

West Nile Virus



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

West Nile virus (WNV) is a single-stranded RNA virus of the family *Flaviviridae*, genus *Flavivirus*, that is spread by mosquitoes. Viruses transmitted by mosquitoes are referred to as arthropod-borne viruses or arboviruses. WNV is one of more than 30 arboviruses that have been identified as human pathogens in the Western Hemisphere.

B. Clinical Description

Most WNV infections are asymptomatic. Mild infections are common and include fever, headache, and body aches, often with a skin rash and swollen lymph glands. More severe infections are often associated with high fever and neurologic involvement including aseptic meningitis (inflammation of the lining of the brain and spinal cord) and encephalitis (inflammation of the brain). WNV encephalitis is not easily distinguished clinically from other causes of encephalitis. Manifestations can include headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, paralysis, and sometimes, death. Case-fatality rates for such WNV disease range from 3–15% of cases with clinical encephalitis. Persons older than 50 years of age have a higher risk of developing severe illness.

C. Vectors and Reservoirs

Birds are believed to serve as the primary reservoir for WNV. Mosquitoes spread the virus from bird to bird. Some mosquitoes prefer to feed on birds, while others feed on both birds and mammals, such as humans and horses. If a mosquito bites an infected bird and then bites a person, that person may become infected with WNV.

D. Modes of Transmission

WNV is spread to humans by the bite of an infected mosquito. There is no evidence to suggest that a person can get WNV infection from handling a live or dead infected bird or other animal. Common sense precautions should be followed, including using gloves and/or a plastic bag when handling any dead animal. Current evidence supports the likelihood of direct bird-to-bird transmission.

Additional modes of transmission, including organ transplantation, blood transfusion, breastfeeding, transplacental (mother to infant), and occupational exposures, were recognized during the 2002 WNV epidemic in the U.S. However, these modes of transmission represent a very small percentage of cases. WNV is not spread through casual contact such as touching or kissing a person with the virus.

E. Incubation Period

The incubation period for WNV infection is generally 3–14 days.

F. Period of Communicability or Infectious Period

WNV infection is not communicable from person to person, other than the rare alternative modes of transmission discussed in Section 1D.

G. Epidemiology

WNV was first isolated in the West Nile Province of Uganda in 1937. The first epidemic occurred in Israel during the 1950's. WNV occurs naturally in Africa, India, Australia, the Middle East, Europe, and most recently, North America. Before the fall of 1999, WNV had not been documented in the Western Hemisphere. In 1999, human cases of WNV infection were identified in New York City. By the end of October 1999, WNV had been confirmed in multiple native species of birds from New York City and areas within a 200-mile radius. Since 1999, WNV infection in humans, birds, other animals and mosquitoes has been reported throughout the U.S.

Most cases of WNV infection in North America occur in the summer and early- to mid-fall. People over the age of 50, if they get sick, are more likely to develop serious symptoms from WNV infection.

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 case of WNV infection diagnosed by a health care provider, with or without supporting laboratory results.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI) performs serologic testing for West Nile virus using immunoglobulin G (IgG) and immunoglobulin M (IgM) capture enzyme immunoassays (EIA) and plaque reduction neutralization testing (PRNT) for confirmation. Cell culture is performed on cerebrospinal fluid (CSF) and serum from patients with meningoencephalitis or encephalitis. Selected specimens are also subjected to real-time detection polymerase chain reaction (RTD-PCR). Accurate information about date of collection, date of onset of symptoms, travel history, flavivirus vaccination, and disease history are essential for test interpretation.

For additional information on testing or specimen submission, contact the SLI Virus Isolation Laboratory at (617) 983-6382 or the SLI Virus Serology Laboratory at (617) 983-6396.



Section 3:

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

- ◆ To identify locally-acquired cases of WNV infection in humans in order to better understand the local epidemiology of WNV.
- ◆ To identify locally-acquired cases of WNV infection in humans to help target mosquito control and public health education efforts.
- ◆ To identify whether or not local cases of WNV infection may have been blood or organ donors or recipients.

B. Laboratory and Health Care Provider Reporting Requirements

WNV is reportable to the local board of health (LBOH). Due to the rarity and potential severity of WNV encephalitis, 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 WNV, as defined by the reporting criteria in Section 2A. If this is not possible, call the MDPH Division of Epidemiology and Immunization, any time of day or night, at (617) 983-6800 or (888) 658-2850.

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

For questions related to WNV in animals or to report a suspect case of WNV infection in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services and Biosecurity (DAH) at (617) 626-1795.

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

MDPH regulations (*105 CMR 300.000*) stipulate that WNV is reportable to the LBOH and that each LBOH must report any case of WNV or suspect case of WNV, 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.

