West Nile Virus

(Arboviral Disease)

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per NJAC 8:57, health care providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of West Nile virus to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml.

If the health officer is unavailable, the health care provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.

December 2008

1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Viruses that are transmitted by infected blood feeding insects such as mosquitoes are referred to as arboviruses, which is short for **ar**thropod-**bo**rne **viruses**. Over 500 arboviruses have been identified worldwide; more than 100 of these can cause disease in humans. West Nile virus (WNV) is a single-stranded RNA virus of the family *Flaviviridae*, genus *Flavivirus*, that is transmitted by infected mosquitoes.

B. Clinical Description and Laboratory Diagnosis

Most WNV infections are asymptomatic. Mild infections are also common and symptoms include fever, headache, and body aches, often with a skin rash and swollen lymph glands. More severe infections involve the central nervous system and result in meningitis (inflammation of the lining of the brain and spinal cord), encephalitis (inflammation of the brain), or acute flaccid paralysis. WNV encephalitis cannot be distinguished clinically from many other causes of encephalitis. Manifestations can include headache, confusion, lethargy, nausea, altered consciousness, vomiting, fever, cranial nerve palsies, paresis (muscular weakness) or paralysis, sensory deficits, altered reflexes, tremors, convulsions, abnormal movements, coma of varying degree, and, in some cases, death. Case-fatality rates for WNV encephalitis range from 3% to 15%.

Laboratory diagnosis is based on isolation of virus or identification of viral antigen or nucleic acids in clinical specimens, demonstration of immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies in cerebrospinal fluid (CSF) or serum by enzyme-linked immunoassay (enzyme-linked immunosorbent assay [ELISA], enzyme immunoassay [EIA], and immunofluorescence assay [IFA]), hemagglutination inhibition, polymerase chain reaction (PCR), and plaque-reduction neutralizing test.

C. Reservoirs

WNV appears to be carried by birds. The virus persists in nature in a bird-mosquito cycle, involving mosquitoes that feed primarily on birds and not humans. In mid- to late summer

and early fall, amplification of the cycle may occur, with spillover of the virus into mosquitoes that bite humans, horses, and other mammals. Humans, horses, and other mammals are generally considered dead-end hosts, that is, they do not serve as a reservoir for continuation of the disease.

D. Mode of Transmission

WNV is spread to humans primarily by the bite of an infected mosquito (primarily *Culex* species, although transmission from *Aedes* species may occur too). Direct person-to-person spread of WNV does not occur. There is no evidence that a person can get WNV from handling live or dead infected birds or wildlife; however, gloves should always be worn when performing such activities. In 2002, three additional routes of WNV human infection were discovered, although these types of transmission occur in a very small proportion of WNV cases. These additional routes of transmission include

- Transplanted organs and blood transfusions. Starting in 2003, all blood donations are screened for WNV and positive results are sent to the New Jersey Department of Health and Social Services (NJDHSS). The blood screening program has been very successful in reducing the risk of WNV infection through blood transfusions.
- Transplacental (mother-to-child) and breast milk transmission. Only one case of each has been identified, and both were outside of New Jersey.
- Transmission to laboratory workers through improperly handled specimens. Two cases were reported outside of New Jersey.

It is important to note that WNV transmission primarily occurs through the bite of an infected mosquito and these additional routes of transmission pose a relatively small risk.

E. Incubation Period

The incubation period for WNV is 3 to 14 days.

F. Period of Communicability or Infectious Period

WNV, like other arboviral infections, is not transmitted from person to person, with the rare exceptions noted above in section 1D.

G. Epidemiology

WNV was first isolated in the West Nile Province of Uganda in 1937. The first epidemic was in Israel during the 1950s. WNV occurs naturally in Africa, India, Australia, the Middle East, and Eastern Europe. Previous to August 1999, when human cases of WNV were first identified in New York City, WNV had not been documented in the Western Hemisphere. By the end of October 1999, WNV had also been confirmed in multiple native species of birds from New York City and in horses and birds within a 200-mile radius of New York City. Since that time, WNV has spread coast-to-coast in the United States and Canada.

