

MEDICAL EDUCATION SYSTEMS

Course

West Nile Virus



Medical Education Systems

TOLL FREE 1-877-295-4719

FAX (619) 295-0252

EMAIL: info@mededys.com

www.mededys.com

P.O Box 81831 San Diego, CA 92138-3939

West Nile Virus Basics

Prevention:

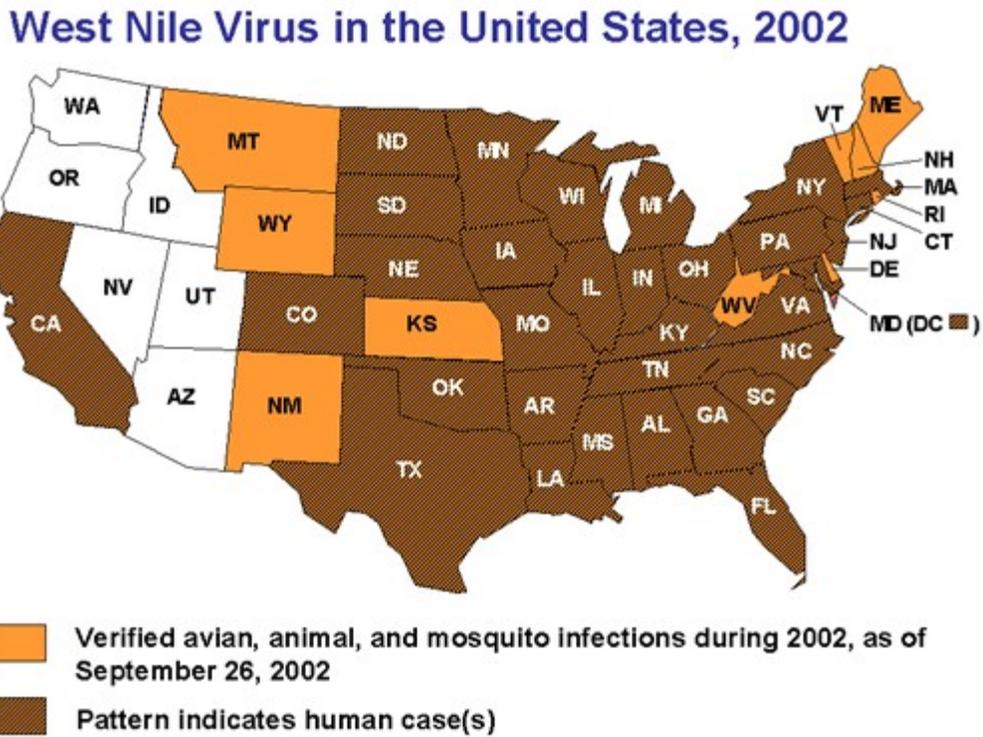
Avoid Mosquito Bites to Avoid Infection

Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low.