Under *105 CMR 300.140, Reporting of Animal Diseases with Zoonotic Potential by Veterinarians*, any veterinarian or LBOH with knowledge of an animal disease potentially infectious to humans must also report the disease to the DAH. Specific diseases in animals which veterinarians must also report directly to MDPH are anthrax, plague, WNV, and Eastern equine encephalitis virus infection.

Case Investigation

1. LBOH should immediately call the MDPH with initial information on any suspect cases of WNV infection, any time of day or night, at (617) 983-6800 or (888) 658-2850.

2. Once the case has been confirmed through laboratory testing done at MDPH, the LBOH may be asked to assist in completing an official MDPH *Arbovirus Case Report Form* (found at the end of this chapter) by interviewing the case and others who may be able to provide pertinent information. 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 on 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, associated dates, and physician contact information.
 - c. Laboratory information: Check off all appropriate tests and attach a copy of any laboratory results.
 - d. Information relevant to control and prevention: It is important to record the case's travel history by determining the date(s) and geographic area(s) traveled to by the case within 30 days prior to onset of illness. Also complete the vaccination and disease history sections. Note whether the case is a neonate, breastfed infant, or works with materials potentially infected with WNV. Note whether the case either received or donated organs or blood within 30 days prior to onset of illness.
 - e. 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, 5th 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*)

Minimum Period of Isolation of Patient

No restrictions.

Minimum Period of Quarantine of Contacts

No restrictions.

B. Protection of Contacts of a Case

None.

As mentioned in Section 1F, WNV is not communicable from person to person, with the rare exceptions of blood transfusions, organ transplants, breastfeeding, or perinatal transmission.

C. Managing Special Situations*Locally-Acquired Case*

If you suspect that the case acquired the infection locally—because the person does not have recent travel history to an endemic area or country—it may be necessary to investigate local risk factors for viral transmission or to conduct surveillance for other people with illness.

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If you suspect an outbreak, contact the epidemiologist on-call at the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The situation may warrant an investigation of a cluster or implementation of effective prevention and control measures (e.g., mosquito control). The MDPH Division of Epidemiology and Immunization 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.

Case Is a Recent Blood or Organ Donor or Recipient

If you determine, during the course of the investigation, that a case has donated or been the recipient of blood products or organs within the last 30 days, consult the epidemiologist on-call at the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The situation will warrant further investigation to determine if and where the donated blood or organs were used and to determine a source of infection in the blood or organ recipient.

Blood collection agencies nationwide are screening blood donations for WNV. When the MDPH is notified of a confirmed WNV positive result in a blood donor (by a blood collection agency), the donor will be contacted by the MDPH, with assistance from the LBOH as necessary, to determine whether they have become symptomatic and to recommend additional follow-up testing if appropriate.

D. Preventive Measures*Environmental Measures*

People should be encouraged to reduce mosquito populations around their homes and neighborhoods by getting rid of any standing water that might support mosquito breeding. Mosquitoes will begin to breed in any puddle or standing water that lasts for more than four days. People should be advised of the following:

- ◆ Dispose of or regularly empty any metal cans, plastic containers, ceramic pots, and other containers (including trash cans) on their property that might hold water.

- ◆ Pay special attention to discarded tires. Stagnant water in tires is a common place for mosquitoes to breed.
- ◆ Drill holes in the bottom of recycling containers that are left outdoors, so that water can drain out.
- ◆ Clean clogged roof gutters; remove leaves and debris that may prevent drainage of rainwater.
- ◆ Turn over plastic wading pools and wheelbarrows when not in use.
- ◆ Do not allow water to stagnate in birdbaths; aerate ornamental ponds or stock them with fish.
- ◆ Keep swimming pools clean and properly chlorinated; remove standing water from pool covers.
- ◆ Use landscaping to eliminate standing water.

Decisions about the need for mosquito control activities (removing mosquito breeding areas, larviciding, or adulticiding) are normally made by local cities and towns in conjunction with the local mosquito control district and are based on mosquito habitat and density, surveillance for WNV in mosquitoes, number of cases in birds and other animals, and numbers of cases in humans. In Massachusetts, the MDPH Arbovirus Surveillance Program conducts environmental surveillance for mosquitoes in numerous sites throughout the state for WNV, Eastern equine encephalitis (EEE) virus (see separate chapter), and Highlands J virus (Highlands J virus is another mosquito-borne arbovirus which does not cause illness in humans but serves as a sentinel for EEE virus). Arbovirus surveillance information on birds, mosquitoes, horses, and humans can be accessed on the MDPH website at www.mass.gov/dph.

