

# West Nile virus infection prevention and control measures in Greece <sup>[1]</sup>

Image from [Climate Adapt](#) about this case study

[2]

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West Nile virus (WNV) is a vector-borne pathogen, which can infect humans, mammals (e.g., horses) and birds. Its transmission cycle is related to the interactions between pathogen, vector, vertebrate hosts, and the environment. Weather conditions have direct and indirect influences on this vector; changes in climatic conditions (temperature, precipitation, relative humidity, and winds) could lead to an increased spread of WNV also in areas that currently are not severely affected.

WNV infection cases are recorded - on an annual basis - in several European countries. In Greece, the first WNV infection outbreak was recorded in 2010, in the region of Central Macedonia (northern Greece). In the following years, the virus spread, with cases recorded in various regions. Further cases of WNV infection are expected in the future. In Greece, the surveillance of human WNV infection is annually implemented since 2010 (in the period May - November) by the Hellenic National Public Health Organization (NPHO). The goal is to promptly identify human cases of WNV infection and monitor their temporal and geographical distribution, in order to guide targeted prevention measures. In the long term, surveillance aims to quantify the disease burden, and identify seasonal, geographical, and demographic patterns, and populations at risk. In addition, enhanced surveillance of animal WNV infection (in horses and wild birds) is also implemented by the national animal health authorities.

## Case Study Description

### **Challenges:**

WNV is mainly transmitted through the bite of infected “common” mosquitoes. The main reservoir hosts (i.e. hosts that do not experience the symptoms of disease when infected by the pathogen) are birds, predominantly wild ones. The mosquitoes become infected by biting them, while infected humans cannot further transmit the virus and infect other mosquitoes. The majority (80%) of infected humans remain asymptomatic, nearly 20% present mild symptoms of a viral syndrome and less than 1% present severe disease with central nervous systems manifestations, mainly encephalitis, meningitis, or acute flaccid paralysis. The most severe manifestations usually affect those over the age of 50 years, immunocompromised people and people with pre-existing chronic diseases.

WNV transmission is related to the interactions between pathogen, vector, vertebrate hosts and environment. Climate change (in particular mild winters, high temperatures in spring and early summer, as well as rainfall causing flooding in the summer) can contribute to an increased spread of this virus. For example, the number of WNV infections across Europe in the unusually warm year 2018 exceeded the cumulative number of all reported infections between 2010 and 2017 ([Bakonyi and Haussig, 2020](#) <sup>[3]</sup>). The increase in temperatures and relative humidity in the future may contribute to intensified WNV circulation in Greece ([Pervanidou et al., 2020](#) <sup>[4]</sup>), as well as the spread of the virus northwards ([Bakonyi and Haussig, 2020](#) <sup>[3]</sup>).

### **Objectives:**

The main objective of the enhanced surveillance initiative is the timely implementation of targeted response and preventive measures to address and manage WNV infections in humans in Greece. In addition, considering the expected seasonal occurrence of cases of infection, the aim is to strengthen the surveillance and response

capacity also in the medium and long term.

**Importance and relevance of the adaptation:**

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Additional Details

**Stakeholder engagement:**

Several administrations and institutions are involved in the prevention and control of WNV in Greece at the national level. Main national stakeholders include: (i) the Ministry of Health (MoH), with its intersectoral National Committee for the Prevention and Management of Tropical Diseases, (ii) the Hellenic National Public Health Organization (NPHO), (iii) the National blood safety authorities, and, (iv) the Ministry of Rural Development and Food.

In this context, the MoH and its National Committee for the Prevention and Management of Tropical Diseases is responsible for the health policy development also related to WNV, through legislation, circulars on vector control and consultation on emergency response mosquito control treatments.

The NPHO performs enhanced surveillance for WNV disease in humans through awareness raising of clinicians and doctors concerning the diagnosis of WNV infection, active laboratory-based surveillance throughout the transmission season (daily communication pattern with reference/specialised laboratories), case investigation, immediate update of national and regional and local stakeholders on the diagnosed cases, support of the laboratory diagnosis capacity (funding the National Reference Laboratory and other specialised diagnostic laboratories for free-of-charge diagnosis for the patient), as well as communication and health promotion activities for the public, risk assessment, and mosquito surveillance.

