World Health Organization
REGIONAL OFFICE FOR Europe

WEST NILE VIRUS in the WHO EUROPEAN REGION

This information leaflet contains six sections and is intended for a generic and public health audience:

1. **WNV is found in Europe.**
   What are the risks in European countries?
2. **WNV is transmitted by mosquitoes.**
   How is the disease transmitted? What are the risk factors?
3. **Disease characteristics of WNF.**
   What are the symptoms and how can it be treated?
4. **WNF can be prevented.**
   What measures can be taken to protect yourself?
5. **WHO response.**
   How is WHO responding and what support could you get?
6. **More information is available.**
   Where can you find more information and guidance on effective prevention and control activities?

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Key messages

- West Nile virus (WNV) is a mosquito-borne infectious disease, transmitted to humans through the bite of an infected mosquito, usually of the genus *Culex*.
- Human WNV infection has been described in Europe since 1950. An increased number of outbreaks have been observed over the last twenty years.
- While 80% of those infected with WNV show no symptoms, in 20% of cases the virus will develop into West Nile Fever (WNF), a febrile, influenza-like illness with symptoms similar to those of dengue.
- Mortality is usually rare, occurring mainly in elderly patients, and recovery is complete. There is no specific treatment for WNF other than relieving the symptoms.
- Currently, there is no human vaccine against WNV and prevention of the illness in humans is based on mosquito control. The first WNV vaccine for use in horses was licensed in the European Union in 2008.
- WNV infection through blood transfusions and organ transplants has been reported in a very small number of cases.

1. WNV is found in Europe

WNV is endemic in Europe with an increasing number of outbreaks. The virus has been reported in temperate areas of the WHO European Region, as well as in Africa, the Middle East and North America, presenting a potential threat to public health. WNV cases have been documented in about 20 countries of the WHO European Region over the last decade (Fig. 1).

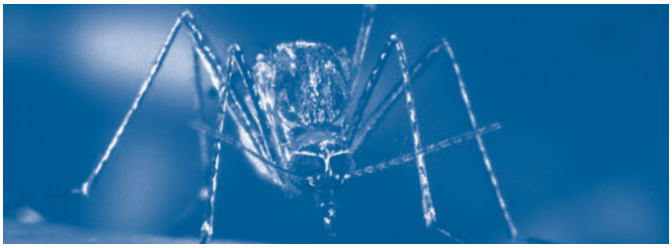
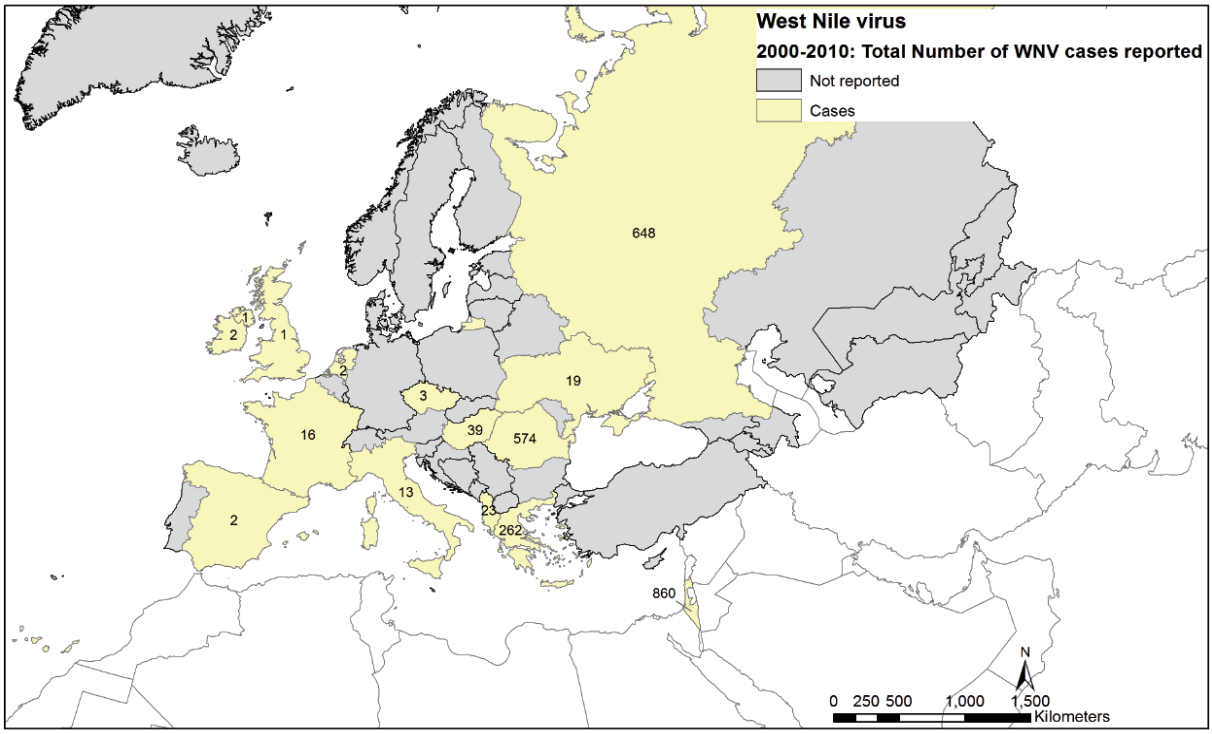


