

# Dengue

(Also known as Dengue Fever, Dengue Hemorrhagic Fever, and Breakbone Fever)



Section 1:

## ABOUT THE DISEASE

### A. Etiologic Agent

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

### B. Clinical Description

DF is an acute, viral illness characterized by sudden onset of fever, severe headache, eye pain, muscle and joint pain, and rash. Gastrointestinal upset and loss of appetite often occur. Swollen lymph nodes, petechiae (small bleeds into the skin that resemble flea bites), nosebleeds, and bleeding gums also occur frequently. Recovery is often associated with prolonged fatigue and depression. DHF is a more serious form of DF, characterized by sudden onset of fever as well as bleeding (often severe) from mucosal surfaces (e.g., nasal, gastrointestinal, vaginal, gums), liver enlargement, and in severe cases, circulatory failure. DHF is associated with abnormal blood clotting, low platelet count (thrombocytopenia), and evidence of plasma leaking through capillaries. Patients who develop gastrointestinal bleeding have a higher mortality rate than those who do not. Dengue shock syndrome (DSS) includes all of the criteria for DHF described above, as well as life-threatening hypotension (severely reduced blood pressure, shock). Fatalities associated with DF are rare. With DHF, case fatality rates without treatment approach 50%, although with intensive treatment, rates are much lower (1–2%). DHF generally occurs in people with a history of exposure to multiple dengue virus serotypes, and the partial immune reaction contributes to the severity of the disease.

### C. Vectors and Reservoirs

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

### D. Modes of Transmission

Dengue (DF and DHF) viruses are transmitted to humans by infected mosquitoes, principally *Aedes aegypti*. Other *Aedes* species also may play a role in transmission. These viruses are not transmitted directly from person to person.

*Note: The A. aegypti mosquito has not been found in Massachusetts, although it and other dengue vectors are suspected of expanding their range. Concerns over local transmission should be extremely remote.*

### E. Incubation Period

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

## F. Period of Communicability or Infectious Period

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

## G. Epidemiology

DF and DHF are endemic in most tropical countries, including Australia and countries in Asia, Africa, the Caribbean, Central America, and South America. Hawaii, southern Texas, and the southeastern U.S., where *A. aegypti* is found, are at risk for dengue transmission and sporadic outbreaks. Puerto Rico is endemic for dengue. DHF occurs more frequently in children. Once an individual recovers from an infection, they are protected from re-infection with the same serotype; however infection with one of the other serotypes and clinical illness may still occur. In Massachusetts, DF and DHF may be identified in people who have traveled to an endemic area.

## H. Bioterrorist Potential

This pathogen is not considered to be of risk for use in bioterrorism.



### Section 2:

## REPORTING CRITERIA AND LABORATORY TESTING

### A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspicion of dengue called to your attention by a health care provider or any positive laboratory result pertaining to dengue.

*Note: See Section 3C for information on how to report a case.*

### B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI) does not provide testing services for dengue virus. However, the SLI Virus Serology Laboratory can arrange for serum samples to be forwarded to the Centers for Disease Control and Prevention (CDC) for testing.

**For additional information on testing or specimen submission, contact the SLI Viral Serology Laboratory at (617) 983-6396. Please call the laboratory prior to specimen submission.**



## Section 3:

**REPORTING RESPONSIBILITIES AND CASE INVESTIGATION****A. Purpose of Surveillance and Reporting**

- ◆ To identify imported cases, and to better understand the epidemiology of endemic and epidemic DF and DHF.
- ◆ To ensure that cases are appropriately contained to prevent the introduction of virus into native mosquito populations.
- ◆ To identify locally acquired cases, if they occur, so that appropriate active surveillance and mosquito control interventions can be taken.
- ◆ To provide travelers with appropriate preventive health information.

**B. Laboratory and Health Care Provider Reporting Requirements**

Dengue is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of dengue, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of dengue infection shall report such evidence of infection directly to the MDPH within 24 hours.

