

West Nile Encephalitis Professional Fact Sheet

1. What is encephalitis?

Encephalitis means an inflammation of the brain and can be caused by either head injury, bacterial infections, or, most commonly, viral infections.

2. What is West Nile encephalitis?

West Nile encephalitis (WNE) is caused by West Nile virus (WNV), a flavivirus previously only found in Africa, Eastern Europe, and West Asia. WNV is closely related to St. Louis encephalitis virus (SLEV) which is found in the United States and to Kunjin virus (KV) which is found in Australia, some Western Pacific islands and parts of South East Asia.

3. How do people get WNE?

People become infected with West Nile virus after being bitten by an infected mosquito. There is no evidence that people can transmit the West Nile virus to other animals, birds, or people.

4. Can other animals get sick?

During the 1999 and 2000 WNV outbreak, sick and dead cats, crows and horses were laboratory confirmed by the presence of WNV antibodies, and WNV ribonucleic acid (RNA). In addition, dogs, many other species of wild birds, and many species of domestic birds (chickens, ducks, geese and turkeys) while not clinically ill were tested and shown to be serologically positive for WNV antibodies, thereby, demonstrating they had been infected.

5. What is the basic transmission cycle?

Mosquitoes become infected when they feed on infected birds, which may circulate the virus in their blood for a few days. After an incubation period of 10-14 days, infected mosquitoes can then transmit WNV to birds, animals, and humans while biting to take blood. The virus is located in the mosquito's salivary glands. During blood feeding, the virus is injected into the bird, animal or human, where it then multiplies and may cause illness.

Vertical transmission (adult->eggs->larvae->adult) of the WNV has been demonstrated in mosquitoes.

6. Can you get WNE from another person?

No. WNE is NOT transmitted from person-to-person. For example, you cannot get infected by WNV from touching, or kissing a person who has the disease, or from contact with a health care worker who has recently treated someone with the disease.

7. Can you get WNE directly from birds or from insects other than mosquitoes?

In general, only infected mosquitoes usually transmit WNV. However, ticks may transmit WNV between birds, and, possibly, from infected birds to people.

8. What are the symptoms of WNE?

Mild infections are common and include fever, headache, and body aches, often with skin rash and swollen lymph glands. People with more severe infections may experience high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions, paralysis, and sometimes death. If you have any of these symptoms, contact your doctor.

9. What is the incubation period of WNE?

The incubation period of a WNV infection is usually 5-15 days.

10. How can you reduce the number of mosquitoes around your home and neighborhood?

Populations of the primary WNV mosquito vector species, *Culex pipiens* (a container breeder) and the risk of infected mosquitoes feeding on your family can be significantly decreased by reducing the amount of standing water available for mosquito breeding.

- a. Dispose of tin cans, plastic containers, ceramic pots or similar water holding containers that have accumulated on your property. Do not overlook containers that have become overgrown by aquatic vegetation.
- b. Pay special attention to discarded tires that may have accumulated on your property. The used tire is the most important domestic mosquito producer in this country.
- c. Drill holes in the bottom of recycling containers that are left out of doors. Drainage holes that are located on the container sides collect enough water for mosquitoes to breed in.
- d. Clean clogged roof gutters on an annual basis, particularly if the leaves from surrounding trees have a tendency to plug up the drains. Roof gutters are easily overlooked but can produce millions of mosquitoes each season.
- e. Turn over plastic wading pools when not in use. A wading pool becomes a mosquito producer if it is not used on a regular basis.
- f. Turn over wheelbarrows and do not allow water to stagnate in birdbaths. Both provide breeding habitat for domestic mosquitoes.
- g. Aerate ornamental pools or stock them with fish. Water gardens are fashionable but become major mosquito producers if they are allowed to stagnate. Clean and chlorinate swimming pools that are not being used. A swimming pool that is left untended by a family that goes on vacation for a month can produce enough mosquitoes to result in

neighborhood-wide complaints. Be aware that mosquitoes may even breed in the water that collects on swimming pool covers.

- h. Use landscaping to eliminate standing water that collects on your property. Mosquitoes will develop in any puddle that lasts for more than four days.

11. What is the mortality rate of WNE?

Historically, the WNE case-fatality rate ranges from 3% to 15% (especially in the elderly).

12. How many cases of WNE occur in the United States?

Prior to 1999, no WNE cases had been reported in the United States. Sixty-two WNE cases were diagnosed in 1999 and 21 in 2000.

13. Was the New York encephalitis outbreak caused by WNV?

Yes. CDC has since confirmed that the outbreak was caused by the Israel Strain of WNV, rather than either KV, or SLEV.

14. How many confirmed cases of human illness have there been in the United States?

During the 1999 encephalitis outbreak, there were 62 human cases and seven deaths. All of the cases were in New York City, or its immediate suburbs in New York State. The majority of cases had an onset of illness during the last three weeks of August. The median age of cases was 71 years (range 5-90); 60% of cases occurred among adults aged 65 years or older. Fifty-one percent of cases were male. All seven fatalities occurred among persons aged 75 years or older. In 2000, there were 21 diagnosed cases and two deaths.

