DVM (CAPT, USPHS), who served as Response Incident Manager during the early months of the mpox outbreak, analyzes the latest case counts with Hilary Kelly, MPH, Chief of Staff for the response in CDC's Emergency Operations Center. Partners have been essential during this emergency response, she said. "I want to thank the many healthcare providers, state and local public health officials, and community-based organizations, especially trusted messengers in the LGBTQ+ community, for their partnership to educate and protect those at greatest risk for mpox."*



## Assisting travelers

NCEZID's **global migration** expertise served a crucial role in the mpox response. NCEZID coordinated aircraft contact investigations by identifying travelers exposed to a person with mpox on arriving international flights, or flights between states, and sharing their contact information with health departments for notification and public health management. These experts also responded to notifications from other countries under the International Health Regulation regarding travelers with mpox who entered the United States. NCEZID informed travelers about how to protect themselves and others from mpox and what to do if they were exposed during travel. Experts also provided clinicians and health departments guidance on risk assessment and public health management of mpox cases and contacts in travel settings. We also collaborated with GeoSentinel, a worldwide network of travel medicine clinics, to conduct mpox surveillance so we can better understand how and where mpox spreads, who is most affected, and how to protect people from infection. NCEZID's global migration capabilities serve a critical, specialized mission in CDC emergency responses, including the U.S. mpox response. As global migration responsibilities continue to rise, so does the need for expanded public health defenses to mitigate the risk of communicable disease spreading into and within the United States.

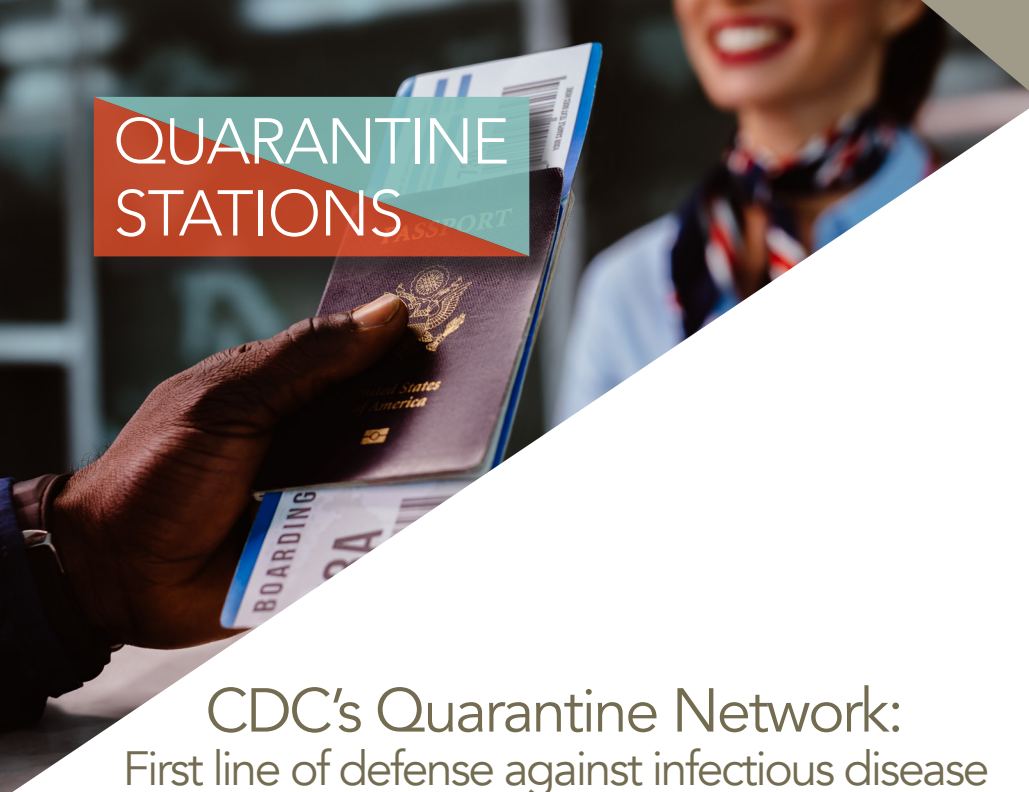


## MPOX | VISUAL EXAMPLES OF MPOX RASH



Photo Credit: NHS England High Consequence Infectious Diseases Network

# QUARANTINE STATIONS



**Michelle Decenteceo, MPH,**  
Regional Officer in Charge,  
CDC's NCEZID Quarantine Branch,  
Division of Global Migration and  
Quarantine (DGMQ)

## CDC's Quarantine Network: First line of defense against infectious disease

As a regional officer responsible for overseeing operations at 4 of CDC's 20 **Quarantine Stations**, Michelle Decenteceo never knows what each day will bring. On a typical day, her teams of quarantine public health officers may **inspect a crate of turtles** to prevent **Salmonella** importation or assess an ill passenger for signs or symptoms of a communicable disease. On rarer occasions, they might have to assess an entire plane of passengers who may have been exposed to an infectious person or respond to a shipment of prohibited **animal products** someone is attempting to **import** into the United States.

Each day can bring its own unique set of challenges, but Michelle and her teams at CDC's National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) work hard to use their available resources in ways that best protect the public's health. For example, when a member of Michelle's team received a call in the middle of the night that a patient in another state was diagnosed and extremely ill with **botulism** and in need of life-saving medication, the team member jumped into action. They raced to the airport and pulled the life-saving medication from CDC's drug supply so it could be flown to the patient on the next flight, saving that person's life from a deadly disease.



*We stand ready to respond to whatever comes our way."*



## DGMQ/Quarantine Stations By the Numbers 2022



49

Ports of entry with communicable disease response plans, developed and validated by CDC and partners, to better prepare the United States for future outbreaks

165

Life-saving drugs distributed from CDC Quarantine Stations to treat people with rare diseases

11,000

Travelers given a health screening upon entry into the United States from Uganda for the 2022 **Ebola Outbreak in Uganda**

The Chicago Quarantine Station, where Michelle is located, is one of 20 CDC Quarantine Stations strategically located throughout the United States at ports of entry where high volumes of international travelers arrive. This comprehensive Quarantine System serves to limit the introduction of infectious diseases into the United States and to prevent their spread. With the next outbreak only a flight or boat ride away, CDC's quarantine network is critical to the nation's ability to identify and respond to disease threats.

In 2022, the National Academies of Science, Engineering, and Medicine (NASEM) outlined the need for additional capabilities to ensure CDC's Quarantine System can continue to respond to the increasingly frequent and complex emerging disease threats facing the United States. The NASEM recommendations included modernizing systems, technology, and communications with travelers and creating a Quarantine Station model that meets the expanding needs of a globally mobile world.

CDC's quarantine network should be able to respond swiftly and effectively to the next disease threat. CDC and partners must continue to modernize and enhance the Quarantine System to better meet the needs of a rapidly changing global landscape.