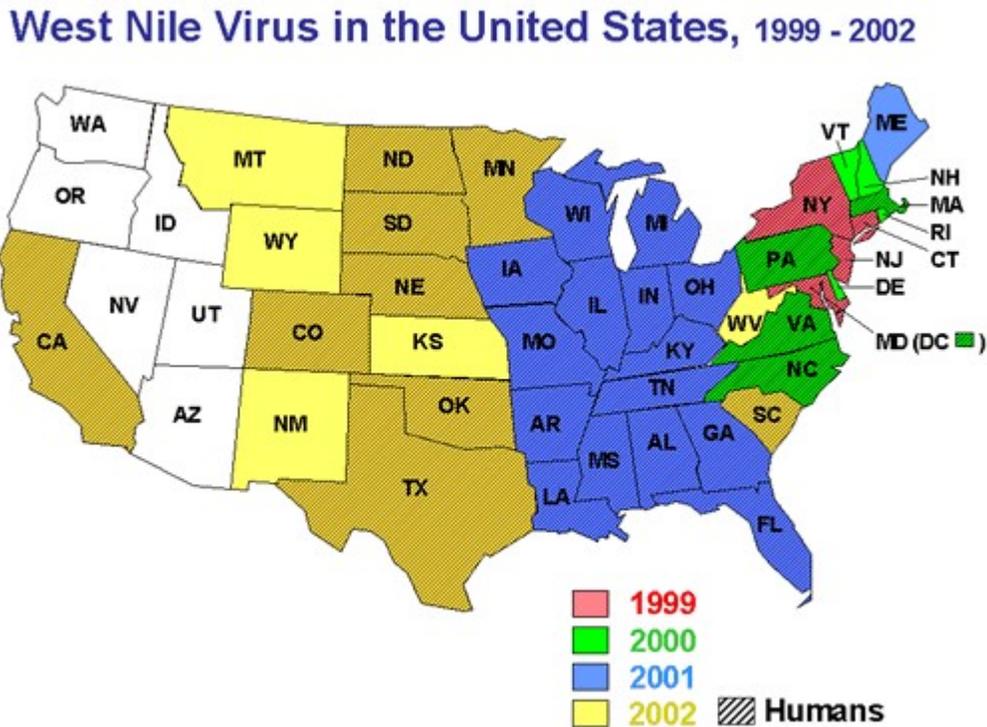
You can further reduce your chances of becoming ill by protecting yourself from mosquito bites. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors. For details on when and how to apply repellent, see [Insect Repellent Use and Safety](#) in our [Questions and Answers](#) pages. See also [Using Insect Repellent Safely](#) from the EPA*.
- When possible, wear long-sleeved clothes and long pants treated with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing.
- Consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times.
- Limit the number of places available for mosquitos to lay their eggs by eliminating standing water sources from around your home. Learn more on the [Prevention of West Nile Virus](#) question and answer page.
- Check to see if there is an organized mosquito control program in your area. If no program exists, work with your [local government](#) officials to establish a program. The [American Mosquito Control Association](#)* can provide advice, and their book *Organization for Mosquito Control* is a useful reference. Another source of information about pesticides and repellents is the [National Pesticide Information Center](#)*, which also operates a toll-free information line: 1-800-858-7378 (check their Web site for hours).

Map 1: States reporting laboratory-positive West Nile virus infection in birds, mosquitoes, animals, or humans between January 1 - September 26, 2002.



Map 3: Spread of West Nile virus by state, 1999-2002. West Nile Virus Activity in the U.S. in Birds, Horses, Mosquitoes, Animals, or Humans.



About the Virus, the Disease, and Its Spread

West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals.

Most people who become infected with West Nile virus will have either no symptoms or only mild ones. However, on rare occasions, West Nile virus infection can result in severe and sometimes fatal illnesses.

There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

PLEASE NOTE: CDC is not a hospital or clinical facility; we do not see patients and are unable to diagnose your illness, provide treatment, prescribe medication, or refer you to specialists.

If you have a medical emergency, contacting CDC is not the proper way to get immediate help. If you are a patient, please see your health care provider or the nearest emergency room. If you are a health care provider, please contact your state epidemiologist or local health department.

Reporting Dead Birds

Dead birds in an area may mean that West Nile virus is circulating between the birds and the mosquitoes in that area. Over 110 species of birds are known to have been infected with West Nile virus. Although birds, particularly crows and jays, infected with WN virus can die or become ill, most infected birds do survive.

The public can play an important role in monitoring West Nile virus through reporting dead birds to state and local health departments. However, in some areas, birds are no longer being collected. In addition, state and local agencies have different policies for collecting and testing birds. See the [Links to State and Local Government Sites](#) page to find information about reporting dead birds in your area.

PLEASE NOTE: Because CDC is a federal agency, we do not deal directly with the reporting of dead birds. State and local health departments are responsible for initiating these investigations. They report their findings to CDC.

