

West Nile Virus¹

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What Is West Nile Virus and How Does It Affect Humans and Horses?

West Nile virus (WNV) is carried by mosquitoes and if transmitted to humans, it can cause severe encephalitis. It is closely related to St. Louis Encephalitis virus (SLEV) which is sometimes a problem in Florida. WNV was first isolated in 1937, from a woman in the West Nile province of Uganda in Central Africa. Epidemics of West Nile have occurred in Israel, France, South Africa, and Romania. West Nile virus was first documented in the United States in New York City (NYC) during an epidemic in August 1999.

Human West Nile Fever and West Nile Virus Encephalitis

Most humans who are infected with WNV do not develop clinical illness. Approximately 20% of the people who are infected will exhibit fever, headache, body aches, swollen lymph glands, and a skin rash. These collective symptoms are defined as West Nile Fever. Symptoms of WN Fever typically last a few days.

More severe infections include headache, high fever, neck stiffness, disorientation, coma, convulsions, muscle weakness and paralysis. This severe form of the infection is defined as West Nile encephalitis. About one out of every 150 human infections results in encephalitis. West Nile encephalitis may last several weeks to months. Some individuals suffering from West Nile encephalitis experience permanent neurological effects.

West Nile Virus in Horses

Horses infected with WNV often exhibit signs of ataxia (loss of muscle coordination) which often affects the rear limbs, causing stumbling, staggering, and wobbly gait. Other signs include teeth grinding; muscle fasciculation; lying down with difficulty and an inability to rise; facial paralysis, twitching, and blindness. Treatment of infected horses is based on clinical signs with a goal of reducing the severity of the disease. Fluid and nutrient supportive therapy is often required.

According to USDA-APHIS Veterinary Services, horses that are infected with WNV are *not required to be euthanized*. Horses do not produce substantial WNV viremias in their blood. As a result

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1. This document is Fact Sheet ENY-642, one of a series of the Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Date first published: October 2000. Revised April 2003. Revised March 2006, and March 2009. Please visit the EDIS Web site at <http://edis.ufl.edu>.
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horses are dead-end hosts for WNV and it is unlikely that mosquitoes feeding on infected horses ingest enough WNV to become infective and transmit the virus to other animals. Horses are euthanized only when they are suffering from severe encephalitis from which they will unlikely recover. Also, because horses are dead-end hosts, quarantines of infected animals are not required.

How Does the Virus Get into Humans and Horses?

The most important mode of transmission of WNV to humans and horses is through the bite of a WNV-infected mosquito. Mosquitoes usually obtain the virus by feeding on infected wild birds. After a mosquito feeds on an infected bird the virus goes through a temperature-dependent incubation period within the mosquito. At the conclusion of this incubation period virus can be passed each time the infected female mosquito feeds on a vertebrate host. When the infective mosquito blood-feeds, WNV is mixed with the mosquito's saliva and released into the blood stream of the second host. If the second host is susceptible to the virus, a clinical or subclinical WNV infection may result.

The mosquito species that are most likely to be important in WNV transmission are members of the genus *Culex*. *Culex* species have been implicated in West Nile outbreaks throughout much of the tropical and temperate world, and there is evidence in Florida that *Culex nigripalpus* is an important vector of WNV. Females of this species lay their eggs in flooded citrus groves, catch basins, sewers, cisterns, and temporary flood water pools. The peak time for blood-feeding of this mosquito species is between sunset and sunrise with concentrated blood-feeding peaks immediately following sunset and just before sunrise.

Rare Forms of WNV Transmission

A small proportion of human West Nile cases have resulted from modes of infection other than through the bite of an infected mosquito. A small number of confirmed human WN cases have resulted from organ transplants, blood transfusions, *in utero* transmission, and accidental laboratory infections. West Nile virus is not transmitted from one human to

another through casual contact. Also, it is not transmitted from birds to humans or from horses to humans. There is no evidence that WNV can be transmitted to humans by the consumption of cooked infected birds, eggs, or other animals. A human, horse, wild bird or other vertebrate that survives a WNV infection is assumed to have lifelong immunity to the virus.

WNV in Florida

West Nile virus was first detected in Florida in a single dead crow collected on June 18, 2001 in Jefferson County. It is likely that WNV arrived in Florida during the fall of 2000, probably in birds migrating south from areas of the country that had ongoing WNV transmission. Since 2001, confirmed cases of WN in humans and horses have been reported nearly every year in Florida (Table 1).