### WHAT'S NEXT

CDC and partners are working to modernize data and surveillance systems, bolster the preparedness and response infrastructure, and strengthen the evidence base by evaluating interventions – all to create an effective and innovative Quarantine Station model that matches the expanding and changing needs of a globally mobile world.

### WHAT'S THE POINT?

CDC's quarantine network and its frontline quarantine officers are critical to limit the introduction and spread of contagious diseases in the United States. This network must stand ready and have resources in place to respond swiftly and effectively to the next disease threat.



# EMERGING INFECTIOUS DISEASES

## Staying vigilant tracking emerging infectious diseases

CDC's activities to protect Americans from emerging health threats are a foundation of many critical NCEZID infectious disease programs. NCEZID's support for cutting-edge scientific research, public health programs, and outbreak response activities protect the United States from hundreds of dangerous viruses, bacteria, and mysterious organisms we have not yet identified.

NCEZID's emerging infectious disease (EI) programs also provide fundamental support to the nation's local, state, and territorial health departments.

EI programs are a top priority, critical to maintaining—and continually improving—surveillance, laboratory, and outbreak response capacity across the United States and around the world.

Melioidosis is caused by infection with the bacteria *Burkholderia pseudomallei*.

## Melioidosis discoveries continue to surprise

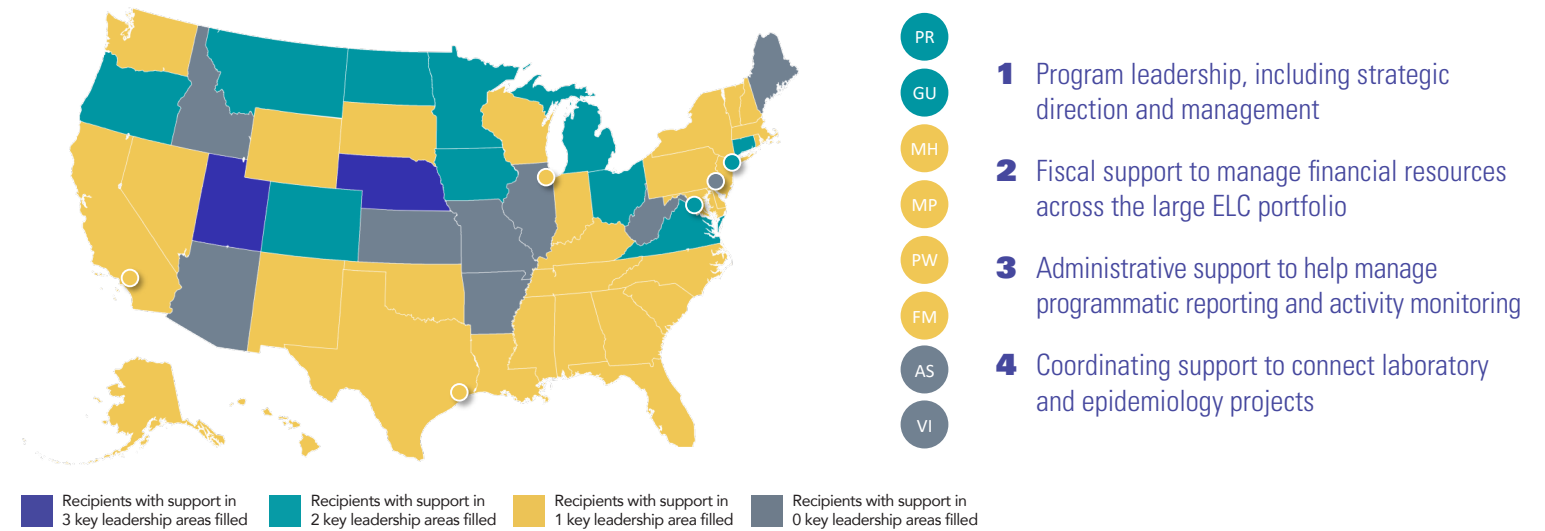
NCEZID staff made a needle-in-a-haystack discovery in late 2021 when they linked four **melioidosis** cases (including two deaths) in four different states to a contaminated **aromatherapy spray**. This disease usually occurs in tropical climates, especially Southeast Asia and northern Australia, and can cause serious illness in people and animals. Treatment is difficult, and 10% to 50% of people infected with melioidosis die. Before 2022, nearly all melioidosis cases in the United States were among people who traveled outside the United States and were likely infected in places where the bacteria are more common.

In 2022, melioidosis threw another curveball. We discovered bacteria that cause melioidosis, *Burkholderia pseudomallei*, in **soil and water** along the Mississippi Gulf Coast. These bacteria were detected in the environment for the first time in the continental United States thanks to astute detective work by scientists investigating two melioidosis cases in southern Mississippi. Tests showed the bacteria that infected the two patients were genetically related, even though the illnesses occurred 2 years apart. NCEZID scientists and partners at the Mississippi Department of Health collected samples from both patients' homes and then tested and sequenced them at CDC. Samples from soil and water around one of the homes tested positive for *B. pseudomallei*.

Climatic factors such as rising temperatures and precipitation could be making environmental conditions more favorable for pathogens like *B. pseudomallei* to expand into new areas. NCEZID's increased support for its EI programs will bolster laboratory capacity to respond to emerging threats and strengthen the nation's ability to prepare for, investigate, and respond to rare but dangerous illnesses like melioidosis.

# ELC Leadership, Management, and Administration Project Investments

ELC funding to public health laboratories expands support through four leadership areas.\*



\* The map above shows the number of key leadership areas filled through the ELC Cooperative Agreement by state. These investments are strongly influenced by recipient need as reflected in their ELC application and by availability of funds. None of the recipients has support in all four leadership areas.

## Improving management of critical ELC resources

For more than 27 years, the **Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases (ELC) Cooperative Agreement**—and its 64-recipient state, large local, and U.S. territory and freely associated state health departments—have been critical to the nation's infectious disease infrastructure. CDC's ELC provides these recipients with financial and technical assistance to detect, prevent, and respond to emerging infectious diseases.

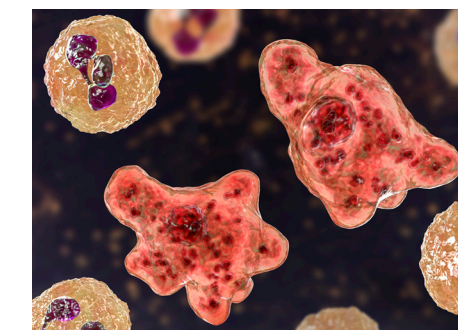
As the ELC cooperative agreement has grown so has the need for leadership and management in state and local health departments to support strategic planning and management. To address this need, ELC established the **Leadership, Management, and Administration** project in 2019, using NCEZID's Emerging Infectious Disease funding and the **Prevention and Public Health Fund**. With this project, the ELC is helping health departments create infectious disease leadership that drives infectious disease readiness and response across a broad range of threats. This includes engagement and coordination across laboratory, epidemiology, and health information systems.

