



PREVENTING INFECTIONS · PROTECTING PEOPLE · RESPONDING TO THREATS · SAVING LIVES

NATIONAL CENTER FOR PREPAREDNESS, DETECTION, AND CONTROL OF INFECTIOUS DISEASES





We envision a world where...

...People know how to protect themselves and others from infectious diseases, whether at home, work, school, or play.

...Patients and staff are safe from the spread of infections in hospitals, nursing homes, outpatient centers, and other healthcare facilities.

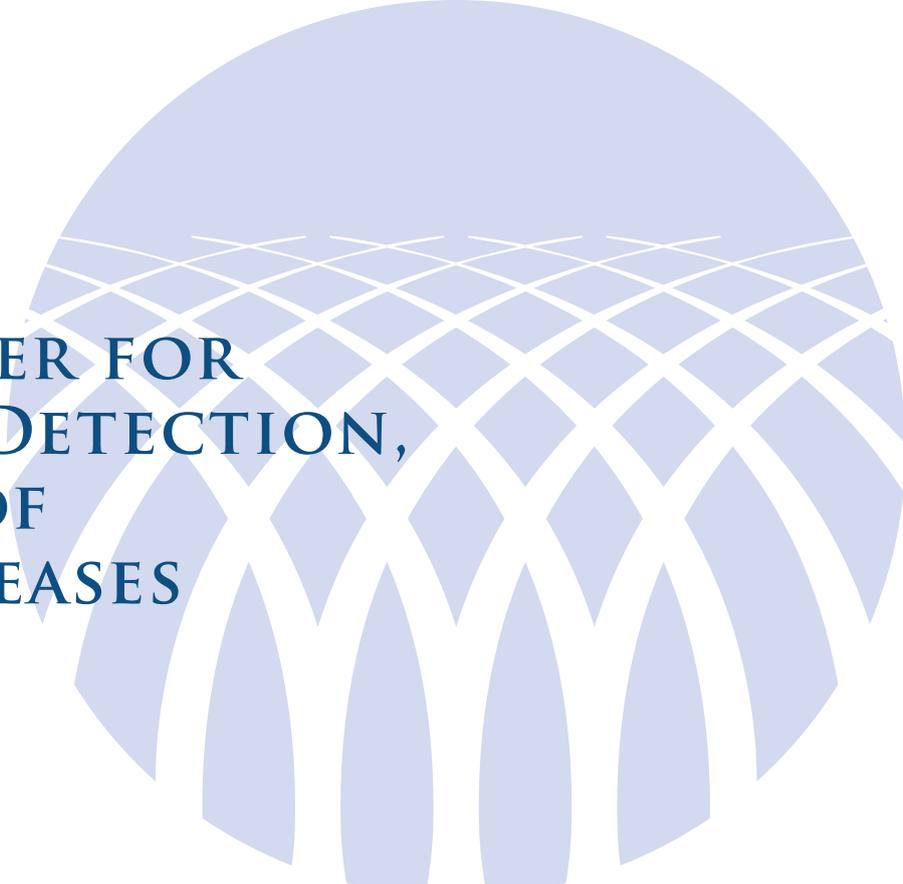
...Communicable diseases are detected and contained before they cross international borders.

...Health departments, hospitals, laboratories, and other partners work closely together to gather and share data, identify health problems early, and take swift action to prevent infections.

...CDC and its partners are prepared to respond quickly and effectively to emergencies, whether from natural causes, accidents, or bioterrorism.

...Laboratories around the globe produce fast, reliable test results to identify infectious diseases so that outbreaks can be contained and patients can promptly get the treatment they need.

...CDC and its partners use science and cutting-edge technology to learn more about infectious diseases and ways to prevent them from spreading.



NATIONAL CENTER FOR PREPAREDNESS, DETECTION, AND CONTROL OF INFECTIOUS DISEASES

We provide leadership and bring many partners together to protect the world from infectious diseases. Our aim is to detect, prevent, and control infectious diseases from spreading, whether they are naturally occurring, unintentional, or the result of terrorism.

We achieve this by working here and abroad to establish safe and high-quality healthcare, laboratory services, surveillance systems, and networks that share vital information about infectious diseases. We focus on

- **Specific populations**, such as immigrants, refugees, travelers, patients, and healthcare providers.
 - **Specific places**, including U.S. and international borders and places where newly emerging diseases threaten the world population's health.
 - **Specific settings**, such as laboratories, hospitals, outpatient clinics, nursing homes, dialysis centers, and other healthcare settings.
-

*We collaborate with many of the centers at CDC.
As you read this report, you will see examples of
how our activities support CDC's goals and efforts
to make good health available to all people.*



Rima F. Khabbaz, MD, Director of the National Center for Preparedness, Detection, and Control of Infectious Diseases, attended the opening of the International Emerging Infections Program (IEIP) Egypt office in Cairo with the office's Director, Erica L. Dueger, PhD, DVM, and Co-Director, Mohamed Abukela, MD.



A Message from the Director

In this highly connected world, infectious diseases continue to present new challenges. We must be alert and prepared to detect these potentially infectious threats and respond as quickly and effectively as we can, whether these threats are natural, unintentional, or the result of bioterrorism. This requires flexible systems and skilled professionals working together to monitor and detect infectious diseases here and around the globe.

At the National Center for Preparedness, Detection, and Control of Infectious Diseases, we are dedicated to making the world a safer, healthier place from infectious disease threats. Our center's goals are directly aligned with CDC's broader goals:

- People Prepared for Emerging Health Threats.
- Healthy People in Healthy Places.
- Healthy People in a Healthy World.
- Healthy People in Every Stage of Life.

We achieve these goals by sharing our expertise and connecting many different partners. One of our greatest strengths is our diverse workforce. We are laboratorians and information technology experts. We are statisticians, health economists, veterinarians, and health communication experts. We are nurses, medical doctors, and epidemiologists in cities and remote villages. We are infection control practitioners. We are health officials keeping the nation's 20 quarantine stations on alert every minute of every day.

As you read the stories in this report, you will see how we and our partners strive to build a strong global network that is prepared for infectious disease threats today and in the future. In this interconnected world, these partnerships are vital to our health and safety.

A handwritten signature in black ink, appearing to read "Rima Khabbaz". The signature is fluid and cursive.

*Rima F. Khabbaz, MD
Director*

National Center for Preparedness, Detection, and Control of Infectious Diseases



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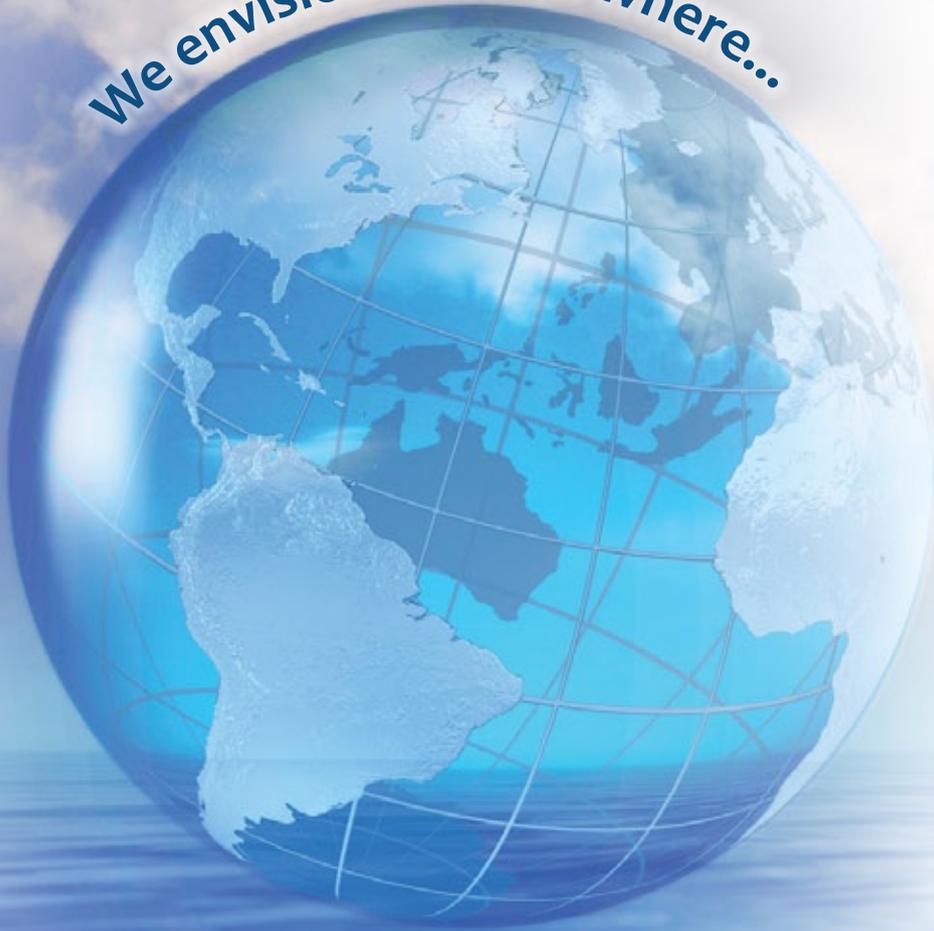
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Protecting People on the Home Front



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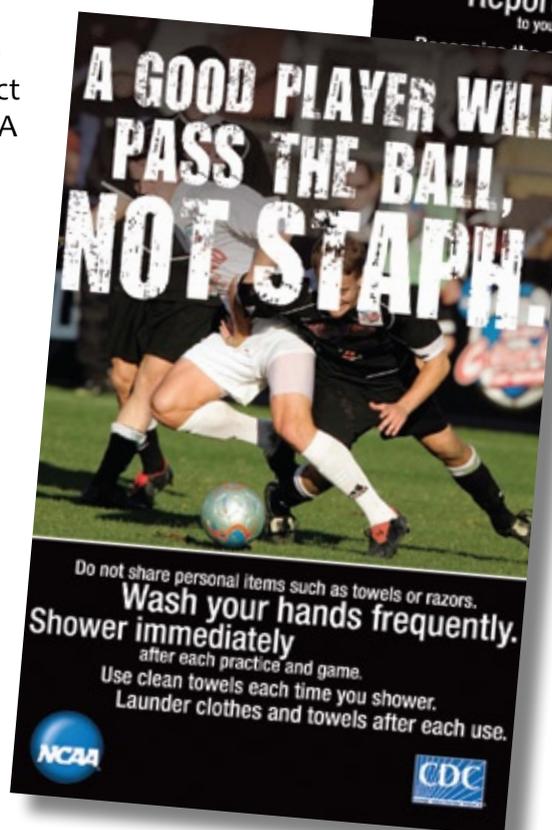
Protecting People on the Home Front

Stopping Staph in the Community

Drug-resistant *Staphylococcus* infections are a growing problem in U.S. communities, and often the culprit is methicillin-resistant *Staphylococcus aureus*—or **MRSA**. MRSA usually causes limited disease if it is caught and treated early. But if it's not treated properly, MRSA can spread, causing severe pneumonia or infection of the bloodstream or bones.

Most serious MRSA infections occur in hospitals and other healthcare settings. Each year, about 94,000 people develop these serious MRSA infections, and nearly 19,000 of them die as a result. More recently, MRSA infections began to appear as a cause of skin and other infections in the community. Since the emergence of MRSA in the community, the number of healthcare visits for skin infection has doubled. These infections are most likely to be spread in places where people are in close contact with others—for instance, schools and locker rooms where athletes might share razors or towels.

CDC works with many partners to teach people how they can protect themselves and others from MRSA in the community. For example, CDC and the **National Collegiate Athletic Association (NCAA)** produced a series of posters that offer practical tips on preventing skin infections to coaches, athletic trainers, and athletes. These posters emphasize the need to wash hands often, shower after playing sports, and keep cuts clean and covered with a bandage. CDC also has designed posters discouraging people from sharing towels and other personal items. Educating the public about easy ways to prevent the spread of MRSA is a top priority at CDC.





A CHILD'S FIRST LINE OF DEFENSE
AGAINST MRSA:
A WELL-INFORMED MOM.

What are the signs and symptoms of an MRSA skin infection?

- MRSA and other staph skin infections appear as a bump or infected area on the skin that may be:
- > Red
 - > Swollen
 - > Painful
 - > Warm to the touch
 - > Full of pus or other drainage
 - > Accompanied by a fever

MRSA is methicillin-resistant *Staphylococcus aureus*, a potentially dangerous type of staph bacteria that is resistant to certain antibiotics and may cause skin and other infections. Staph, including MRSA, is usually spread by having direct contact with someone else's infected area. When treated early, MRSA skin infections usually get better.

To protect yourself and your family from MRSA, keep hands and skin clean, cover cuts and scrapes, and avoid sharing personal items such as towels or razors.

If you or someone in your family experiences these signs and symptoms, cover the area with a bandage and contact your healthcare professional. This is especially important if MRSA signs and symptoms are accompanied by a fever.



For more information, please call 1-800-CDC-INFO or visit www.cdc.gov/MRSA.

Developed with support from the CDC Foundation through an educational grant from Pfizer Inc.



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Building Our Knowledge About Infections

CDC's efforts to prevent MRSA infections are based on good scientific evidence. As the following examples illustrate, we work with many partners to gather reliable data, conduct research, and spread the word about strategies that have been proven effective in preventing the spread of infections.

- CDC's **Active Bacterial Core surveillance (ABCs)** system of CDC's Emerging Infections Program collects data on serious MRSA infections in the general U.S. population. Since 2004, the ABCs system has monitored the occurrence of MRSA infections in nine states, where more than 16 million people reside.
- The **National Health and Nutrition Examination Survey (NHANES)** provides a snapshot of the health of the U.S. population through physical exams, clinical and laboratory tests, and personal interviews with about 7,000 people each year. By adding MRSA to NHANES, we estimate how commonly people in the United States are colonized with the bacteria (colonized means they have MRSA on one or more of their body sites, such as inside their nose, and yet they have no observable symptoms of infection).
- CDC is building a national library, called **PulseNet**, to identify the genetic patterns of different types of MRSA. This information is vital to efforts to develop more effective strategies to prevent the spread of MRSA infections.

Supporting Researchers and Laboratory Staff

- CDC leads national efforts to **investigate and control outbreaks** of staph infections while working closely with state and local health departments.
- CDC's **national reference laboratory for staphylococci** performs tests to confirm whether a strain of staph is susceptible or resistant to antimicrobials. The laboratory also evaluates toxins and conducts molecular typing for MRSA and other drug-resistant bacteria.
- By providing isolates to the **Network on Antimicrobial Resistance in *S. aureus***, CDC supports critical research of staph infections and antimicrobial resistance conducted by scientists worldwide.



In CDC's Staphylococcal Reference Laboratory, microbiologist Sigrid McAllister, MT (ASCP) (foreground) and Valerie Schoonover, a fellow working on CDC's Active Bacterial Core surveillance (ABCs) system, work on culture plates and prepare gel electrophoresis to characterize *Staphylococcus aureus* isolates.

Nearly 2 million people get infections while in U.S. hospitals each year. Almost 100,000 of them die as a result. Two common causes:

- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- *Clostridium difficile* (*C. diff*)

Giving Hospitals the Tools to Prevent Infections

Josh Nahum spent weeks in intensive care after he was injured in a skydiving accident. He was on the mend, but his recuperation was cut short by infections that he acquired while in the hospital. He died at age 27.

