EMERGING & ZOONOTIC INFECTIOUS DISEASES

CDC Vitalsigns™
March 2011

Making Health Care Safer

Reducing bloodstream infections

1 in 20

About 1 in 20 patients gets an infection each year while receiving medical care.

41,000

About 41,000 bloodstream infections strike hospital patients with central lines each year.

37,000

About 37,000 bloodstream infections happen each year to kidney dialysis patients with central lines.

A central line is a tube that a doctor usually places in a large vein of a patient's neck or chest to give important medical treatment. When not put in correctly or kept clean, central lines can become a freeway for germs to enter the body and cause serious bloodstream infections. These infections can be deadly. Of patients who get a bloodstream infection from having a central line, up to 1 in 4 die. Bloodstream infections in patients with central lines are largely preventable when healthcare providers use CDC-recommended infection control steps. Medical professionals have reduced these infections in hospital intensive care unit (ICU) patients by 58% since 2001. Even so, many still occur in ICUs, in other parts of hospitals, and in outpatient care locations. In 2008, about 37,000 bloodstream infections occurred in hemodialysis* outpatients with central lines.

*Use of a machine to clean or filter the blood when kidneys no longer work.

Learn what you can do to reduce central line bloodstream infections.

→ See page 4

Want to learn more? Visit www.cdc.gov/vitalsigns or http://www.cdc.gov/vitalsigns

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

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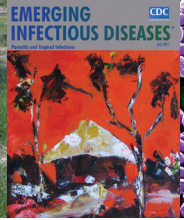

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National Center for Emerging and Zoonotic Infectious Diseases

The National Center for Emerging and Zoonotic Infectious Diseases is committed to protecting people from infectious diseases. We target familiar problems (like foodborne illnesses) and many that are less common (like viral hemorrhagic fever).

Here are just a few examples of what we do:

- **Foodborne illness.** One in six Americans gets sick each year from something they ate. Illnesses caused by eating food contaminated with germs like *Salmonella* and *Escherichia coli (E. coli)* are costly and all too common. The good news is that these illnesses can be prevented.
- **Infections that spread in a hospital, nursing home, or other healthcare setting.** At any given time, about 1 in every 20 patients has an infection related to their hospital care. But when staff and patients follow recommendations, infections are prevented, and this saves both lives and dollars.
- **Infections that are resistant to antimicrobial drugs (like antibiotics).** Antimicrobial resistance is the result of germs changing in a way that reduces or eliminates the effectiveness of drugs, chemicals, or

Above, L-R: 1 CDC scientists in 2011 study bats in Uganda to learn more about their relationship to Marburg virus which, like Ebola virus, can cause a rare but deadly hemorrhagic fever in humans and other primates. **2** Worldwide water quality is declining, as evidenced by the outbreak of cholera in Haiti in 2010. **3** The *Emerging Infectious Diseases* journal publishes peer-reviewed scientific articles about emerging infections. **4** *Bacillus anthracis* spores cause anthrax, a rare but deadly disease in animals (for example, cows) and people.

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other agents to cure or prevent infections. Methicillin-resistant *Staphylococcus aureus* (MRSA) is one of the more familiar types of antimicrobial infections, but many others are rapidly spreading in hospitals, the community, and even on the farm. Tracking and limiting the spread of antimicrobial-resistant microorganisms is critical to the center's mission.

- **Deadly diseases.** Germs that cause smallpox, anthrax, rabies, Ebola hemorrhagic fever, and plague require 24/7 oversight, especially because of the threat of bioterrorism. Tracking these diseases domestically and globally, operating state-of-the-art laboratories that can identify them, and preventing their spread are national priorities.
- **Illnesses that affect immigrants, refugees, migrants, expatriates, and travelers.** For example, where do international travelers find up-to-date advice about shots they need or precautions they should take? The Travelers' Health Web site (www.cdc.gov/travel) is *the* comprehensive online resource for travelers who need answers to their questions about how to stay healthy before, during, and after a trip.
- **Diseases spread by mosquitoes, ticks, and fleas.** These vectors continue to spread many of the world's most destructive diseases. Each year, scientists discover, on average, about two new mosquito-transmitted viruses that can make people sick.

