CDC Division of Vector-Borne Diseases

DVBD Priority Diseases

- Dengue hemorrhagic fever
- Ehrlichiosis and Anaplasmosis
- Lyme disease
- Plague
- Q fever
- Rocky Mountain spotted fever
- Tularemia
- West Nile and other mosquito borne viruses

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Key DVBD Functions

- **Lead agency** for prevention and response to viral and bacterial vector-borne disease.
- Coordinates **nationwide** disease **surveillance**. Identifies and responds to changes in disease patterns.
- Serves as national **diagnostic reference laboratory**, supporting state laboratory networks to quickly identify the cause of outbreaks.
- Responds to vector-borne disease outbreaks with **science-based guidance** and leadership for control.
- As CDC's only major infectious disease laboratory outside of Atlanta, provides emergency **continuity-of-operations**; tests for all major infectious bioterrorism agents.

Promoting Health and Quality of Life by Preventing and Controlling Vector-Borne Diseases

Some of the world's most destructive diseases are vector-borne—that is they are transmitted to humans by vectors such as ticks, mosquitoes or fleas. The Centers for Disease Control and Prevention (CDC)'s Division of Vector-Borne Diseases (DVBD) is one of the **world's foremost centers of research** for preventing and controlling vector-borne viruses and bacteria.

Vector-borne diseases are among the most complex of all infectious diseases to prevent and control. Not only is it difficult to predict the habits of the vectors, but most vector-borne agents can infect animals as well. The rapid, unstoppable spread of **West Nile virus** (WNV) across the United States (US) is an example of the problem. Another emerging infection, **Lyme disease**, has resulted in over 20,000 annual reported human cases in the US in recent years. **Dengue fever** causes thousands of cases of illness in US territories and US travelers, and millions of cases worldwide. *Yersinia pestis*, which causes the ancient disease known as **plague**, continues to cause focal outbreaks in the US and is a significant health threat in Africa and Asia. Looking forward, we are preparing for the potential introduction of **chikungunya** and **Rift Valley fever** viruses. Tickborne rickettsial diseases, such as **Rocky Mountain spotted fever** (RMSF), **ehrlichiosis**, and **anaplasmosis** are responsible for over 4,000 cases each year, including some with fatal outcome.

DVBD combines specialized **epidemiology, ecology and laboratory expertise** to respond to the challenges presented by vector-borne infectious diseases. We support state and local health departments, work with partners in industry and other federal agencies and answer the call for expertise from international partners during epidemics. We are more cognizant than ever of the potential risks presented by globalization and climate change. The world is an increasingly smaller place, and the **US is at greater risk than ever from vector-borne disease**. It is DVBD's challenge to mitigate that risk.

DVBD Works with States

DVBD provides **diagnostic and reference** services for all state health departments. DVBD laboratories test samples for vector-borne diseases that are uncommon in the US that require special testing equipment. State public health laboratories also rely on DVBD for special laboratory materials.

DVBD's **technical assistance and disease investigation** includes collaboration with Colorado and New Mexico in the investigations of plague, investigation of tularemia outbreaks in Utah and Missouri, work with Native American tribes in several states and investigations of fevers of unknown origin in Arkansas.

DVBD coordinates surveillance with all states through ArboNET, the computerized national surveillance system it developed for tracking WNV. ArboNet address states' needs for tracking WNV. This electronic data sharing allows all partners to make decisions about mosquito control or outbreak preparation and response.

In 2010, DVBD provided funds valued at $13 million to health departments in **48** states, 1 territoriy and 5 large cities to support activities for WNV and other medically important arboviruses. Another $48,000 was provided to 12 states to support enhanced surveillance for Lyme disease and ticks.

Dr. Ingrid Weber examines a child in Uganda.

DVBD International

DVBD supports two types of international projects:

- ***Outbreak response***—Short-term assistance in the suppression of epidemics.
  Recent examples include the response to outbreaks of yellow fever in **Sudan**, **Uganda**, **Peru**, and **Paraguay**; Rift Valley fever in **Kenya**; Zika virus in the Pacific island of **Yap**, and chikungunya in the **Indian Ocean** region.
- ***Research and development***—Long-term, multidisciplinary projects with the aim of improving diagnosis and control of diseases at their source. Recent activities include:
  - » **Africa**: Although rare in the US, **plague** is a significant endemic disease in Africa. In *Uganda*, DVBD, with support from USAID, is conducting the largest multidisciplinary study of plague in the world. This study will provide the knowledge to better predict, diagnose, prevent and treat plague anywhere. For example, in 2010, DVBD and its Ugandan partners will begin the first trial to test the efficacy of the readily available, inexpensive antibiotic ciprofloxacin (Cipro™) in the treatment of plague—the results of which may influence the US National Stockpile of drugs kept in reserve for bioterrorism. Another highlight is rapid, inexpensive bedside diagnostic tests ("dipsticks") being developed at DVBD, with the goal of transferring this technology to Africa where it will have broader application to other diseases as well.
  - » **Asia: Japanese encephalitis (JE)**, a mosquito-borne disease, is one of the leading causes of viral encephalitis in Asia. JE is a continuing health threat to children in these areas with tens of thousands of cases reported each year. Since 2007, DVBD has helped initiate local disease monitoring programs, provide training, establish a laboratory network and evaluate programs that will allow better vaccine coverage for children in Cambodia, China, India and Bangladesh.
  - » **Latin America**: DVBD is working with local partners to assess the disease burden from **WNV**, dengue, and **other arboviruses** in *Guatemala*, *Panama*, and *Mexico*. Some of these viruses are transported by migrating birds throughout the Americas.