Fig. 1. Total number of WNV cases reported to the WHO Regional Office for Europe, 2000-2010.



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2. WNV is transmitted by mosquitoes

WNV is a mosquito-borne infectious disease that was first identified in the West Nile subregion of Uganda in 1937. It is maintained in a cycle between mosquitoes and birds. Birds are the natural hosts of WNV. Humans and horses are incidental dead-end hosts through the bite of an infected mosquito, usually of the genus *Culex*. Infected humans and horses do not seem to spread the virus to other mammals. Direct person-to-person transmission has not been reported. The virus can be transmitted from person to person through blood transfusion or organ transplantation.

Culex mosquitoes appear to be the most important maintenance vectors for WNV, but mosquito species from other genera are also susceptible to infection. Of the two species of *Culex* mosquitoes that transmit the virus, *Culex pipiens* is distributed widely in the European Region, while *Culex modestus* is confined to the wetland and fishpond areas of southern and central Europe and lives only in reed-belt habitats.

Environmental conditions may favour high viral amplification with significant numbers of bridge-vector mosquitoes (that is, mosquitoes that feed on both birds and mammals) becoming infected and spreading the virus to humans, horses and other incidental hosts.

The risk of local transmission of WNV depends on the simultaneous presence of the virus, competent amplifying hosts and mosquito vectors, and susceptible human hosts. There is ample evidence that WNV is transported by migratory birds. Virus transmission by blood transfusion or organ transplant has been documented.

In the European Region, the most favourable period during which WNF affects humans is July-October, with a peak in August and September when seasonal mosquito activity is enhanced.

Many environmental factors, including human activities, might enhance the population density of the mosquito vectors. Examples of these factors are: irrigation; heavy rains followed by floods and subsequent warm, dry weather; higher-than-usual temperatures; and suitable mosquito breeding habitats. Warm air currents can carry infected mosquitoes northwards.

3. Disease characteristics of WNF

In most cases, WNV infection does not cause any symptoms, but in 20% of cases it can develop into WNF.

WNF is a febrile, influenza-like illness characterized by an abrupt onset of moderate to high fever with headache, sore throat, muscle and joint pain, backache, fatigue, nausea and diarrhoea. A rash can appear spreading from the trunk of the body to the head and extremities; often the face is flushed. Recovery - rapid in children but slow in adults - is complete but it is often accompanied by long-term muscle pain and weakness.

Less than 1% of infected persons present with severe symptoms, such as meningitis or encephalitis. The case-fatality rate in patients with neuroinvasive illness ranges from 4% to 14%; it can reach 15–29% in patients over 70 years old. There is evidence that having a concurrent condition, such as diabetes or immunosuppression, increases the risk of death. Seriously ill patients may suffer substantial long-term morbidity after recovery; fatigue, memory loss, difficulty walking, muscle weakness and depression have been reported.

