Surveillance Protocol
Dengue Fever
(Breakbone fever, Dengue Hemorrhagic Fever)

**Provider Responsibilities**

1. Report suspect or confirmed cases of Dengue Fever (DF) or Dengue Hemorrhagic Fever (DHF) to your local health department by phone within 24 hours.

2. Complete the provider section (yellow) of the WVEDSS form and forward to the local health department.
   a) In the note section of the WVEDSS form, document signs and symptoms such as sudden onset of fever, severe headache, eye pain, muscle and joint pain, rash, or GI upset or loss of appetite. For DHF, document any abnormal blood clotting, low platelet count, and evidence of plasma leaking through capillaries.
   b) Document the date of onset of symptoms.
   c) In the note section of the form, list any travel history. Note in the note section if mosquito precautions were used during travel.
   d) In the note section, list any labs performed and the results.

3. Submit serum sample to the Office of Laboratory Services (OLS) for forwarding to CDC for testing.

4. Submit paper copies of any positive laboratory results pertaining to DF or DHF to the local health department via fax.

**Laboratory Responsibilities**

1. Forward copies of any positive test results for DHF to the local health department within 24 hours.

2. Reserve serum from any patient tested for DHF; refer positive serum samples to OLS for confirmatory testing at CDC after consulting with WVDHHR’s Infectious Disease Epidemiology Program (IDEP) at 1-800-423-1271.

**Public Health Action**

West Virginia Department of Health and Human Resources; March, 2006
1. Educate the public about DF and DHF infections, especially the importance of using protection against mosquitoes if traveling to endemic areas. Unlike other vectors, Ae. aegypti mosquitoes bite during daytime hours.

2. Educate the public to seek medical advice prior to travel.

3. Educate physicians and infection control practitioners about diagnosis and reporting of Dengue. Providers should be alert to the clinical symptoms of the viral illness and be educated to inquire about recent travels of the case.

4. If a suspect or confirmed case has no travel history to an enzootic area, contact IDEP immediately. Issue an alert to physicians and infection control practitioners, asking for prompt reporting of additional cases.

**Disease Control Objectives**

1. With confirmation of a case, prevent local spread by avoiding exposure to mosquitoes until fever subsides.

**Disease Prevention Objectives**

1. Prevent cases of DF or DHF by educating the public and healthcare providers to:
   a) Seek medical advice prior to travel.
   b) Take mosquito precautions in endemic areas.
   c) Seek medical attention if ill during or after travel to endemic countries.

**Disease Surveillance Objectives**

1. Identify imported cases to understand the epidemiology of endemic and epidemic DF and DHF better.

2. Identify locally acquired cases, if they occur, so that appropriate active surveillance and mosquito control programs can be undertaken.

3. Identify demographic characteristics of patients with DF or DHF.

4. Identify risk factors for DF or DHF.
Public Health Significance

The first reported epidemics of DF occurred in 1779-1780 in Asia, Africa, and North America. The near simultaneous occurrence of outbreaks on three continents indicates that these viruses and their mosquito vector have had a worldwide distribution in the tropics for more than 200 years. During most of this time, DF was considered a mild, nonfatal disease of visitors to the tropics. Generally, there were long intervals (10-40 years) between major epidemics, mainly because the introduction of a new serotype in a susceptible population occurred only if viruses and their mosquito vector could survive the slow transport between population centers by sailing vessels.

A pandemic of dengue began in Southeast Asia after World War II and has spread around the globe since that time. Epidemics caused by multiple serotypes (hyperendemicity) are more frequent, the geographic distribution of dengue viruses and their mosquito vectors has expanded, and DHF has emerged in the Pacific region and the Americas. In Southeast Asia, epidemic DHF first appeared in the 1950s, but by 1975 it had become a frequent cause of hospitalization and death among children in many countries in that region.

In 2005, dengue is the most important mosquito-borne viral disease affecting humans; its global distribution is comparable to that of malaria, and an estimated 2.5 billion people live in areas at risk for epidemic transmission (Figure 4). Each year, tens of millions of cases of DF occur and, depending on the year, up to hundreds of thousands of cases of DHF. The case-fatality rate of DHF in most countries is about 5%, but this can be reduced to less than 1% with proper treatment. Most fatal cases are among children and young adults.

The reasons for the dramatic global emergence of DF/DHF as a major public health problem are complex and not well understood. However, several important factors can be identified.
1. First, major global demographic changes have occurred, the most important of which have been uncontrolled urbanization and concurrent population growth. These demographic changes have resulted in substandard housing and inadequate water, sewer, and waste management systems, all of which increase Ae. aegypti population densities and facilitate transmission of Ae. aegypti-borne disease.

2. In most countries, the public health infrastructure has deteriorated. Limited financial and human resources and competing priorities have resulted in a "crisis mentality" with emphasis on implementing so-called emergency control methods in response to epidemics rather than on developing programs to prevent epidemic transmission. This approach has been particularly detrimental to dengue control because, in most countries, surveillance is (just as in the U.S.) passive; the system to detect increased transmission normally relies on reports by local physicians who often do not consider dengue in their differential diagnoses. As a result, an epidemic has often reached or passed its peak before it is recognized.

3. Increased travel by airplane provides the ideal mechanism for infected human transport of dengue viruses between population centers of the tropics, resulting in a frequent exchange of dengue viruses and other pathogens.

4. Lastly, effective mosquito control is virtually nonexistent in most dengue-endemic countries. Considerable emphasis in the past has been placed on ultralow-volume insecticide space sprays for adult mosquito control, a relatively ineffective approach for controlling Ae. aegypti.

No dengue vaccine is available. Recently, however, attenuated candidate vaccine viruses have been developed. Efficacy trials in human volunteers have yet to be initiated. Research also is ongoing to develop second-generation recombinant vaccine viruses. Therefore, an effective dengue vaccine for public use will not be available for 5 to 10 years.