Contacting State and Local Health Agencies

Find localized West Nile virus information and contacts on the CDC [Links to State and Local Government Sites](#) page.

Overview of West Nile Virus Updated

Q: What are West Nile virus, West Nile fever, and West Nile encephalitis?

A. “West Nile Virus” is a flavivirus commonly found in Africa, West Asia, and the Middle East. It is closely related to St. Louis encephalitis virus found in the United States. The virus can infect humans, birds, mosquitoes, horses and some other mammals.

“West Nile fever” is a case of mild disease in people, characterized by flu-like symptoms. West Nile fever typically lasts only a few days and does not appear to cause any long-term health effects.

More severe disease due to a person being infected with this virus can be “West Nile encephalitis,” “West Nile meningitis” or “West Nile meningoencephalitis.” Encephalitis refers to an inflammation of the brain, meningitis is an inflammation of the membrane around the brain and the spinal cord, and meningoencephalitis refers to inflammation of the brain and the membrane surrounding it.

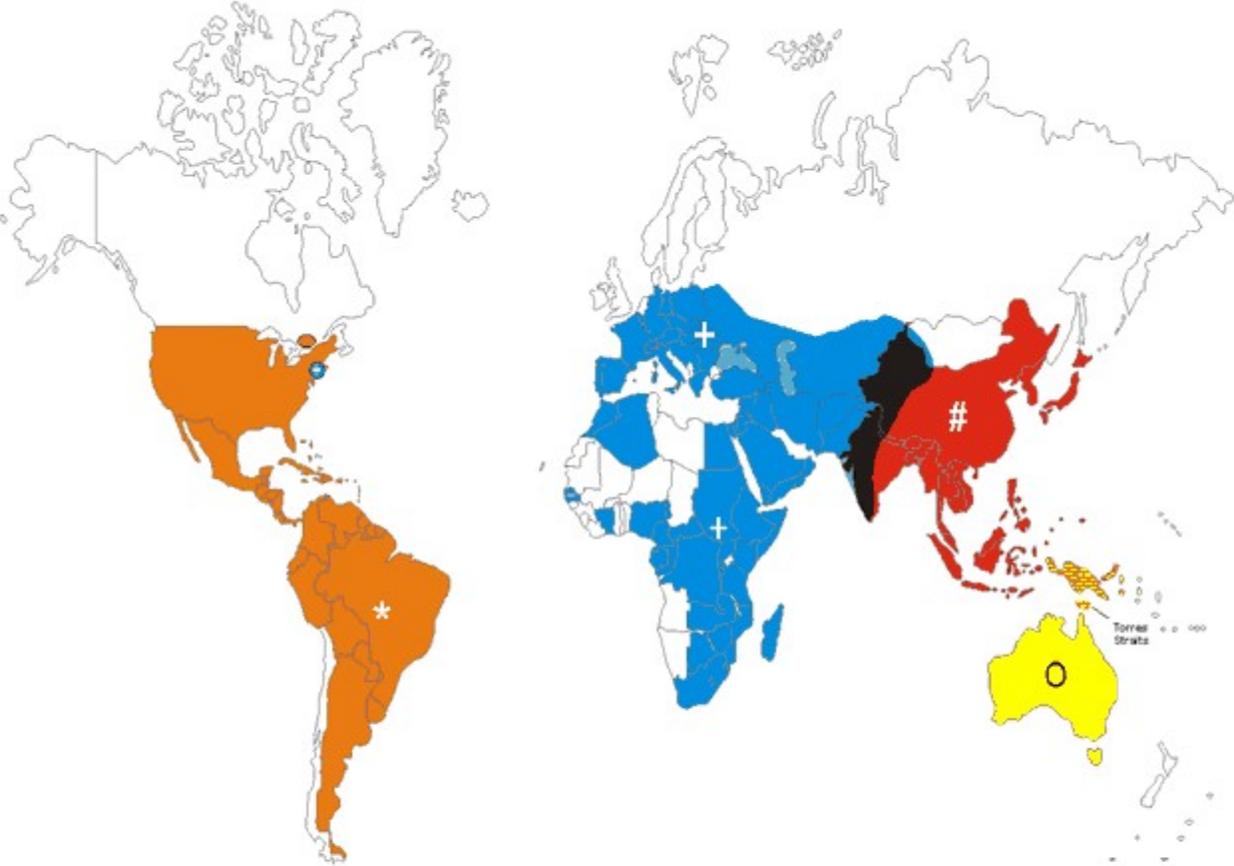
Q. Where did West Nile virus come from?