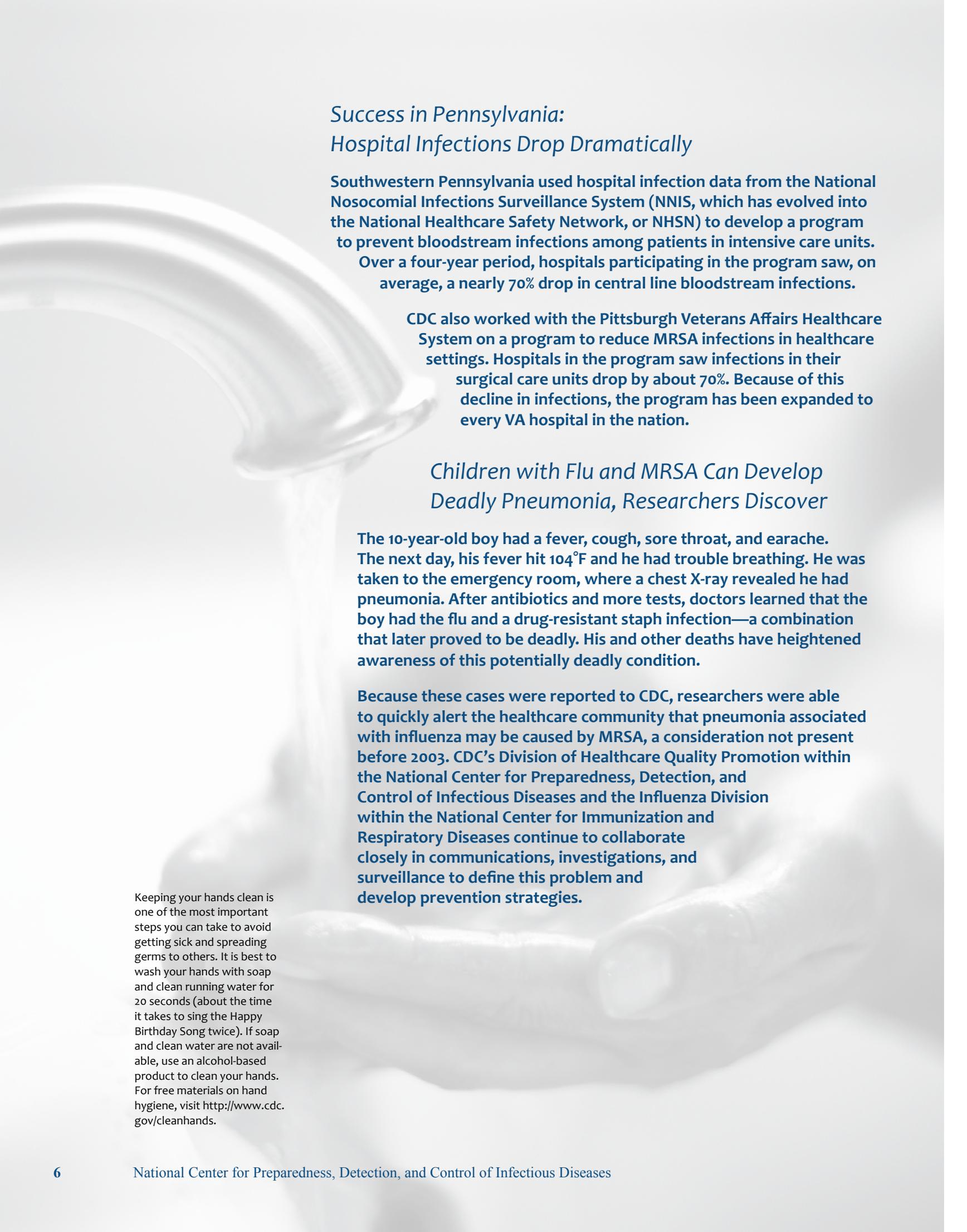
Armando and Victoria Nahum, Josh's father and stepmother, are determined to make sure that others know how to protect their loved ones from infections in the hospital. One of their most recent projects is a handwashing video that will play in thousands of patients' hospital rooms across the country. CDC health educators and scientists worked with the Nahums and the Association for Professionals in Infection Control and Epidemiology to develop the video, which encourages patients and their families to remind all visitors and staff entering a patient's room to wash their hands or use a hand sanitizer before touching or caring for the patient. This video was supported by the CDC Foundation through a donation from Kimberly-Clark Corporation.

CDC also oversees a national network that provides hospitals with vital information they can use to reduce infections. The **National Healthcare Safety Network** includes hospitals in 47 states that have volunteered to report to CDC any infections affecting their patients. In return, hospitals receive tools they can use to analyze their own infection data and then tailor their efforts to address the specific germs that are causing the infections. Hospitals that have joined the network have been able to reduce many types of drug-resistant infections.

CDC expects that many new hospitals will be joining the National Healthcare Safety Network as more states require hospitals to report their infection rates and more consumers demand this information. To handle the anticipated influx of new hospitals, CDC is updating the national network's Web-based reporting system and is providing more training and support to participating hospitals.



Armando Nahum (left) with son Josh, who died of infections he acquired while in a hospital. The Nahums are working with CDC to encourage hospital visitors and staff to wash their hands.



Success in Pennsylvania: Hospital Infections Drop Dramatically

Southwestern Pennsylvania used hospital infection data from the National Nosocomial Infections Surveillance System (NNIS, which has evolved into the National Healthcare Safety Network, or NHSN) to develop a program to prevent bloodstream infections among patients in intensive care units.

Over a four-year period, hospitals participating in the program saw, on average, a nearly 70% drop in central line bloodstream infections.

CDC also worked with the Pittsburgh Veterans Affairs Healthcare System on a program to reduce MRSA infections in healthcare settings. Hospitals in the program saw infections in their surgical care units drop by about 70%. Because of this decline in infections, the program has been expanded to every VA hospital in the nation.

Children with Flu and MRSA Can Develop Deadly Pneumonia, Researchers Discover

The 10-year-old boy had a fever, cough, sore throat, and earache. The next day, his fever hit 104°F and he had trouble breathing. He was taken to the emergency room, where a chest X-ray revealed he had pneumonia. After antibiotics and more tests, doctors learned that the boy had the flu and a drug-resistant staph infection—a combination that later proved to be deadly. His and other deaths have heightened awareness of this potentially deadly condition.

Because these cases were reported to CDC, researchers were able to quickly alert the healthcare community that pneumonia associated with influenza may be caused by MRSA, a consideration not present before 2003. CDC's Division of Healthcare Quality Promotion within the National Center for Preparedness, Detection, and Control of Infectious Diseases and the Influenza Division within the National Center for Immunization and Respiratory Diseases continue to collaborate closely in communications, investigations, and surveillance to define this problem and develop prevention strategies.

Keeping your hands clean is one of the most important steps you can take to avoid getting sick and spreading germs to others. It is best to wash your hands with soap and clean running water for 20 seconds (about the time it takes to sing the Happy Birthday Song twice). If soap and clean water are not available, use an alcohol-based product to clean your hands. For free materials on hand hygiene, visit <http://www.cdc.gov/cleanhands>.

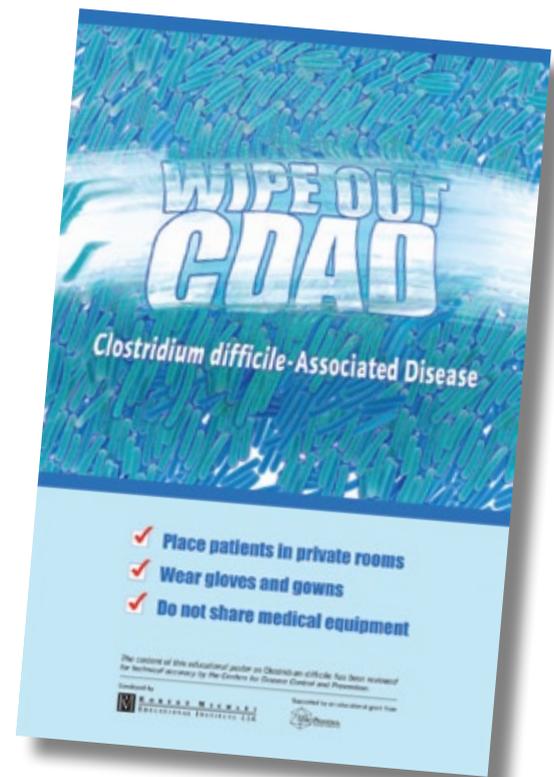
Clostridium difficile: A Sleeping Giant

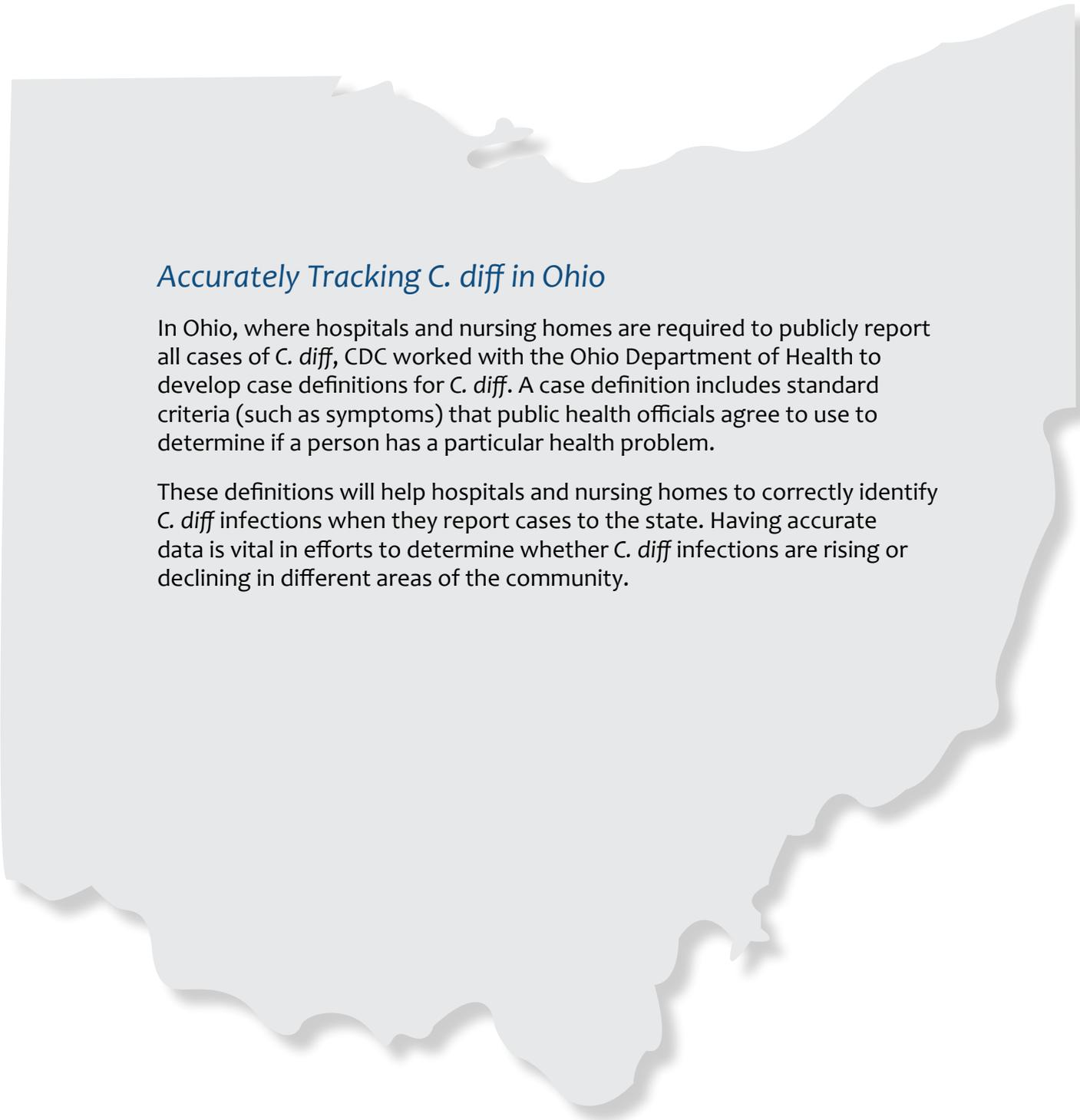
CDC also is working with hospitals to keep close watch over a toxic new strain of bacteria that can cause diarrhea and severe colitis. Just 10 years ago, this strain of *Clostridium difficile* (or *C. diff*) was rarely seen. Today, it has been found in many areas of the United States, Canada, and Western Europe. People who get *C. diff* infections are usually elderly and are taking antibiotics for another infection.

More hospitals are seeing an increase in patients with *C. diff* infections, and the infections they are seeing are more severe than in the past. *C. diff* is resistant to many of the antibiotics that doctors normally use to treat infections so physicians must prescribe special antibiotics that are known to be effective against the bacteria.

CDC works with public and private partners to develop materials to educate hospital staff about ways they can protect their patients from *C. diff* infections. For example, CDC provided technical expertise to the Robert Michael Education Institute, which developed a poster offering hospital staff tips on preventing the spread of infection.

In addition, CDC recommends that patients in hospitals and residents in nursing homes wash their hands often and avoid touching surfaces, especially in bathrooms. Patients and their families also should remind healthcare workers to clean their hands before and after caring for a patient or resident.





Accurately Tracking C. diff in Ohio

In Ohio, where hospitals and nursing homes are required to publicly report all cases of *C. diff*, CDC worked with the Ohio Department of Health to develop case definitions for *C. diff*. A case definition includes standard criteria (such as symptoms) that public health officials agree to use to determine if a person has a particular health problem.

These definitions will help hospitals and nursing homes to correctly identify *C. diff* infections when they report cases to the state. Having accurate data is vital in efforts to determine whether *C. diff* infections are rising or declining in different areas of the community.

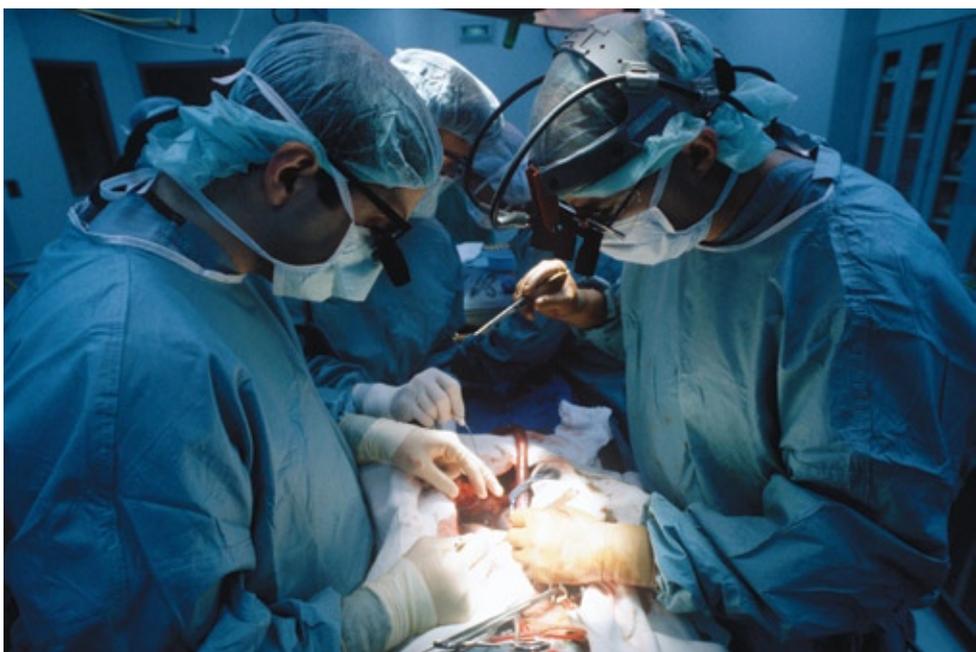
Safeguarding the Nation's Donor Blood, Tissue, and Organs

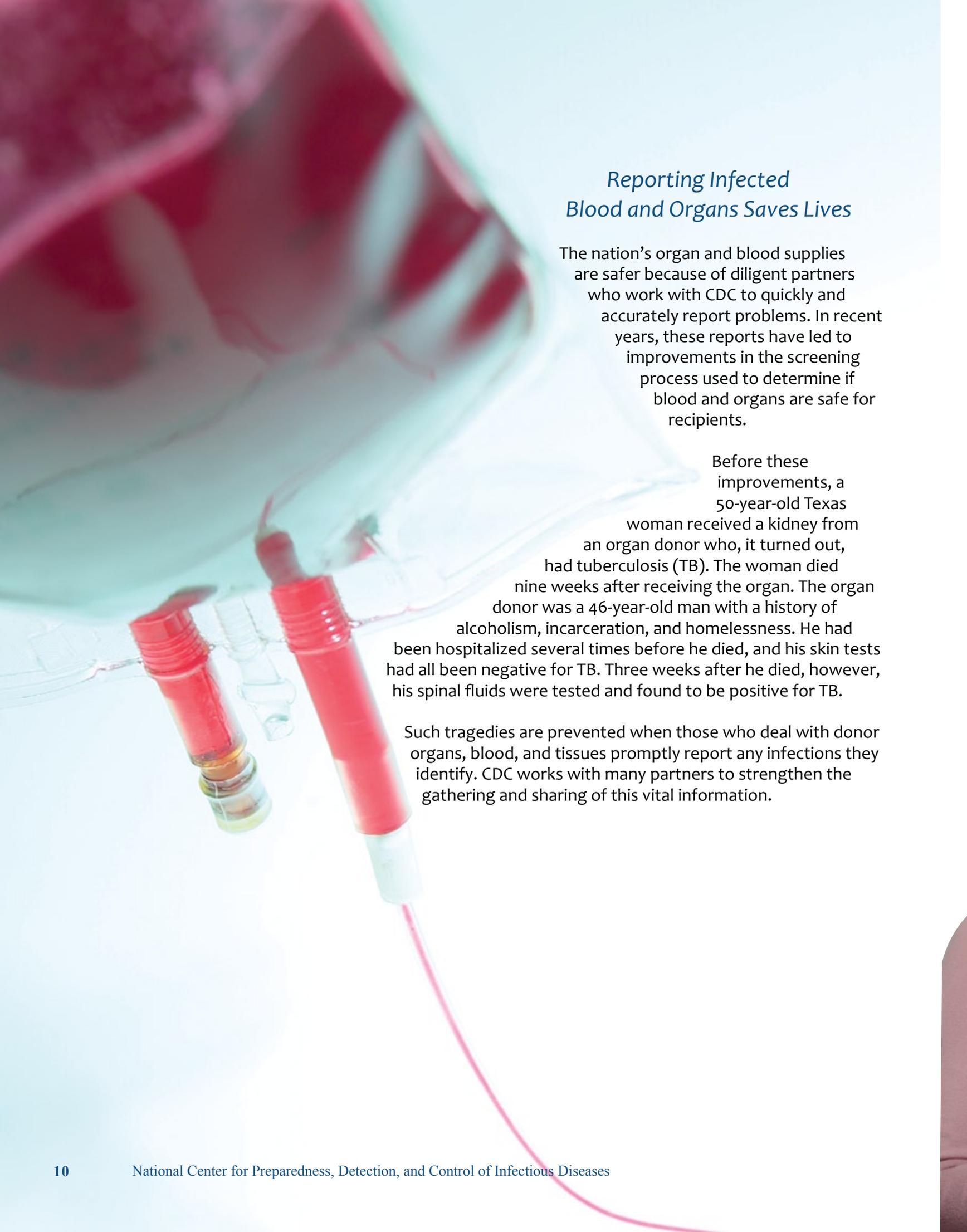
Almost 100,000 patients are on the transplant waiting list, and only 25,000 organs are available each year. Tissue use also has grown, with well over one million implants of musculoskeletal tissue alone being performed every year. Making sure that donor organs and tissues are free of infectious disease is challenging because most donors cannot answer questions about their health history. Adding to this challenge is the urgent need for donated organs.