Since 2001, WNV has been reported from sentinel chickens maintained throughout Florida. Mosquito control districts, state and local health departments, and the Centers for Disease Control and Prevention test dead birds, sentinels (chickens and other vertebrates), mosquitoes, and horses for WNV and antibody to WNV. In Florida, all confirmed positive WNV and antibody test results are reported to stake-holders in local health departments and mosquito control organizations by the Florida Department of Health. Authorities will then make decisions about what strategies to use to reduce risk of human and equine exposure to WNV based on scientific information about the virus, vectors, avian amplification hosts, and local or regional environmental conditions.

How Can the Risk of Exposure to West Nile be Reduced?

Human vaccines are not currently available for the majority of arthropod-borne viral pathogens including WNV and SLEV. During the arboviral transmission season (July-October), individuals should pay attention to all medical and veterinary alerts and follow specific recommendations. Medical Alerts will be posted on the FMEL Encephalitis Information System at <http://eis.ifas.ufl.edu> as soon as they become available.

Table 1.

Florida WN Cases	2001	2002	2003	2004	2005	2006	2007	2008
Human	12	35	92	42	21	3	3	3
Horse	491	500	119	6	12	0	0	1

The best method of reducing risk of exposure to mosquito-borne viruses is to avoid mosquito bites through personal protection by wearing mosquito repellents and protective clothing during times when mosquitoes are most active.

Personal Protection

Personal protection against biting arthropods, particularly when they are infected with dangerous pathogens, remains one of the most important ways to avoid disease. When possible, avoid mosquitoes. Make sure screens are in good repair to prevent mosquitoes from entering homes. If you must enter areas where there is a threat of encountering infected mosquitoes, wear protective clothing.

Use a personal insect repellent that provides a reasonable Complete Protection Time (CPT). The CPT is the total time following repellent application that the treated individual will remain bite free. For example, under normal conditions the CPT for a 5% formulation of DEET (diethyl toluamide, presently the most effective insect repellent) is approximately 2 hours. The CPT for a 24% DEET formulation is more than 4 hours. For more information on repellents, refer to the University of Florida/IFAS Fact Sheet ENY-671 "Mosquito Repellents."

- Avoid exposure to mosquitoes - stay indoors during peak biting times.
- If you must be outside during peak biting times, wear long sleeves and pants.
- Wear mosquito repellents when outside during peak biting times. Use mosquito repellents containing the active ingredient DEET. Be sure to follow all application directions on the label.
- Make sure window and door screens are in good repair to prevent mosquitoes from entering homes.

- Remove unnecessary sources of water outside the home that may provide breeding places for mosquitoes.
- Flush out the water in bird baths, flower pot overflow dishes, toys, and outdoor pet dishes every 3 - 4 days.
- Remove leaf litter, standing water, and debris from roof gutters and boat covers.
- For more information see: The Florida Medical Entomology Lab's Fact Sheet on Personal Protection (ENY-671 - Mosquito Repellents).

Public Protection

Fortunately, the USA has some of the best mosquito and vector control programs in the world. Vector control and personal protection against vectors and the diseases they carry are the best way to avoid infection with vector-borne pathogens. Strategies that might be effective against being infected with WNV include: source reduction of mosquito breeding sites; focal applications of insecticides directed against adult and immature mosquitoes; Public Service Announcements to educate residents about the vector, the disease, and disease avoidance; tips to help prevent home-invasion by infected vectors; and information about the most effective means of personal protection. St. Louis encephalitis and WNV epidemics and outbreaks in Florida have proved that an effective means of reducing human infection is to widely disseminate accurate information through the media. An individual's first line of defense during a vector-borne disease emergency is knowledge and personal protection.

Vaccine for Horses

The Commissioner of the Florida Department of Agriculture and Consumer Services has urged that all equine owners to have their horses vaccinated against WNV and to be vigilant about scheduling booster

shots at regular intervals. For more information on this vaccine, contact your veterinarian or call the Florida Department of Agriculture and Consumer Services WNV vaccine hotline: 850-410-0900. Horses that have been vaccinated against eastern equine encephalitis virus (EEEV) are not protected from infection with WNV.

Further information on West Nile

For updates on the current situation on West Nile and other mosquito-borne diseases in Florida, visit the Florida Medical Entomology Laboratory's Encephalitis Information System (<http://eis.ifas.ufl.edu>) to view current health alerts. Additionally, information is provided on the FMEL EIS web page to assist readers in understanding the real risk of exposure to the mosquito-borne viruses in Florida.