World Health Organization

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West Nile virus

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Key facts

- **West Nile virus can cause a fatal neurological disease in humans.**
- **However, approximately 80% of people who are infected will not show any symptoms.**
- **West Nile virus is mainly transmitted to people through the bites of infected mosquitoes.**
- **The virus can cause severe disease and death in horses.**
- **Vaccines are available for use in horses but not yet available for people.**
- **Birds are the natural hosts of West Nile virus.**

West Nile Virus (WNV) can cause neurological disease and death in people. WNV is commonly found in Africa, Europe, the Middle East, North America and West Asia. WNV is maintained in nature in a cycle involving transmission between birds and mosquitoes. Humans, horses and other mammals can be infected.

West Nile Virus (WNV) is a member of the *flavivirus* genus and belongs to the Japanese encephalitis antigenic complex of the family *Flaviviridae*.

Outbreaks

West Nile Virus (WNV) was first isolated in a woman in the West Nile district of Uganda in 1937. It was identified in birds (crows and columbiformes) in Nile delta region in 1953. Before 1997 WNV was not considered pathogenic for birds, but at that time in Israel a more

virulent strain caused the death of different bird species presenting signs of encephalitis and paralysis. Human infections attributable to WNV have been reported in many countries in the World for over 50 years.

In 1999 a WNV circulating in Israel and Tunisia was imported in New York producing a large and dramatic outbreak that spread throughout the continental United States of America (USA) in the following years. The WNV outbreak in USA (1999-2010) highlighted that importation and establishment of vector-borne pathogens outside their current habitat represent a serious danger to the world.

The largest outbreaks occurred in Greece, Israel, Romania, Russia and USA. Outbreak sites are on major birds migratory routes. In its original range, WNV was prevalent throughout Africa, parts of Europe, Middle East, West Asia, and Australia. Since its introduction in 1999 into USA, the virus has spread and is now widely established from Canada to Venezuela.

Transmission

Human infection is most often the result of bites from infected mosquitoes. Mosquitoes become infected when they feed on infected birds, which circulate the virus in their blood for a few days. The virus eventually gets into the mosquito's salivary glands. During later blood meals (when mosquitoes bite), the virus may be injected into humans and animals, where it can multiply and possibly cause illness.

The virus may also be transmitted through contact with other infected animals, their blood, or other tissues.

A very small proportion of human infections have occurred through organ transplant, blood transfusions and breast milk. There is one reported case of transplacental (mother-to-child) WNV transmission.

To date, no human-to-human transmission of WNV through casual contact has been documented, and no transmission of WNV to health care workers has been reported when standard infection control precautions have been put in place.

Transmission of WNV to laboratory workers has been reported.

Signs and symptoms

Infection with WNV is either asymptomatic (no symptoms) in around 80% of infected people, or can lead to West Nile fever or severe West Nile disease.

About 20% of people who become infected with WNV will develop West Nile fever. Symptoms include fever, headache, tiredness, and body aches, nausea, vomiting, occasionally with a skin rash (on the trunk of the body) and swollen lymph glands.

The symptoms of severe disease (also called neuroinvasive disease, such as West Nile encephalitis or meningitis or West Nile poliomyelitis) include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. It is estimated that approximately 1 in 150 persons infected with the West Nile virus will develop a more severe form of disease. Serious illness can occur in people of any age, however people over the age of 50 and some immunocompromised persons (for example, transplant patients) are at the highest risk for getting severely ill when infected with WNV.

The incubation period is usually 3 to 14 days.

Diagnosis

West Nile virus can be diagnosed by a number of different tests:

- **IgG antibody sero-conversion (or significant increase in antibody titers) in two serial specimen collected at a one week interval by enzyme-linked immunosorbent assay (ELISA);**
- **IgM antibody capture enzyme-linked immunosorbent assay (ELISA);**
- **neutralisation assays;**
- **viral detection by reverse transcription polymerase chain reaction (RT-PCR) assay, and**
- **virus isolation by cell culture.**

IgM can be detected in nearly all cerebrospinal fluid (CSF) and serum specimens received from WNV infected patients at the time of their clinical presentation. Serum IgM antibody may persist for more than a year.

Treatment and vaccine

Treatment is supportive for patients with neuro-invasive West Nile virus, often involving hospitalization, intravenous fluids, respiratory support, and prevention of secondary infections. No vaccine is available for humans.

Vector and animal hosts

WN virus is maintained in nature in a mosquito-bird-mosquito transmission cycle. Mosquitoes of the genus *Culex* are generally considered the principal vectors of WNV, in particular *Cx. Pipiens*. WNV is maintained in mosquito populations through vertical

transmission (adults to eggs).

Birds are the reservoir hosts of WNV. In Europe, Africa, Middle East and Asia, mortality in birds associated with WNV infection is rare. In striking contrast, the virus is highly pathogenic for birds in the Americas. Members of the crow family (*Corvidae*) are particularly susceptible, but virus has been detected in dead and dying birds of more than 250 species. Birds can be infected by a variety of routes other than mosquito bites, and different species may have different potential for maintaining the transmission cycle.

Horses, just like humans, are “dead-end” hosts, meaning that while they become infected, they do not spread the infection. Symptomatic infections in horses are also rare and generally mild, but can cause neurologic disease, including fatal encephalomyelitis.

Prevention

Preventing transmission in horses

Since WNV outbreaks in animals precede human cases, the establishment of an active animal health surveillance system to detect new cases in birds and horses is essential in providing early warning for veterinary and human public health authorities. In the Americas, it is important to help the community by reporting dead birds to local authorities.

Vaccines have been developed for horses. Treatment is supportive and consistent with standard veterinary practices for animals infected with a viral agent.

Reducing the risk of infection in people

In the absence of a vaccine, the only way to reduce infection in people is by raising awareness of the risk factors and educating people about the measures they can take to reduce exposure to the virus.

Public health educational messages should focus on the following:

- **Reducing the risk of mosquito transmission. Efforts to prevent transmission should first focus on personal and community protection against mosquito bites through the use of mosquito nets, personal insect repellent, by wearing light coloured clothing (long-sleeved shirts and trousers) and by avoiding outdoor activity at peak biting times. In addition community programmes should encourage communities to destroy mosquito breeding sites in residential areas.**
- **Reducing the risk of animal-to-human transmission. Gloves and other protective clothing should be worn while handling sick animals or their tissues, and during slaughtering and culling procedures.**

- **Reducing the risk of transmission through blood transfusion and organ transplant. Blood and organ donation restrictions and laboratory testing should be considered at the time of the outbreak in the affected areas after assessing the local/regional epidemiological situation.**

Vector Control

Effective prevention of human WNV infections depends on the development of comprehensive, integrated mosquito surveillance and control programmes in areas where the virus occurs. Studies should identify local mosquito species that play a role in WNV transmission, including those that might serve as a “bridge” from birds to human beings. Emphasis should be on integrated control measures including source reduction (with community participation), water management, chemicals, and biological control methods.

Preventing infection in health-care settings

Health-care workers caring for patients with suspected or confirmed WNV infection, or handling specimens from them, should implement standard infection control precautions. Samples taken from people and animals with suspected WNV infection should be handled by trained staff working in suitably equipped laboratories.

WHO response

The WHO regional office for Europe and WHO region of the Americas are intensively supporting WNV surveillance and outbreak response activities respectively in Europe and in North America, Latin America and the Caribbean, together with country offices and international partners.