15. Does mosquito surveillance and abatement really help?

New York City, New Jersey and Connecticut successfully sprayed pesticides to kill infected mosquitoes and stop further spread of the 1999 disease outbreak. They trapped mosquitoes and did virus isolation from homogenized pools of the same mosquito species to determine if ongoing abatement efforts were truly effective and/or if the WNV was spreading.

16. How could WNV have entered the United States?

The WNV may have entered the United States in infected mosquitoes, birds or persons.

17. Do birds naturally infected with WNV die or become ill?

In the 1999 and 2000 outbreaks, large numbers of North American crows and other birds became seriously ill and died.

18. What about migrating birds?

State and federal officials believe that WNV infected birds probably have migrated from the New York City area to other parts of the United States, since ill birds can be infectious for feeding mosquitoes from 20 to 100 days. Even though it is not yet known how far WNV will ultimately spread in the United States, the Commonwealth has developed a plan of action for

implementation this spring. In 2000, laboratory confirmed WNV positive birds, mosquito pools, and horse were reported from 19 counties in the state.

19. What about ticks?

Since ticks have been found infected with WNV in other countries and that infection was transmitted vertically (adult->eggs->larvae->nymphs->adults), the Centers for Disease Prevention and Control (CDC) also tested ticks for WNV in the 1999 outbreak area. It is important to realize that infected ticks cannot be killed by aerial insecticide spraying like mosquitoes can, and that infected ticks, therefore, may prove to be a very important vector in the future possible spread of WNV in the United States.

20. Will WNV successfully over-winter?

Infected mosquitoes, which routinely successfully hibernate, over-winter in sheltered areas, could emerge in the spring and further continue the spread of WNV. Adult ticks, eggs and larvae normally successfully over-winter as part of their two-year life cycle, therefore, the majority of infected ticks from this outbreak should be expected to survive this winter.

21. What about human disease in Pennsylvania?

WNE disease has been identified in people in Pennsylvania.

22. How is WNE treated?

There is no specific treatment for West Nile virus infection. In more severe cases, intensive supportive therapy is indicated, often involving hospitalization, intravenous fluids, airway management, respiratory support (ventilator), prevention of secondary infections (pneumonia, urinary tract, etc.), and good nursing care.

23. Is there a vaccine against WNE?

No human vaccine, but some companies are working towards developing a vaccine.

24. Is the disease seasonal in its occurrence?

In temperate areas of the world, WNE cases occur primarily in the late summer or early fall. In the tropical climates where temperatures are milder, it can occur year round.

25. Who is at risk for getting WNE?

All residents of areas where West Nile virus have been identified are at increased risk of getting WNE, but persons > 50 years of age have the highest risk of developing severe illness.

26. Does Pennsylvania have an effective mosquito surveillance and abatement program?

In 1999, Pennsylvania had very limited local mosquito surveillance and abatement programs in Allegheny, Blair, Cumberland, Monroe, Northampton, and Philadelphia counties; and Scott Township in Columbia county. In 2000, the Commonwealth implemented a statewide Arbovirus disease surveillance, public education, and mosquito control strategy to reduce

vector mosquito populations and prevent the transmission of mosquito-borne viruses. This strategy will be implemented in all counties during the 2001 mosquito season

27. Where do I call/go if I need more information about West Nile Virus?

Citizens can visit the West Nile WebPage at www.westnile.state.pa.us You may also call 1-877-PA-HEALTH toll-free.

28. What about dead birds?

The Pennsylvania Department of Health is collecting and testing dead birds for WNV. Call 1-877-PA-HEALTH to report a dead bird.

29. What does CDC recommend be done?

CDC recognized that the epidemic/epizootic of WNV in the northeastern United States in the summer and fall of 1999 was an unprecedented event, underscoring the ease with which emerging infectious pathogens can move into new geographic areas. It also raised the issue of the preparedness of many local, state and national public health agencies to deal with epidemics of vector-borne diseases in this country. Because it is unknown whether WNV will be able to persist through the winter, whether it has already or will spread to new geographic locations, and what the public health and animal health implications of this introduction will be, it is important to proactively establish surveillance, prevention and control programs to prevent future WN virus epidemics in this country. Accordingly, CDC and USDA co-sponsored a meeting of experts representing a wide range of disciplines to review the state of our knowledge about the epidemic/epizootic in the NE and to provide input and guidance on the kinds of programs that should be established to effectively monitor WN virus activity and to prevent potential future outbreaks of disease.

a. **Surveillance:** Enhanced surveillance was identified as a high priority for those states that were affected or that are at higher risk for being affected because of bird migration patterns. These include states from Massachusetts to Texas along the Atlantic and Gulf Coasts, as well as countries in the Caribbean, Central and South America, underscoring the need for international cooperation. Depending on the geographic location of the state, active surveillance activities should be implemented now and continued through the winter months (southern states where mosquito activity is continuous throughout the year), or implemented early in the spring (northern states where mosquito activity has ceased due to cold weather). In all northeastern and southern states that face potential WNV activity, the following surveillance activities should be emphasized:

- **Active bird surveillance:** Monitoring of Arbovirus activity in wild birds, sentinel birds, or both. Surveillance for dead crows, in particular, may be a sensitive means to detect the presence of WNV in an area.
- **Active mosquito surveillance:** Surveillance of mosquito populations to detect WNV and other Arbovirus virus activity, to help identify potential mosquito vectors in a particular area, and to monitor population densities of those vectors.