A. West Nile virus has been commonly found in humans and birds and other vertebrates in Africa, Eastern Europe, West Asia, and the Middle East, but until 1999 had not previously been documented in the Western Hemisphere. It is not known from where the U.S. virus originated, but it is most closely related genetically to strains found in the Middle East.

Map: Geographic Distribution of the Japanese Encephalitis Serocomplex of the Family Flaviridae, 2000.



The Geographic Distribution of the Japanese Encephalitis Serocomplex of the Family Flaviridae, 2000.



- St. Louis encephalitis
- * Rocio and St. Louis (Brazil)
- + West Nile virus
- # Japanese encephalitis
- West Nile and Japanese encephalitis
- Japanese and Murray Valley encephalitis
- Murray Valley and Kunjin

Q. Historically, where has West Nile encephalitis occurred worldwide?

A. See the map describing distribution of flaviviruses, including West Nile virus:

Q. How long has West Nile virus been in the U.S.?

A. It is not known how long it has been in the U.S., but CDC scientists believe the virus has probably been in the eastern U.S. since the early summer of 1999, possibly longer.

Q. I understand West Nile virus was found in "overwintering" mosquitoes in the New York City area in early 2000. What does this mean?

A. One of the species of mosquitos found to carry West Nile virus is the *Culex* species which survive through the winter, or "overwinter," in the adult stage. That the virus survived along with the mosquitoes was documented by the widespread transmission the summer of 2000.

Q. Is West Nile virus now established in the Western Hemisphere?

A. The continued expansion of West Nile virus in the United States indicates that it is permanently established in the Western Hemisphere.

Q. Is the disease seasonal in its occurrence?

A. In the temperate zone of the world (i.e., between latitudes 23.5° and 66.5° north and south), West Nile encephalitis cases occur primarily in the late Summer or early Fall. In the southern climates where temperatures are milder, West Nile virus can be transmitted year round.

Transmission Updated

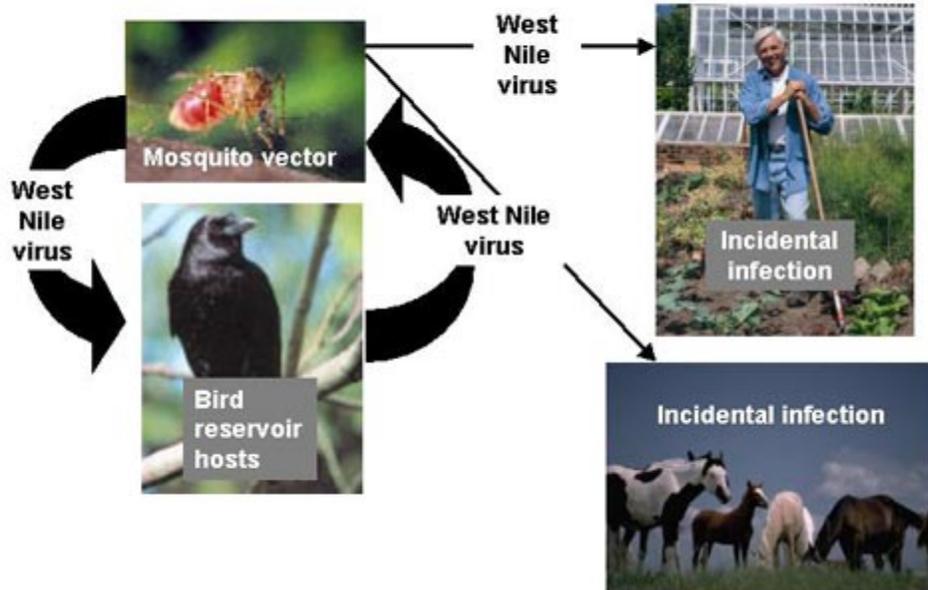
Q. How do people get infected with West Nile virus (WNV)?