In the Northeastern United States and New Jersey, cases of WNV occur in the summer and fall. In states with warmer climates, such as California, cases of WNV have been reported year-round. The elderly are at greatest risk of more serious symptoms of WNV infection, including encephalitis. In New Jersey, the peak of human cases occurred in 2003, when 34 confirmed cases of WNV infection were reported to NJDHSS, with three fatalities. Between 2004 and 2007, fewer than six cases of WNV have been reported to NJDHSS each year, with no fatalities. In 2008, ten cases of WNV were confirmed at NJDHSS, with two fatalities.

2 NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES CASE DEFINITION

A. Clinical Description

Cases of arboviral disease, including WNV, are classified as either neuroinvasive or nonneuroinvasive based on clinical criteria, and classified as confirmed or probable based on laboratory criteria.

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:

- Acutely altered mental status (e.g., disorientation, obtundation, stupor, or coma), OR
- 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 the CSF) associated with illness clinically compatible with meningitis (e.g., headache or stiff neck).

Nonneuroinvasive disease requires, at minimum:

- The presence of documented fever, as measured by the patient or clinician, AND
- The absence of neuroinvasive disease (above), AND
- The absence of a more likely clinical explanation for the illness.

B. Laboratory Criteria and Case Classification

CONFIRMED
A clinically compatible neuroinvasive or nonneuroinvasive case, AND

- Four-fold or greater change in virus-specific serum antibody titer, OR
- Isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, CSF, or other body fluid, OR
- Virus-specific IgM antibodies demonstrated in CSF by antibody-capture EIA, OR

- Virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum IgG antibodies in the same or a later specimen by another serologic assay (e.g., neutralization or hemagglutination inhibition).

PROBABLE
A clinically compatible neuroinvasive or nonneuroinvasive case, AND

- 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.

POSSIBLE
Not used

C. Differences from Centers for Disease Control and Prevention Case Definition

NJDHSS and Centers for Disease Control and Prevention (CDC) case definitions are the same.

3 LABORATORY TESTING AVAILABLE

Commercial laboratories offer serology by enzyme-linked immunoassay (EIA or ELISA) or IFA to detect IgM and IgG antibodies that are produced in response to WNV exposure. Laboratory tests that are IgG positive and IgM negative indicate past infection or previous exposure and do not require further investigation. Commercial laboratory tests that are positive for IgM may be false positive, especially in the absence of neuroinvasive clinical symptoms, or may exhibit serologic cross-reactivity with other diseases or closely related arboviruses. As such, commercial laboratory tests that are positive for IgM must be retested at the NJDHSS Public Health and Environmental Laboratories (PHEL). Accurate information about date of collection, date of symptom onset, travel history, and clinical symptoms are essential for test interpretation.

The NJDHSS PHEL performs IgG and IgM ELISA tests for WNV on human serum and PCR on CSF specimens. All suspect cases must be approved by the NJDHSS Infectious and Zoonotic Diseases Program (IZDP) prior to submission for testing at PHEL.

4 PURPOSE OF SURVEILLANCE AND REPORTING AND REPORTING REQUIREMENTS

A. Purpose of Surveillance and Reporting

- To identify locally acquired cases of WNV infection in humans to better understand the local epidemiology of WNV
- To identify locally acquired cases of WNV infection in humans to help target mosquito control measures
- To provide residents of New Jersey and travelers to the state with appropriate preventive health information

B. Laboratory Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.6) stipulates that laboratories report (by telephone, by confidential fax, or over the Internet using the Communicable Disease Reporting and Surveillance System [CDRSS]) all cases of WNV to the local health officer having jurisdiction over the locality in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. The report shall contain, at a minimum, the reporting laboratory's name, address, and telephone number; the age, date of birth, gender, race, ethnicity, home address, and telephone number of the person tested; the test performed; the date of testing; the test results; and the healthcare provider's name and address.

C. Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.4) stipulates that healthcare providers report (by telephone, confidential fax, or in writing) all cases of WNV infection to the local health officer having jurisdiction over the locality in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. The report shall contain the name of the disease; date of illness onset; and name, age, date of birth, race, ethnicity, home address, and telephone number of the person they are reporting. In addition, the name, address, institution, and telephone number of reporting official should be reported.

D. Health Officer Reporting

The New Jersey Administrative Code (NJAC 8:57-1.7) stipulates that each local health officer must report the occurrence of any case of WNV infection within 24 hours of receiving the report. Written or electronic copies of the reports must be made to NJDHSS and may be submitted over the Internet using the confidential and secure CDRSS.