During the COVID-19 pandemic, staff in these leadership roles managed unprecedented funding levels and transformed these resources into impactful public health actions. The project has grown to 75 whole or partial positions across 51 of ELC's 64 recipients. Expansion of this leadership project will help ensure all ELC recipients have the support needed to fortify U.S. health departments strategically and effectively.

## Rare brain-eating ameba may be moving north

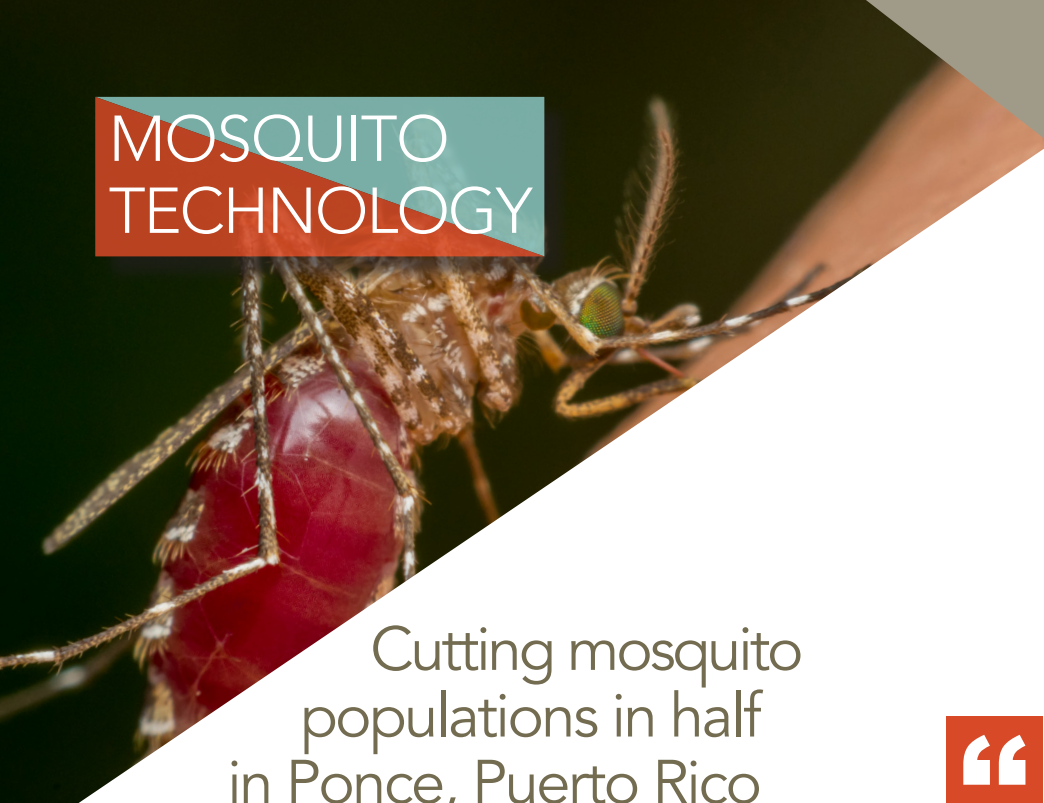
**Naegleria fowleri** is an ameba that can cause a devastating brain infection called primary amebic meningoencephalitis (PAM). It is more commonly known as the brain-eating ameba. Since 1962, CDC has received reports of 157 people diagnosed with PAM in the United States; only four of them survived. The ameba usually infects people when contaminated water (often warm fresh water) enters through their nose.

In 2022, three children died from PAM. One became ill after swimming at a state park lake in Iowa, one after swimming in a small river in northeast Nebraska, and the third after swimming in a lake in Arizona. Until recently, PAM cases mostly occurred in the southern United States. However, since 2010, infections have been reported from more northern locations, suggesting the geographic range of *Naegleria fowleri* is expanding. Rising temperatures may be contributing to this change, as the ameba prefer to live in warmer waters. Expansion of disease surveillance systems, such as those supported by NCEZID's emerging infectious disease programs, allows scientists to track dangerous infections like PAM and determine if they are increasing or changing due to our warming climate or other circumstances.



*Naegleria fowleri* is an ameba that lives in soil and warm fresh water, such as lakes, rivers, and hot springs.

# MOSQUITO TECHNOLOGY



## Cutting mosquito populations in half in Ponce, Puerto Rico

Long before Liliana Sánchez-González became a doctor, she got very sick with **dengue** when she was a teenager in Colombia. She was lucky to live through it and, years later, found purpose in caring for her own patients with dengue. But she never dreamed she would one day coordinate a project aimed at ending dengue at the source, by releasing mosquitoes infected with the **Wolbachia** bacteria to breed with and stop the local mosquitoes that spread dengue.

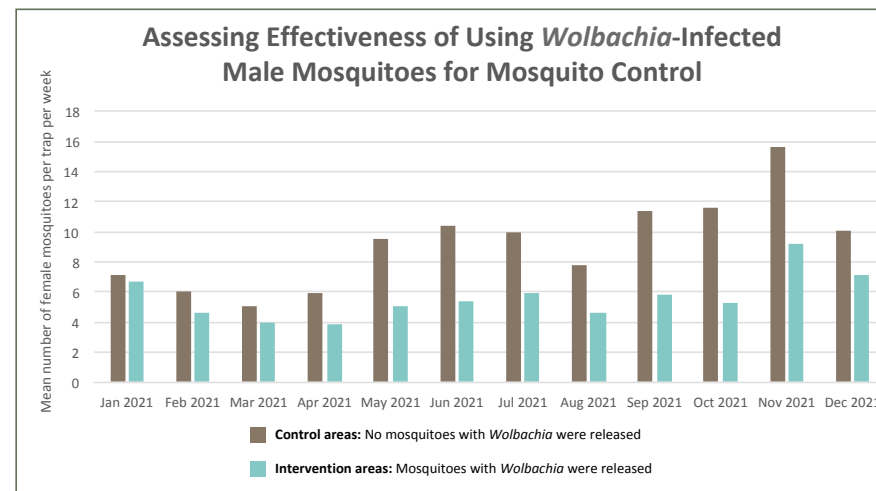
Liliana was the lead coordinator for **COPA (Communities Organized to Prevent Arboviruses)**, a collaboration with CDC's National Center for Emerging and Zoonotic Infectious Diseases, Ponce Health Science University, and the Puerto Rico Vector Control Unit. One of COPA's goals was to assess the effectiveness of emerging mosquito control methods, like releasing *Wolbachia*-infected mosquitoes into the environment. When male *Aedes aegypti* mosquitoes infected with *Wolbachia* are released and mate with wild female mosquitoes that do not have *Wolbachia*, the eggs will not hatch. This results in a reduction in the mosquito population.



**Liliana Sánchez-González, MD, MPH**  
COPA Lead Program Coordinator, CDC's NCEZID Division of Vector-Borne Diseases



*We worked with community promotores who had previously established relationships in the community. Gaining widespread buy-in and support meant that the community believed we had the best intentions of getting rid of dengue.*



During the year-long evaluation, the project achieved up to 50% reduction of the local mosquito population in some areas while maintaining high levels of community acceptance.