**Since the CDC is the principal testing laboratory for DF and DHF in the U.S., any confirmed cases in Massachusetts residents would be reported to the MDPH by the CDC, and the MDPH would notify the LBOH in the community where the case resides. Occasionally, the MDPH will receive a positive laboratory result from a private laboratory. In this case, the LBOH may be notified to assist in obtaining additional specimens for confirmation.**

**C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities***Reporting Requirements*

MDPH regulations (*105 CMR 300.000*) stipulate that dengue is reportable to the LBOH and that each LBOH must report any case of dengue or suspect case of dengue, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using an official MDPH *Arbovirus Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

*Case Investigation*

**Case investigation of dengue in Massachusetts residents will be coordinated by the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850.**

1. Following notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Arbovirus Case Report Form*. Most of the information required on the form can be obtained from the health care provider or from the medical record. Use the following guidelines to assist in completing the form.
  - a. Demographic information: Accurately record the contact information of the case as well as the case's age, sex, race, and occupation.
  - b. Clinical information: Note the symptom onset date and check off all reported symptoms. Also note whether the case is pregnant. Record whether the case was hospitalized, including location of hospitalization and associated dates as well as the physician's contact information.
  - c. Laboratory information: Check off all appropriate tests performed, and attach a copy of any laboratory results.
  - d. Information relevant to control and prevention: It is extremely important to record the case's travel history accurately by determining the date(s) and geographic area(s) of travel by the case within 30 days prior to onset of illness. Also complete the vaccination and disease history sections, especially in regard to immunization against any arbovirus disease.
2. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
3. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

**MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)**  
**305 South Street, 5<sup>th</sup> Floor**  
**Jamaica Plain, MA 02130**  
**Fax: (617) 983-6813**

4. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



## Section 4:

# CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements (105 CMR 300.200)

No restrictions. While there are no required restrictions, to prevent spread to local mosquito populations, cases should avoid exposure to mosquitoes until fever subsides. Access of day-biting mosquitoes to patients can be prevented by screening the sickroom or using a mosquito bednet (preferably insecticide-impregnated) for febrile patients, or by spraying quarters with a knockdown adulticide or residual insecticide.

*Note: The *A. aegypti* mosquito has not been found in Massachusetts, although it and other vectors are suspected of expanding their range. Concerns over local transmission should be extremely remote.*

## **B. Protection of Contacts of a Case**

No restrictions.

## **C. Managing Special Situations**

### *Locally Acquired Case*

As noted in Section 4A, a locally acquired case of dengue would be an unusual occurrence as *A. aegypti* mosquitoes have not been found in Massachusetts. But if you determine, during the course of an investigation, that a case does not have a recent travel history to an endemic country, environmental measures, such as investigating local areas visited by the case to locate the focus of infection and surveillance of other people for illness, may be necessary.

### *Reported Incidence Is Higher Than Usual/Outbreak Suspected*

Outbreaks can occur wherever vectors are present and virus is introduced. These outbreaks can be extensive and can affect a large number of people. If you suspect an outbreak, investigate to determine the source of infection and the mode of transmission. A common exposure to or an association with *A. aegypti* mosquitoes (e.g., travelers returning from endemic countries) should be sought, and applicable preventive or control measures should be instituted.

For either situation, contact the epidemiologist on-call at the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, as soon as possible. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

## **D. Preventive Measures**

### *International Travel*

Since epidemics of dengue can be extensive and may affect a high percentage of the population, travelers should avoid areas with ongoing epidemics. Individuals who are traveling to endemic areas should keep in mind that unlike other vectors, the *A. aegypti* mosquitoes may bite during daytime hours. There is currently no vaccine for dengue. Yellow fever vaccination may be recommended for travelers in certain endemic areas since the urban vector for both diseases is *A. aegypti*. Travelers can protect themselves from mosquitoes by using repellents that contain DEET, by wearing protective clothing, and by using mosquito nets when rooms are not screened.