Keeping track of these procedures is an enormous and costly task. All potential risks must be considered to make sure that transplant patients have the best possible chance for good health following the operation.

To improve the safety of organ transplants and blood transfusions, CDC works with private and public groups to ensure that problems are reported and acted on rapidly. For instance, CDC provided support to the **United Network for Organ Sharing** to develop a pilot surveillance system that will help doctors and hospitals quickly identify problems with donor organs so that quick action can be taken to safeguard organ recipients. Although still in the pilot phase, the **Transplantation Transmission Sentinel Network** is designed to be a secure Web-based registry and communications network that tracks data on tissues and organs and then links organizations providing organs and tissues, clinical centers, and regulatory and public health agencies.

CDC also is working with the **Food and Drug Administration (FDA)**, the **Health Resources and Services Administration**, the **Centers for Medicare and Medicaid Services**, and private-sector partners to create improved systems to monitor the safety of not only blood and organs but also tissues and cells. One component of this effort is a National Healthcare Safety Network hemovigilance module that will collect data on blood safety. This module will complement mandatory reporting systems used by FDA.





Reporting Infected Blood and Organs Saves Lives

The nation's organ and blood supplies are safer because of diligent partners who work with CDC to quickly and accurately report problems. In recent years, these reports have led to improvements in the screening process used to determine if blood and organs are safe for recipients.

Before these improvements, a 50-year-old Texas woman received a kidney from an organ donor who, it turned out, had tuberculosis (TB). The woman died nine weeks after receiving the organ. The organ donor was a 46-year-old man with a history of alcoholism, incarceration, and homelessness. He had been hospitalized several times before he died, and his skin tests had all been negative for TB. Three weeks after he died, however, his spinal fluids were tested and found to be positive for TB.

Such tragedies are prevented when those who deal with donor organs, blood, and tissues promptly report any infections they identify. CDC works with many partners to strengthen the gathering and sharing of this vital information.

Monitoring the Safety of Immunizations

CDC works closely with partners to ensure that the United States continues to have the safest, most effective vaccine supply. Serious vaccine side effects are rare and difficult to detect even with the well-designed large clinical trials that are conducted on vaccines before they are licensed. Therefore, monitoring adverse events after vaccines are licensed for use is essential. This rigorous monitoring is important for several reasons:

- **To detect rare reactions.** The most important reason to monitor the safety of immunizations is to detect rare reactions. Although vaccines are tested extensively before they are licensed for use in the United States, not enough people are included in the tests to detect reactions that happen only rarely. If serious reactions are found when the vaccine is in widespread use, the vaccine can be withdrawn.
- **To protect people in higher risk groups.** Monitoring the safety of immunizations also ensures that new vaccines are safe for groups such as the elderly, people with chronic medical conditions, and pregnant women. Vaccine trials might not include members of these groups.
- **To maintain public confidence in vaccines.** Monitoring immunization safety also helps to maintain the public's confidence in vaccines. Such confidence is essential to keep enough people vaccinated to prevent disease outbreaks.



Monitoring Safety

In the United States, we have an early warning system to detect problems that might be related to a vaccine. The **Vaccine Adverse Event Reporting System (VAERS)** is administered by CDC in collaboration with the U.S. Food and Drug Administration. Anyone can report a suspected problem to VAERS. Those who report a vaccine reaction to VAERS are asked if the reaction led to hospitalization, life-threatening illness, disability, or death. If the answer is yes, these events are classified as serious and are often subject to further study. Reports of adverse events after getting a vaccine can be submitted to VAERS by phone, online, or by mail.

How Do We Know If It's a True Reaction or a Coincidence?

Immunization safety cannot be measured directly. Instead, safety must be estimated by the number of adverse events that are reported. An adverse event is a problem that happens after a person is immunized and that is believed to have been caused by the vaccine. Adverse events can be—

- True reactions to the vaccine.
- Events that would have occurred even if the person had not been vaccinated (unrelated coincidences).
- Reactions related to mistakes in vaccine preparation, handling, or administration.
- Events that cannot be related directly to the vaccine; their cause is unknown.

A formal scientific study usually is required to distinguish between coincidences and true reactions. It is rarely possible to say for sure whether a vaccine caused a specific adverse event.

Another tool that CDC uses to monitor immunization safety is the **Vaccine Safety Datalink (VSD)** project, a collaboration between CDC's Immunization Safety Office and eight large managed care organizations. VSD project staff monitor the medical records of more than 5.5 million members of these managed care organizations to gather data about rare and serious adverse events. Scientists use this information to compare short- and long-term health problems between vaccinated and unvaccinated people. The VSD project complements VAERS by conducting near real-time surveillance of adverse events potentially associated with new vaccines or changes in immunization schedules.

CDC also works with other countries to strengthen the monitoring of immunizations. The **Brighton Collaboration** pairs CDC with scientists from 71 countries to develop standard case definitions for adverse events and guidelines for collecting, analyzing, and presenting data on adverse events. Standard case definitions and guidelines help to ensure that researchers can compare data on adverse events, including data from surveillance systems, clinical trials, and other studies.

Conducting Research

CDC supports research to help us better understand complex issues surrounding immunization safety. For example, the **Clinical Immunization Safety Assessment (CISA)** is a national network of six medical research centers with expertise in immunization safety. These centers conduct clinical research on health risks associated with vaccines. CISA studies adverse events, identifies risk factors (including genetic risk factors) associated with developing an adverse event, and develops guidance to help clinicians make decisions when assessing and managing these events.

Preparing for Emergencies

CDC also ensures that immunizations remain safe in case an emergency occurs and a mass vaccination campaign is needed. Emergency preparedness activities aim to protect the public's health in the event of a disease outbreak by working with federal partners, state and local health departments, and vaccine manufacturers to ensure that vaccines are produced, distributed, and administered safely and effectively under emergency conditions.

As new vaccines are developed, the list of recommended vaccines is expanded, and new global activities in immunization are launched, monitoring the safety of immunizations becomes even more important. Reporting systems and research projects such as these will continue to be used to monitor adverse events so that vaccines can continue to be held to very high standards of safety.



Protecting Healthcare Workers

Preventing the spread of infectious diseases to healthcare workers is an important part of infection control in hospitals, nursing homes, dialysis centers, urgent care centers, and other settings where patients receive care.

CDC recommends that hospitals and other facilities use several strategies to prevent the spread of infections to their employees:

- Develop general infection control programs that go beyond patient safety and also include strategies to protect staff.
- Give healthcare workers the information and tools they need to reduce their exposure to patients' blood so they can avoid diseases like hepatitis B, hepatitis C, and HIV infection.
- Help healthcare workers stay up to date on vaccines that can protect them from diseases they might be exposed to at work.

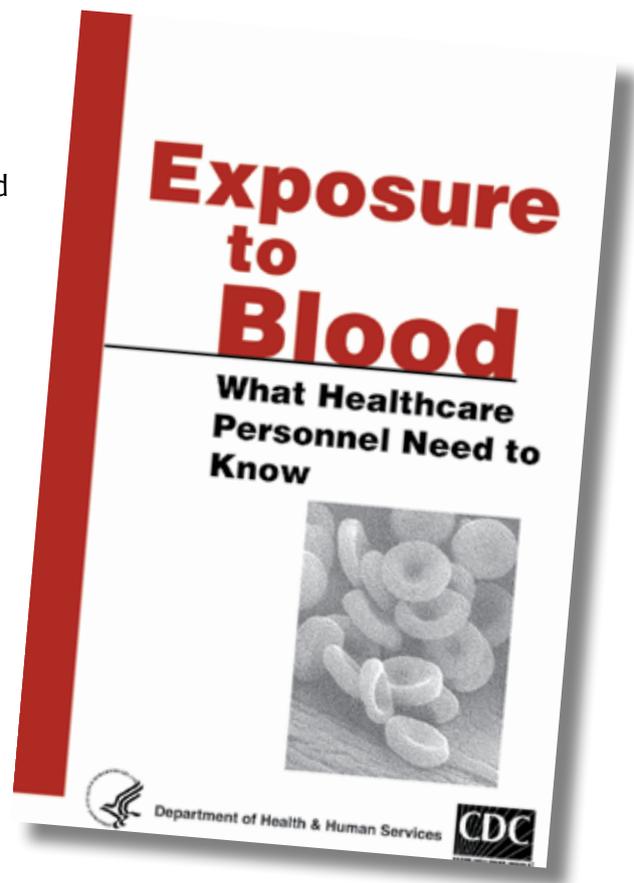


CDC also develops educational posters, brochures, and guidelines to help healthcare workers avoid infectious diseases. CDC receives guidance from the **Healthcare Infection Control Practices Advisory Committee (HICPAC)**, composed of experts in infection control who meet regularly to issue guidelines and advice on ways to prevent infections in healthcare facilities.

Recent HICPAC publications provide healthcare workers with guidance on tasks that are essential to their safety and the safety of patients.

For instance:

- Proper use of face masks, goggles, gowns, and gloves.
- How and why to keep hands clean.
- How to avoid needlesticks.
- How to safely wash soiled laundry and handle dishware for patients.
- Techniques for managing infections that are resistant to drugs.
- Ways to increase the number of employees who get flu shots.
- Proper ways of reporting infections that occur in hospitals and other healthcare settings.





Nurse Kim Boyd Hummel of CDC's Arctic Investigations Program travels to villages that can only be reached by plane, boat, or snow machine.

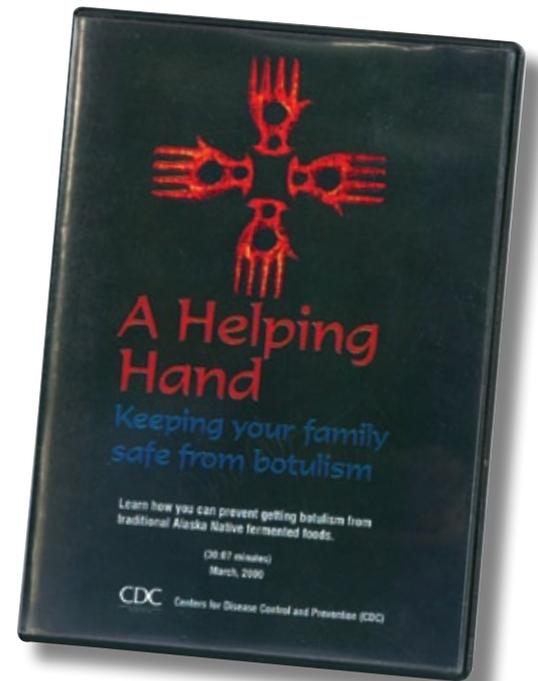
Respecting Native People's Culture

CDC strives to develop programs that are respectful of special populations and the environment in which they live. For example, in Alaska frigid weather and snow present unique challenges for CDC's **Arctic Investigations Program** staff members, who work with state and tribal health officials to study diseases such as pneumonia, bird flu, hepatitis, and foodborne illnesses as well as health problems resulting from climate change and pollution. They must travel to remote villages that can only be reached by airplane, boat, or snow machine. They also must reach out to diverse groups of Alaska Natives who speak more than 20 different languages and follow traditions that their ancestors have practiced for hundreds of years.

CDC employees are respectful of culture and tradition as they design programs to prevent the unique health problems affecting people living in polar climates. For instance, Alaska Natives suffer from an unusually high rate of foodborne botulism poisoning, in part because of their tradition of eating fermented foods. Among the traditional foods eaten by Alaska Natives are fermented salmon heads and beaver tail, or "stinky heads" and "stinky beaver tail," as they refer to them.

Traditionally, the heads and tails are buried in the ground and left to ferment for several weeks before they are eaten. But some Alaska Natives have started using nontraditional methods where they will seal the heads and tails in plastic bags or place them in buckets before burying them. These nontraditional methods are more likely to lead to botulism poisoning.

In response, the Arctic Investigations Program staff created an educational DVD, **A Helping Hand** (above), which shows how to safely prepare fermented foods using traditional methods: placing the food in holes that have been dug in the ground and lined with grasses. Because this method creates cooler temperatures and better air circulation around the food, bacteria are less likely to grow and cause illness.



Running Water is Vital to Alaska Natives' Health



Alaska Natives living in rural areas without running water have much higher rates of respiratory and skin infections than the rest of the U.S. population, according to a 2008 study by CDC. For infants in villages with the fewest homes with water service, the rate of hospitalizations for pneumonia was 11 times higher than for the general U.S. population. Young children and the elderly were most affected by the lack of running water in homes.

To improve the health of Alaska Natives, Congress passed a bill that reauthorizes grants of up to \$65 million a year to build water and wastewater systems in rural Alaska Native villages.

“Access to clean water for handwashing and hygiene is extremely important for preventing disease,” said study coauthor Thomas Hennessy, MD, director of CDC’s Arctic Investigations Program. “Without better access to in-home water for handwashing and hygiene, Alaska Natives will continue to face higher rates of largely preventable infections.”



Working in remote villages in Alaska is routine for nurse Helen Peters of CDC’s Arctic Investigations Program.



Preventing the Spread of Disease at U.S. Ports and Land Border Crossings



We envision a world where...



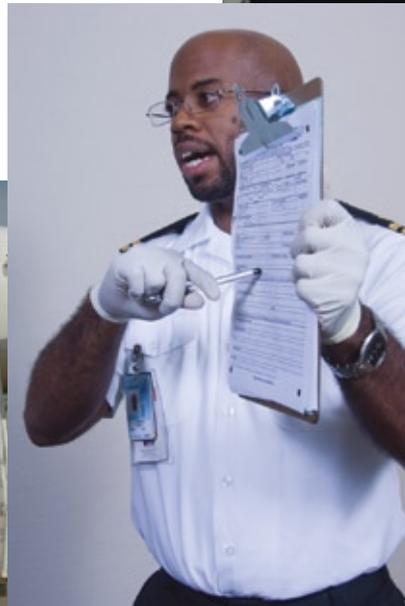
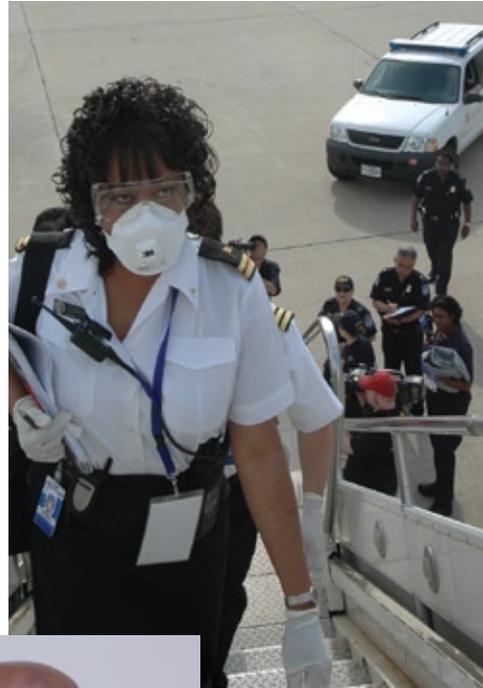
...**Communicable diseases** are detected and contained before they cross international borders.