5 CASE INVESTIGATION

A. Forms and Laboratory Reports

1) It is requested that the local health officer complete a CDS-2 WNV Patient Intake form, which can be found online at http://www.state.nj.us/health/forms/cds-2.dot, for all IgM laboratory reports by interviewing the clinician, patient, and others who may be able to provide pertinent information. Much of the information required on the form can be obtained from the patient's healthcare provider or the medical record.

   WNV IgM results from a commercial laboratory may indicate a false positive or may exhibit serologic cross-reactivity with other diseases or closely related arboviruses. In order to accurately classify suspect cases of WNV, all IgM results from a commercial laboratory must be retested at PHEL. The local health officer may be asked to assist with forwarding a WNV specimen from a commercial laboratory for retesting at PHEL or obtaining another acute and convalescent specimen from the healthcare provider. Instructions on sending specimens to PHEL are detailed below.

NOTE: WNV IgG positive/IgM negative results indicate previous infection or past exposure and do not require further investigation.

2) Healthcare providers are encouraged to send specimens from clinically compatible WNV cases directly to PHEL for WNV testing. These specimens must be approved by the NJDHSS IZDP prior to submission to PHEL. It is requested that the local health officer complete a CDS-2 WNV Patient Intake form, which can be found online at http://www.state.nj.us/health/forms/cds-2.dot, by interviewing the clinician, patient, and others who may be able to provide pertinent information, and faxing the form to the NJDHSS IZDP at 609.588.2546. If a case is approved for testing at PHEL, healthcare providers may submit sera or CSF according to the instructions included on Form C: Submitting Specimens for WNV Testing, which can be found online at http://www.state.nj.us/health/cd/westnile/humanprotocol.doc. When a specimen is sent to PHEL, a VIR-1 form must be included with the specimen. The VIR-1 form can be found online at http://www.state.nj.us/health/forms/vir-1.dot.

B. Entry into CDRSS

The mandatory fields in CDRSS include disease, last name, county, municipality, gender, race, ethnicity, case status, and report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of WNV. The "Tab" column includes the tabs that appear along the top of the CDRSS screen. The "Required Information" column provides detailed explanations of what data should be entered.

CDRSS Screen	Required Information
Patient Info	Enter the disease name (“WEST NILE VIRUS”), patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). There are no subgroups for WNV.
Addresses	Enter any alternate address (e.g., rehabilitation facility). Use the “COMMENTS” section in this screen to record any pertinent information about the alternate address (e.g., length of stay at rehabilitation facility). Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction.
Clinical Status	Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient’s care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals (ICPs) covering these facilities. If the patient died, date of death should be recorded under the “MORTALITY” section.
Signs/Symptoms	Check appropriate boxes for signs and symptoms and indicate their onset. Make every effort to get complete information by interviewing the physician, family members, ICP, or others who might have knowledge of the patient’s illness. Also, information regarding the resolution of signs and symptoms should be entered.
Risk Factors	Enter complete information about risk factors (i.e., travel history outside of the United States, travel history to other states in the United States, and local outdoor exposure) to facilitate mosquito control activities in New Jersey. Note whether the case-patient is a neonate or breastfed infant, or works in a laboratory with materials potentially infected with WNV. Note whether the case-patient received or donated blood or organs within 30 days prior to onset of illness.

CDRSS Screen	Required Information
Laboratory Eval	For all WNV IgM-positive tests, select "WEST NILE VIRUS AB.IGM" for ELISA, EIA, or IFA. In "TEST RESULT" field select "POSITIVE/REACTIVE." If available, titers should be placed in the "VALUE" field. For all WNV IgG-positive tests, select "WEST NILE VIRUS AB.IGG" for ELISA, EIA, or IFA. In "TEST RESULT" field select "POSITIVE/REACTIVE." If available, titers should be placed in the "VALUE" field. The "REFERENCE RANGE" field should be completed for all ELISA, EIA, and IFA tests. In addition, the "Paired Sera" field should be completed by selecting "ACUTE" or "CONVALESCENT." If arrangements have been made to retest a specimen at PHEL, enter the specific information in the "LABORATORY COMMENTS" section.
Contact Tracing	Information regarding contacts is not required for this disease.
Case Comments	Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the "COMMENTS" section. **NOTE:** Select pieces of information entered in the "COMMENTS" section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports.
Epidemiology	Record name of and contact information for case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the "COMMENTS" section.
Case Classification Report Status	Case status options are "REPORT UNDER INVESTIGATION (RUI)," "CONFIRMED," "PROBABLE," "POSSIBLE," and "NOT A CASE." • All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Cases still under investigation by the LHD should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)." • Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. "CONFIRMED," "PROBABLE," and "NOT A CASE" are the only appropriate options for classifying a case of WNV (see section 2B).