- **Enhanced passive veterinary surveillance:** As a backup system to detect the presence of WNV and to monitor the extent of its transmission outside the bird-mosquito cycle, enhanced passive surveillance (passive surveillance enhanced by general alerts to veterinarians) for neurologic disease in horses and other animals.
- **Enhanced passive human surveillance:** As a backup system to detect the presence of WNV activity, enhanced passive surveillance (passive surveillance enhanced by general alerts to health care providers) for cases of viral encephalitis and, if resources permit, aseptic meningitis.

b. Laboratory Diagnosis: Unequivocal diagnosis of WNV or other Arbovirus infections requires specialized laboratory diagnostic tests. Success of surveillance activities is dependent on the availability of laboratories that can provide diagnostic support. The following minimal laboratory support is critical. CDC will provide reagents and training as needed.

- **Serology:** The IgM and IgG ELISA's should be available in all state public health and veterinary laboratories to provide the first line testing for human and animal serum and CSF specimens. In addition, selected state health and veterinary, as well as reference laboratories should have the capability to do neutralization tests to identify specific flavivirus antibody.
- **Virus isolation and detection:** Selected state public health laboratories and reference laboratories should have virus isolation and identification capabilities. These, plus selected other laboratories should also have RT-PCR capability to detect viral RNA. All laboratory investigations that require handling live virus should be conducted under Biosafety Level Three (BL-3) containment. Antigen-capture ELISA's should be developed to detect WNV and other Arboviruses in mosquito pools, and should be made available to state and local laboratories. Finally, selected state public health and reference laboratories should have the capability to do immunohistochemistry to detect WNV in autopsy tissues.

c. Prevention and Control: Currently, the most effective way to prevent transmission of WNV and other Arboviruses to humans and other animals, or to control an epidemic once transmission has begun, is to reduce human exposure via mosquito control. To prevent human and domestic animal disease, it is essential that state and local health departments have adequate mosquito control capabilities.

d. Mosquito abatement districts: The most effective and economical way to control mosquitoes is by larval source reduction. Experience suggests that this is done best through locally funded abatement programs that monitor mosquito populations and initiate control before disease transmission to humans and domestic animals occurs. These programs can also be used as the first-line emergency response for mosquito control if and when virus activity is detected in an area or human disease is reported. Control of adult mosquito populations by aerial application of insecticides is usually reserved as a last resort.

e. Public outreach: A critical component of any prevention and control program for vector-borne diseases is public education about these diseases, how they are transmitted and how to

prevent or reduce risk of exposure. Public education should utilize behavioral science and social marketing methods to effectively communicate information to target populations.

f. **Public Health Infrastructure:** Effective surveillance, prevention and control of vector-borne diseases, including disease caused by WNV, may require a re-evaluation of resource priorities in local and state health departments. Currently, only a few states and even fewer local health departments have trained personnel or the resources to adequately address vector-borne diseases. Every state health department should have, at a minimum, a functional Arbovirus surveillance and response capability, including entomology and veterinary health capacity and an adequately equipped laboratory with trained staff. Ultimately, the annual risk of Arbovirus activity will determine the extent of a state's activities to deal with Arbovirus diseases.

g. **Interjurisdictional Data Sharing:** WNV is a zoonosis that affects a number of animal species, including humans. Effective surveillance and response requires close coordination and data exchange between multiple agencies, including federal, state and local public health, vector control, agriculture and wildlife departments. Information and data exchange can be facilitated through a system of secure electronic communication, e.g., list servers and web sites, that can be accessed by authorized users.

h. **Research Priorities:** Understanding how and why the 1999 WNV epidemic/epizootic occurred, the public health and animal health implications of this introduction to the western hemisphere, and development of effective prevention strategies will require considerable research. Some of the high priority research topics identified at the workshop include:

- Current and future geographic distribution
- Bird migration as a mechanism of virus dispersal
- Vector relationships and range
- Vertebrate host relationships and range
- Virus persistence mechanisms
- Mosquito biology and behavior
- Mosquito control methodologies
- Mosquito surveillance methodologies
- Development and evaluation of prevention strategies
- Improved laboratory diagnostic tests
- Clinical spectrum of disease and long-term prognosis in humans
- Risk factor studies in enzootic areas
- Viral pathogenesis

- Genetic relationships and molecular basis of virulence
- WN virus vaccine development for animals and humans
- Antiviral therapy for WNV
- Economic analysis of the epidemic