The National blood safety authorities implement blood safety measures for the protection of blood donations against WNV infection. The Hellenic National Blood Transfusion Center-EKEA implements nationwide blood safety measures for blood donors residing or having visited affected municipalities. The Coordinating Centre for Haemovigilance and Surveillance of Transfusion of the NPHO issues guidance on haemovigilance. At the same time, an Intersectional Working Group for the designation of affected areas by vector-borne diseases (under the MoH National Committee for the Prevention and Management of Tropical Diseases) consulted on the characterization and designation of WNV affected areas (where blood safety measures are implemented).

The Ministry of Rural Development and Food is the central competent authority for the implementation of the national WNV surveillance in the context of national animal health authorities (animal health policy, horses and birds' WNV surveillance). Its Benaki Phytopathological Institute performs mosquito surveillance programmes.

Other organizations or entities that contribute to the functioning of the surveillance system are:

- Doctors, clinicians and laboratory experts, involved in case diagnosis and case management. The NPHO prompts them to conduct laboratory testing of all WNV infection suspected cases.
- Official veterinarians, private vet practitioners, horse owners, hunting or environmental associations involved in reporting every suspect case to the competent veterinary authorities.
- National Reference Laboratory for Arboviruses and other specialised laboratories, involved in the diagnosis of WNV infection. NPHO recommends referral of samples to specific specialised laboratories for testing.
- Medical Entomology Unit of the School of Public Health, University of West Attica: which is involved in the mosquito surveillance funded by the NPHO.
- Hellenic Transplant Organisation, responsible for transplant safety measures.
- Regions (regional public health and animal health authorities) and municipalities, working on integrated mosquito surveillance and control activities, communication, and health promotion activities for the public, and on equids and birds' surveillance at the regional level.

**Success and limiting factors:**

The main success of the measures implemented in Greece is related to the enhancement of the epidemiological WNV surveillance systems which has improved prompt response and related public health measures. Important success factors for the establishment and function of proper surveillance systems and control programs in Greece are: the strong commitment of all involved stakeholders, established mechanisms of a structured inter-sectoral collaboration and communication (based on working groups, committees, networking, direct interpersonal communication), laboratory expertise and high diagnostic capacity, free-of-charge diagnosis for the patient in specialized laboratories, and the operation of established integrated mosquito surveillance and control programmes in most Greek regions.

Major constraints relate to the complex epidemiology of the WNV, which makes its spread and geographical distribution difficult to predict. To date, researchers are working at a global and European level on the improvement of risk assessment tools and control measures effectiveness evaluation, but uncertainties are still high. In addition, mosquito surveillance and control strategies need further guidance, standardization and coordination nationwide, as well as a more flexible legal framework to overcome some organizational barriers (procurement delays), whereas challenges also exist on the use of biocides (availability, access, restrictions of use) at the EU level.

#### **Budget, funding and additional benefits:**

A quantitative estimation of the budget devoted to the surveillance system is not available. Main costs of the epidemiological WNV surveillance systems relate to: (i) human resources for implementing surveillance in humans, animals and mosquito vectors, (ii) WNV testing in humans, animals and mosquitoes, (iii) blood safety measures (e.g., screening of blood donations).

The benefits are the minimization of the WNV circulation and spread, and thus to the reduction of the number of human and animal cases in each transmission season (reduced WNV burden), through the timely identification of human and animal WNV infection cases, the prompt recording of cases at the local, regional, national, and European level, as well as the prompt implementation of targeted response measures. Increased effectiveness of surveillance actions for WNV could also lead to the adoption of trialled best practices by surveillance systems of other vector-borne diseases.

#### **Legal aspects:**

The NPHO is responsible for the surveillance of infectious diseases and implements enhanced WNV surveillance in humans since 2010. The operational WNV surveillance plan of the NPHO has not been included in a formal disease-specific legal framework to date.

Development of a formal legislation framework regarding a more coordinating structure and planning of public health, animal health and mosquito management strategies, at national, regional, and local level, would have an added value and is under consideration.

Reference Information

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