Such wide-ranging work is guided by principles—to conduct exemplary science, inform policies using our scientific evidence, strengthen preparedness, and share vital information with the public. Making the country safer from the spread of infectious diseases also requires ongoing collaborations with national and global partners.

Above, L-R: 1 The Biotechnology Core Facility uses state-of-the-art methods to help CDC researchers study infectious agents. **2** CDC's laboratories at Fort Collins, Colorado, help develop vaccines to prevent dengue, West Nile virus infection, and other diseases spread by mosquitoes. **3** Producing posters for display in airports is one way that CDC helps international travelers stay healthy. **4** Healthcare-associated infections do not just affect patients in hospitals. These infections are also a problem for the millions of older adults living in nursing homes and assisted living facilities.

About Our Name

Infectious diseases mean illnesses caused by germs (such as bacteria, viruses, and fungi) that enter the body, multiply, and can cause an infection.

- Some infectious diseases are contagious (or communicable), that is, spread from one person to another.
- Other infectious diseases can be spread by germs carried in air, water, food, or soil. They can also be spread by vectors (like biting insects) or by animals.

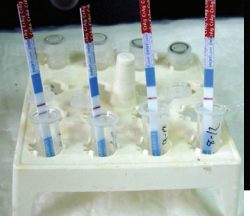
Emerging means infections that have increased recently or are threatening to increase in the near future. These infections could be

- completely new (like SARS).
- reappearing in an area (like dengue in south Florida).
- old infections that have become resistant to antibiotics (like staph and the deadly gram-negative infections that are cropping up in hospitals).

Zoonotic means infectious diseases of animals that are spread to humans by ticks, mosquitoes, or fleas or contact with animals; these diseases include

- Lyme disease (spread by ticks).
- West Nile virus disease (spread by mosquitoes).
- rabies (spread by raccoons, skunks, bats, and other mammals).

Below, L-R: 1 Farm animals such as goats can spread *Salmonella, E. coli*, the bacteria that cause Q fever, and other germs. 2 This type of flea can spread plague. Scattered cases of plague occur in the southwestern United States. 3 Each year, roughly 1 in 6 people in the United States gets sick (and 3,000 die) from eating contaminated food. 4 Athletes should bandage scrapes and cuts to protect against MRSA infection.



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The Center's Seven Divisions

The center's seven divisions work with partners throughout the United States and around the world to prevent illness, disability, and death caused by infectious diseases.

Division of Foodborne, Waterborne, and Environmental Diseases

Focus

To prevent diseases caused by contaminated food or water and detect and contain fungal infections.

Some key activities

- Rapidly identify the germs that cause foodborne illnesses, track down the places where contamination occurs, and inform people how to protect themselves and others.
- Quickly detect outbreaks of foodborne disease that cause illnesses in multiple states.
- Direct the center's work in global water, sanitation, and hygiene (WASH)-related disease, focusing on diarrheal diseases, such as cholera and typhoid.
- Educate people in the United States about using water sanitation systems and good hygiene to keep our drinking water, swimming pools, lakes, and other water sources safe.
- Detect fungal threats, such as candidiasis, cryptococcosis, and mucormycosis so that they can be quickly contained before causing harm to people with impaired immune systems.

http://www.cdc.gov/ncezid/dfwed/

Above, L-R: 1 A novel dipstick screening test reduces deaths caused by a deadly infection from a fungus called *Cryptococcus*. **2** When consumed raw, milk, certain cheeses, ice cream, and yogurt can pose severe health risks. **3** An outbreak of listeriosis in cantaloupe in 2011 was the deadliest outbreak of foodborne disease in the U.S. in nearly 90 years. **4** Swimming when ill with diarrhea places other swimmers at significant risk for getting sick. **5** CDC works to prevent diseases caused by contaminated food and water and dangerous fungal infections found in the soil.

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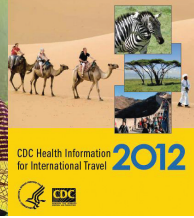

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Division of Global Migration and Quarantine

Focus

To protect the health of our communities in a globally mobile world by preventing the introduction, transmission, and spread of communicable diseases.