Preventing the Spread of Disease at U.S. Ports and Land Border Crossings

CDC Quarantine Station Officers Help Protect Public Health

The United States has 20 quarantine stations at port cities and land border crossings where most international travelers arrive—more than double the number of stations in operation just a decade ago. These stations are operated by CDC and play a critical role in protecting public health. They are staffed with CDC quarantine medical and public health officers. These health officers decide whether ill persons can enter the United States and what measures should be taken to prevent the spread of **communicable diseases** (diseases that are contagious).

CDC quarantine station staff work closely with local and state health departments, U.S. Customs and Border Protection, Emergency Medical Service, airlines, and cruise lines to take fast action when public health risks are identified. CDC also trains Customs and Border Protection officers and others in airports and seaports to recognize any signs that a traveler may have a communicable disease, which could spread from person to person. These federal agents serve as extra eyes and ears for staff at quarantine stations.



CDC quarantine staff promptly respond to reports of illness on incoming flights and vessels. They assess the ill passengers, inspect nonhuman primates and certain pets, and process people coming to live permanently in the United States.

CDC has 20 quarantine stations at major ports of entry and land border crossings into the United States. Each station is responsible for not only the port city where it is located, but also all of the air and sea ports and border crossings in its jurisdiction. The colored regions in this map show the different areas for which each quarantine station is responsible.



Quarantine Station Activities

At U.S. ports of entry, CDC quarantine station staff—

- Respond to illnesses or deaths on airplanes, on maritime vessels, and at land border crossings.
- Perform passenger notification and contact tracing when a travel-related disease exposure occurs.
- Monitor health and collect medical information for immigrants and refugees.
- Distribute hard-to-find antitoxins and other drugs for emergency use to save lives.
- Inspect animals, cargo, and hand-carried items that pose a threat to human health.
- Provide guidance on border strategies to prevent, detect, and respond to a pandemic.
- Alert local health departments in the areas where refugees and immigrants resettle about any health issues that need follow up.
- Respond to mass migration emergencies.
- Plan and prepare for emergency response.
- Build partnerships for disease surveillance and control.

CDC Has Legal Authority

CDC has the legal authority to detain any person who may have an infectious disease that is specified by Executive Order to be quarantinable. If necessary, CDC can deny ill persons with these diseases entry to the United States. CDC also can have them admitted to a hospital or confined to a home for a certain amount of time to prevent the spread of disease.

By Executive Order of the President, federal isolation and quarantine are authorized for these communicable diseases:

- Cholera
- Diphtheria
- Infectious tuberculosis
- Plague
- Smallpox
- Yellow fever
- Viral hemorrhagic fevers
- SARS
- Flu that can cause a pandemic

The President can revise this list by Executive Order.



CDC Atlanta Quarantine Station staff work with other agencies during Operation Big Bird, a drill to test a joint-agency public health emergency response plan in real time for a traveler with avian flu. Operation Big Bird brought together local and state public health officials, airport officials, emergency medical services, CDC's Atlanta Quarantine Station staff, and Customs and Border Protection officers.

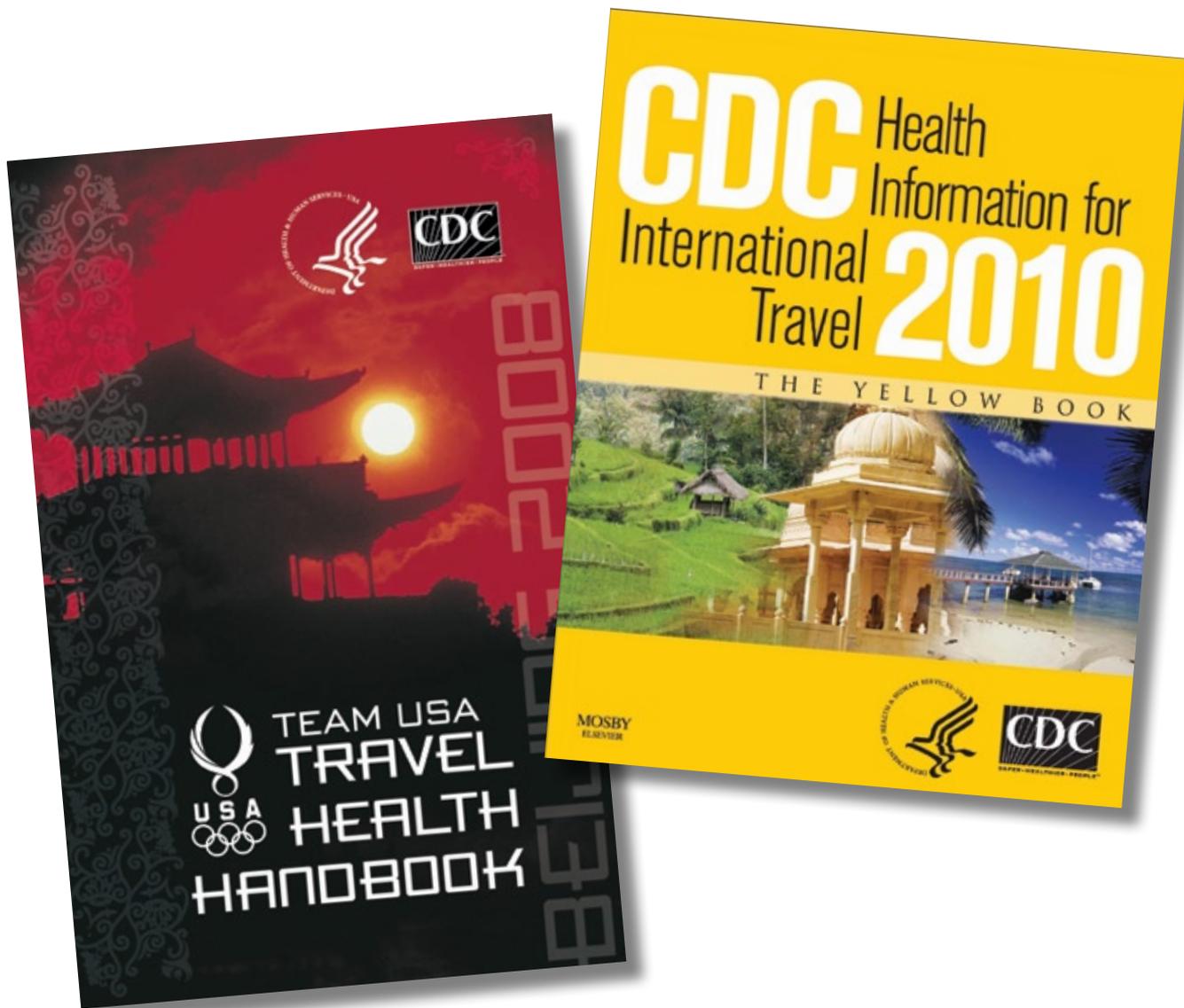
Isolation is used to separate *ill* people who have a communicable disease from those who are well. Separating and restricting the movement of ill people helps to stop the spread of certain diseases. For example, hospitals use isolation for patients with infectious tuberculosis.

Quarantine is used to separate and restrict the movement of *well* people who may have been exposed to a communicable disease to see if they become ill. These people may have been exposed to a disease and do not know it, or they may have the disease but do not show signs. Quarantine is also used to help limit the spread of communicable diseases.

Helping International Travelers Stay Healthy and Safe

For decades, people have relied on CDC for advice on how to stay healthy while traveling abroad. Two trusted resources are *Health Information for International Travel* (known as the *Yellow Book*, right) and the CDC *Travelers' Health Web site* (www.cdc.gov/travel). Travelers can select which country they plan to visit to get health information specific to their travel plans. CDC also issues online health advisories to keep travelers and their doctors abreast of current health risks around the world.





CDC works with colleagues around the world to keep health information for travelers current and relevant. For instance, CDC developed the **Team USA Travel Health Handbook** for U.S. Olympic and Paralympic athletes to advise them about ways to stay healthy and safe while competing in the 2008 Summer Games in China. CDC's **Yellow Book** provides healthcare professionals with information on advising patients about how to stay healthy and safe while traveling out of the country. This book and other helpful information for travelers and their doctors are available at the CDC **Travelers' Health Web site**: www.cdc.gov/travel.

Promoting the Health of Refugees Entering the United States

Their Health and Ours Are Intertwined

An estimated 50,000 to 70,000 refugees are resettled to the United States each year. These individuals can suffer from many health conditions— infectious diseases, malnutrition, and post-traumatic stress disorder caused by war to name a few. Such health conditions can make it hard for refugees to get settled in this country and can also place a strain on the health and social services in the communities where they live. Unfortunately, refugees are rarely checked for such conditions when they have the medical exams that are required before they can resettle in the United States.

Research shows that when refugees are checked for these health conditions and treated before they resettle, life is better for them and for our nation. Such steps often save money in the long run by preventing costly medical expenses later. In recent years, outbreaks of diseases among refugees have caused interruptions in resettlement and in rare cases allowed the spread of diseases to others in the United States. These conditions—such as measles, mumps, malaria, and intestinal parasites— all could have been prevented if the refugees had been screened and vaccinated before they resettled here.



Life is better for refugees and for the United States when refugees are checked for health conditions and treated before they resettle. Such steps often save money in the long run by preventing costly medical expenses later. CDC medical officer B.K. Kapella, MD, is providing public health training to local staff in a refugee camp in Thailand.

In response to this need, CDC developed the **Refugee Health Program**, which uses the required overseas medical exam as an opportunity to screen refugees for health problems when they are overseas, before they come to the United States. In each country, the screenings and treatments are tailored to meet the refugees' unique needs. By immunizing more than 50,000 refugees overseas, we would save about \$13 million, according to a recent CDC analysis that compared the cost of vaccinating refugees overseas versus after their arrival in the United States.

CDC has also developed guidelines to help health departments improve the health of refugees and a reporting system that allows the doctors conducting overseas medical exams to rapidly report information on diseases and health conditions to health departments in resettlement communities. This system makes it easy for health departments to provide refugees with the follow-up care they need after they arrive in the United States.



Outbreaks of diseases among refugees have caused interruptions in resettlement. At this refugee clinic in Thailand, directly observed therapy (DOT) is used to ensure that tuberculosis patients take their medication.



Preparing for Threats Today and Tomorrow

We envision a world where...



...Health departments, hospitals, laboratories, and other partners work closely together to gather and share data, identify health problems early, and take swift action to prevent infections.

...CDC and its partners are prepared to respond quickly and effectively to emergencies, whether from natural causes, accidents, or bioterrorism.

Preparing for Threats Today and Tomorrow

The Emerging Infections Program

Ten state health departments across the country and a host of partners work closely with CDC to assess how new and emerging infections in the United States are affecting people's health. As participants in CDC's **Emerging Infections Program (EIP)**, these partners also conduct surveillance and evaluation to find the best ways to prevent these new infections from spreading in the U.S. population.

Each state's EIP program is coordinated by a state health department and an academic medical center in the state. In Tennessee, for example, the **Tennessee State Health Department** teams up with **Vanderbilt University**. In Connecticut, the **Connecticut State Health Department**, **Yale University**, and the **University of Connecticut** are partners. Professors and researchers collaborate to collect data on new infectious diseases, evaluate activities to prevent the spread of emerging infectious diseases, and provide vital information needed to develop new policies to protect the public from emerging infectious diseases.

To protect the U.S. public from infectious diseases, CDC's domestic Emerging Infections Program pulls together many partners:

- State and local health departments
- Universities, teaching hospitals, and medical centers
- Laboratories
- Infection control practitioners
- Healthcare providers
- Other federal agencies besides CDC

EIP Partnerships

State Health Departments:

California Department of Health Services

Colorado Dept. of Public Health & Environment

Connecticut Department of Public Health

Georgia Department of Human Resources

Maryland Dept. of Mental Health and Hygiene

Minnesota Department of Health

New Mexico Department of Health

New York State Department of Health

Oregon Department of Human Services

Tennessee Department of Health

Academic Institutions:

University of California Berkeley

University of California San Francisco

University of Colorado Health Sciences Ctr.

Yale University

University of Connecticut

Emory University

University of Georgia

Johns Hopkins University

University of Maryland

University of Minnesota

University of New Mexico

University of Rochester

Oregon Health Sciences University

Vanderbilt University

“ The EIP workforce is on the cutting edge, and people are eager to do things right and put data out in a way that the bigger picture can help drive policy so that we have a lasting effect on the nation’s public health. ”

James Hadler, MD, MPH
State Epidemiologist
and Chief, Section of
Infectious Diseases
Connecticut
Department of
Public Health
(1984 - 2008)

Over the years, the EIP network has played an important role in assessing public health practices and transferring what it has learned to the public health community. For example, the EIP **Active Bacterial Core surveillance (ABCs)** system conducts active laboratory-based surveillance for invasive diseases caused by emerging, vaccine-preventable, and drug-resistant bacterial pathogens such as *Streptococcus pneumoniae* (pneumococcus) and groups A and B streptococcus. The EIP ABCs system provided a crucial means for evaluating the impact of the 7-valent pneumococcal conjugate vaccine. EIP ABCs data also provided a basis for revising recommendations for the prevention of perinatal group B streptococcal (GBS) disease, an important cause of illness and death among newborns. The system continues to monitor GBS disease trends to help us understand the impact of the recommendations and detect any potential adverse events, such as an emergence of new patterns of antimicrobial resistance.

Tennessee EIP Asks: Does Vaccinating Children Against Flu Also Protect Adults in the Community?

The activities of each Emerging Infections Program go beyond the routine functions of health departments in ways that allow important questions to be answered—for instance, does vaccinating children against flu also offer some protection to adults in the community? In Tennessee, the EIP staff are working with the **Knox County Health Department** and vaccine manufacturer MedImmune on a campaign to vaccinate all schoolchildren in grades kindergarten–12 and all school staff against influenza. Students and employees in Knox County schools were offered free live attenuated influenza vaccine.

The campaign’s goal was to protect not only students and employees but also people in the community with whom they have contact. The program’s hypothesis was that protecting children from the flu also protects adults. **Vanderbilt University** is helping to evaluate the campaign and measure any benefits of high childhood vaccination rates.

The EIPs’ work “rises to the level of research because it is done with such rigor and innovation,” notes Dr. William Schaffner, an EIP collaborator and the Chair of the Department of Preventive Medicine at the Vanderbilt School of Medicine. The Tennessee EIP also has used the EIP surveillance network to study *Shigella*, drug-resistant staph, and other infections.

Preparing for a Flu Pandemic

Since 2004, more than 350 cases of humans infected with avian influenza A (H5N1) have been reported around the world, mainly in Asia. In some areas of the world, more than half of people who get H5N1 flu die. Because H5N1 flu has the potential to change and gain the ability to spread easily between people, CDC and its partners around the world have made it a top priority to monitor whether any cases of person-to-person transmission of H5N1 flu have occurred. Until recently, diagnosing H5N1 flu was difficult, time-consuming, and costly. A new rapid diagnostic test changed that.

CDC developed the rapid test and distributed it to Laboratory Response Network (LRN) laboratories across the country. Laboratories in the public health, veterinary, military, and federal sectors now have this highly reliable, low-cost test to detect H5N1 virus. As a result, the United States is better prepared to detect an influenza outbreak caused by H5N1.

Seasonal Flu

When people say they have “the flu,” they are most likely referring to **seasonal flu**—a respiratory illness that can be transmitted from person to person. A laboratory test is needed to confirm that a person’s illness is indeed the flu. Most people have some immunity to seasonal flu, and a vaccine is available every year.

Bird Flu

Bird flu (also known as avian influenza) is a type of flu that affects birds. Most forms of bird flu are mild, but some such as H5N1 can be deadly. H5N1 can spread from birds to humans and animals, but this does not happen often. Spread from birds to humans can occur when people have direct contact with sick or dead poultry or wild birds or when they visit a live poultry market.

H5N1 is a concern for humans because we have no natural immunity to this virus. Thankfully, the H5N1 flu strain cannot spread easily from person to person, but scientists are concerned that this could change. An H5N1 flu vaccine for humans is available, but supplies of the vaccine are limited.

Pandemic Flu

For the past 30 years, the world has been free of **pandemic flu**—a dangerous form of flu that spreads rapidly and causes high numbers of people to be ill. To be considered a pandemic, the flu would have to meet these criteria:

- It must be a new strain of flu that spreads easily from person to person.
- It must cause serious illness among people in different areas of the world.