A. West Nile virus may be transmitted when an infected mosquito bites a human to take in blood. Mosquitoes become infected when they feed on infected birds, which may circulate the virus in their blood for a few days. The virus is located in the mosquito's salivary glands. During blood feeding, the virus may be injected into humans, where it can multiply and possibly cause illness.

In addition, a recent investigation has confirmed WNV transmission through transplanted organs. Investigations of other patients who developed WNV infection within several weeks of receiving blood products or organs are ongoing to determine whether WNV was transmitted by transfusion or transplantation in any of these cases.

Flowchart: West Nile Virus Transmission Cycle

West Nile Virus Transmission Cycle



Q. What is the basic transmission cycle of West Nile virus?

A. Mosquitoes become infected when they feed on infected birds, which may circulate the virus in their blood for a few days. Infected mosquitoes can then transmit West Nile virus to humans and animals while biting to take blood. The virus is located in the mosquito's salivary glands. During blood feeding, the virus may be injected into the animal or human, where it may multiply, possibly causing illness.

Q. If I live in an area where birds or mosquitoes with West Nile virus have been reported and a mosquito bites me, am I likely to get sick?

A. No. Even in areas where the virus is circulating, very few mosquitoes are infected with the virus. Even if the mosquito is infected, less than 1% of people who get bitten and become infected will get severely ill. The chances you will become severely ill from any one mosquito bite are extremely small.

Q. Can you get West Nile encephalitis from another person?

A. No. West Nile encephalitis is NOT transmitted from person-to-person. For example, you

cannot get West Nile virus from touching or kissing a person who has the disease, or from a health care worker who has treated someone with the disease.

Q. Is a woman's pregnancy at risk if she gets infected with West Nile virus?

A. There is no documented evidence that a pregnancy is at risk due to infection with West Nile virus.

Q. Can you transmit West Nile virus through blood transfusions?

A. Please refer to CDC's [Blood Transfusions and Transmission: Questions and Answers: http://www.cdc.gov/ncidod/dvbid/westnile/qa/transfusion.htm](http://www.cdc.gov/ncidod/dvbid/westnile/qa/transfusion.htm)

Q. Besides mosquitoes, can you get West Nile virus directly from other insects or ticks?

A. Infected mosquitoes are the primary source for West Nile virus. Although ticks infected with West Nile virus have been found in Asia and Africa, their role in the transmission and maintenance of the virus is uncertain. However, there is no information to suggest that ticks played any role in the cases identified in the United States.

Q. How many types of animals have been found to be infected with West Nile virus?

A. Although the vast majority of infections have been identified in birds, WN virus has been shown to infect horses, cats, bats, chipmunks, skunks, squirrels, and domestic rabbits.

Q. Can you get West Nile virus directly from birds?

A. There is no evidence that a person can get the virus from handling live or dead infected birds. However, persons should avoid bare-handed contact when handling *any* dead animals and use gloves or double plastic bags to place the carcass in a garbage can.

Q. Can you get infected with West Nile virus by caring for an infected horse?

A. West Nile virus is transmitted by infectious mosquitoes. There is no documented evidence of person-to-person or animal-to-person transmission of West Nile virus. Normal veterinary infection control precautions should be followed when caring for a horse suspected to have this or any viral infection.