Some key activities

- Provide education and manage programs to screen immigrants and refugees for infectious diseases.
- Partner for health at airports, seaports, and land borders.
- Provide vital health information to help international travelers stay healthy before, during, and after their trips.
- Promote the safe importation of animals and animal products through regulations.
- Respond to global public health emergencies to slow the spread of illness—for example, cholera in Haiti, the radiation disaster in Japan, H1N1 pandemic flu, and tuberculosis outbreaks near the U.S.-Mexican border.

http://www.cdc.gov/ncezid/dgmq/

Above, L-R: 1 Quarantine officer at an airport reviewing data collected from an airline contact investigation. **2** Following CDC's guidance, healthcare workers at a clinic in a refugee camp in Thailand watch to make sure that refugees with tuberculosis are taking their medicine before they come to the United States. **3** Doctor discussing an immigrant's chest X-ray. **4** *The Yellow Book* is a reference for doctors, nurses, and other healthcare professionals who advise international travelers about health risks.

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Division of Healthcare Quality Promotion

Focus

To protect patients and healthcare workers and to promote safety in healthcare settings.

Some key activities

- Investigate and respond to emerging infections and adverse events in healthcare facilities, including healthcare-associated infections; antimicrobial (drug-resistant) infections; adverse events from the use or misuse of a drug (like accidental overdoses); blood, organ, and tissue safety; and vaccine safety.
- Support the enhancement of state infrastructure for elimination of healthcare-associated infections.
- Develop and disseminate evidence-based guidelines and recommendations to prevent and control healthcare-associated infections, antimicrobial resistance, and medical errors.
- Maintain the National Healthcare Safety Network (NHSN), a tool for monitoring and preventing healthcare-associated infections, used by healthcare facilities in all 50 states.

http://www.cdc.gov/ncezid/dhqp/

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Above, L-R: 1 CDC works with many partners to encourage healthcare professionals to eliminate infections spread through contaminated needles, solutions, and syringes. **2** Educational materials promote healthy behaviors, such as hand hygiene in hospitals. Keeping hands clean is one of the most important ways to prevent the spread of infections. **3** CDC scientists track antimicrobial-resistant pathogens around the globe. Antimicrobial resistance is one of the world's most pressing health problems. **4** At any given time, about 1 in every 20 patients has an infection related to their hospital care.

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Division of High-Consequence Pathogens and Pathology

Focus

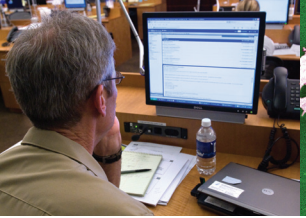
To improve public health and safety domestically and globally by preventing illness and death caused by highly lethal, contagious, or unexplained diseases.

Some key activities

- Monitor, investigate, and study diseases caused by hazardous viruses and bacteria—such as those that cause rabies, anthrax, and viral hemorrhagic fevers (like Ebola in Africa).
- Collaborate with partners around the world to find ways to prevent these infections.
- Assist in investigations of unexplained critical illness and deaths.
- Conduct laboratory studies of tissue samples and investigate infectious diseases of unknown origin. These studies helped identify SARS and hantavirus pulmonary syndrome, a deadly disease spread by mice and rats.
- Conduct laboratory studies to better understand human papillomavirus infection, which increases the risk for cervical and other cancers.
- Track specific prion diseases (diseases that attack the brain and central nervous system), such as Creutzfeldt-Jakob disease.
- Research potential causes of chronic fatigue syndrome and recommend new interventions.

http://www.cdc.gov/ncezid/dhcpp/

Above, L-R: 1 Although most bats do not have rabies, rabid bats have been found in all states except Hawaii. **2** The remains of a hospital in Sudan that was devastated in 1976 by that region's Ebola viral hemorrhagic fever outbreak. **3** Hantavirus pulmonary syndrome is a sometimes deadly disease transmitted by infected mice and rats. **4** The 2-year-old girl in Bangladesh who had the world's last known case of naturally occurring smallpox (variola major) in 1975. Although smallpox has been eradicated, monkeypox (a related disease mostly found in Africa) sickened several people in the United States in 2003.