CDRSS Screen	Required Information
	Report status options are “PENDING,” “LHD OPEN,” “LHD REVIEW,” “LHD CLOSED,” “DELETE,” “REOPENED,” “DHSS OPEN,” “DHSS REVIEW,” and “DHSS APPROVED.” • Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of “PENDING.” • Once the LHD begins investigating a case, the report status should be changed to “LHD OPEN.” • The “LHD REVIEW” option can be used if the LHD has a person who reviews the case before it is closed (e.g., health officer or director of nursing). • Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to “LHD CLOSED.” • “LHD CLOSED” cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be changed to “REOPENED” and the LHD will be notified by e-mail. Cases that are “DHSS APPROVED” cannot be edited by LHD staff (see section 5C below). If a case is inappropriately entered (e.g., a case of WNV IgG positive/IgM negative) the case should be assigned a report status of “DELETE.” A report status of “DELETE” should NOT be used if a reported case of WNV simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above.

C. Other Reporting/Investigation Issues

1. Case report forms (CDS-2 and labs) DO NOT need to be mailed to NJDHSS as long as mandatory fields in CDRSS indicated in section 5B are completed.

2. Once an LHD completes its investigation and assigns a report status of “LHD CLOSED,” NJDHSS will review the case. NJDHSS will approve the case by changing the report status to “DHSS APPROVED.” At this time, the case will be submitted to the CDC and the case will be locked for editing. If additional information is received after a case has been placed in “DHSS APPROVED,” LHDs will need to contact NJDHSS to reopen the case. This should be done only if the additional information changes the case status of the report.

3. Every effort should be made to complete the investigation within three months of opening a case. Cases that remain open for three months or more and have no investigation or update notes will be closed by NJDHSS and marked as not a case.

6 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1.10)

Because WNV is not transmitted from person to person, there are no restrictions for case-patients or contacts of case-patients.

B. Protection of Contacts of a Case

There are no restrictions of contacts. There is no approved human vaccine available, and person-to-person transmission does not occur, with the rare exceptions of blood transfusions, organ transplants, breastfeeding, or perinatal transmission.

C. Managing Special Situations

Locally Acquired Case

Since WNV was first identified in 1999, the virus has become endemic in some mosquito species found in New Jersey. The local health officer should obtain accurate exposure information, including outdoor activity during the incubation period (i.e., 3 to 14 days prior to symptom onset). The local mosquito control agency should be notified of the case and the local travel history. The agency will conduct mosquito surveillance and abatement activities as indicated. See section 6D below.

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If an outbreak is suspected, contact the NJDHSS IZDP at 609.588.7500. The situation may warrant an investigation of clustered cases or implementation of effective prevention and control measures (e.g., spraying for mosquitoes). NJDHSS IZDP staff helps determine a course of action to prevent further cases and can perform surveillance for cases across jurisdictions and that would be difficult to identify at a local level.

Case Is a Recent Blood or Organ Donor or Recipient

If a case-patient has donated or been the recipient of blood products or organs within the past 30 days, contact the NJDHSS IZDP at 609.588.7500. Although blood collection agencies nationwide are screening donations for WNV, further investigation may be warranted to determine if donated blood or organs were used and may be a source of infection.

