West Nile Fever Fact Sheet

1. Disease overview

West Nile fever virus (WNV) causes West Nile fever (WNF), a mosquito-borne viral disease. Birds are the main hosts for WNV with regular spill over events affecting human and horses. WNF includes a variety of clinical signs, from asymptomatic to flu-like, encephalitis and death (Spickler, 2023; WOAH, 2025b).

West Nile fever is a WOAH-notifiable disease and is listed in the EU AHL under category E.

2. Agent

WNV is an enveloped, single-stranded, positive-sense RNA virus belonging to the *Orthoflavivirus* genus within the Flaviviridae family. The virion has a spherical shape, with surface proteins arranged in an icosahedral-like symmetry. Its genome, approximately 10–11 kb in length, encodes 11 proteins: four structural proteins (C, Pr, M, and E) and seven non-structural proteins (NS1, NS2A, NS2B, NS3, NS4A, NS4B, and NS5).

Phylogenetic analyses have identified up to nine distinct lineages of WNV based on genetic differences in the envelope and non-structural protein genes, with lineage 1 and lineage 2 being most prevalent and associated with severe human disease. In Europe, lineage 2 has been the predominant strain (Lu et al., 2024; May et al., 2011; Mukhopadhyay et al., 2005; Petersen et al., 2013).

3. Geographical Distribution

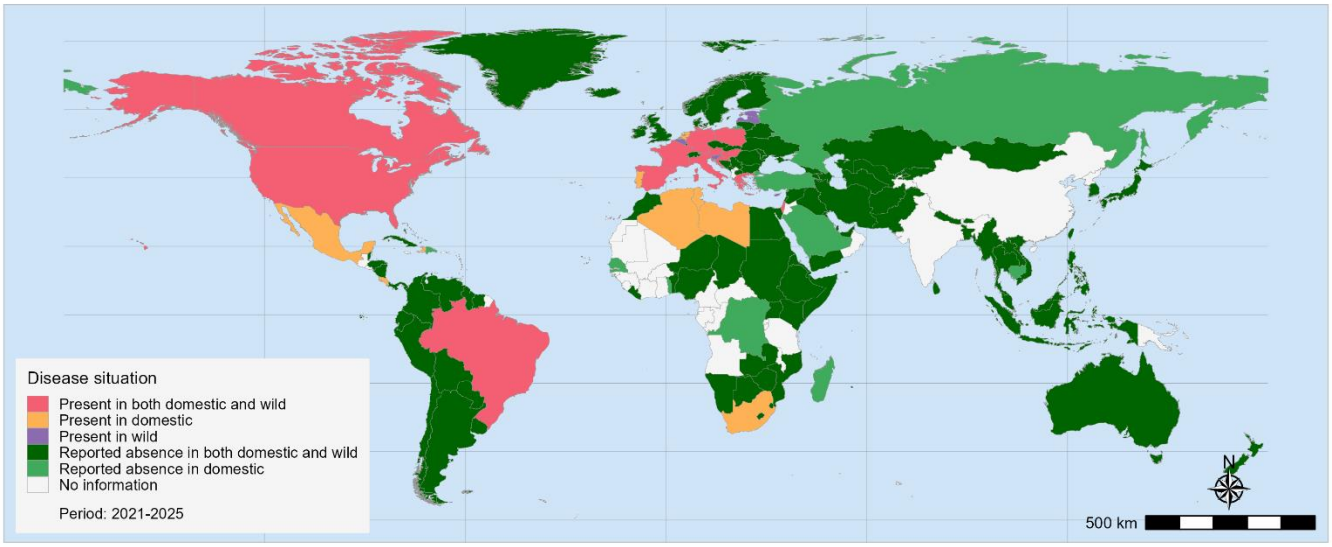


Figure 1. Geographical distribution of WNFV detected events (2021-2025), as reported to WOAH.

WNV has been reported in North and South America, Africa, the Middle East, South-East Asia and Europe. In the EU, WNF cases have been detected over the past 5 years (Figure 1). Up to date maps based on WAHIS are available in the online version of the Disease Profile (accessible via the button in the top right corner).