During the project, COPA staff released more than 90 million mosquitoes infected with *Wolbachia*. "The logistics would make you think it was an impossible task," said Liliana. "By working with *promotores* (community health workers) who had previously established relationships in the community, we made it happen."

Working collaboratively with and through community partners, such as **promotores**, is critical to cultivating community engagement and trust. It is also an effective way to mobilize resources, influence systems, improve public health programs, and ultimately improve the health of communities.

Preliminary analyses show local mosquito populations in some areas decreased by about 50%. "We had hoped to decrease mosquito populations more but are proud of this work and have learned that if we combine this method with other traditional mosquito control methods, we are likely to have even greater success," said Liliana.

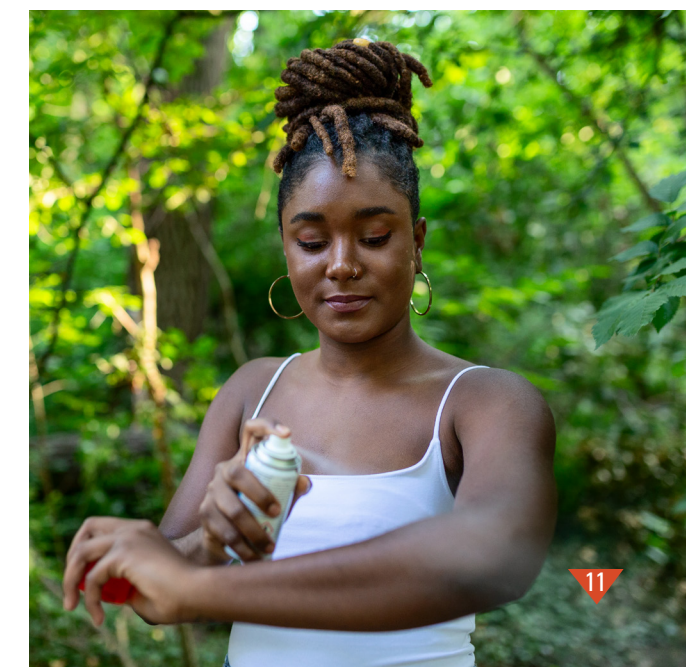
"Working on the *Wolbachia* release project positively impacted my career path," said Liliana. "I've never done this type of work before. On any given day, my work ranged from recruiting community participants to collecting data. Drawing on past experiences and learning new skills helped me grow as a researcher, clinician, and public health professional."

## WHAT'S NEXT

This project is a step into the future for mosquito control in Puerto Rico. CDC and its partners have learned more about mosquitoes in Puerto Rico and how to implement emerging control methods. The door is now open for continued mosquito control projects and opportunities to evaluate impact on human health and build on existing partnerships and community engagement.

## WHAT'S THE POINT?

Controlling mosquitoes and preventing the viruses they spread continue to challenge public health professionals. After releasing *Wolbachia*-infected mosquitoes, local mosquito populations decreased by about 50% in some areas. Community health workers were key partners who helped make it happen.



# ANTIMICROBIAL RESISTANCE



**Dawn Sievert, PhD, MS**, Senior Science Advisor for the Antimicrobial Resistance Coordination and Strategy Unit

## Going global: CDC launches novel antimicrobial resistance tracking network in 50 countries

By the start of 2022, we reached an incredible milestone—launching the **Global Antimicrobial Resistance Laboratory and Response Network (Global AR Lab & Response Network)**. This network takes a **One Health** approach and recognizes that resistant organisms can spread across continents through people, animals, and their shared environments. It aims to improve the detection of **antimicrobial-resistant threats** and prevent their spread globally. The network spans nearly 50 countries and works with more than 20 organizations worldwide to build laboratory capacity to detect antimicrobial-resistant organisms, prevent infections in healthcare and the community through proven practices, and apply innovative ways to respond to antimicrobial resistance threats.

Additionally, we work with partners to identify risk factors driving the emergence and spread of antimicrobial resistance, while providing support for on-the-ground response to antimicrobial resistance threats emerging across healthcare, sexually transmitted, fungal, enteric, and invasive bacterial and respiratory pathogens.

The Global AR Lab & Response Network builds on the success of CDC's domestic Antimicrobial Resistance Laboratory Network (AR Lab Network) by filling critical detection and response gaps around the world. The collaborative, expansive network will also inform global prevention strategies and grow our understanding of how antimicrobial resistance may impact or be impacted by important



*The successful U.S.-based AR Lab Network provided a critical foundation for the global network, including cultivating strong partnerships that ensure close coordination between CDC, health departments, laboratories, and other public health partners in the United States.”*

## CDC launches new global networks & research to save lives from antimicrobial resistance (AR) and other infectious disease threats



**\$22 million**  
invested from CDC

**50 countries** (shown in gold)

**2 new networks:**

CDC's Global Action in Healthcare Network (GAIHN)

CDC's Global Antimicrobial Resistance Lab & Response Network

**10 global AR innovation research projects**

**27 partners** collaborating to save lives



Learn more: [bit.ly/globalHAI-ARnetworks](https://bit.ly/globalHAI-ARnetworks)

## WHAT'S NEXT

CDC will expand ongoing work through the Global AR Lab & Response Network. However, sustained efforts are essential to ensure comprehensive implementation of a One Health response across this global program.

issues like climate change and social and health inequities. This ongoing and evolving work helps ensure antimicrobial resistance threats are stopped when and where they emerge, and it helps slow the spread of threats identified in CDC's **Antibiotic Resistance Threats in the United States, 2019 (2019 AR Threats Report)**.

As demonstrated in our new analysis, **COVID-19: U.S. Impact on Antimicrobial Resistance, Special Report 2022**, the COVID-19 pandemic created alarming setbacks in the fight against antimicrobial resistance. In the United States alone, the threat of resistant infections is not only still present but has worsened—with resistant hospital-onset infections and deaths both increasing at least 15% during 2020, the first year of the pandemic. Pandemic-related challenges weakened infection prevention and control practices in U.S. healthcare facilities, such as hand hygiene, cleaning equipment, separating patients, and using personal protective equipment. Although these findings are devastating, these setbacks can and must be temporary. The Global AR Lab & Response Network, plus our global innovation research, reflect CDC's commitment to transforming the way the world responds to antimicrobial resistance across One Health.

Through CDC's **Antimicrobial Resistance Solutions Initiative**, we continue to prioritize proven prevention activities and build on foundational investments globally. The pandemic has reminded us that prevention-focused efforts, such as the ones made by CDC to combat antimicrobial resistance, provide the foundational capacity to address new and unknown threats quickly, whether it's today or in the future.