When using repellents containing DEET (N,N-diethyl-m-toluamide), individuals should choose a product that will provide sufficient protection for the amount of time spent outdoors. Product labels often indicate the length of time that someone can expect protection from a product. DEET is considered safe when used according to the manufacturer's directions. The efficacy of DEET levels off at a concentration of 30%, which is the highest concentration recommended for children and adults. DEET products should not be used on children less than two months of age. Mosquito netting may be used to cover infant carriers or to protect other areas for children less than two months of age. Individuals should observe the following precautions when using DEET products:

- ◆ Avoid using DEET products that combine the repellent with a sunscreen. Sunscreens may need to be reapplied too often, resulting in an over application of DEET.
- ◆ Apply DEET on exposed skin, using only as much as needed.

- ◆ Do not use DEET on the hands of young children, and avoid applying repellent to areas around the eyes and mouth.
- ◆ Do not use DEET over cuts, wounds, or irritated skin.
- ◆ Wash treated skin with soap and water after returning indoors, and wash treated clothing.
- ◆ Avoid spraying DEET products in enclosed areas.

Picardin (KBR 3023) is a relatively new repellent that is now available in the U.S. Recent studies have shown it to be safe and effective. Picardin-containing repellents should be used according to the manufacturer's recommendations.

Permethrin-containing products will kill mosquitoes and ticks on contact. Permethrin products are not designed to be applied to the skin. Clothing should be treated and allowed to dry in a well-ventilated area prior to wearing. Because permethrin binds very tightly to fabrics, once the fabric is dry, very little of the permethrin gets onto the skin.

A number of plant-derived products are available for use as repellents, but most of these products do not provide the same level or duration of protection as products containing DEET. However, there are studies that show that oil of lemon eucalyptus [p-methane 3,8-diol(PMD)] provides as much protection as low concentrations of DEET when tested against mosquitoes found in the U.S.

Recent travelers to endemic countries with acute onset of fever and other compatible symptoms should seek medical attention immediately.

*Note: For more information regarding international travel and dengue, contact the CDC's Traveler's Health Office at (877) 394-8747 or on the CDC website at [www.cdc.gov/travel](http://www.cdc.gov/travel).*



## ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for dengue fever. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2A of this chapter. (CDC case definitions are used by the MDPH and the CDC to maintain uniform standards for national reporting.) For reporting a case to the MDPH, always use the criteria outlined in Section 2A.

*Note: The most up-to-date CDC case definitions are available on the CDC website at [www.cdc.gov/epo/dphsi/casedef/case\\_definitions.htm](http://www.cdc.gov/epo/dphsi/casedef/case_definitions.htm).*

### Clinical Description

An acute febrile illness characterized by frontal headaches, retro-ocular pain, muscle and joint pain, and rash. The principal vector is the *A. 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

- ◆ Isolation of dengue virus from serum and/or autopsy tissue samples;

- ◆ Demonstration of a four-fold 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
- ◆ Demonstration of dengue virus antigen in autopsy tissue or serum samples by immunohistochemistry or by viral nucleic acid detection.

### Case Classification

<b>Probable</b>	A clinically compatible case with supportive serologic findings (a reciprocal IgG antibody titer of $\geq 1280$ or a positive IgM antibody test in a single acute [late]- or convalescent-phase serum specimen to one or more dengue virus antigens).
<b>Confirmed</b>	A clinically compatible case that is laboratory-confirmed.



## REFERENCES

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## **FORMS & WORKSHEETS**

*Dengue*

*(Also known as Dengue Fever,  
Dengue Hemorrhagic Fever, and Breakbone Fever)*

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## LBOH Action Steps

*This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to dengue case investigation activities.*

LBOH staff should follow these steps when dengue is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation and follow-up, refer to the preceding chapter.

*Note: Since the CDC is the principal testing laboratory for dengue fever (DF) and dengue hemorrhagic fever (DHF) in the U.S., any confirmed cases in Massachusetts residents would be reported to the MDPH by the CDC. MDPH would, in turn, notify the LBOH in the community where the case resides. Occasionally, MDPH will receive a positive laboratory result from a private laboratory, and in this case, the LBOH may be notified to assist in obtaining additional specimens for confirmation.*

- Work with the MDPH to obtain additional specimens for laboratory confirmation, when indicated.
- Assist MDPH in obtaining information needed to complete a MDPH *Arbovirus Case Report Form* (attach laboratory results). An accurate and complete travel history is critical.
- Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).