Over the past century, flu pandemics occurred in 1918, 1958, and 1968. Since the mid-1970s, there have been threats of flu pandemics, but the disease has not developed into a pandemic. Today, scientists worldwide remain vigilant to detect any threats of dangerous flu so that they can take swift action to stop a pandemic. The deadly H5N1 bird flu is at the top of their list of concerns.

Health and Law Enforcement: Acting as a Team

Public health and law enforcement agencies each have different ways of looking at bioterrorism, and their methods of investigation also differ. In the past, their different approaches have resulted in confusion, duplicated efforts, and mishandling of evidence. This became apparent during the anthrax investigations of 2001, after a terrorist mailed anthrax-laced letters to different locations across the country. That experience prompted federal law enforcement agencies and CDC to work together to strengthen their interactions and ensure that if any threats happen in the future, public health and law enforcement officials will work well together. For example, these two groups of agencies have

- Developed policies outlining how they will work together to investigate bioterrorists' threats.
- Published a guidebook on joint investigations that has been delivered to local law enforcement and public health offices across the nation.
- Begun offering federal employees a course that compares and contrasts CDC's and federal law enforcement agencies' duties.
- Developed a joint forensic epidemiology training course for law enforcement and public health officials.

CDC also collaborates with federal law enforcement agents to ensure that state and local health departments are prepared to work well with law enforcement staff to investigate bioterrorist events or threats. Existing relationships between public health and law enforcement officials are vital to ensuring that health threat assessments are done in a coordinated way, that specimens collected during investigations undergo fast and reliable laboratory tests, and that public health staff work well with law enforcement staff to track the source of bioterrorism.

CDC also helps public health and law enforcement agencies develop protocols for how they will work together during a crisis. For example, Los Angeles County and New York City have outlined procedures that law enforcement and public health agencies have agreed to follow when working together to investigate bioterrorist events or threats. Having a protocol in place for joint investigations enables both parties to function seamlessly as a team to catch the perpetrators and protect the public.

Fast Teamwork Prevented Further Anthrax Exposure in Pennsylvania

In 2006, Pennsylvania health officials discovered that a New York City resident visiting the state had inhalation anthrax. They quickly reported the news to CDC and the New York City Department of Health and Mental Hygiene, following CDC's established disease reporting policies.

The man was a member of a dance troupe that had traveled from New York to Pennsylvania for a performance. While in Pennsylvania, he got sick and was admitted to a local hospital where testing confirmed that he was infected with anthrax. Local, state, and federal agencies worked quickly to find the source of the infection. CDC and the New York City Department of Health and Mental Hygiene took samples at the man's home, van, and workspace and sent them to their laboratories. When they interviewed the man, his family, and colleagues, they learned that he made traditional African drums from animal hides. They confirmed that he had been exposed to anthrax while scraping a contaminated animal hide in an unventilated room.

The health agencies then worked rapidly to prevent others from being exposed. They recommended medication for four people who had been in the man's workspace while he was scraping the animal hide. No additional cases of anthrax were identified. New York City health officials provided regular updates on the status of the investigation and informed the public that other people in the man's apartment building or his workspace had no risk of contracting inhalation anthrax.

After the initial diagnosis of inhalation anthrax was made, the rapid response and investigations by public health, animal health, and law enforcement authorities contributed to a prompt understanding of the man's exposure and possible risk to others. The coordinated responses were critical to minimizing risk for exposure and infection and alleviating concern among the public.



Early Warning System Detects Threats Quickly

More than 3,700 patients flooded Boston's emergency rooms, stricken with nausea, vomiting, and diarrhea during the winter of 2006-2007. The **Boston Public Health Commission** was able to track the progression of the infection by using a surveillance tool known as the **Early Aberration Reporting System (EARS)**. They identified the culprit as the intestinal germ norovirus.

More than 100 public health organizations across the country and world use EARS to detect disease outbreaks early so that they can take fast action. EARS is a Web-based tool that allows health departments to determine whether the number of illnesses is higher than usual and to identify clusters of people affected by the outbreak. During Boston's norovirus outbreak, for example, health officials used EARS to identify the ages and ZIP codes of patients. This information allowed health officials to rapidly identify where they needed to focus their efforts.

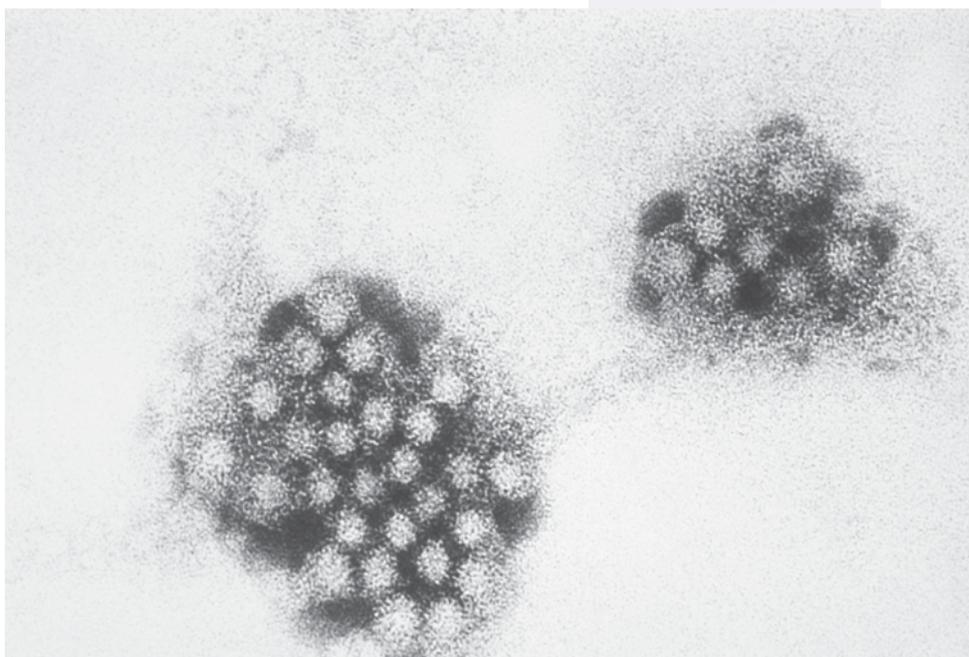
EARS is flexible and can be used to detect far more than just infectious disease outbreaks. For instance, EARS has been used to identify health problems in the aftermath of natural disasters, such as Hurricane Katrina, and during large-scale public events such as the Super Bowl and the World Series. EARS data also can be used to detect threats of bioterrorism.

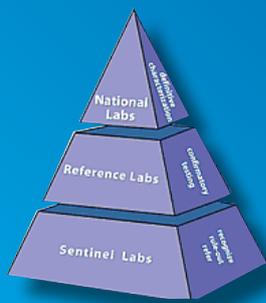
In recent years, CDC has used EARS to help health departments develop their **syndromic surveillance systems**. These systems monitor activities that can be early warning signs of a health crisis—for instance, increases in sales of a particular over-the-counter drug, absenteeism among schoolchildren, and emergency room visits for a particular health condition. Many local, state, federal, and international health officials are using EARS data to conduct syndromic surveillance. EARS has strengthened CDC’s partnerships with these agencies and created a stronger web of information to safeguard the public’s health both here and around the world.

“We currently use EARS to analyze data from emergency department visits, emergency 911 calls, outpatient physician visits, and school absenteeism. . . . EARS has also proved useful for analyzing and monitoring trends in reportable communicable disease data and identifying the onset and tracking the severity of influenza season. EARS is a valuable tool in our public health surveillance arsenal.”

Brian Lawson,
Epidemiologist
Knox County Health
Department
Knoxville, TN

An electron micrograph of norovirus, which causes an estimated 181,000 cases of food poisoning each year in the United States. Photo by E.L. Palmer, CDC.





The Laboratory Response Network (LRN) was established in 1999 by CDC, the Federal Bureau of Investigation, and the Association of Public Health Laboratories to identify and defend against chemical and biological agents. The LRN includes 160 laboratories that can identify biological agents and 62 laboratories that can identify chemical agents. These laboratories each have a role to play in keeping our nation safe from public health threats:

- *National laboratories* have trained staff and high-tech equipment required to handle highly infectious agents. Their role is to identify specific strains of agents that can cause disease.
- *Reference laboratories* can perform tests to detect and confirm the presence of a potentially dangerous agent. These laboratories can respond rapidly to a local terrorist event because they don't have to rely on confirmation of their test results from laboratories at CDC.
- *Sentinel laboratories* are the thousands of laboratories in hospitals and clinics that are on the front lines and have direct contact with patients during routine health care. These laboratories can be the first to recognize a suspicious organism or agent.

Creating a Powerful Network of Laboratories to Respond to Threats

Nearly 90% of people in the United States are within 100 miles of a laboratory that participates in the **Laboratory Response Network (LRN)**. This network of laboratories can spring into action to identify harmful agents and develop ways to defend against their spread. The network includes laboratories from many different sectors:

- Federal laboratories.
- State and local health department laboratories.
- Veterinary laboratories.
- Agriculture laboratories.
- Laboratories that test food and water.
- Military laboratories.
- Laboratories in other countries.

Laboratories in the LRN are equipped to respond quickly to acts of biological or chemical terrorism. They also can detect new diseases never before seen in the United States. For instance, in 2003, the LRN laboratories worked quickly to identify the cause of a mysterious new form of pneumonia that we now refer to as severe acute respiratory syndrome (SARS). When a terrorist used the nation's mail system to mail anthrax-tainted letters in 2001, the LRN played a key role in the investigation.

Routinely, the LRN is called upon to provide laboratory services during major sporting events, national political conventions, and other high-profile events that attract large crowds and international media attention. Because of the LRN, laboratories are better equipped to respond to emergencies.



Federal laboratories, including those at the CDC, are part of the Laboratory Response Network. Michael D. Bowen, PhD, is a microbiologist in CDC's Bioterrorism Rapid Response and Advanced Technology Laboratory, which supports CDC's efforts to prepare and respond to threats of bioterrorism.



Monitoring the Nation's Air for Dangerous Agents

At secret locations across the United States, air samples are regularly tested to detect infectious agents of concern that could threaten the nation's health. These samplers, part of the Department of Homeland Security's BioWatch program, monitor the air 24 hours a day, 7 days a week. Filters from these samplers are tested at Laboratory Response Network laboratories. Tests include polymerase chain reaction, which can quickly detect the presence of an agent's unique DNA.



What Caused These Schoolchildren To Get Sick?

In the winter of 2006-2007, children at two elementary schools in Rhode Island became severely ill, and one of them died. CDC was called in after two students from the same classroom were found to have encephalitis.

CDC worked closely with the Rhode Island Department of Health and state and city officials to identify the cause of the encephalitis—*Mycoplasma pneumoniae*—and any new cases of the disease. The investigators reviewed attendance logs to locate students who had missed two or more days of school. They then interviewed the parents and collected blood samples from the children. CDC was able to quickly test the samples and identify more children with the disease, prompting health officials to close the schools.

CDC and the state of Rhode Island worked together to identify proper treatment to protect students at the schools. They distributed nearly 1,200 doses of antibiotics. Most of the testing was done during the holiday break, and the schools were able to reopen as scheduled without any additional people getting sick.

Mycoplasma is difficult to detect in laboratory tests, and the disease is not normally reported to health officials. CDC and Rhode Island laboratory scientists were able to identify *Mycoplasma pneumoniae* as the culprit thanks to well-trained, knowledgeable laboratory staff and high-tech laboratory equipment that allows rapid processing of specimens. CDC laboratory staff processed over 900 specimens during the outbreak, and most of these specimens were processed using a bio-robot. The bio-robot allows 96 specimens to be processed simultaneously—that's about 360 specimens a day.

Protecting the Nation and World from New Infectious Diseases

CDC's **International Emerging Infections Program** (IEIP) extends CDC's protective web by establishing centers of excellence in infectious disease epidemiology at sites around the world. As of 2008, IEIPs are operating in six countries (Bangladesh, China, Egypt, Guatemala, Kenya, and Thailand), and startup activities are under way in a seventh country (Kazakhstan).

At each of the IEIP sites, CDC employees team up with local health officials to develop sustainable, in-country capacity for disease surveillance, outbreak investigation and response, public health training, and applied research on diseases of regional or global importance; and to foster the next generation of international public health leaders. The programs benefit not only the local populations but also the rest of the world because they enable the countries to detect and respond to infectious diseases before they have spread widely. The examples that follow highlight a few of the diverse ways that CDC's IEIP staff are working with colleagues abroad to tackle diseases that could pose a serious threat to our health and the world's.



CDC's International Emerging Infections Program in Kenya uses hand-held computers or personal digital assistants (PDAs) to gather health and demographic information in the Bondo district near Kisumu. With PDAs to record the answers, community interviewers ask standard questions about who in the household may be experiencing pneumonia, diarrhea, jaundice, or fever.

Keeping Tabs on Flu in Thailand

In Thailand, International Emerging Infections Program collaborated with the Thailand Ministry of Public Health to study the burden of influenza. The study demonstrated that the disease and cost burden of influenza in Thailand was substantially greater than had been previously appreciated. These data were used to support the implementation of a policy that provides publicly funded flu shots to Thai seniors with chronic diseases. Thailand eventually aims to provide flu shots to everyone with chronic disease as well as to all seniors.

Implementation of the new vaccination policy is intended to reduce hospitalizations and save the lives of Thai senior citizens who have chronic illnesses that put them at highest risk for developing severe complications due to influenza infection. A government plant to manufacture flu shots locally should be up and running by 2011, with an initial capacity of 2 million doses per year. Eventually, the operation is expected to be able to produce more than 10 million doses annually, one of several steps that Thailand is taking to prepare for a flu pandemic.

The International Emerging Infections Program also has established a surveillance system to track bird flu in humans. IEIP scientists used a combination of epidemiologic surveillance data and laboratory data to evaluate confirmed cases of bird flu. They analyzed the combined laboratory-surveillance data to estimate how many people in Thailand had bird flu, how much the outbreak cost the nation, and what behaviors and other risk factors might have led to the flu's spread to humans.

IEIP staff investigate human-to-human transmission of avian flu in Thailand.



Studying Vaccine's Effectiveness and Safety for Children in Kenya

Each year, more than half a million young children die of rotavirus, the most common cause of severe diarrhea among children. Most of these children live in developing countries like Kenya. In the United States, where many children are routinely vaccinated against rotavirus and have better access to healthcare, rotavirus is not as serious a problem. However, the vaccine has not been tested in Africa or Asia. Vaccines that work well in the United States don't always have the same success in developing countries such as Kenya, where people suffer from malnutrition, HIV infection, and other health problems. A number of organizations are willing to fund efforts to bring the rotavirus vaccine to developing countries, but first, since the vaccine is costly, they want scientific proof that the vaccine would indeed help children in those countries.



IEIP Kenya plays a critical role in meeting this burden of proof. The program has taken fundamental steps to accumulate data that demonstrate that the current version of the rotavirus vaccine is safe and effective. International acceptance of the rotavirus vaccine provides credibility to potential financial donors, increasing the likelihood that this vaccine will soon be available to the Kenyan population.

