

West Nile virus disease



Wetlands inhabited
by disease vectors
and groups of
susceptible animals

Wildlife ✓
Livestock ✓
Human ✓



Synonyms: WNVD, West Nile fever (WNF), West Nile fever virus (WNFV), West Nile virus (WNV)

KEY FACTS

What is West Nile virus disease?	A disease that is primarily transmitted between birds, animals and humans by the bite of infected mosquitoes, commonly of the <i>Culex</i> and <i>Aedes</i> species. Mosquitoes acquire the virus when feeding on infected birds, which are considered the natural hosts of the virus. In birds, it can cause mortality and reduced survival. Other animals, particular horses, may become infected and humans may also contract the virus. In humans the majority of infections will go unnoticed or cause mild disease but in a small proportion of cases the virus can cause severe neurological illness or death. Epidemics are most likely to occur during periods of high mosquito activity.
Causal agent	Virus from the genus <i>Flavivirus</i> (arbovirus group B).
Species affected	Many species of bird and some species of terrestrial mammal, including humans. It has also been found, to a lesser extent, in reptiles and amphibians.
Geographic distribution	Originally detected in Africa, the virus appears to be expanding its geographic range into western Asia, the Middle East and Europe, and is now also an important disease in the USA.
Environment	Both temperate and tropical regions inhabited by disease vectors and supporting groups of birds and/or susceptible mammals.

TRANSMISSION AND SPREAD

Vector(s)	Most commonly spread by the bite of an infected mosquito but also by ticks and other insects.
How is the disease transmitted to animals?	Mosquitoes become infected by feeding on infected birds and mammals and then transmit infection when taking the next blood meal. Birds may also become infected after ingesting infected vertebrates and insects.
How does the disease spread between groups of animals?	Birds are the main hosts and once infected, mosquitoes and other biting insects can then spread the disease to other animals and humans. Transmission depends upon the level of virus in the blood, which varies from species to species and stage of infection. Humans and horses are considered 'dead-end' hosts, with only low levels of virus in the blood insufficient for efficient mosquito transmission.
How is the disease transmitted to humans?	Most commonly spread by the bite of an infected mosquito but also by ticks and other insects. The disease may also spread to humans through blood transfusions, organ transplants, breast-feeding and from mother to baby during pregnancy but is not spread by person-to-person contact.

IDENTIFICATION AND RESPONSE

Field signs

Unusual bird mortality may signal an outbreak as seen in the USA, but some outbreaks in Europe have not been associated with detectable bird mortality. Commonly reported signs in animals, particularly horses, include weakness, stumbling, trembling, head tremors, reduced mobility, and lack of awareness that allows them to be easily approached and handled.

Humans may suffer from symptoms, also known as West Nile fever, which can include fever, headache, body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for between a few days to several weeks. A small number of people will develop severe symptoms which can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, loss of vision, numbness and paralysis. These symptoms can last several weeks and neurological effects may be permanent.

Recommended action if suspected

The disease is notifiable to the OIE so report suspected cases to local and national authorities. Contact and seek assistance from animal and human health professionals immediately if there is any unusual bird mortality or illness in birds, livestock and/or people.

Diagnosis

Detection of the causative agent by health professionals is needed for a definitive diagnosis. For dead birds, fresh organ specimens are required, preferably kidney, brain or heart. Ideally, a variety of species should be tested with emphasis on corvids. In live birds, diagnosis can be made by testing the blood. For other animals and humans, testing usually involves extracting serum and cerebrospinal fluid (CSF).

PREVENTION AND CONTROL IN WETLANDS

Overall

Habitat management.

Encourage mosquito predators and their access to mosquito breeding habitats:

- Connect shallow water habitat (mosquito breeding areas) with deep-water habitat > 0.6m (favoured by larvivorous fish) with steep sides, through meandering channel connections, deep ditches and tidal creeks.
- Include at least some permanent or semi-permanent open water.
- Construct artificial homes or manage for mosquito predators such as bird, bat and fish species.

Reduce mosquito breeding habitat:

- Reduce the number of isolated, stagnant, shallow (2-3 inches deep) areas.
- Cover or empty artificial containers which collect water.
- Manage stormwater retention facilities.
- Strategic manipulation of vegetation.
- Vary water levels.
- Construct a vegetation buffer between the adjacent land and the wetland to filter nutrients and sediments.
- Install fences to keep livestock from entering the wetland to reduce nutrient-loading and sedimentation problems.

In ornamental/more managed ponds:

- Add a waterfall, or install an aerating pump, to keep water moving and reduce mosquito larvae. Natural ponds usually have sufficient surface water movement.

- Keep the surface of the water clear of free-floating vegetation and debris during times of peak mosquito activity.

Vector control (chemical).

It may be necessary to use alternative mosquito control measures if the above measures are not possible or ineffective.

- Use larvicides in standing water sources to target mosquitoes during their aquatic stage. This method is deemed least damaging to non-target wildlife and should be used before adulticides. However, during periods of flooding, the number and extent of breeding sites is usually too high for larvicidal measures to be feasible.
- Use adulticides to spray adult mosquitoes.
- The environmental impact of vector control measures should be evaluated and appropriate approvals should be granted before they are undertaken.

Biosecurity.

Protocols for handling sick or dead wild animals and contaminated equipment can help prevent further spread of disease.