4. Animal hosts

4.1. Susceptible hosts

Based on epidemiological knowledge of host–pathogen–vector interactions and outbreak reports, the main hosts of WNV are passerine birds, whereas humans and horses are considered dead-end hosts. However, other susceptible species have been identified by the EFSA's systematic literature review (SLR), with the summary provided in Table 1.

Table 1. Susceptible host species of West Nile fever virus.

The systematic literature review reported in the WNFV disease profile, identified the following susceptible species (updated until 31/12/2025, for references see online disease profile)
FIELD
Epidemiological studies carried out in the field **Pathogen was detected in the following animal species:** • Accipitridae: No species specified • Columbidae: No species specified • Equidae: *Equus caballus* • Falconidae: No species specified • Hominidae: *Homo sapiens* • Phasianidae: *Gallus gallus domesticus* • Strigidae: No species specified • Suidae: *Sus scrofa domesticus* **Antibodies were detected in the following animal species:** • Accipitridae: No species specified • Bovidae: *Bos taurus, Capra hircus, Ovis aries* • Camelidae: *Camelus dromedarius, Camelus bactrianus* • Canidae: *Canis lupus familiaris* • Columbidae: No species specified • Equidae: *Equus caballus, Equus africanus asinus* • Falconidae: No species specified • Felidae: *Felis catus* • Hominidae: *Homo sapiens* • Phasianidae: *Gallus gallus domesticus* • Strigidae: No species specified **Outbreaks reported to WOAH included the following species:** • Accipitridae: *Aquila heliaca, Accipiter gentilis, Accipiter nisus, Buteo buteo, Gyps fulvus* • Anatidae: *Aythya nyroca, Chenonetta jubata* • Bombycillidae: No species specified • Cacatuidae: *Cacatua galerita* • Camelidae: No species specified • Canidae: *Canis lupus familiaris* • Charadriidae: No species specified • Columbidae: *Streptopelia decaocto, Columba livia, Columba palumbus* • Corvidae: *Corvus corax, Corvus cornix, Corvus corone, Corvus frugilegus, Coloeus monedula, Pica pica, Garrulus glandarius* • Equidae: No species specified • Falconidae: *Falco cherrug, Falco rusticolus, Falco sparverius, Falco tinnunculus* • Fringillidae: *Serinus canaria*

- Hirundinidae: *Delichon urbicum*
- Laridae: *Larus michahellis, Ichthyaetus melanocephalus*
- Paridae: *Cyanistes caeruleus, Parus major*
- Passeridae: *Passer domesticus*
- Pelecanidae: *Pelecanus rufescens*
- Phalacrocoracidae: *Phalacrocorax carbo*
- Phasianidae: *Gallus gallus domesticus*
- Phoenicopteridae: *Phoenicopterus chilensis, Phoenicopterus roseus, Phoenicopterus ruber*
- Psittacidae: *Psittacula krameri, Pionus maximiliani*
- Psittaculidae: *Glossopsitta pusilla*
- Scolopacidae: *Numenius arquata*
- Spheniscidae: *Spheniscus demersus, Spheniscus humboldti*
- Strigidae: *Otus scops, Strix nebulosa, Asio otus, Bubo bubo, Bubo scandiacus*
- Sturnidae: *Acridotheres tristis*
- Turdidae: *Turdus merula*

EXPERIMENTS

Experimental studies demonstrated infection in:

- Anatidae: No species specified
- Bovidae: *Ovis aries*
- Canidae: *Canis lupus familiaris*
- Columbidae: No species specified
- Corvidae: No species specified
- Equidae: *Equus caballus*
- Felidae: *Felis catus*
- Fringillidae: *Serinus canaria*
- Leporidae: No species specified
- Phasianidae: *Gallus gallus domesticus, Meleagris gallopavo*
- Strigidae: No species specified
- Suidae: *Sus scrofa domesticus*