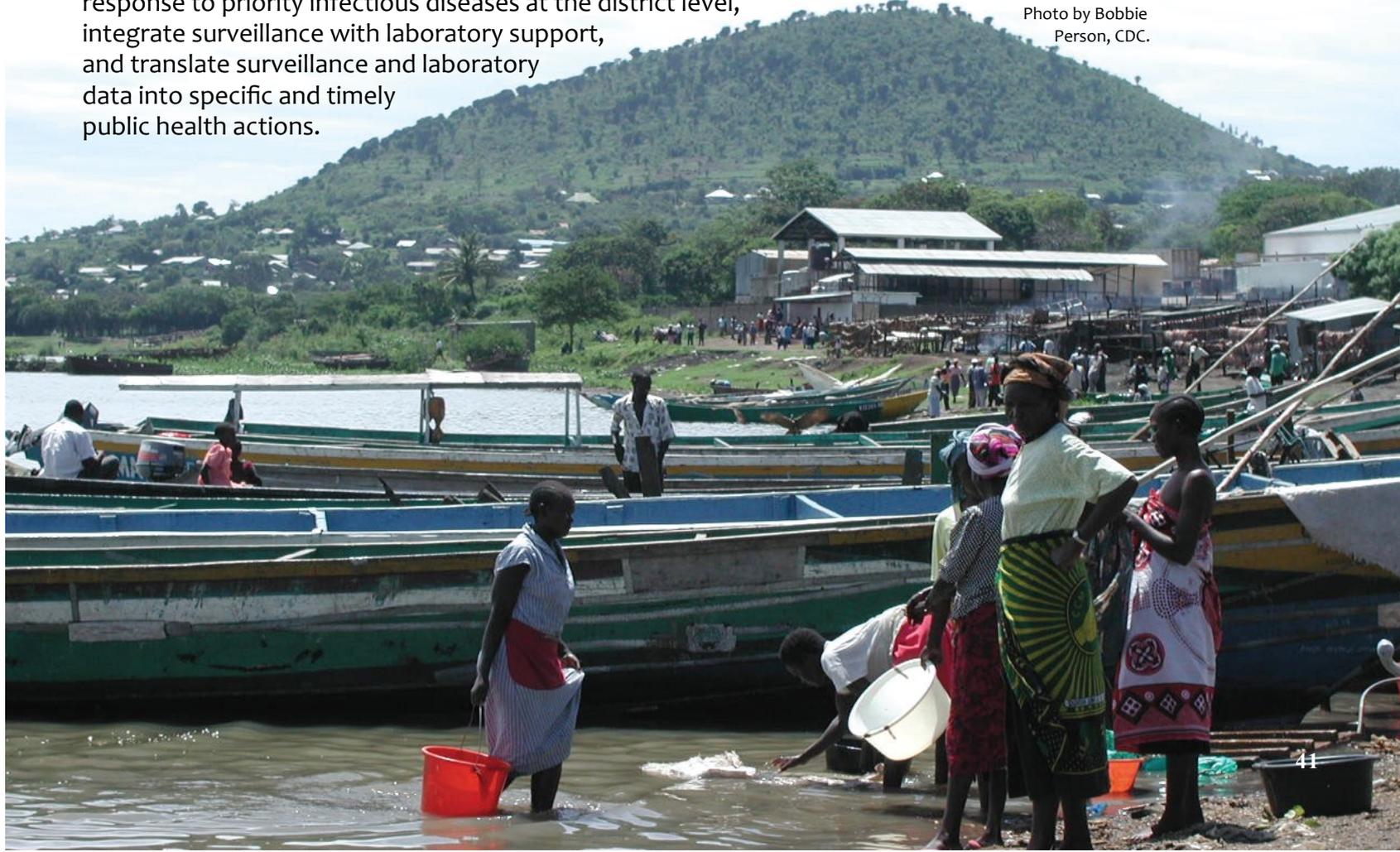
Strengthening Disease Surveillance and Response in Africa

Communicable diseases remain the most common cause of death, disability, and illness in African countries. While these diseases present a large threat to the well-being of African communities, well-known interventions are available for controlling and preventing them. Decisions about selecting appropriate, timely, and relevant interventions are guided by surveillance and laboratory data. To strengthen the surveillance capacities for providing data for making these decisions, the member states of the **World Health Organization Regional Office for Africa (WHO-AFRO)** adopted a strategy known as **Integrated Disease Surveillance and Response (IDSR)** in 1998. The purpose of the strategy is to strengthen skills, resources, and processes so that data are timelier and public health threats are detected in time to do something about them. Participating countries learn how to identify and report these diseases, monitor and evaluate the occurrence of these diseases, manage the data, analyze and interpret the data, and strengthen their laboratories' capacity to support surveillance activities.

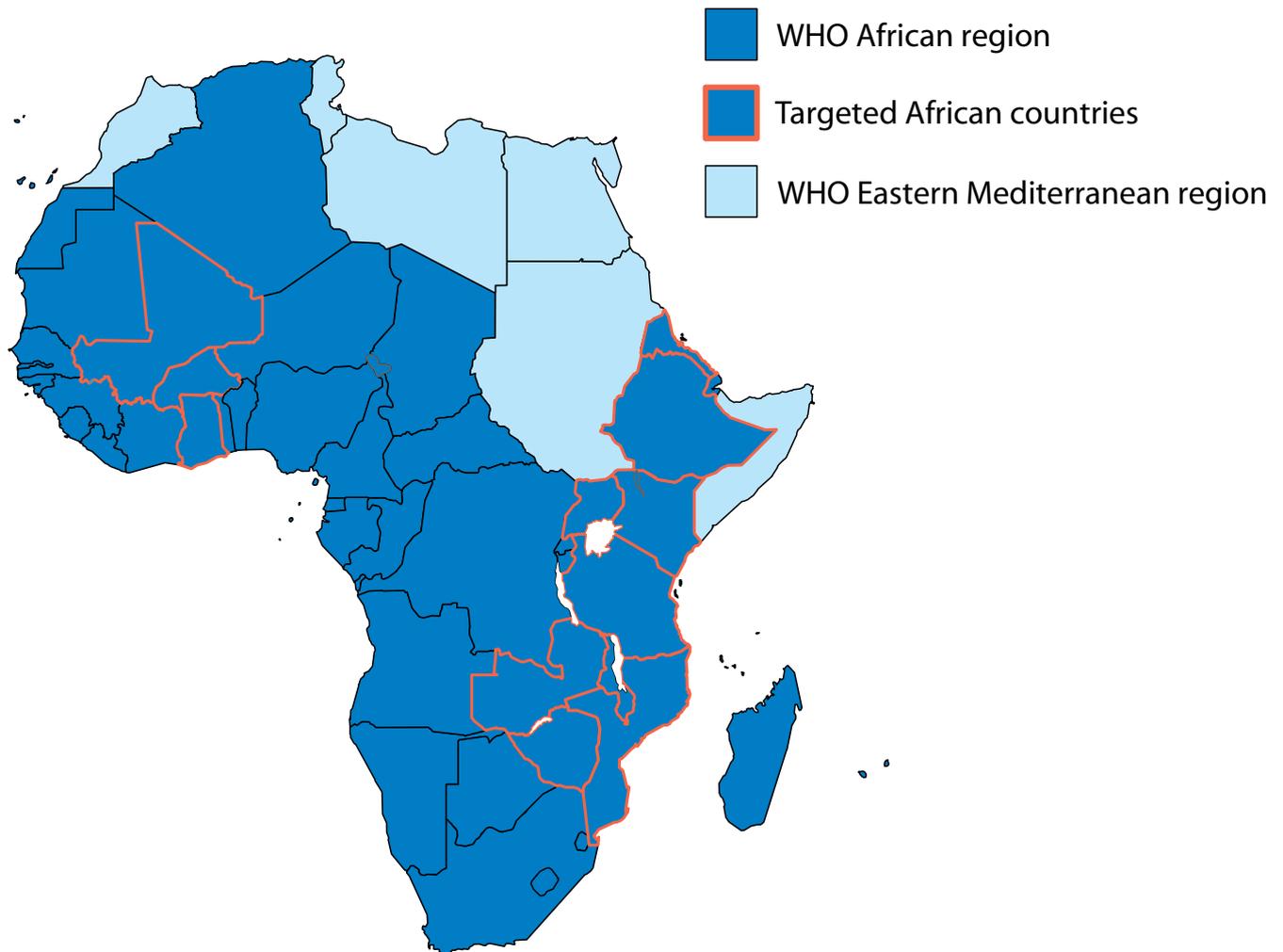
CDC, with funding from the **United States Agency for International Development (USAID)**, has been a technical partner with WHO-AFRO in the design, development, implementation, monitoring, and evaluation of IDSR. The goals of IDSR are to strengthen public health surveillance and response to priority infectious diseases at the district level, integrate surveillance with laboratory support, and translate surveillance and laboratory data into specific and timely public health actions.

Surveillance is essential to rapid response to outbreaks of disease. In Western Kenya cholera outbreaks have been traced back to Lake Victoria, where many residents rely on the lake for their drinking water. They must boil or treat the water to avoid ingesting the bacteria that causes cholera.

Photo by Bobbie Person, CDC.



African Countries Participating in the Integrated Disease Surveillance and Response (IDSR) Strategy



Currently, 43 out of 46 countries in the WHO African region use the IDSR strategy. CDC has provided many of these countries with the knowledge and expertise to conduct surveillance and respond to infectious disease outbreaks.

Infectious Diseases Targeted by IDSR in Africa

Major endemic infectious diseases of public health importance	Diseases targeted for eradication and elimination	Epidemic-prone diseases
<ul style="list-style-type: none"> • Diarrhea in children less than 5 years of age • Pneumonia in children less than 5 years of age • New cases of HIV/AIDS • Malaria • Onchocerciasis • Sexually transmitted infections • Trypanosomiasis • Tuberculosis 	<ul style="list-style-type: none"> • Poliomyelitis (acute flaccid paralysis) • Dracunculiasis • Leprosy • Neonatal tetanus 	<ul style="list-style-type: none"> • Cholera • Diarrhea with blood • Measles • Meningitis • Plague • Viral hemorrhagic fevers • Yellow fever

IDSR is Making a Difference

All of the African countries participating in IDSR have taken steps to improve their ability to respond to potential disease outbreaks, and already, positive results are evident. As of 2007, 43 of the 46 countries in WHO-AFRO have conducted an assessment and made a plan of action for improving their surveillance systems. Forty-one of the countries began using IDSR technical guidelines, and 39 African countries have adapted IDSR training modules to improve their disease surveillance systems.



**Our Backbone:
A Strong Network of
Laboratories and Researchers**



We envision a world where...



...Laboratories around the globe produce fast, reliable test results to identify infectious diseases so that outbreaks can be contained and patients can promptly get the treatment they need.

...CDC and its partners use science and cutting-edge technology to learn more about infectious diseases and ways to prevent them from spreading.

Our Backbone:

A Strong Network of Laboratories and Researchers

At the National Center for Preparedness, Detection, and Control of Infectious Diseases, one of our primary responsibilities is to provide leadership to laboratories and to help them provide high-quality services that will protect the public from infectious diseases and other health threats. This is a huge responsibility that requires us to collaborate with many different partners and to be experts in a wide range of diseases and health conditions.

We start closest to home by supporting all of the laboratories at CDC—laboratories dealing not only with infectious diseases but also cancer, genetics, and environmental health threats. We offer a wide range of support. For instance, we supply all CDC laboratories with sterile test tubes and other basic equipment they need to conduct their work.

We also analyze specimens and develop test kits that CDC researchers can use to identify bacteria, viruses, fungi, and environmental contaminants. Much of our work to strengthen laboratories, however, is devoted to helping laboratories outside of CDC. In this section of the report, you will learn—

- How we are helping health departments' epidemiologists and laboratory staff strengthen their ability to combat infectious diseases.
- How we are building a nationwide system of laboratories that can work together to detect and report disease outbreaks.
- Why accurate, timely, and reliable laboratory results are critical to combating public health threats and saving lives.
- How we are promoting excellence in laboratory practices for both clinical and public health laboratories.

As the following stories illustrate, strong, reliable laboratories are our backbone. They are essential to our nation's health and future.

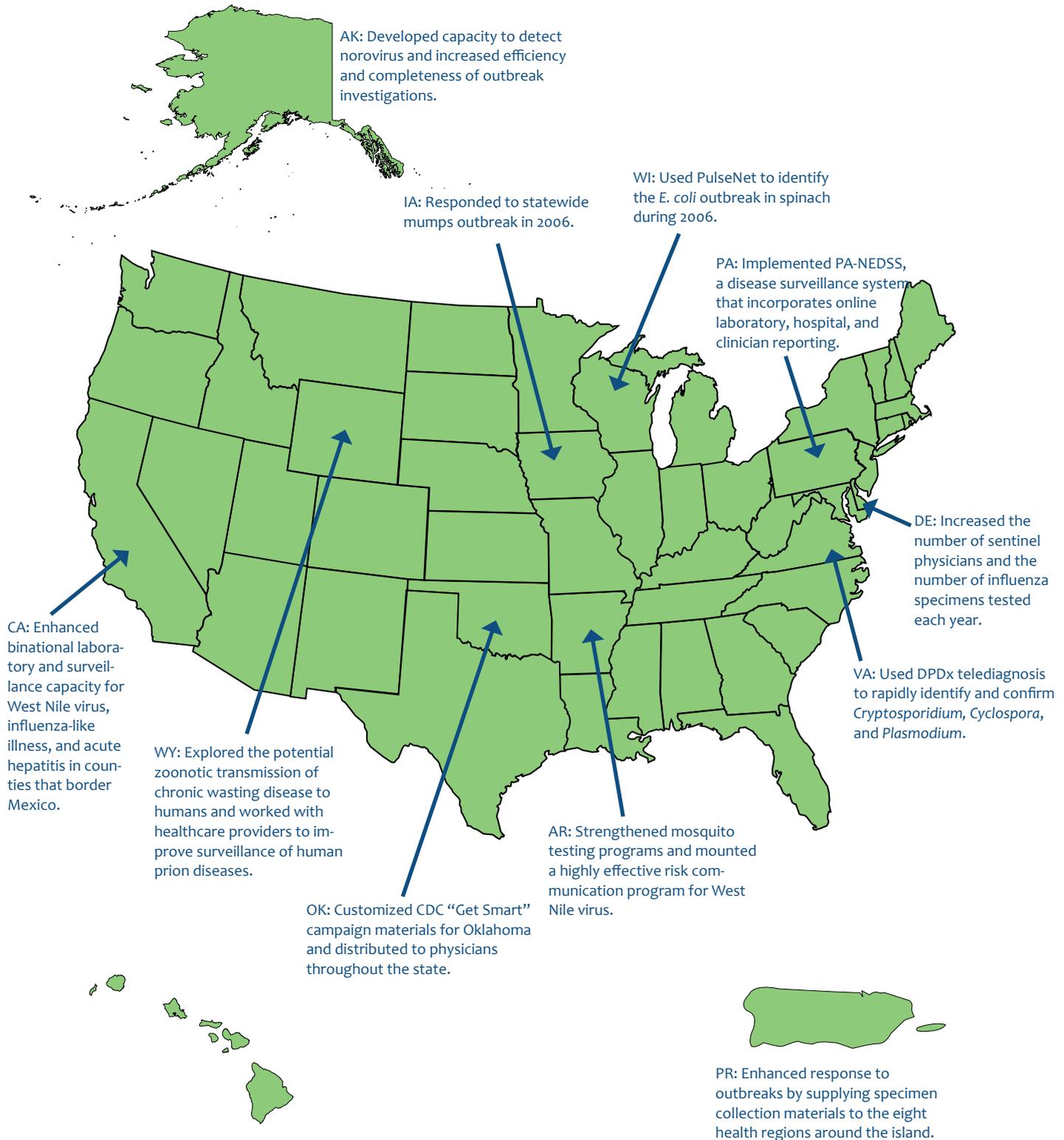
Strong Epidemiology, Strong Laboratories: Health Departments Need Them

The **Epidemiology and Laboratory Capacity for Infectious Diseases (ELC)** program provides funding and expertise to help health departments strengthen their capacity to address infectious disease threats. The ELC program focuses on vaccine-preventable diseases, drug-resistant infections, and diseases that are spread via food, water, and vectors such as mosquitoes and ticks. Because of the ELC program, health departments are better able to —

- Identify when infectious diseases threaten a community's health and monitor these diseases closely.
- Respond to outbreaks and other emergencies caused by infectious diseases.
- Describe the factors that put people at risk for infectious diseases.
- Use health data to establish public health priorities and policies.
- Assess the effectiveness of activities to prevent diseases.
- Strengthen collaboration between laboratory and epidemiology practices.

ELC cooperative agreements are established in all 50 states. In addition, funding is provided for ELC programs in six large local health departments (New York City, Philadelphia, Washington, D.C., Chicago, Houston, and Los Angeles), and two territories (Puerto Rico and the Republic of Palau).

Epidemiology and Laboratory Capacity for Infectious Diseases (ELC) Program



The strength of a national laboratory system will be its ability to connect laboratories in doctors' offices with hospital laboratories, independent laboratories, state and local health departments' laboratories, and federal laboratories such as those at CDC.

National Laboratory System Initiative

The future health and safety of our communities depends on laboratories sharing important findings with each other and coordinating their efforts to detect and report outbreaks of disease. It also depends on laboratories having the expertise and equipment they need to provide reliable and timely test results.

The first place many people go to get a diagnosis is their doctor's office. That diagnostic test result, when linked with similar results from other doctors' offices, could provide an early warning of a health threat before it has a chance to become an epidemic. CDC is leading efforts to build a national laboratory system that will bring together laboratories across the country—this includes **clinical laboratories** (for instance, those in doctors' offices and hospitals) and **public health laboratories** (for example, those in local health departments and state and federal agencies).

These efforts are aimed at enhancing the nation's ability to protect the public from current threats while preparing for threats from future infectious agents that have not yet been identified. The **National Laboratory System (NLS) Initiative** calls for developing such a system, which will be essential for maintaining public health, especially during disasters.

Before the anthrax attacks of 2001, for instance, the first NLS demonstration projects had shown the value of establishing stronger relationships between each state laboratory and the clinical laboratories in its jurisdiction. These lessons were immediately applied as best practices for national preparedness against bioterrorism and chemical terrorism after 9/11.