As a Division of CDC, DVBD blends world-class scientific research in vector-borne disease with operational response to vector-borne disease epidemics and bioterrorism.

DVBD is the focal point for national coordination of public health efforts for vector-borne diseases.

Innovative Research to Predict, Prevent and Control Disease

Disease prediction is key in prevention and control. Data on the number and location of human cases, the vector quantity and type, ecological and climate patterns as well as infection rates in hosts animals and vectors can give a picture of when, where and how a disease is spreading or declining. This and other data can help predict future outbreaks, identify unique disease cycles, as well as frame research, preparedness and prevention plans.

To that end, DVBD's ongoing surveillance identified 28, 921 human cases of Lyme disease in 2008, the most common vector-borne disease in the US. DVBD developed and manages the internet-based ArboNet, the only surveillance system at CDC that tracks human cases of disease as well as reports of infection in vectors and hosts. ArboNet carefully tracked WNV as it progressed across the US in less than a decade. With ArboNet, state health departments can view hot spots of vector activity or human cases in neighboring states and areas to better initiate prevention activities to reduce human risk.

Dengue fever causes thousands of cases of illness in US territories and travelers from the US. DVBD's ongoing surveillance in Puerto Rico tracks dengue epidemics, such as in 2010 when over 22,000 cases were identified. Understanding the disease patterns alerts public health officials to heighten mosquito control, alert the public to increase personal protection and allows health care facilities to manage a potential increase in patients.

DVBD research focuses on prevention and control strategies that can reach the targeted disease or vector at multiple levels while being mindful of cost effective delivery that is acceptable to the public, and cognizant of the world's ecology. Current research includes vaccine development, vector control, and public and health care provider education. At another level, novel approaches to control ticks, including evaluation of insecticides and repellents derived from natural products are being investigated.

DVBD will continue to develop more refined surveillance systems, develop human and animal vaccines, research novel approaches to control vectors and their ability to transmit disease, while increasing public and health care provider education. US citizens can feel secure in that their public health system is the most sophisticated in the world.

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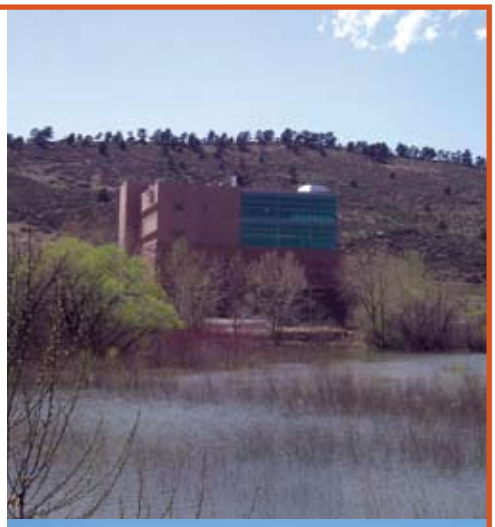

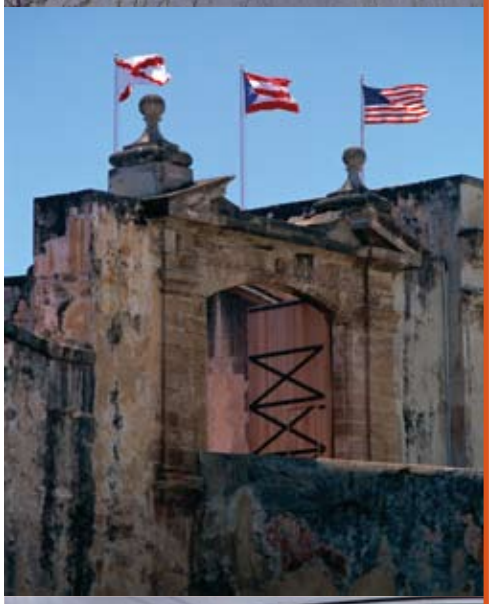

DVBD's goal: reduce the threat and burden from vector-borne diseases everywhere.

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