Q. Can you get WNV from eating game birds or animals that have been infected?

A. There is no evidence that WNV virus can be transmitted to humans through consuming infected birds or animals. In keeping with overall public health practice, and due to the risk of known food-borne pathogens, people should always follow procedures for fully cooking meat from either birds or mammals.

Q. How does West Nile virus actually cause severe illness and death in humans?

A. Following transmission by an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal central nervous system functioning and causes inflammation of brain tissue.

Q. How long does the West Nile virus remain in a person’s body after they are infected?

A. There is no scientific evidence indicating that people can be chronically infected with West Nile virus. What remain in a person’s body for long periods of time are antibodies and “memory” white blood cells (T-lymphocytes) that the body produces to the virus. These antibodies and T-lymphocytes last for years, and may last for the rest of a person’s life. Antibodies are what many diagnostic tests look for when clinical laboratories testing is performed. Both antibodies and “memory” T-lymphocytes provide future protection from the virus.

Q. If a person contracts West Nile virus, does that person develop a natural immunity to future infection by the virus?

A. It is assumed that immunity will be lifelong; however, it may wane in later years.

Prevention

Q. What can I do to reduce my risk of becoming infected with West Nile virus?

A. Here are preventive measures that you and your family can take:

Protect yourself from mosquito bites:

- Apply insect repellent sparingly to exposed skin. The more DEET a repellent contains the longer time it can protect you from mosquito bites. A higher percentage of DEET in a repellent does not mean that your protection is better—just that it will last longer. DEET concentrations higher than 50% do not increase the length of protection. Choose a repellent that provides protection for the [amount of time](#) that you will be outdoors.
 - Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands of children.
 - *Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.*
 - **For detailed information about using repellents, see the [Insect Repellent Use and Safety](#) questions.**
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing.
- When possible, wear long-sleeved shirts and long pants whenever you are outdoors.
- Place mosquito netting over infant carriers when you are outdoors with infants.
- Consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times.
- Install or repair window and door screens so that mosquitoes cannot get indoors.

Help reduce the number of mosquitoes in areas outdoors where you work or play, by draining sources of standing water. In this way, you reduce the number of places mosquitoes can lay their eggs and breed.

- At least once or twice a week, empty water from flower pots, pet food and water dishes, birdbaths, swimming pool covers, buckets, barrels, and cans.
- Check for clogged rain gutters and clean them out.
- Remove discarded tires, and other items that could collect water.
- Be sure to check for containers or trash in places that may be hard to see, such as under bushes or under your home.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

New! Kids can learn how to protect themselves from mosquito bites on "[The Buzz-z-z-z on West Nile Virus](#)" (on BAM!, the CDC site for kids).

Q. What can be done to prevent outbreaks of West Nile virus?

A. Prevention and control of West Nile virus and other arboviral diseases is most effectively accomplished through integrated vector management programs. These programs should include surveillance for West Nile virus activity in mosquito vectors, birds, horses, other animals, and humans, and implementation of appropriate mosquito control measures to reduce mosquito populations when necessary. Additionally, when virus activity is detected in an area, residents should be alerted and advised to increase measures to reduce contact with mosquitoes. Details about effective prevention and control of West Nile virus can be found in [CDC's Guidelines for Surveillance, Prevention, and Control](#)  (286 KB, 111 pages).

Q. Is there a vaccine against West Nile encephalitis?

A. No, but several companies are working towards developing a vaccine.

Q. Where can I get information about the use of pesticide sprays that are being used for mosquito control?

A. The federal agency responsible for pesticide evaluation is the Environmental Protection Agency (EPA). [See the EPA Web site](#)  for detailed answers to the questions about pesticides used for mosquito control.

Blood Transfusions and Organ Donations Updated

Q. Is West Nile virus (WNV) transmitted by blood transfusion or organ donation?

A. A recent investigation has identified transplanted organs as the source of WNV infection in four recipients of organs from a single donor. How the organ donor became infected is unknown. The organ donor might have become infected from a mosquito bite or possibly acquired the infection through transfusion; an investigation of the numerous transfusions received by the organ donor is ongoing. Since the report of these cases, CDC has been informed of other patients who developed WNV infection within several weeks of receiving blood products or organs. Investigations are ongoing to determine whether WNV was transmitted by transfusion or transplantation in any of these cases.