How CDC Is Building the National Laboratory System

- By helping public health and clinical laboratories understand their interdependent roles and responsibilities.
- By providing guidance on how laboratories can better detect, respond, and track infectious disease and other public health threats.
- By offering support and guidance on how laboratories can conduct high-quality and timely testing and strengthen their capacity to collect, analyze, and distribute test data.
- By supporting efforts to assess laboratory practices, equipment, and staffing needs.
- By drafting policies and guidelines to strengthen the quality of laboratory practices.

More recently, the NLS developed a program to improve antimicrobial susceptibility testing (AST), a method of standardized testing procedures that laboratories use to determine if a microorganism will respond to commonly prescribed antibiotics or if it can be treated with a particular antimicrobial. Several states have received funding to improve AST and reporting and boost adherence to AST guidelines among clinical laboratories. If this model is successful, the lessons learned can be applied to safeguard the population by improving AST practices nationwide. Accurate and prompt reporting of susceptibility results will allow doctors to select appropriate antibiotics and stop using inappropriate ones.



Erin Bowles, Wisconsin's assistant Clinical Laboratory Network coordinator, leads a Gram stain workshop on the University of Wisconsin-Madison campus. With funding from a CDC National Laboratory System cooperative agreement, the Wisconsin State Laboratory of Hygiene is sharing its successful methods for developing a laboratory network with other state public health laboratories. Supporting this effort are CDC, the Association of Public Health Laboratories, and the National Laboratory Training Network.

Clinical Laboratory Testing and Practice Standards

Ensuring High-Quality Diagnostic Tests for Everyone, No Matter Where You Live

Every person in America wants assurance that they are getting the same high-quality diagnostic tests as anyone else in the country, regardless of where they live. Reliable laboratory results are essential—doctors rely on laboratory results to make important decisions about patients' treatment, and public health agencies rely on laboratory results to detect biological and environmental threats to the public's health. Accurate, timely, and reliable laboratory test results are critical to saving lives and improving the quality of our lives.

About 8 billion tests are performed each year by more than 200,000 U.S. laboratories regulated under the **Clinical Laboratory Improvement Amendments of 1988** (CLIA). All laboratories that report patient results, including those within CDC, must meet CLIA requirements. Although the CLIA program is administered by the Centers for Medicare & Medicaid Services (CMS), through an interagency agreement CDC provides technical and scientific consultation and assistance on laboratory issues. As part of this agreement, CDC conducts studies to evaluate the quality of laboratory testing and services and develops interventions to improve the quality of laboratory testing.

CLIA requirements should be updated as new laboratory methods and practices develop. CDC collaborates with the Food and Drug Administration and CMS to consider these changes and, based on recommendations from

the federal Clinical Laboratory Improvement Advisory Committee, assists CMS in drafting revised regulatory standards. External input from experts and the advisory committee is an invaluable part of the process.

The **Clinical Laboratory Improvement Advisory Committee (CLIAC)**, established under authority of the Clinical Laboratory Improvement Amendments of 1988, advises the Secretary of HHS and the Assistant Secretary for Health about the standards under which clinical laboratories are regulated. Shown at left are CLIAC members during the Committee's meeting at CDC in September 2008.



Bolstering Laboratory Performance

Promoting Laboratory Quality Improvement at Home and Around the World

In the past, CDC has served as a resource that laboratories around the world have relied on for guidance in implementing high-quality laboratory practices. For instance, CDC's **Model Performance Evaluation Program (MPEP)** has been recognized for helping attain and ensure quality laboratory testing for HIV and TB worldwide. In addition, CDC helped Zimbabwe develop an accredited **External Quality Assessment** program for its laboratories. Domestically, CDC has served as an expert laboratory consultant and trainer for multiple partners, including many state and local health departments.

For laboratories here and abroad, CDC continues to serve as a trusted resource on effective methods for promoting—

- A systematic way to look at and establish the policies, processes, and procedures of a laboratory to maximize effectiveness, efficiency, and high quality.
- Development of External Quality Assessment tools to evaluate whether laboratories perform tests competently.
- Development and implementation of laboratory quality standards in low-resource countries.
- Effective laboratory services to support clinical and public health programs.



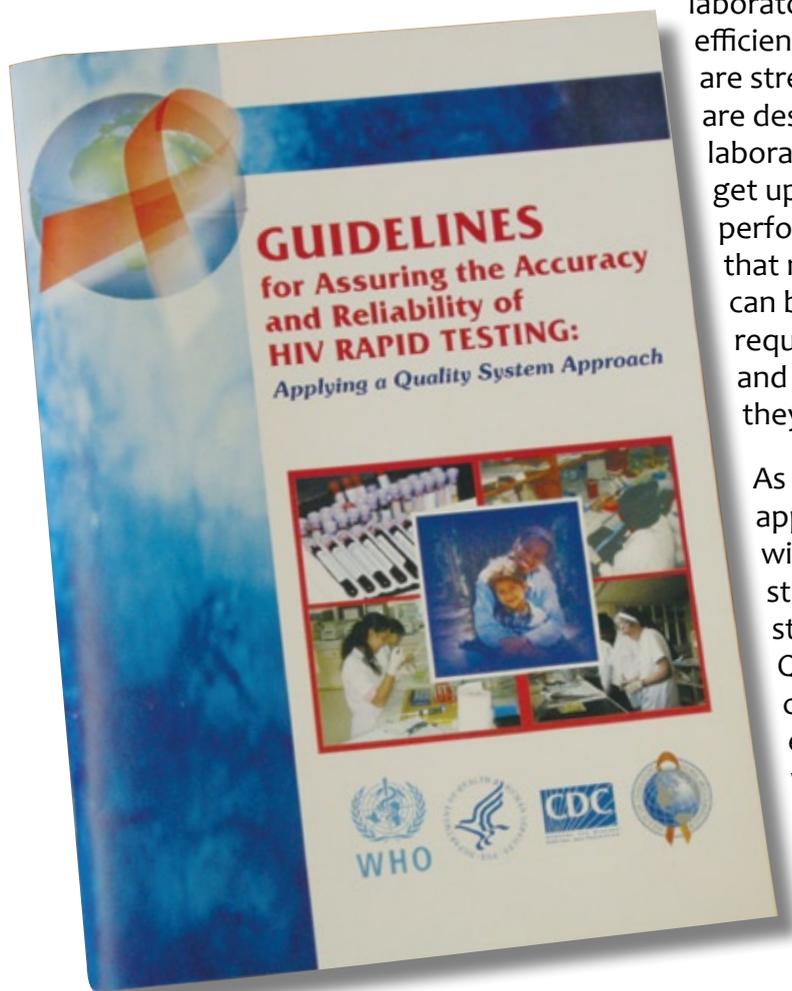
CDC collaborates with the World Health Organization and other international partners to develop materials that countries use to strengthen their laboratory training programs. One such tool is the Acid-Fast Direct Smear Microscopy Training Package for laboratories that test for tuberculosis. This “workshop in a box” provides countries with presentations, exercises, and step-by-step guidance needed to conduct laboratory workshops that aim to improve the reliability and timeliness of test results. This tool can be adapted to meet the unique needs, technical requirements, and policies of each country.

Road Map for Improving the Quality of Laboratory Practices

We aim to improve the quality of laboratory practices at CDC, across the nation, and internationally. One effective tool to help us achieve this goal is known as a **Quality Management System (QMS)**. CDC laboratory experts and partners developed a package of QMS guidance and training materials as a systematic way to look at and establish the policies, processes, and procedures of a laboratory to maximize its effectiveness, efficiency, and quality.

When senior managers and staff commit to promoting quality throughout the organization, the results are higher quality services, better customer satisfaction, and more reliable laboratory data. In such situations, where laboratories fully embrace QMS, they become more efficient. Processes are clarified, and procedures are streamlined and easy to follow. All processes are described and documented clearly so that new laboratorians and other laboratory employees can get up to speed quickly. Everyone learns how to perform tasks reproducibly and consistently, so that mistakes are reduced and laboratory results can be replicated easily. In the end, those who are requesting the laboratory services, their patients and their customers, quickly get laboratory results they can rely on.

As part of its commitment to furthering the QMS approach to laboratory practice, CDC collaborates with national and international voluntary quality standards organizations to develop QMS standards and training materials. By promoting QMS, CDC anticipates that public health and clinical laboratory staff will be encouraged to examine work processes and identify areas where improvements can be made.



These guidelines describe the processes and procedures that must be carried out correctly to ensure the accuracy and reliability of HIV rapid testing. Such information is used by government health officials, people responsible for HIV/AIDS programs, those who manage voluntary testing and counseling sites, and personnel involved in testing, both trained laboratory technologists and those with no laboratory training. CDC collaborates with the World Health Organization and other partners to develop materials that aim to strengthen the quality of laboratory practices around the world.

Extending the Goals for Quality to Laboratories Worldwide

In April 2008, the World Health Organization and CDC hosted an international conference on quality systems in laboratories. The conference, held in Lyon, France, brought together over 200 experts from 70 countries to review the status of laboratory quality systems around the world. They identified strategies for garnering the political will necessary to ensure accurate, reliable, and timely laboratory test results in all laboratories. In addition, all 200 participants endorsed a joint WHO-CDC statement making a commitment to improving laboratory quality globally.

CDC also led a workshop on Quality Management Systems in Beijing, China, for laboratory managers and senior technologists who oversee laboratory surveillance and emergency response networks for China at the national level.



In Beijing, laboratory managers and senior technologists attended a Quality Management Systems workshop led by CDC.

“ If there were the suspected release of an infectious agent, we could rapidly identify whether it’s *Bacillus anthracis*, smallpox virus, rickettsia, or another agent. ”

**Keith Lvert, PhD,
CDC research chemist,
commenting on the
Biotech Core Facility’s
Ibis T-5000**

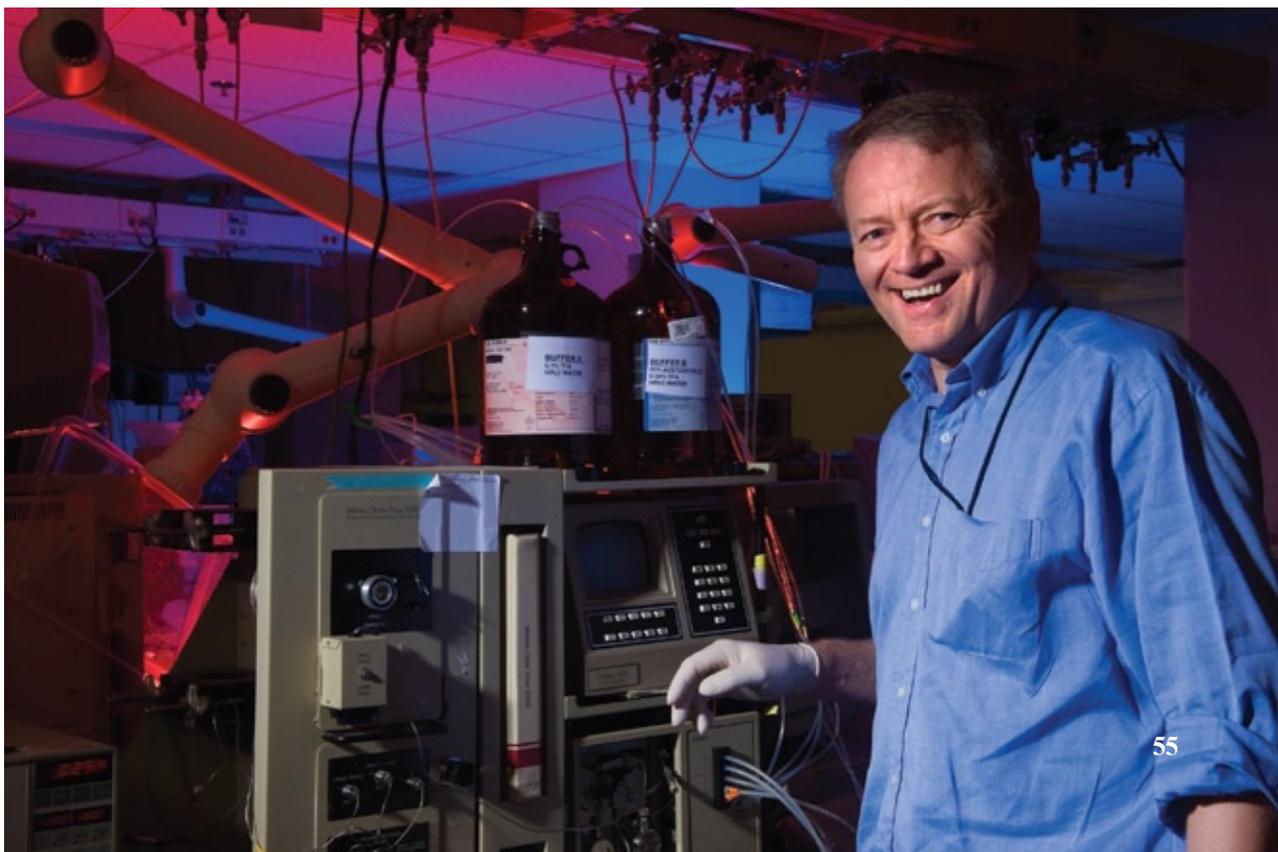
Biotechnology Core Laboratories Support CDC Researchers Around the Clock

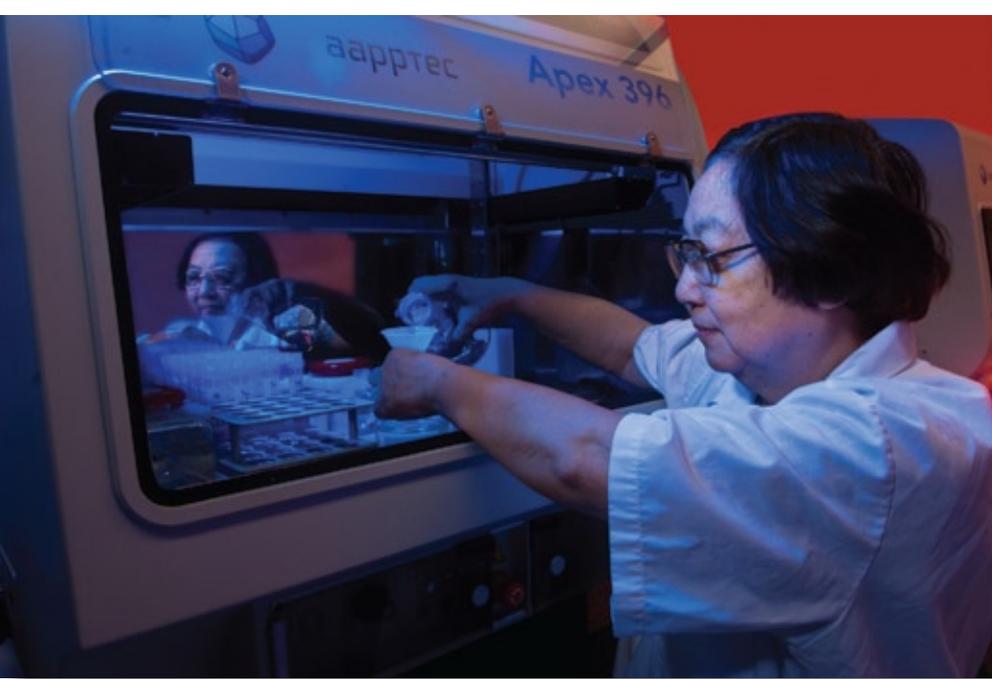
When CDC researchers need to identify an infectious agent, be it viral, bacterial, or fungal, they know they can rely on the **Biotechnology Core Facility** for support. When it opened 25 years ago, the facility had only one staff member. Now, a staff of 30 laboratory personnel operate high-tech equipment as they provide support to nearly 1,000 CDC researchers working in the fields of genomics, proteomics, and bioinformatics. One of the most requested services is to produce synthetic DNA to be used as primers and probes in any type of assay.

The Biotechnology Core Facility collaborates with all CDC laboratories that deal with infectious and genetic diseases, both domestically and internationally. The facility also supports many larger laboratory networks by providing reagents and technical expertise. For example, the laboratory staff provide real-time polymerase chain reaction kits to the CDC's Laboratory Response Network to ensure that there are sufficient stockpiles of diagnostic kits to detect infectious agents if a bioterrorist attack were to occur.

In addition, the staff members have assembled reaction kits to support pandemic flu preparedness activities. Moreover, the Biotechnology Core Facility staff members in the DNA synthesis section have synthesized reagents that the **Global Disease Detection (GDD)** program uses to assemble detection assays for distribution to all international laboratories in the GDD network.

Jan Pohl, PhD, chief of the Biotechnology Core Facility, oversees a high-pressure liquid chromatography (HPLC) instrument used to purify compounds so that they are safe to use. Photo by CDC photographer Greg Knobloch.