### In the first year of the COVID-19 pandemic:

**↑ 15%**

Resistant infections & deaths increased 15% in hospitals in 2020

**~80%**

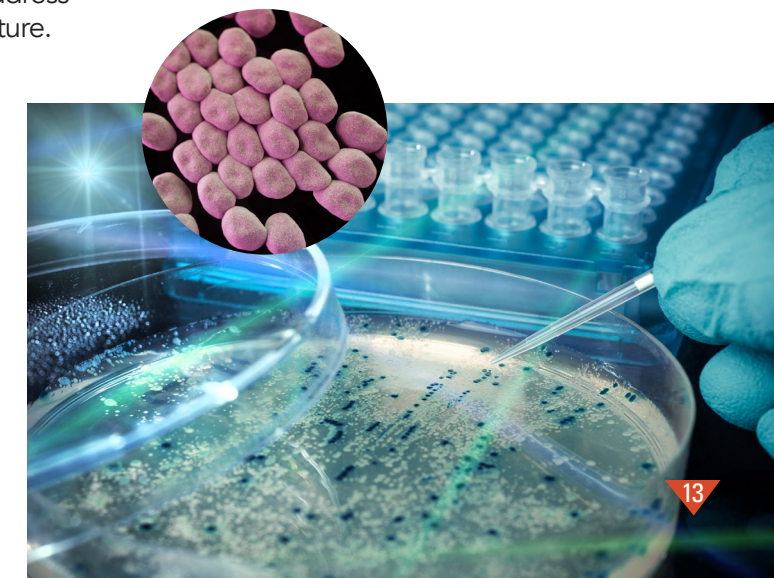
80% of patients hospitalized with COVID-19 received an antibiotic March-Oct. 2020, most were probably not needed



Delayed or unavailable data led to resistant infections spreading undetected & untreated

## WHAT'S THE POINT?

The Global AR Lab & Response Network helps fill critical gaps identified in CDC's 2019 AR Threats Report while meeting pivotal goals set in the **National Action Plan for Combating Antibiotic-Resistant Bacteria, 2020–2025**.



# ADVANCED MOLECULAR DETECTION



**Ellie Click, MD, PhD (CAPT, USPHS),**  
Lead for Extramural Innovation,  
Advanced Molecular Detection Program

## AMD: Translating genomic data into public health action

When new variants of SARS-CoV-2 (the virus that causes COVID-19) were first detected in 2020, scientists across the world turned to genomic sequencing to discover how variants might affect COVID-19 and countermeasures—like vaccines and therapeutics—being developed to combat it. The efforts to control the pandemic coupled with the increasing demand for other innovative solutions made possible by sequencing have spurred renewed interest in the role of pathogen genomics in public health.

For the past several years, NCEZID’s innovative and modernizing initiative, the **Advanced Molecular Detection (AMD) program**, has worked closely with CDC programs and state and local health departments to bring genomic sequencing of pathogens into routine use, identify and implement new genomic technology innovations, and transform infectious disease detection.

AMD has accelerated innovation and stakeholder partnerships in new ways—harnessing the collective efforts of public health and academic expertise to advance the application of genomics to better protect the health of all Americans.



*The collective response to COVID-19 fostered a huge amount of creativity and collaboration between academia and public health in pathogen genomics. The **Pathogen Genomics Centers of Excellence** will serve as a platform for ongoing partnership and innovation to inform how we tackle infectious disease threats.”*



In 2022, Rhode Island Gov. Dan McKee and state leaders broke ground for a state-of-the-art facility, which will include a dedicated genomics sequencing core laboratory. The facility is partially funded from CDC’s AMD Program via the **Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases (ELC) Cooperative Agreement**.

In 2022, CDC launched the Pathogen Genomics Centers of Excellence (PGCoE) network to build on AMD’s foundational work translating genomic data into action. The PGCoE network expands and deepens collaboration between U.S. public health agencies and universities and will serve as an important model to foster innovation and technical capacity in pathogen genomics. Ultimately, this network will improve the nation’s public health system so it can detect and respond to urgent infectious disease threats with flexibility and resilience. The PGCoE network will expand capacity and integrate practical advances in laboratory technologies, scientific computing, and applied research into public health agencies around the country.

The PGCoE network will develop useful new tools and practices to immediately address public health department priorities. The network will also provide much-needed support for developing a robust public health workforce with expertise in genomics applications, including bioinformaticians, microbiologists, and epidemiologists.

CDC and academic partners have mobilized scientific resources and built collaborative partnerships in other ways, too, such as supporting **Broad Agency Announcement innovation contracts** and developing the **Sequencing for Public Health Emergency Response, Epidemiology, and Surveillance (SPHERES) consortium**. These partnerships have already been leveraged for infectious disease response efforts beyond COVID-19, such as mpox. Looking ahead, the Pathogen Genomics network will build on collaborations to fuel cutting-edge innovations in genomic epidemiology for SARS-CoV-2 and other pathogens of public health concern.

### WHAT'S THE POINT?

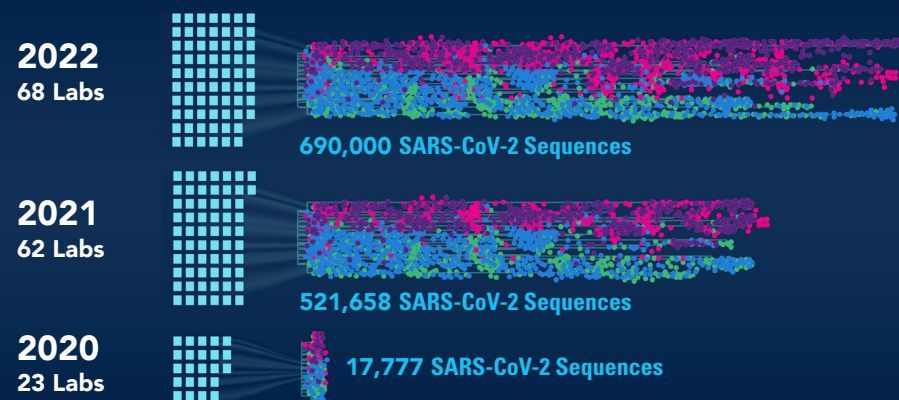
AMD supports state, local, and academic partners in the innovation and application of pathogen genomics to produce actionable sequence data and improve the health of all Americans.



### WHAT'S NEXT

With accelerating interest in the role of pathogen genomics for infectious disease investigation and response, AMD is rapidly expanding education, innovation, and bioinformatics efforts to help the public health workforce meet these new demands.

### SARS-CoV-2 Sequencing Activity in U.S. Public Health Laboratories, 2020-2022





# WASTEWATER SURVEILLANCE



## Wasting no time: CDC adapts wastewater surveillance to stay vigilant for emerging threats

The COVID-19 pandemic made the value of sewage clear. For epidemiologists, CDC's **National Wastewater Surveillance System** (NWSS) provides invaluable insights by helping identify community infection trends before they appear in clinical cases. In 2022, NWSS enhanced detection of **SARS-CoV-2** and its variants. But perhaps equally critical were efforts to adapt **wastewater surveillance** for other emerging infectious disease challenges.