Q. What is being done about the possibility of transfusion-related WNV transmission?

A. CDC, FDA, blood collection agencies, and state and local health departments are investigating possible cases of WNV transmission through blood transfusion and organ transplantation. For cases currently under investigation, any remaining blood products from donors whose blood was transfused to patients with confirmed or suspected WNV infection have been withdrawn and efforts are underway to contact these donors as well as other recipients of blood products from these donors for follow up.

As part of the investigation, CDC has asked that physicians notify public health authorities of any patients who develop symptoms of WNV infection within 4 weeks of receiving a blood transfusion or organ transplantation. In addition, patients with WNV infection whose symptoms begin in the weeks preceding blood or organ donation should also be reported. Prompt reporting of these persons will help facilitate withdrawal of potentially infected blood components.

Q. Should people avoid donating blood or getting blood transfusions or organ transplants?

A. Blood is lifesaving and is currently in short supply. Donating blood is safe, and we encourage blood donation now and in the future. Approximately 4.5 million persons receive blood or blood products annually. Although persons needing blood transfusions or organ transplants should be aware of the risk for WNV infection, the benefits of receiving needed transfusions or transplants outweigh the potential risk for WNV infection.

Q. How can blood banks avoid collecting blood from donors who may have West Nile virus?

A. On August 17, FDA issued an alert to blood banks and organizations to be vigilant in excluding individuals who may have early symptoms of West Nile virus from donating blood. Most people who have West Nile virus do not show symptoms, making it difficult to defer them from donation. However, some individuals develop minor symptoms of fever and headache. Blood banks need to be vigilant to defer all of those who may have minor illnesses, especially in areas where West Nile virus is most active.

Q. If a person has had West Nile virus, can they still donate blood?

A. With West Nile virus infection, the viremia usually is transient, and people clear the virus very quickly. Blood centers will take precautions (see preceding question and answer) to be sure that donors who have been diagnosed with West Nile virus have fully recovered before donating.

Q. If I recently had a transfusion or transplant, should I be concerned about getting West Nile virus?

A. You should be aware of the potential risk for WNV infection and the need to monitor your health. If you have symptoms of West Nile virus or other concerns you should contact your physician. However, it is important to remember that a large number of WNV infections due to mosquito bites have occurred among persons in the United States this year. By chance alone, some of these persons will have received blood transfusions and/or organ transplantations. Recent receipt of a blood transfusion or organ transplantation by a person with WNV infection does not necessarily implicate the transfusion/transplantation as the source of infection.

Symptoms of West Nile Virus Updated

Q. What are the symptoms of West Nile virus infection?

A. Most people who are infected with the West Nile virus will not have any type of illness. It is estimated that 20% of the people who become infected will develop West Nile fever: mild symptoms, including fever, headache, and body aches, occasionally with a skin rash on the trunk of the body and swollen lymph glands.

The symptoms of severe infection (West Nile encephalitis or meningitis) include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. It is estimated that 1 in 150 persons infected with the West Nile virus will develop a more severe form of disease.

Q. What is the incubation period in humans (i.e., time from infection to onset of disease symptoms) for West Nile encephalitis?

A. Usually 3 to 14 days.

Q. How long do symptoms last?

A. Symptoms of mild disease will generally last a few days. Symptoms of severe disease may last several weeks, although neurological effects may be permanent.

West Nile Virus Post-Test

Select the *best* answer to each of the following items. Mark your responses on the Answer form.

1. Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low.