There is no specific vaccine or drug treatment for WNV infection, thus treatment is directed primarily at relieving the symptoms of WNF, especially in the case of neuroinvasive disease. This often involves hospitalization, intravenous fluid therapy and respiratory support.

4. WNF can be prevented

The lack of a human vaccine for and prophylaxic or specific treatment of WNF, in combination with the presence of the *Culex* mosquito vector in large parts of the Region, means that avoiding exposure in risk areas is key to preventing the disease. The only way to reduce infection in humans is to raise people's awareness of the risk factors and educate them about the measures they can take to reduce their exposure to the virus.

To reduce the risk of mosquito transmission, efforts to prevent transmission should focus first on individual and community protection against mosquito bites through the use of mosquito nets, insect repellent and light-coloured clothing (long-sleeved shirts and trousers) and by avoiding outdoor activity at peak biting times; many mosquitoes are most active at dusk and dawn.

To reduce 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.

To reduce the risk of transmission through blood transfusion and organ transplant, restricting blood and organ donation and laboratory testing should be considered during outbreaks in the affected areas.

The effective prevention of human WNV infections depends on the development of mosquito surveillance and control programmes in areas where the virus occurs. Research should identify local mosquito species that play a role in WNV transmission, including those that might serve as a bridge from birds to humans. The emphasis should be on integrated control measures, including broad insecticide spraying and the destruction of mosquito breeding sites, with community participation.

Health-care workers should be informed about the possibility of WNV infections during a likely epidemic period, and about ways of detecting them. Workers providing health care to patients with suspected or confirmed WNV infection, or handling specimens from these patients or animals, should take standard infection-control precautions and work in suitably equipped laboratories.

5. WHO response

The WHO Regional Office for Europe and the WHO Regional Office for the Americas provide intensive support to WNV surveillance and outbreak-response activities in Europe and in North America, Latin America and the Caribbean, respectively, in collaboration with country offices and international partners.

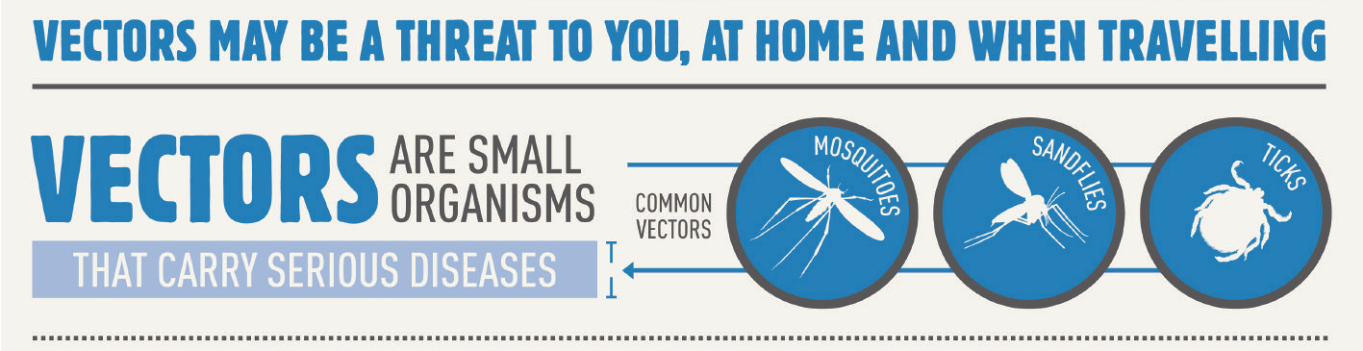
To assist Member States in reducing the risks of WNV and other vector-borne infectious diseases, the WHO Regional Office for Europe has developed the *Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne diseases 2014–2020*.