CDC's National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) launched NWSS in September 2020 to track the presence of **SARS-CoV-2 in community-level wastewater samples** collected from sewersheds across the United States. Building on initial investments, CDC worked with public health, utility, private sector, academic, and federal partners to track SARS-CoV-2 and scale the surveillance system to include an estimated 1,200 testing sites across the United States, including in territories and on tribal lands.



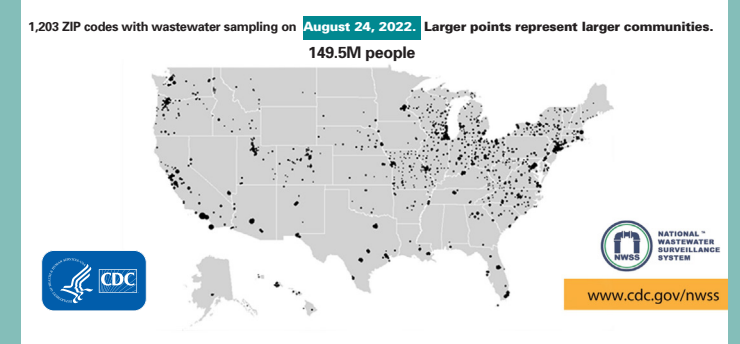
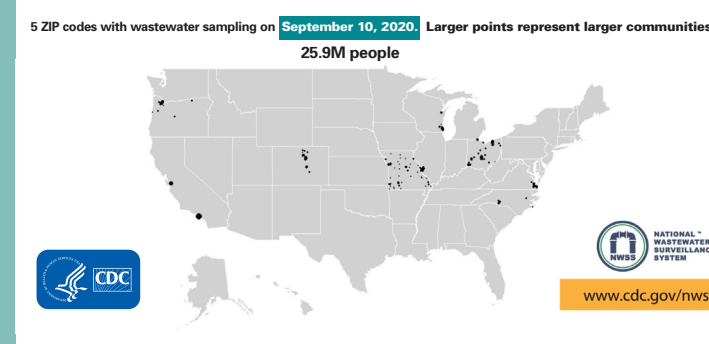
**Amy Kirby, PhD, MPH,**  
National Wastewater Surveillance System  
Team Lead for CDC's NCEZID Waterborne  
Disease Prevention Branch, Division of Foodborne,  
Waterborne, and Environmental Diseases



*One of the strengths of wastewater surveillance is that it is very flexible. We've structured the NWSS platform to rapidly adapt to changing public health needs. As new needs arise, we are prepared to test, adapt, and expand on the strong foundation we've built."*



## BUILDING NATIONAL WASTEWATER SURVEILLANCE



Since 2020, hundreds of communities have started reporting wastewater data to CDC's National Wastewater Surveillance System to track COVID-19.

The system analyzed over 90,000 community-level samples from wastewater systems that serve more than 2 in 5 people in the United States (nearly 150 million people). Many public health agencies used these surveillance data to detect early evidence of SARS-CoV-2 variants in community wastewater. In fact, wastewater surveillance programs in California, Colorado, New York City, and Houston, Texas, were among the first to identify the Omicron variant. Wastewater test results combined with other surveillance efforts helped guide public health decisions.

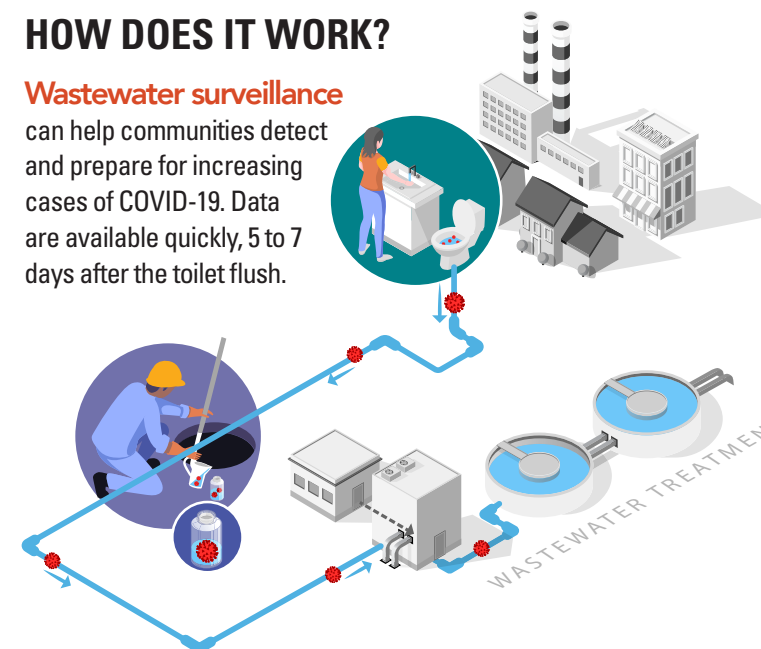
In fall 2022, NWSS incorporated **mpox** testing into the existing surveillance network and has been providing data to health departments through CDC's Data Collation and Integration for Public Health Event Response (DCIPHER) platform. Signals of mpox virus in community wastewater helped public health officials better understand the extent of the mpox outbreak and monitor the impact of large public events on local spread.

CDC and public health partners have been exploring ways to use NWSS to better respond to other threats detectable in wastewater, such as **antimicrobial-resistant pathogens**; foodborne pathogens like **E. coli**; respiratory viruses like influenza; and emerging pathogens like **Candida auris**. For example, in fall 2022, NWSS began supporting poliovirus testing in strategic sites as part of CDC's New York State Polio Response, although poliovirus wastewater surveillance is currently not part of routine NWSS testing.

Wastewater surveillance is not only a valuable tool to guide public health decisions. It also offers an opportunity to better identify and address health inequities through efficient, non-invasive sampling that could support historically marginalized communities, including those with limited access to services. Expansion of NWSS capabilities, participation, and strengthened relationships with **wastewater partners** will help prepare communities to detect and track disease threats now and in years to come.

### Wastewater Surveillance HOW DOES IT WORK?

**Wastewater surveillance** can help communities detect and prepare for increasing cases of COVID-19. Data are available quickly, 5 to 7 days after the toilet flush.



### WHAT'S NEXT

CDC is exploring the possibility and benefit of monitoring for other health threats detectable in wastewater, including antimicrobial-resistant pathogens, **Shiga toxin-producing E. coli**, **norovirus**, and influenza. Early detection and infection prevention and control measures are critical to prevent extensive transmission.

### WHAT'S THE POINT?

Wastewater surveillance provides a wealth of powerful data that could signal an important early warning of emerging infectious disease threats.