Chemist Sunan Fang, PhD, works with amino acids to create peptides. “They order it. I make it,” she says of the CDC laboratories she supports. The peptides are used for various laboratory studies, including research to find a malaria vaccine. Photo by CDC photographer Greg Knobloch.

Over the past decade, the Biotechnology Core Facility’s ability to synthesize large-scale reagents needed to assemble detection assays at laboratories responding to potential pandemics has been indispensable—for instance, during the SARS outbreak of 2003 and in current activities to prepare for a potential flu pandemic. Reagents to support up to

500,000 tests can be synthesized for kit assembly within 1 week. CDC has found that when reagents are created and distributed from a single source, testing is more precise, providing more control and accuracy in testing. The rapid creation and deployment of these kits allow for timely and effective response to an outbreak.

In addition, the facility maintains the largest genome sequencing facility at CDC capable of sequencing small viral genomes in a single day and larger bacterial genomes in less than a week. By combining the latest laboratory technology and methods with a staff that is trained for emergency situations and available 24 hours a day, 7 days a week, the Biotechnology Core Facility is an instrumental part of CDC’s efforts to remain prepared for emergency responses.



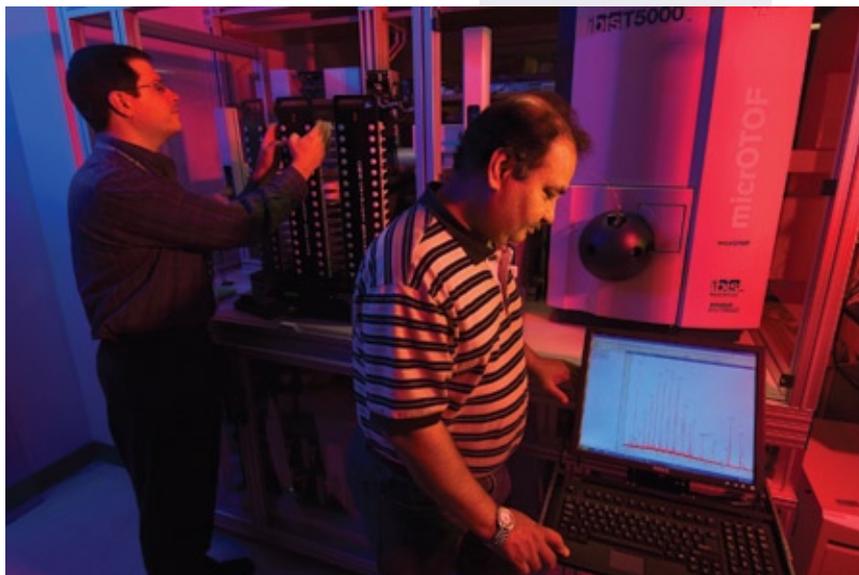
Dongxia Wang, PhD, a senior fellow at the CDC’s Biotechnology Core Facility, runs the mass spectrometer to identify proteins from different samples. The mass spectrometer is used to develop diagnostic tools, conduct basic research, and control the quality of oligonucleotides that the laboratory produces to ensure that they are of the correct mass. Photo by CDC photographer Greg Knobloch.

High-Containment Research

In 2005, CDC partnered with the National Institutes of Health and Emory University to share with veterinarian researchers across the country CDC's unique knowledge about working with animals in a biosafety level 3 or 4 (BSL-3 or BSL-4) laboratory. This combination of veterinary skills and knowledge of high containment work is rare but critical to further research used to develop methods to combat bioterrorism.

Diseases such as Ebola and smallpox pose a grave danger to the public if used as instruments of bioterrorism. The search for countermeasures must be conducted with extreme caution. Only high-containment BSL-3 and BSL-4 laboratories have the protective equipment, safety measures, and special staff training that allow scientists to safely study agents favored by terrorists.

Instruction on working with animal subjects while operating in biosafety laboratories at a BSL-3 or BSL-4 safety level is offered to veterinarians by Emory University, and subject matter experts from CDC provide course instruction and guidance. This collaborative effort provides participants with the expertise to work with animals in high-containment laboratories. Knowledge of biosafety practices for this type of laboratory work enhances the safety of laboratory workers and the general public by minimizing the risk of accidents or security breaches. As part of their training, participants conduct mock exercises in BSL-3 and BSL-4 laboratories. As trainees return to their respective laboratories across the country, they take with them the knowledge and practices they have learned, thus increasing the number of individuals and laboratories that are qualified to participate in potentially life-saving preparedness research.



Above, Keith Levert, PhD, research chemist, and Irshad Sulaiman, PhD, research scientist, operate the Ibis T-5000, a mass spectrometer-based machine used to detect existing pathogens and discover new ones. The machine has reference fingerprints from DNA sequences for known pathogens, and it tries to match specimens against these references. "This machine can detect the majority of known human pathogens of public health importance—bacterial or viral or fungal," explains Sulaiman. "If it's an unknown pathogen and it's bacterial, it will give you a bacterial answer. It might not give you the exact germ, but it will be a closely matching germ." Photo by CDC photographer Greg Knobloch.



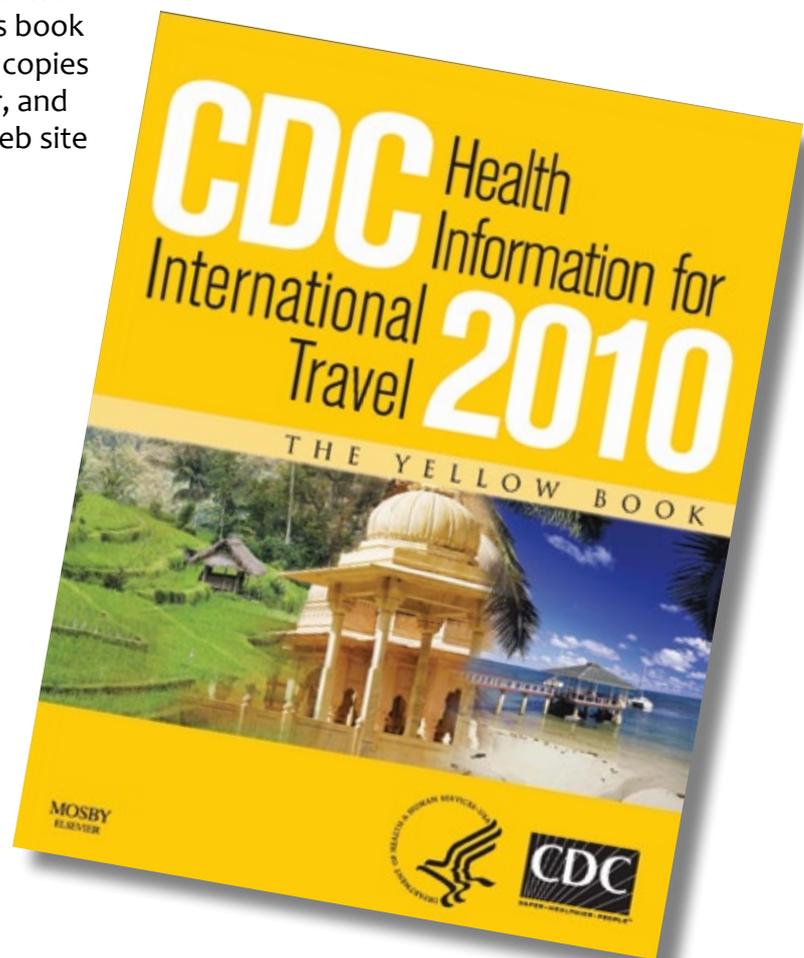
Resources from CDC

The *Yellow Book*

wwwn.cdc.gov/travel/contentYellowBook.aspx

CDC Health Information for International Travel, also known as the *Yellow Book*, is published every 2 years by CDC as a reference for those who advise travelers of health risks they may face when traveling abroad. Although the *Yellow Book* is written primarily for healthcare providers, including doctors, nurses, and pharmacists, other groups such as the travel industry, multinational corporations, and missionary and volunteer organizations, as well as individuals and families who vacation abroad, can all find a wealth of information within this text.

For instance, the *Yellow Book* has the latest information on vaccines as well as ways to prevent and treat diseases not commonly seen in the United States—like malaria. The book is regularly updated to include new diseases that world travelers need to be aware of. The text is written by subject matter experts both within CDC and outside the agency, and the guidelines presented in this book are based on solid scientific evidence. Hard copies of the book can be purchased from Elsevier, and free copies can be downloaded from the Web site listed above.



Emerging Infectious Diseases

www.cdc.gov/ncidod/eid

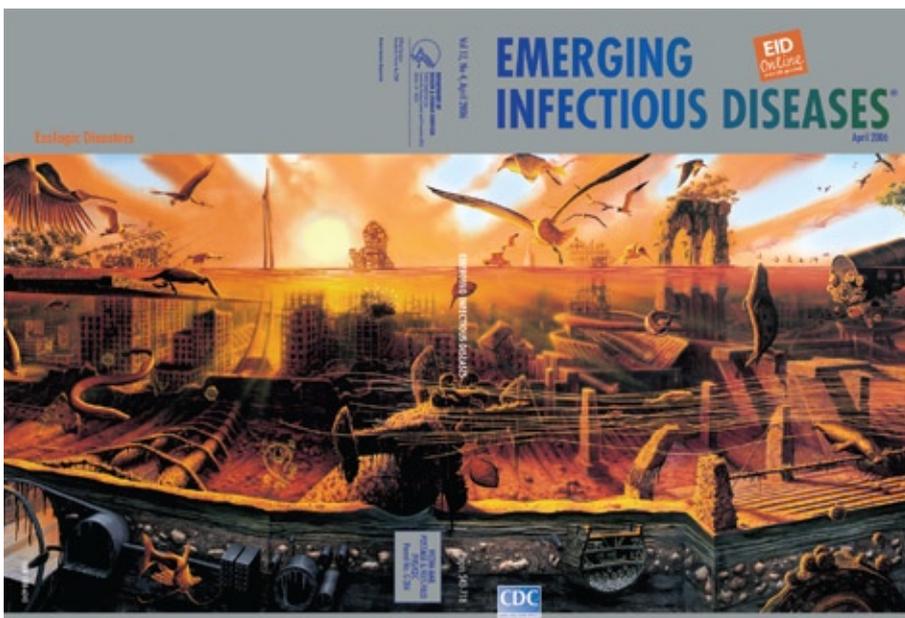
Since 1995, the *Emerging Infectious Diseases*® journal has communicated the threat of newly emerging infectious diseases to readers around the world. Authors from many different countries contribute articles to the journal, which undergoes rigorous peer review. The journal investigates factors that lead to the emergence of these new diseases; reports laboratory and epidemiologic findings; provides swift updates of infectious disease trends and research; and highlights developments in antimicrobial drugs, vaccines, as well as disease prevention and elimination. The journal encourages insightful analysis and commentary.

Emerging Infectious Diseases® also quickly communicates urgent public health information. For example, soon after anthrax spores were disseminated through the U.S. postal system, the journal described the first 10 cases of human exposure to anthrax. Five days after the authors submitted the article describing these 10 cases, the article underwent rigorous and swift peer review and was published. The information gave healthcare professionals the data they needed to recognize potential new cases. In 2004, the journal published more than 40 peer-reviewed articles on SARS, a disease that did not exist a year before.

The journal continues to cover health issues that remain cause for concern: avian flu, HIV/AIDS, reemerging TB, coronavirus, West Nile virus, ecologic disaster, and antimicrobial drug resistance, to name a few. The journal reaches more than 50,000 global subscribers and receives hundreds of thousands of hits on its Web site each month. In addition, this journal

is one of the top five most often cited infectious disease journals in the world.

Its iconic cover art, strong brand, and profile are linked to the public health content, strengthening the journal's mission to communicate the threat of emerging infections and reduce their global impact, particularly among the most vulnerable: the young, the old, and those with compromised immune systems.



Software to Plan for the Next Flu Pandemic

www.cdc.gov/flu/pandemic/preparednesstools.htm

Because it is impossible to predict when and where a flu pandemic will occur, the United States and other countries have developed preparedness plans to ensure that we are ready to deal with the consequences of a pandemic. CDC has developed three software programs that health agencies can use to prepare for the next flu pandemic. FluWorkLoss, FluSurge, and FluAid can be downloaded for free from CDC's Web site. Policy makers who are responsible for the public health of over 1 billion people have used these tools and indicated they were easy to use and quite useful in helping them ensure that the nation's workforce, healthcare facilities, and communities are prepared for a flu pandemic.



FluWorkLoss estimates the potential number of days lost from work due to an influenza pandemic. Users can change almost any input value, such as the number of workdays assumed lost when a worker becomes ill or the number of workdays lost due to a worker staying home to care for a family member. Users can also change the length and virulence of the pandemic so that a range of possible impacts can be estimated. FluWorkLoss provides a range of estimates of total workdays lost, as well as graphic illustrations of the workdays lost by week and percentage of total workdays lost to influenza-related illnesses.



FluSurge is a spreadsheet-based model that hospital administrators and public health officials can use to generate estimates of the surge in demand for hospital-based services during the next influenza pandemic. FluSurge estimates the number of hospitalizations and deaths of an influenza pandemic (whose length and virulence are determined by the user) and compares the number of persons hospitalized, the number of persons requiring ICU care, and the number of persons requiring ventilator support during a pandemic with existing hospital capacity. Variables that can be altered by the user include the assumed average length of hospital stay for an influenza-related illness, and the percentage of influenza-related hospital admits that will require a bed in an intensive care unit. The user can also change the total number of persons requiring hospitalization.



FluAid is designed to assist state and local level planners in preparing for the next influenza pandemic by providing estimates of potential impact specific to their locality. FluAid provides a range of estimates of impact in terms of deaths, hospitalizations, and outpatient visits due to pandemic influenza.

Hand Hygiene Saves Lives: Patient Admission Video

www.cdc.gov/handhygiene/Patient_Admission_Video.html

This video promotes hand hygiene for hospital patients and visitors. CDC partnered with the **Association for Professionals in Infection Control and Epidemiology** and the **Safe Care Campaign** to develop the video, which teaches the importance of practicing hand hygiene while in the hospital and the appropriateness of asking or reminding healthcare providers to practice hand hygiene.



Modeled after the video that airline passengers are required to view before take-off, this new video is intended to be shown to patients upon admission to the hospital. The goal is to inform patients at the beginning of their hospital stay about what they can do to help prevent infections throughout the duration of their stay. The 5-minute video begins with a brief introduction on healthcare-associated infections. It is then narrated by a nurse character named Gayle who stresses the importance of hand hygiene for both patients and healthcare providers. There are two patient room scenes in which patients and visitors model the behavior of asking one another as well as their healthcare providers to perform hand hygiene—with positive results.

The video and accompanying brochures and posters (available in English and Spanish) may be downloaded for free from the CDC Web site listed above.

Hand Hygiene Interactive Training Course

www.cdc.gov/handhygiene/

This new online training course reviews the key concepts of hand hygiene and other standard precautions to prevent healthcare-associated infections. It is intended for healthcare providers and includes a self-paced navigation program that allows users to learn through both text and image-based pages. The course also includes several interactive activities and questions that reemphasize the learning objectives throughout. A unique close-captioned 60-second video demonstrates the appropriate technique for handwashing mid-way through the course. At the conclusion of the course, there are creative posters and screen savers available for download. The training course is available at the CDC Web site listed above.

Infectious Diseases, Pestorius served as deputy director for management

HAND HYGIENE
RESOURCE WEB PAGE

WELCOME

to the CDC Hand Hygiene Resource web page.

This course and promotional materials review key concepts of hand hygiene and Standard Precautions.

LAUNCH THE COURSE

CLICK HERE TO DOWNLOAD PROMOTIONAL MATERIALS

CDC
USA.gov
DEPARTMENT OF HEALTH AND HUMAN SERVICES

For More Information

Centers for Disease Control and Prevention
<http://www.cdc.gov>

Coordinating Center for Infectious Diseases
<http://www.cdc.gov/about/organization/ccid.htm>

National Center for Preparedness, Detection, and Control of
Infectious Diseases
<http://www.cdc.gov/ncpdcid/>

Division of Bioterrorism Preparedness and Response
<http://www.bt.cdc.gov/bioterrorism/overview.asp>

Division of Global Migration and Quarantine
<http://www.cdc.gov/ncidod/dq/>

Division of Scientific Resources
<http://www.cdc.gov/ncidod/srp/>

Division of Laboratory Systems
<http://wwwn.cdc.gov/dls/default.aspx>

Division of Healthcare Quality Promotion
<http://www.cdc.gov/ncidod/dhqp/index.html>

Division of Emerging Infections and Surveillance Services
<http://www.cdc.gov/ncidod/osr/>



www.cdc.gov/ncpdcid

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