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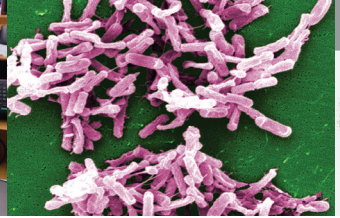

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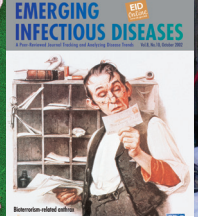

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Division of Preparedness and Emerging Infections

Focus

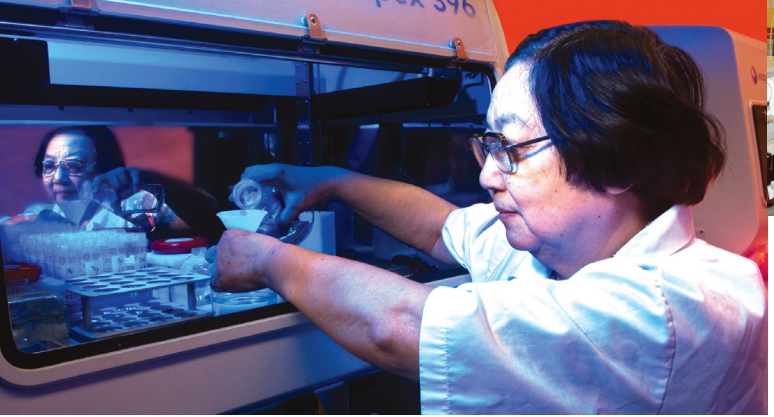
To assure that the public health system can detect and respond to infectious disease threats, with a special focus on emerging pathogens, biological warfare agents, and the diseases that are of particular concern to people living in Alaska and other Arctic regions.

Some key activities

- Help prepare CDC and its partners to use vaccines, drugs, and diagnostic tests—countermeasures that would be critically important to saving lives during a large-scale public health emergency caused by bioterrorists.
- Work to ensure that public health laboratories throughout the country are using the same high standards that are vital for successful collaborations.
- Assist state and local health departments in building their capacity through activities such as the Emerging Infections Program and the Epidemiology and Laboratory Capacity program.
- Manage the Laboratory Response Network, which links 160 highly specialized laboratories, including health department laboratories, federal and military laboratories, environmental testing and diagnostic veterinary laboratories, as well as international laboratories. This unique network of laboratories is designed to respond to bioterrorism, chemical terrorism, and other public health emergencies.
- Target diseases that are a special problem for Alaska Natives, such as viral hepatitis and foodborne botulism.

http://www.cdc.gov/ncezid/dpei/

Above, L-R: 1 CDC staff help coordinate the agency's rapid response to bioterrorism and other infectious disease emergencies, such as the H1N1 flu outbreak. **2** CDC's Emerging Infections Program tracks infections caused by gram-positive *Clostridium difficile* that patients can get in a hospital or other healthcare facility. **3** Anthrax was used as a weapon in 2001, when it was deliberately spread through the U.S. postal system. **4** The Arctic Investigations Program sent a team to a remote Alaskan village to investigate an outbreak of meningitis.



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Division of Scientific Resources

Focus

To partner with CDC laboratories in responding to public health needs through the supply of state-of-the-art technology, expertise, and high-quality products.

Some key activities

- Provide expertise to develop and apply modern technologies (such as genomic sequencing) that result in faster identification of bacteria, viruses, fungi, and other pathogens.
- Provide high-quality laboratory products and services, in compliance with FDA regulations, that CDC laboratorians need to do their work.
- Distribute investigational and licensed drugs and unique biologicals (antitoxins) to approved physicians for treatment of rare, tropical, or exceptional diseases.
- Maintain an adequate supply of smallpox vaccine in the Strategic National Stockpile for emergency distribution. The stockpile has medicine and medical supplies if there is a public health emergency (like a terrorist attack).
- Receive and distribute specimens to CDC laboratories; report test results to state public health laboratories; ship specimens and products to CDC's partners.
- Manage CDC's laboratory waste decontamination and disposal, as well as laboratory water systems.

http://www.cdc.gov/ncezid/dsr/

Above, L-R: 1 Chemists create peptides for infectious disease research. The peptides are used for various laboratory studies including research to find a malaria vaccine. 2 Scientists make nucleotides, the building blocks for DNA and RNA, to use in genetic studies. 3-4 Division of Scientific Resources staff stock laboratory supplies (such as glassware) and provide services for CDC's high-containment laboratories, where scientists study lethal infectious pathogens.