**Arjun Srinivasan, MD (CAPT, USPHS)**  
Deputy Director for Program Improvement,  
Division of Healthcare Quality Promotion

## National Healthcare Safety Network: The nation's watchdog for healthcare safety

Over the years, we have made great progress increasing the use of the **National Healthcare Safety Network (NHSN)** across most healthcare facilities, including hospitals, nursing homes, dialysis facilities, and ambulatory surgical centers. NHSN is the nation's tracking and response system that identifies emerging and enduring threats across healthcare facilities, including **healthcare-associated infections (HAIs)**, **antimicrobial-resistant (AR) infections**, antibiotic use, and emerging diseases like COVID-19. NHSN allows healthcare facilities to track important measures, such as how many healthcare staff have gotten flu shots and how well facilities are controlling infections. In January 2022, CDC achieved an incredible milestone of enrolling more than 38,000 U.S. healthcare facilities.

NHSN has allowed us to further drive quality improvement and enhance patient safety by enabling healthcare facilities and health departments to track, report, assess gaps, and take actions to address a range of urgent health threats. Federal partners, such as the Centers for Medicare and Medicaid Services (CMS), rely on NHSN data as they perform their regulatory functions. NHSN is also a best buy, saving millions of dollars in annual CMS payments. HAIs are often preventable and cost billions of dollars in annual healthcare expenses. Using NHSN data to drive healthcare improvement efforts ultimately saves money and lives.



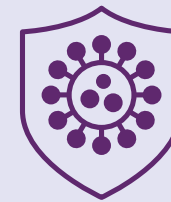
*NHSN is a best buy for public health, healthcare improvement, and emergency response. NHSN data-driven quality improvement efforts have saved millions of dollars in annual CMS payments and have reduced illness and mortality rates across healthcare settings each year. With NHSN data, we have reduced healthcare costs, improved healthcare quality, and saved lives.”*

The data have also been used to improve **healthcare quality** and address health and **healthcare inequities**. During the COVID-19 pandemic, for example, NHSN data helped ensure nursing homes received necessary vaccines and supplies and used prevention control measures. The Federal Office of Rural Health Policy uses this information to monitor the effectiveness of its Medicare Beneficiary Quality Improvement Program for critical access hospitals, which serves disproportionately affected populations in rural areas.

Unfortunately, NHSN data have also shown substantial increases in rates of HAIs and AR infections during the pandemic, reversing several years of steady progress. The pandemic pushed healthcare facilities, health departments, and communities to their breaking points—leading to increased antibiotic use and difficulty following infection prevention actions, resulting in more HAIs and AR infections in U.S. hospitals. We continue to work with partners to drive these infection rates back down to pre-pandemic levels. For example, one rural Georgia area recently experienced an unusual spike in **Candida auris (C. auris) infections**, a fungus often resistant to multiple antifungal drugs that causes outbreaks in healthcare settings. Using NHSN data, Georgia Department of Health staff compiled a list of healthcare facilities with the highest burden of C. auris cases. Georgia's HAI/AR Program contacted these facilities, confirmed the outbreak, and launched a response. Georgia tracked the success of their efforts by monitoring C. auris cases reported to NHSN. This response highlights how NHSN data can be used to quickly identify unusual increases in HAIs and AR infections, improve patient safety, and save lives.

### WHAT'S THE POINT?

Making healthcare safer starts with having reliable and robust data. NHSN data are key to reducing infections, monitoring healthcare system capacity, and stopping the spread of emerging and enduring threats.



**38,000+** facilities use NHSN to track and stop infections.



In 2020, CDC quickly **adapted NHSN** to track information for the U.S. COVID-19 pandemic response.



NHSN data have contributed to saving CMS millions of dollars in payments every year.



### WHAT'S NEXT

CDC will continue improving NHSN by automating reporting and supporting efforts to get actionable data faster. These improvements will allow NHSN to collect urgent data during emergency responses, better understand populations disproportionately affected by HAIs, and serve as a leading U.S. government national healthcare data hub.

# OUTBREAKS

## Leading multiple outbreak responses

Outbreak preparedness and response is one of several core functions CDC's National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) employs to protect the public's health. The center is uniquely equipped with hundreds of disease-specific, world-class experts; programs that crosscut all infectious diseases and agency responses; and extensive experience planning for and responding to infectious disease outbreaks in the United States and around the world, including outbreaks of **fungal meningitis**, **Zika**, and **Middle East respiratory syndrome (MERS)**. Three years into the COVID-19 pandemic, and during the emergence of the global mpox outbreak, NCEZID continues to serve an essential role, leading response efforts to outbreaks ranging from **Salmonella** infections to **Ebola**.



The investigation of a *Salmonella* outbreak that sickened people in 17 states resulted in the manufacturer recalling 49 peanut butter products, with another 21 recalls from companies that made products with the peanut butter.

## Outbreak of *Salmonella* infections quickly linked to peanut butter

CDC, several states, and the U.S. Food and Drug Administration (FDA) investigated an outbreak of **21 *Salmonella* infections in 17 states linked to peanut butter**. In just 8 days, quick collaboration by investigators confirmed peanut butter as the source through interviews with people who were sick and sophisticated **whole genome sequencing (WGS)** analysis, including analysis of a 2010 FDA sample from a peanut butter manufacturing facility. Swift identification of peanut butter as the source prevented additional illnesses and limited the impact of the outbreak. WGS continues to be a revolutionary tool helping disease detectives find and solve outbreaks.

Peanut butter was contaminated with the bacteria *Salmonella*.

## Preventing Ebola requires adding new tools to tried-and-true approaches

Back-to-back Ebola outbreaks—seven during the past 5 years with little reprieve between them—continue to spur NCEZID staff to action. Ongoing efforts aim to enhance lab capacity in affected countries, conduct trainings to sharpen disease detection skills among local public health workers, and partner with local organizations on culturally appropriate, community-based strategies for risk communication and community engagement.