D. Preventive Measures

Environmental Measures

The New Jersey State Mosquito Control Commission and the New Jersey Department of Environmental Protection Office of Mosquito Control Coordination provide funding for mosquito surveillance in numerous sites throughout New Jersey. Local mosquito control

agencies also conduct surveillance and control activities. Decisions about the need for mosquito pesticide spraying are made by the county mosquito control agencies based on mosquito habitat and density as well as surveillance for WNV in mosquitoes, birds, and humans. Results of mosquito and bird surveillance can be accessed on the NJDHSS WNV Web site at http://www.state.nj.us/health/cd/westnile/enceph.htm and on the Rutgers University Center for Vector Biology Web site at http://vectorbio.rutgers.edu. Residents may also contact their local mosquito control agency; contact information for each county mosquito control agency can be obtained by calling a toll-free number at 1.866.NO.NJWNV.

Corvids, including crows and blue jays, continue to be good sentinels for detecting the presence of WNV activity in a general geographic area because of their susceptibility to the virus. NJDHSS requests the participation of local health officers, animal control officers, local police, and wildlife management professionals in the accurate reporting of crow morbidity and mortality incidents in New Jersey. The following guidelines have been prepared to accurately monitor and report avian morbidity and mortality statewide.

- LHDs will be the lead agency in the coordination of preparing and submitting dead or ill bird reports. For all reports made by residents, animal control officers, local police, and wildlife management professionals, LHDs should complete a Dead-Ill Bird Report Lab Submission form, which can be found online at http://www.state.nj.us/health/forms/cds-4.dot, and fax to the NJDHSS IZDP at 609.588.2546 or submit the information over the Internet using the secure WNV Surveillance System. LHDs should ensure that the specific address of the dead or ill bird and county are included. Addresses are critical when mapping the exact location of positive birds.
- Specimens may be submitted to PHEL within four or five days of collection, preferably less. PHEL will accept corvids and raptors for WNV testing; other species must be approved by the NJDHSS IZDP prior to submission. All specimens should be kept refrigerated (not frozen) prior to shipping to PHEL. LHDs should ensure that specimens arrive on or before Friday, as PHEL is closed on weekends. Birds showing signs of decay, decomposition, or infestation with maggots should NOT be submitted. PHEL has requested that birds be submitted as follows:
    - Place each bird into a separate one-gallon, clear plastic bag (i.e., not a green garbage bag) with an “easy-close slider/zipper.”
    - Place the completed Dead-Ill Bird Report/Lab Submission form (with assigned shipping number or USI) in a separate clear, plastic zip-closed bag.
    - Firmly secure the two bags together with staples.
    - Ship to PHEL on cold gel packs or dry ice (do not use ice).

Personal Preventive Measures/Education

People, particularly those living in or visiting high-risk areas (e.g., areas with documented WNV activity in mosquitoes, birds, horses, or humans), are encouraged to protect themselves from mosquito bites by using insect repellents. Repellents should always be used following the manufacturer's instructions found on the product label. Choose a product that will provide sufficient protection for the amount of time spent outdoors. Products containing DEET, Picaridin, IR3535, oil of lemon eucalyptus, and permethrin have been approved by the Environmental Protection Agency and are recommended by the CDC for use in protecting against mosquitoes that may carry WNV. Repellents that contain DEET (diethyltoluamide) should be used in concentrations no higher than 30% and DEET should never be used on children less than two months old. Permethrin is a repellent that can be applied only to clothing, NOT exposed skin.

Other personal preventive measures include staying indoors at dawn and dusk when mosquitoes are most active and wearing light-colored or protective clothing when outdoors during these peak times. Gloves should be worn whenever handling horses and birds that are sick with, or have died from, known or suspect arboviral infection. Screens should be in good repair to prevent mosquitoes from entering houses.

Prevention of WNV also involves reducing mosquito breeding around the home through

- Disposal of old cans, plastic buckets, ceramic pots, or other containers that may collect water
- Disposal of old, discarded tires
- Cleaning clogged gutters
- Eliminating water collecting in pool or boat covers
- Turning over plastic wading pools and wheelbarrows when not in use
- Changing frequently water in birdbaths
- Draining standing puddles, ditches, tree holes, and tree stumps

Additional Information

A WNV Fact Sheet can be obtained at the NJDHSS WNV Web site at http://www.state.nj.us/health/cd/westnile/enceph.htm.

Additional information can also be found on the CDC Web site at http://www.cdc.gov/ncidod/dvbid/westnile/index.htm.

Disease maps for WNV and other arboviruses can be found on the U.S. Geological Survey Web site at http://diseasemaps.usgs.gov/.

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