Your local mosquito control district is an excellent source for information regarding local mosquito surveillance and control efforts. If your city or town does not belong to a mosquito control district but is interested in joining one or creating one with other surrounding towns, contact the State Reclamation and Mosquito Control Board, MDAR Pesticide Bureau at (617) 626-1781.

Personal Preventive Measures/Education

There is no human vaccine to prevent WNV infection or its consequences. People should be advised to take the following precautions if they live in or visit an area with mosquitoes:

- ◆ Avoid outdoor activities between dusk and dawn, if possible, as this is the time of greatest mosquito activity.
- ◆ Fix any holes in screens, and make sure they are tightly attached to all doors and windows.
- ◆ Use repellents containing DEET (N,N-diethyl-m-toluamide), and 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. The following precautions should be observed 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 the 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.

A WNV Public Health Fact Sheet is available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the "Publications and Statistics" link, and select the "Public Health Fact Sheets" section under "Communicable Disease Control." The fact sheet is available in English, Spanish, and Portuguese. Additional educational materials are available on the MDPH Arbovirus website at www.mass.gov/dph/wnv/wnv1.htm.



ADDITIONAL INFORMATION

Following is the Council of State and Territorial Epidemiologists' (CSTE) updated surveillance case definition of diseases caused by neurotropic domestic arboviruses. The surveillance definition posted on the CDC website is for arboviral encephalitis. CDC implementation of this expanded, revised case definition is pending at the time of this publication. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. For reporting 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.

Case Definition

Neurotropic Domestic Arboviral Diseases

A case must meet one or more of the following clinical criteria and one or more of the following laboratory criteria. (The complete CSTE Position Statement is available on the CSTE website at www.cste.org/ps/2004pdf/04-ID-01-final.pdf.)

Clinical Criteria For Diagnosis

Cases of arboviral disease are classified either as neuroinvasive or non-neuroinvasive, according to the following criteria:

Neuroinvasive	<p>Neuroinvasive disease requires the presence of fever and at least one of the following, as documented by a physician and in the absence of a more likely clinical explanation:</p> <ul style="list-style-type: none"> ◆ Acutely altered mental status (e.g., disorientation, obtundation, stupor, or coma); ◆ Other acute signs of central or peripheral neurologic dysfunction (e.g., paresis or paralysis, nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions, or abnormal movements); or ◆ Pleocytosis (increased white blood cell concentration in cerebrospinal fluid [CSF]) associated with illness clinically compatible with meningitis (e.g., headache or stiff neck).
Non-Neuroinvasive	<p>Non-neuroinvasive disease requires, at minimum:</p> <ul style="list-style-type: none"> ◆ The presence of documented fever, as measured by the patient or clinician; ◆ The absence of neuroinvasive disease (above); and ◆ The absence of a more likely clinical explanation for the illness. Involvement of non-neurological organs (e.g., heart, pancreas, liver) should be documented using standard clinico-laboratory criteria.

Laboratory Criteria for Diagnosis

Cases of arboviral disease are also classified either as confirmed or probable, according to the following laboratory criteria:

Confirmed	<ul style="list-style-type: none"> ◆ Four-fold or greater change in virus-specific serum antibody titer; ◆ Isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, CSF, or other body fluid; ◆ Virus-specific immunoglobulin M (IgM) antibodies demonstrated in CSF by antibody-capture enzyme immunoassay (EIA); or ◆ Virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum immunoglobulin G (IgG) antibodies in the same or a later specimen by another serologic assay (e.g., neutralization or hemagglutination inhibition).
Probable	<ul style="list-style-type: none"> ◆ Stable (less than or equal to a two-fold change) but elevated titer of virus-specific serum antibodies; or ◆ Virus-specific serum IgM antibodies detected by antibody-capture EIA but with no available results of a confirmatory test for virus-specific serum IgG antibodies in the same or a later specimen.

Comment

In temperate areas of the world, such as New England, WNV infection cases occur primarily from early summer through early fall. In tropical climates, infection can occur year-round.



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FORMS & WORKSHEETS

West Nile Virus

West Nile Virus



LBOH Action Steps

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

LBOH staff should follow these steps when WNV 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.

- Notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any confirmed or suspect case(s) of WNV.
- To report a case of WNV virus infection in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services, and Biosecurity (DAH) at (617) 626-1795.
- Assist MDPH with obtaining additional specimens for laboratory confirmation, if necessary.
- Assist MDPH in obtaining information needed to complete a MDPH *Arbovirus Case Report Form*.
- Determine whether or not the case was acquired locally, and if so, conduct enhanced surveillance for human illness and investigate local risk factors for viral transmission.
- If locally acquired, institute mosquito control measures.
- 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).