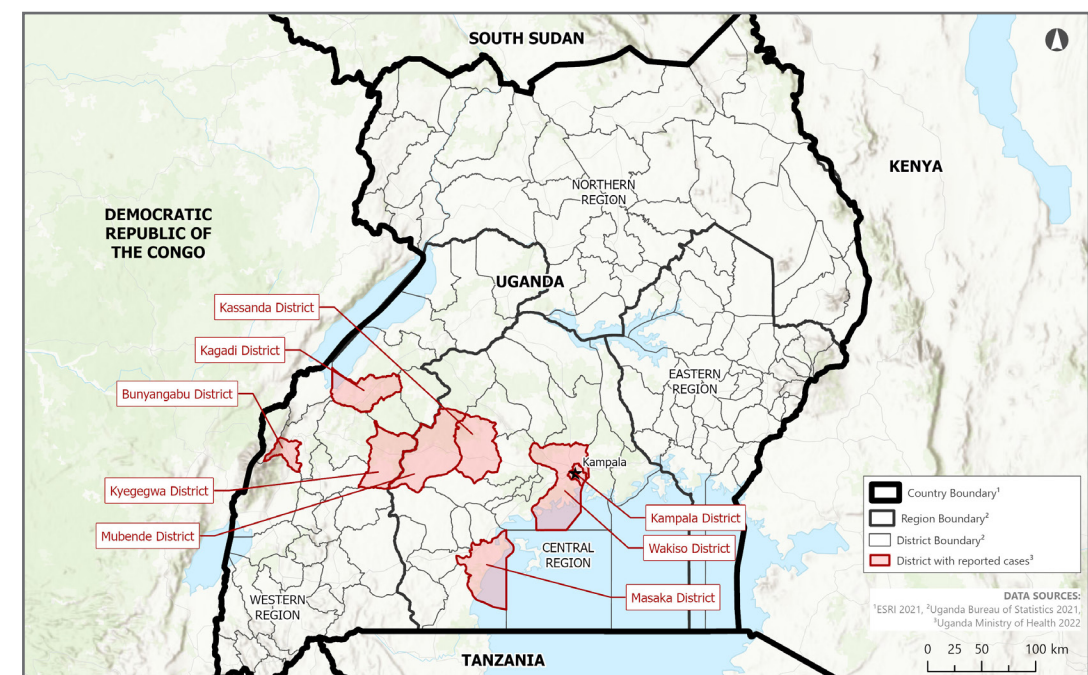
But as Ebola outbreaks continue to emerge, including the most **recent outbreak caused by Sudan virus in Uganda**, there is growing recognition that additional approaches are needed. In 2022, NCEZID launched a multicountry response effort that included blood sample testing (serosurveys), vaccine studies, and follow-up investigations of people who recovered from Ebola (survivor studies). Incorporating these newer tools, while continuing to bolster lab capacity and train local public health workers, will help us learn about the long-term effects of Ebola. It will also help us determine how long the **Ebola vaccine** provides protection, determine the potential for mild or asymptomatic infection, and understand causes of relapse in people who previously recovered from Ebola.



CDC microbiologist Sheny Morales-Betoulle (left) provides instructions before deactivating blood samples for Ebola antibody testing in Goma's BSL3 (Biosafety) lab in the Democratic Republic of the Congo.

There is no single solution to controlling Ebola outbreaks. Quickly detecting and mitigating future outbreaks requires a commitment to interdisciplinary and novel approaches. Training and engaging laboratorians, epidemiologists, health educators, and communicators early is a critical priority to mitigate the effects of such frequent Ebola outbreaks.

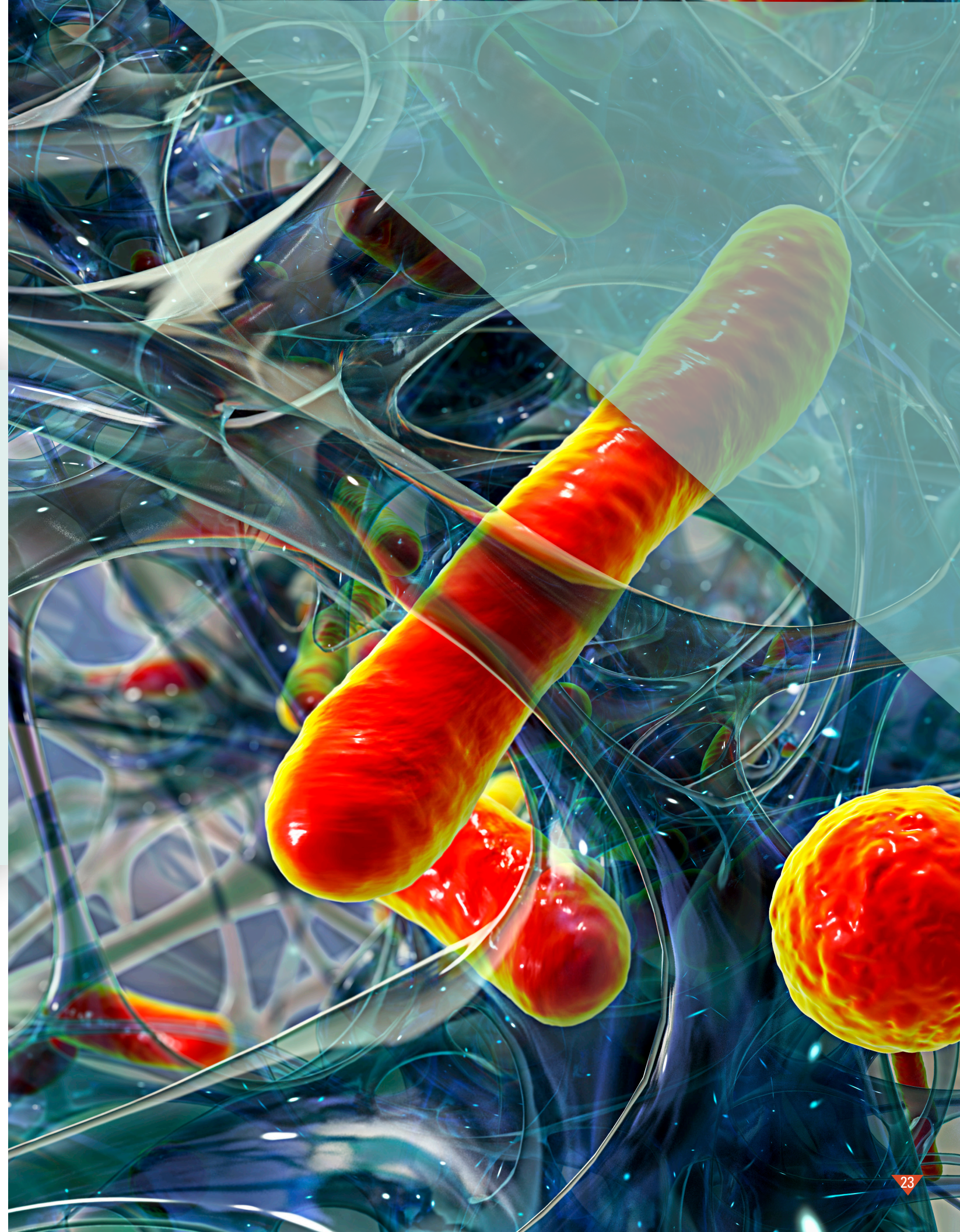
## Uganda: Ebola Virus Disease Outbreak 2022



## Our vision for health equity

We at the National Center for Emerging and Zoonotic Infectious Diseases envision a world where all people achieve their full potential for health and wellbeing, free of inequitable risks and outcomes of emerging and zoonotic infectious diseases.

We are committed to understanding, preventing, and eliminating inequities associated with emerging and zoonotic infectious diseases. We collaborate with state, tribal, local, and territorial public health agencies, communities and community-based organizations, healthcare systems and providers, and other partners to address health inequities. Together, we can and must protect the health of all people and all communities to ensure everyone has a fair and just opportunity to thrive.



[www.cdc.gov/ncezid](http://www.cdc.gov/ncezid)

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*CDC's National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) protects people from domestic and global public health threats. NCEZID helps lead efforts across CDC to prepare for and respond to infectious disease outbreaks.*