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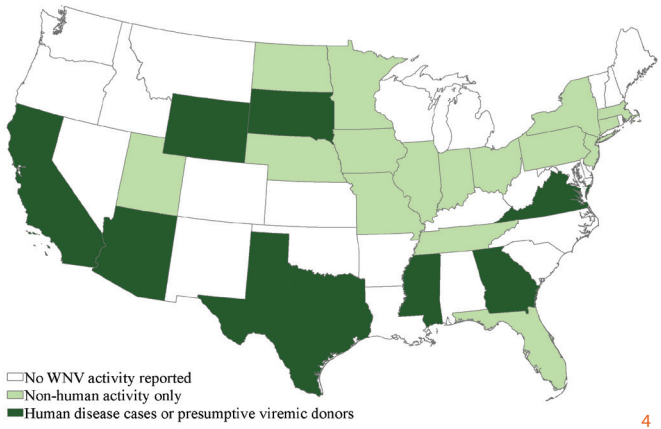
West Nile Virus (WNV) activity reported to ArboNET, January–July 2011



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Division of Vector-Borne Diseases

Focus

To protect the nation from bacterial and viral diseases transmitted by vectors (like insects and ticks).

Some key activities

- Help domestic and global public health agencies identify and respond to epidemics of dangerous vector-borne diseases, such as dengue and yellow fever, and newly emerging pathogens.
- Conduct research to find more effective ways to diagnose and prevent Lyme disease, Rocky Mountain spotted fever, and other tick-borne diseases.
- Discover better insecticides and repellents for mosquitoes and ticks.
- Develop innovative vaccines to prevent dengue and other vector-borne viruses and therapies for plague and other vector-borne bacteria.
- Train domestic and global public health workers in the best methods for preventing, diagnosing, and controlling vector-borne diseases.

http://www.cdc.gov/ncezid/dvbd/

Above, L-R: 1 CDC's Dengue Branch in Puerto Rico focuses on dengue viruses, which infect an estimated 100 million people each year. In 2009, Florida reported dengue cases for the first time in 75 years. **2** Rash in the pattern of a bull's-eye occurs in about 70% of patients who develop Lyme disease. **3** A Rocky Mountain wood tick, which spreads Rocky Mountain spotted fever. **4** After arriving in the United States in 1999, West Nile virus swept across the country in less than 10 years, causing more than 12,700 people to become severely ill.

The National Center for Emerging and Zoonotic Infectious Diseases

is committed to protecting people from domestic and global health threats, including

- Foodborne illness
- Infections that spread in hospitals
- Infections that are resistant to antibiotics
- Deadly diseases like anthrax
- Diseases caused by contact with animals
- Illnesses that affect immigrants, migrants, refugees, and travelers
- Diseases spread by mosquitoes, ticks, and fleas

Front Cover, L-R: 1 CDC staff member in the Biosafety Level 4 laboratory decontamination shower. **2** Water is essential for life, but can also spread illness when contaminated by disease-causing organisms. **3** Vital Signs focuses on important public health issues like healthcare-associated infections. A serious type of bloodstream infection can cause death in up to 25% of infected patients. **4** CDC helps conduct health screenings of recent immigrants along the U.S.-Mexico border. **5** A blood-engorged female "Asian Tiger" mosquito, a carrier of chikungunya and dengue viruses.

For more information please contact
National Center for Emerging and Zoonotic Infectious Diseases | 1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348 | E-mail: cdcinfo@cdc.gov | Web: http://www.cdc.gov/ncezid/

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