The WHO Regional Office for Europe:

- works in partnership with other institutions and agencies to anticipate potential risks from the introduction of invasive mosquitoes and the re-emergence of vector-borne diseases, particularly at the animal-human-ecosystem interface;
- raises awareness of the problem and provides countries with advice on surveillance and control activities, together with the European Commission, the European Centre for Disease Prevention and Control and the European Mosquito Control Association;
- assists European Member States with WNV control within the framework of the International Health Regulations (IHR), the prevention of mosquito invasions and disease emergence serving the IHR requirement to manage acute public health events that can cross borders, by developing and strengthening capacities at designated ports, airports and ground crossings;
- provides countries with technical support in, and guidance on, the effective management of cases and outbreaks;
- through regional and bilateral collaboration and coordination, shares information on methods of surveillance, risk assessment and control and provides guidance on implementing them;
- provides training on clinical management, diagnosis and vector control, together with WHO collaborating centres, and publishes guidelines and handbooks on case management and vector control.

Box 1. What is a vector-borne disease?

- Vector-borne diseases are illnesses caused by pathogens in human populations.
- These diseases are spread by vectors: living organisms that can transmit pathogens between humans or from animals to humans.
- Many vectors are bloodsucking insects, which ingest pathogens during a blood meal from infected hosts (humans or animals) and transfer them to new hosts during subsequent blood meals.
- Mosquitoes are the best known disease vectors. Others include certain species of ticks, flies, sandflies, and fleas.



6. More information is available

WHO documents

Berg H van den, Velayudhan R, Ejov M. Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne diseases 2014–2020. Copenhagen: WHO Regional Office for Europe; 2013 (http://www.euro.who.int/en/health-topics/communicable-diseases/vector-borne-and-parasitic-diseases/publications/2013/regional-framework-for-surveillance-and-control-of-invasive-mosquito-vectors-and-re-emerging-vector-borne-diseases,-20142020).

West Nile virus. Fact sheet No. 354. July 2011. In: Media [website]. Geneva: World Health Organization; 2011 (http://www.who.int/mediacentre/factsheets/fs354/en/).

West Nile virus infection (WNV) in Europe. In: Global alert and response (GAR) [website]. Geneva: World Health Organization; 2011 (http://www.who.int/csr/don/2011_08_16/en/).

External resources

Agenvoort J et al. West Nile viral infection of equids. Veterinary Microbiology. 2013;167:168-80.

Bakonyi T et al. Lineage 1 and 2 strains of encephalitic West Nile virus, central Europe. Emerging Infectious Diseases. 2006;12:618–623 (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3294705/).

Campbell GL et al. West Nile virus. Lancet Infectious Diseases. 2002;2(9):519-29.

Commission Directive 2004/33/EC of 22 March 2004 implementing Directive 2002/98/EC of the European Parliament and of the Council as regards certain technical requirements for blood and blood components. In: Official Journal of the European Union. Brussels: European Commission; 2004 (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:091:0025:0039:EN:PDF)

Engler O et al. European surveillance for West Nile virus in mosquito populations. International Journal of Environment Research and Public Health. 2013;10(10):4869-95 (http://www.mdpi.com/1660-4601/10/10/4869).

Epidemiological situation of West Nile virus infection in the European Union. Update, 13 July 2012. Stockholm: European Centre for Disease Prevention and Control; 2012 (http://ecdc.europa.eu/en/publications/Publications/1207-TER-Rapid-risk-assessment-West-Nile-virus.pdf).

Murgue B et al. West Nile in the Mediterranean Basin, 1950-2000. Annals of the New York Academy of Sciences. 2001;951:117-126 (http://www.ncbi.nlm.nih.gov/pubmed/11797769).

Petersen LR, Brault AC, Nasci RS. West Nile virus: review of the literature. JAMA. 2013;310(3) :308-315. (http://jama.jamanetwork.com/article.aspx?articleid=1713596).

West Nile Fever data, 2012. In: Historical data [website]. Stockholm: European Centre for Disease Prevention and Control; 2102 (http://ecdc.europa.eu/en/healthtopics/west_nile_fever/West-Nile-fever-maps/Pages/historical-data.aspx).

West Nile virus (WNV) fact sheet. Atlanta: National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention; 2013 (http://www.cdc.gov/westnile/resources/pdfs/wnvFactsheet_508.pdf).

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