- Wear gloves whilst handling animals and wash hands with disinfectant or soap immediately after contact with each animal.
- Change or disinfect gloves between animals.
- Change needles and syringes between blood collection from different animals.
- Wear different clothing and footwear at each site and disinfect clothing/footwear between sites.
- Disinfect field equipment between animals and sites.

Monitoring and surveillance.

Bird and mosquito surveillance should be prioritised. Animals, particularly horses, are also important sentinels of epizootic activity and human risk in some geographic regions.

- Dead bird surveillance is the most sensitive early detection system. Unusual mortality events should be reported quickly along with prompt submission of selected individual birds for testing. Generally, surveillance should start when local adult mosquito activity begins or should be ongoing if mosquito activity is high all year round.
- Larval and adult mosquito surveillance.
- Horse surveillance, particularly where there have been unusual mortality events, should be reported quickly along with prompt submission of selected samples for testing.

Livestock

- Reduce the chance of animals being bitten by mosquitoes
 - Use insect repellent. Note that this method should not be solely relied upon.
 - Use screened housing with measures to eliminate mosquitoes from inside structures.
 - Use fans to reduce the ability of mosquitoes to feed on animals.
- Vaccination of horses.

Wildlife

A well managed and healthy wetland is the best strategy to prevent or minimise the spread of the virus in the wild. Actions outlined above (► **Overall, Habitat Management**) should be implemented to maximise mosquito predator abundance/diversity and minimise mosquito habitat (accepting that mosquitoes are part of natural diversity of wetlands).

Conduct active dead bird monitoring: unusual bird deaths may signal a West Nile virus disease outbreak and should be quickly reported to local animal health authorities. Because of their susceptibility, the same caution should also be applied to any wild or free-ranging horse populations inhabiting wetlands.

Humans

Medical attention should be sought if WNV is suspected. Milder symptoms usually pass on their own but hospitalisation may be needed in more severe cases for supportive care (there is no human vaccine and no specific treatment for humans).

Measures to reduce the chance of being bitten by mosquitoes:

- Wear light coloured clothing which covers arms and legs.
- Use impregnated mosquito netting when sleeping outdoors or in an open unscreened structure.
- Avoid mosquito-infested areas or stay indoors when mosquitoes are most active.
- Use colognes and perfumes sparingly as these may attract mosquitoes.
- Use mosquito repellent when outdoors. Note that some repellents cause harm to wildlife species, particularly amphibians. Wash hands before handling amphibians.
- Use citronella candles and mosquito coils in well ventilated indoor areas.
- Use mesh screens on all doors and windows.

IMPORTANCE

Effect on wildlife

Causes morbidity and mortality in many species of bird and some species of mammal although its impacts on animal populations are currently unknown. Some infected bird species may also have reduced survival. There are concerns that species vulnerable to fatal infection may be more prone to extinction, although there is no evidence of this currently. The disease can result in negative perception and therefore unnecessary destruction of wildlife.

Effect on livestock

Horses are particularly affected and up to 30% of those showing clinical signs may die. Poultry do not appear to be seriously affected.



As well as affecting birds and humans, horses are susceptible to infection and can suffer high levels of mortality (*Matthew Simpson*).

Effect on humans

Most people (80%) bitten by an infected mosquito show no signs or symptoms. Only around 20% of the people who become infected will develop symptoms, usually West Nile fever. A small number (<1%) will suffer from a severe infection (West Nile encephalitis, West Nile meningitis, or acute flaccid paralysis). People over 50 years old or with suppressed immune systems are most likely to develop severe illness or die.

Economic importance

There is potential for significant economic losses to the equine industry, through death and illness in horses. Illness in humans can result in economic losses due to the time lost from normal activities. Effects on wildlife and in zoological collections can have a significant impact on tourism.

FURTHER INFORMATION

Useful publications and websites

- ☐ Centers for Disease Control and Prevention (CDC). **Epidemic/epizootic West Nile virus in the United States; guidelines for surveillance, prevention and control.** (2003). www.cdc.gov/ncidod/dvbid/westnile/resources/wnv-guidelines-aug-2003.pdf. [Accessed March 2012].
- ☐ World Organisation for Animal Health (OIE). **Chapter 2.01.20: West Nile disease.** Manual of diagnostic tests and vaccines for terrestrial animals. http://web.oie.int/eng/normes/MANUAL/2008/pdf/2.01.20_WEST_NILE.pdf [Accessed March 2012].
- ☐ European Centre For Disease Prevention and Control (ECDC). **Meeting Report - expert consultation on West Nile virus infection** (2011). http://www.ecdc.europa.eu/en/publications/Publications/1106_MER_WNV_Expert_Consultation.pdf [Accessed March 2012].
- ☐ Centers for Disease Control and Prevention (CDC). **WNV what you need to know.** www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm [Accessed March 2012].
- ☐ U.S Geological Survey (USGS) National Wildlife Health Center. **West Nile virus.** www.nwhc.usgs.gov/disease_information/west_nile_virus/index.jsp. [Accessed March 2012].
- ☐ Wildpro. **West Nile virus disease.** http://wildpro.twycrosszoo.org/S/00dis/viral/WNV_Infection.htm [Accessed March 2012].

Contacts

- ☎ **Centers for Disease Control and Prevention (CDC) public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY).**
- ✉ **WHO Communicable Diseases Surveillance and Response (CSR).** zoonotic_alert@who.int fmeslin@who.int and outbreak@who.int
- ☐ **FAO Animal Production and Health Division.** www.fao.org/ag/againfo/home/en/who.htm