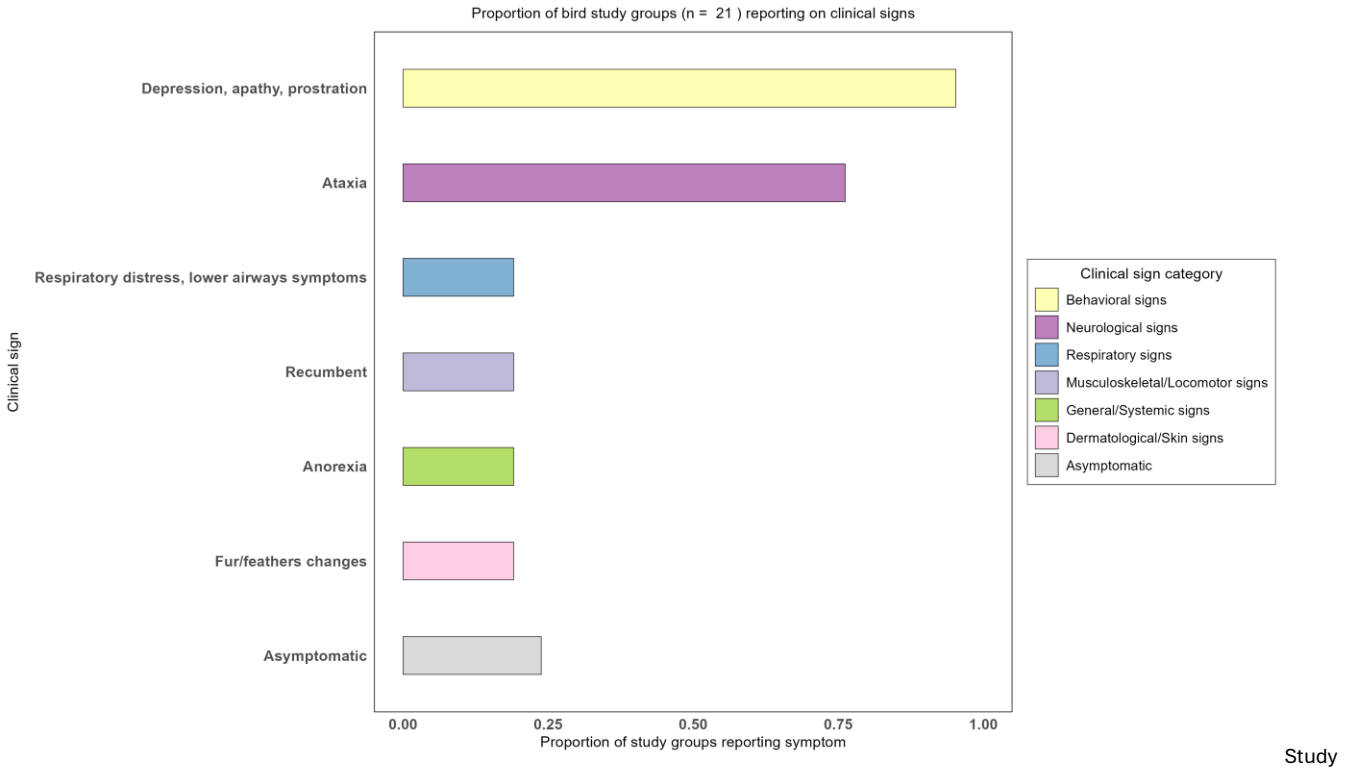
4.2. Clinical Signs

Outcomes of a systematic literature review on clinical signs in 21 bird study groups are displayed in Figure 2. Most study groups showed behavioural and neurological clinical signs.

The clinical manifestation of WNF ranges from subclinical disease to influenza-like symptoms, encephalomyelitis/encephalitis, and death.

In birds, WNV infection in susceptible species can cause several non-specific clinical signs, including weakness, lethargy, dehydration, emaciation, feather loss or fluffed feathers, recumbency, drooped head, and anorexia. Neurological signs may also develop, such as head tilt, nystagmus, ataxia, tremors, paresis, and seizures. In severe cases, WNV infection can be fatal.

In horses, most WNV-infected individuals show no clinical signs or only mild influenza-like illness with fever. In some cases, the infection may also lead to neurological complications. Neurological signs occur in approximately 10% of horses displaying influenza-like signs and may include loss of coordination, stumbling, falling, generalized weakness, and muscle twitching. Affected horses may experience seizures, drooping lips, repetitive lip smacking, and a lowered head position. Teeth grinding and heightened sensitivity to touch or sound can also be observed. In severe cases, the horse may become recumbent and unable to rise.



Study group count per bird species: Goose n = 15; Turkey n = 2; Canary n = 1; Chicken n = 1; Duck n = 1; Pigeon n = 1. The SLR was updated until 31/12/2025, for references see the online disease profile.