Prospects for reversing the recent trend of increased epidemic activity and geographic expansion of dengue are not promising. New dengue virus strains and serotypes will likely continue to be introduced into many areas where the population densities of Ae. aegypti are at high levels. With no new mosquito control technology available, in recent years public health authorities have emphasized disease prevention and mosquito control through community efforts to reduce larval breeding sources. Although this approach will probably be effective in the end, it is unlikely to affect disease transmission in the near future. Therefore, we must develop improved, proactive, laboratory-based surveillance systems that can provide early warning of an impending dengue epidemic. At the very least, surveillance results can alert the public to take action and physicians to diagnose and properly treat DF/DHF cases.

Clinical Description

DF is an acute, viral illness characterized by sudden onset of fever, severe headache, eye pain, muscle and joint pain, and rash. GI upset and loss of appetite often occur. Swollen lymph nodes, petechiae, nosebleeds, and bleeding gums also occur frequently. Recovery is often associated with prolonged fatigue and depression. DHF is a severe viral illness also characterized by sudden onset of fever as well as hemorrhage from multiple sites. DHF is associated with the abnormal blood clotting, low platelet count (thrombocytopenia), and evidence of plasma leaking through capillaries. Patients with
GI bleeding have a greater likelihood of dying. Dengue shock syndrome includes all of the criteria for DHF described above, as well as life-threatening, severely reduced blood pressure (hypotension). Fatalities associated with DF are rare. With DHF, case fatality rates without treatment have reached 50%, although with intensive treatment, rates are much lower (1-2%).

**Etiologic Agent**

Dengue fever (DF) and dengue hemorrhagic fever (DHF) are caused by the same four serotypes of dengue flaviviruses (serotypes 1, 2, 3 and 4).

**Reservoir**

In tropical urban centers, the viruses that cause DF and DHF are maintained in humans and mosquitoes. In parts of Southeast Asia and West Africa, the viruses are maintained in monkeys and mosquitoes.

**Modes of Transmission**

DF and DHF viruses transmit to humans by infected mosquitoes, principally *Aedes aegypti*. Other *Aedes* species, such as *A. albopictus* (found in WV), also play a role in transmission. These viruses do not transmit directly from person-to-person.

**Incubation Period**

The incubation period is usually 4 to 7 days, although it may range from 3 to 14 days.

**Period of Communicability**

The diseases DF and DHF are not communicable from person-to-person. People are generally infectious for mosquitoes from a few days before onset to the end of the febrile period, usually about 3 to 5 days. The mosquito becomes infective 8 to 12 days after a blood meal from an infectious person or monkey, and it remains infective for its lifetime.

**Outbreak Recognition**

A locally acquired case of dengue would be an unusual occurrence as the Ae. aegypti mosquito has not been found in West Virginia. A single case without a recent travel history to an endemic country is defined as an outbreak.
**Case Definition**

**Clinical Description**

An acute febrile illness characterized by frontal headache, retro-ocular pain, muscle and joint pain, and rash. The principal vector is the *Aedes aegypti* mosquito and transmission usually occurs in tropical or subtropical areas. Severe manifestations (e.g., dengue hemorrhagic fever and dengue shock syndrome) are rare but may be fatal.

**Laboratory Criteria for Diagnosis**

1. Isolation of dengue virus from serum and/or autopsy tissue samples, or
2. Demonstration of a fourfold or greater rise or fall in reciprocal immunoglobulin G (IgG) or immunoglobulin M (IgM) antibody titers to one or more dengue virus antigens in paired serum samples, or
3. Demonstration of dengue virus antigen in autopsy tissue or serum samples by immunohistochemistry or by viral nucleic acid detection

**Case Classification**

**Probable:** a clinically compatible case with supportive serologic findings (a reciprocal IgG antibody titer of greater than or equal to 1280 or a positive IgM antibody test on a single acute- (late) or convalescent-phase serum specimen to one or more dengue virus antigens)

**Confirmed:** a clinically compatible case that is laboratory confirmed

**Comment:** Dengue hemorrhagic fever is defined as an acute febrile illness with minor or major bleeding phenomena, thrombocytopenia (less than or equal to 100,000/mm³), and evidence of plasma leakage documented by hemoconcentration (hematocrit increased by greater than or equal to 20%) or other objective evidence of increased capillary permeability. The definition of dengue shock syndrome follows all of the above criteria for dengue hemorrhagic fever and includes hypotension or narrow pulse pressure (less than or equal to 20 mm Hg).

**Prevention interventions**

Since epidemics of dengue can be extensive and may affect a high percentage of the population, travelers should avoid areas with ongoing epidemics. However, for those who do travel to endemic areas, travelers should protect themselves from mosquitoes by:

1. using repellents
2. wearing protective clothing
3. using mosquito nets when rooms are not screened.

Unlike other vectors, *Ae. aegypti* mosquitoes bite during daytime hours. Recent travelers to endemic countries with acute onset of fever and other compatible symptoms should seek medical attention immediately.
Treatment

There is no specific medication for treatment of a dengue infection. People who believe they have dengue should use analgesics (pain relievers) with acetaminophen and avoid those containing aspirin. They also should rest, drink plenty of fluids, and consult a physician.

As with dengue, there is no specific medication for DHF. It can however be effectively treated by fluid replacement therapy if an early clinical diagnosis is made. Hospitalization is frequently required to manage DHF adequately. Physicians who suspect that a patient has DHF may want to consult IDEP.

Surveillance Indicators

- Proportion of cases with complete demographic information
- Proportion of cases with completed travel history
- Proportion of cases with appropriate laboratory testing

References