- a. True
- b. False

2. According to this course you should apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing.

- a. True
- b. False

3. West Nile virus is spread by the bite of an infected mosquito, and can infect _____.

- a. people
- b. horses and some other types of animals
- c. many types of birds
- d. All of the above

4. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

- a. True
- b. False

5. Dead birds in an area may mean that West Nile virus is circulating between the birds and the mosquitoes in that area. Over _____ species of birds are known to have been infected with West Nile virus. Although birds, particularly crows and jays, infected with WN virus can die or become ill, most infected birds do survive.

- a. 25
- b. 70
- c. 110
- d. 200

6. Encephalitis refers to an inflammation of the brain, meningitis is an inflammation of the membrane around the brain and the spinal cord, and meningoencephalitis refers to inflammation of the brain and the _____.

- a. face
- b. synapses that occur in it
- c. membrane surrounding it
- d. None of the above

7. West Nile virus has been commonly found in humans and birds and other vertebrates in Africa, Eastern Europe, West Asia, and the Middle East, but until 1999 had not previously been documented in the Western Hemisphere. It is not known from where the U.S. virus originated, but it is most closely related genetically to strains found in the Middle East.

- a. True
- b. False

8. It is not known how long it has been in the U.S., but CDC scientists believe the virus has probably been in the eastern U.S. since the early summer of 1999, possibly longer.

- a. 1900
- b. 1983
- c. 1993
- d. 1999

9. The continued expansion of West Nile virus in the United States indicates that it is permanently established in the Western Hemisphere.

- a. True
- b. False

10. In the temperate zone of the world (i.e., between latitudes 23.5° and 66.5° north and south), West Nile encephalitis cases occur primarily in the late Summer or early Fall. In the southern climates where temperatures are milder, West Nile virus can be transmitted year round.

- a. True
- b. False

11. West Nile virus may be transmitted when an infected mosquito bites a human to take in blood. Mosquitoes become infected when they feed on infected birds, which may circulate the virus in their blood for a few days. The virus is located in the mosquito's _____. During blood feeding, the virus may be injected into humans, where it can multiply and possibly cause illness.

- a. stomach
- b. salivary glands
- c. blood supply
- d. None of the above

12. Even in areas where the virus is circulating, very few mosquitoes are infected with the virus. Even if the mosquito is infected, less than 1% of people who get bitten and become infected will get severely ill. The chances you will become severely ill from any one mosquito bite are extremely small.

- a. True
- b. False

13. Although ticks infected with West Nile virus have been found in Asia and Africa, their role in the transmission and maintenance of the virus is uncertain. However, there is no information to suggest that ticks played any role in the cases identified in the United States.

- a. True
- b. False

14. Although the vast majority of infections have been identified in birds, WN virus has been shown to infect horses, _____.

- a. cats
- b. bats
- c. domestic rabbits
- d. All of the above

15. There is no evidence that WNV virus can be transmitted to humans through consuming infected birds or animals. In keeping with overall public health practice, and due to the risk of known food-borne pathogens, people should always follow procedures for fully cooking meat from either birds or mammals.

- a. True
- b. False

MEDEDSYS

PO BOX 81831, San Diego, CA, 92138-3939

TOLL FREE 1-877-295-4719

FAX: 619-295-0252

info@mededsys.com

www.mededsys.com

How to Complete Your Test and Print Your Certificate Online

If you chose to receive your order by postal mail, you have been mailed the printed course material(s) and the printed test(s). To take a test, simply complete the mailed test and send it back. Upon successful completion of a test, a certificate will be mailed or faxed to you. If you don't wish to mail the test back, customers who chose to have the course material(s) mailed may also follow the steps below to complete a test and print a certificate online.

INSTRUCTIONS

- 1. Go to www.mededsys.com*
- 2. Login and go to "My Account".*
- 3. On the page that opens, select an option from the "My Courses" menu.*
- 4. Select the test you wish to complete.*
- 5. After completion of test, print your certificate online by clicking on the "Continue" button. Alternatively, you may return to the "My Courses" section and select the option to print a certificate.*