Figure 2. Clinical signs reported in the main hosts of WNFV.

4.2.1. Incubation Period

The incubation period for WNV is usually 2 - 6 days but can reach up to 21 days (Spickler, 2023; and references from SRL available on the online disease profile).

4.2.2. Morbidity and mortality

In birds, morbidity and case fatality rates vary significantly between species. Some species appear resistant, while others suffer fatal neurological disease. In highly susceptible species, such as corvids, morbidity and case fatality rates may approach 100% during an outbreak in a local population. However, some bird species, including waterfowl and chickens, rarely show clinical signs of disease. In horses, the morbidity rate of WNF in a naïve population varies between studies and viral lineage. In Europe, approximately 10–20% of infected horses display clinical signs of WNF, such as fever and decreased general demeanour. Among horses exhibiting clinical signs, around 1–10% develop West Nile encephalitis. The case fatality rate due to neurological WNF is approximately 30% (Spickler, 2023; and references from SRL available on the online disease profile).

4.2.3. Zoonotic Potential

West Nile fever is a zoonotic disease (WHO, 2004).

5. Transmission

WNV is transmitted to vertebrate hosts through the bite of mosquitoes (Diptera; Culicidae). For more information on vector distribution, visit the Vector section in the online disease profile.

WNV is sustained through an enzootic transmission cycle between mosquitoes and birds. Most WNF cases occur during the seasons more favourable for mosquito activity, typically from spring to autumn. The main introduction route into new areas is through migratory birds. Horses and humans are considered dead-end hosts for WNV because they develop low viremia, meaning the virus does not reach levels sufficient for further transmission (Hayes et al., 2005; Kramer et al., 2008; Petersen et al., 2013).

6. Diagnostic tests

Recommended tests (WOAH, 2025) for the detection of the agent: Nested RT-PCR, Real time RT-PCR, Immunohistochemstry and Isolation in tissue culture.

In general, virus isolates are more easily obtained from avian specimens and mosquitoes, with horses and humans being lesser sources. Various bird tissues, including the brain, heart, and liver, can be successfully used for virus isolation. However, detecting the virus in live, clinically ill horses is challenging due to fleeting viremia. For deceased encephalitic horses, brain tissue (especially the hindbrain and medulla) and the spinal cord are preferred specimens for virus isolation.

Recommended tests (WOAH, 2025b) for the detection of immune response: IgM capture ELISA, IgG indirect and competitive ELISAs, plaque-reduction neutralisation (PRN) and virus neutralisation test (VNT).

The IgM capture ELISA is effective for detecting recent natural exposure to WNV in equines, as WNV-specific IgM antibodies typically appear 7–10 days post-infection and persist for 1–2 months. Most horses with West Nile encephalitis test positive by the time clinical signs emerge. Neutralizing antibodies are detectable by two weeks post-infection and may persist for over a year.

In birds, serological tests include ELISA, hemagglutination inhibition, virus neutralisation, and plaque reduction neutralisation (PRN) assays. Some assays may cross-react with related flaviviruses, such as Usutu virus, St. Louis encephalitis virus or Japanese encephalitis virus. Among these, PRN is the most specific for WNV. When cross-reactivity is a concern, comparative titres against related flaviviruses should be assessed.

Interpretation of serological results must account for vaccination history, especially when using PRN, VNT, or IgG ELISA. The IgM capture ELISA can also be applied to birds and other species if appropriate species-specific capture antibodies (e.g., anti-chicken IgM) are available. PRN is suitable for use across species, including avian hosts.

To date, the systematic literature review has not found diagnostic tests evaluation studies meeting the eligibility criteria for inclusion.

7. Prevention and control

7.1. Vaccination

Prophylactic immunization with vaccines is the most effective control strategy against WNF in endemic areas (Spickler, 2023; WOAH, 2025). Currently, vaccines against WNF are available only for horses, with two inactive and one live vaccine approved in the EU (EMA, 2025).

7.2. Treatment

There is currently no specific antiviral treatment for WNV infection. Management is primarily supportive and should be initiated early, focusing on rest and good husbandry practices. Horses with neurological signs often require specialized hospital care (Petersen et al., 2013; Spickler, 2023; WOAH, 2025).

8. References

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