



WEST NILE VIRUS

[Definition](#)
[Clinical Signs](#)
[Incubation Period](#)
[Risk Factors](#)
[Transmission](#)

[Diagnostic Sampling, Testing and Handling](#)
[Post-mortem](#)
[Shedding of Virus Following Resolution of Clinical Signs](#)

[Environmental Persistence](#)
[Specific Control Measures](#)
[Biosecurity Issues for Receiving Animals](#)
[Zoonotic Potential](#)

Definition	West Nile virus (WNV) is a mosquito-borne flavivirus. WNV primarily causes disease in birds, humans, and horses and is transmitted by many different species of mosquitoes. Since 1999, more than 27,600 U.S. horses have been confirmed with WNV neuro-invasive disease with an estimated average case-fatality rate of 30–40%. During 2002 alone, over 15,000 horses were affected in the U.S. WNV is now considered endemic with yearly activity in the U.S. (with an average 300 cases per year), Canada, Mexico and the Caribbean.
Clinical Signs	<ul style="list-style-type: none"> • Depression and anorexia without fever during initial viremia • Mild, low-grade fever (101.5–103.5° F or 38.6–39.7° C) in about 25% of affected horses • Inappetence • Lethargy/somnolence • Neurologic signs <ul style="list-style-type: none"> ○ Onset of neurologic disease is frequently sudden and progressive ○ Periods of hyperexcitability, apprehension and/or somnolence ○ Fine tremors and fasciculations of the face and neck muscles ○ Cranial nerve paralysis; facial paralysis and weakness of the tongue are very common ○ Head tilt, droopy lip, muzzle deviation ○ Weakness, ataxia, and dysmetria in one or all limbs ○ Complete paralysis of one or more limbs ○ Colic ○ Recumbency ○ Death <p>Expect clinical signs to be most severe in the very young and very old</p> <p>About 30% of WNV cases experience an increase in severity of clinical signs within 7–10 days of onset, sometimes after initial clinical signs have abated.</p>
Incubation Period	7–10 days
Risk Factors	<ul style="list-style-type: none"> • Unvaccinated or not up to date on WNV vaccination • Residence in endemic area



Transmission	<ul style="list-style-type: none"> • Pasture turnout during dawn and dusk • Lack of mosquito control <p>Primarily by mosquitoes.</p> <ul style="list-style-type: none"> • Reservoir: Only birds appear to develop significant levels of viremia to serve as a source of infection • A horse affected with WNV encephalitis is not contagious and poses no risk to other horses, or birds • Peak transmission in Western Hemisphere is July to October, but in sub tropics it is year-round • Excessive moisture and increased temperatures increase mosquito activity
Diagnostic Sampling, Testing and Handling	<p>IgM antibody capture ELISA (MAC-ELISA): Single serum sample (red top tube)</p> <ul style="list-style-type: none"> • Positive test: WNV-specific IgM titer \geq 1:400. Increases in IgM rarely occur after vaccination <p>Plaque Reduction Neutralization Test (PRNT) paired serum antibody titers</p> <ul style="list-style-type: none"> • Collect samples 2–4 weeks apart (red top tube) • Four-fold or greater rise in PRNT titers between samples is considered confirmatory in a horse exhibiting clinical signs consistent with WNV and which has not been vaccinated recently • Send serum overnight on cold packs to a laboratory competent to test for WNV infection <p>CSF Analysis: elevated mononuclear cell count and/or high total protein</p> <ul style="list-style-type: none"> • CSF WBC Count: Highly variable range, when abnormal, CSF WBC is usually \geq 7 cells/ul • Protein Level: Highly variable range, when abnormal, CSF protein is usually \geq 70 mg/dl <p>RT-PCR can be attempted on CSF of clinically affected horses.</p> <p>Note: CSF fluid should be evaluated immediately. If cytological evaluation cannot be performed, a direct smear can be made, and the CSF and slide sent to a laboratory overnight on cold packs.</p> <p>Viral isolation may be attempted on CSF, whole blood, or serum.</p>
Post-mortem	<p>A rabies protocol should be followed for ALL horses with encephalitis that undergo a post-mortem examination. See rabies information. Most causes of viral encephalitis in the horse are zoonotic.</p> <p>Viral isolation from brain, or spinal cord tissues, and CSF PCR on brain, spinal cord tissues or CSF.</p>



Post-mortem sample collection requires appropriate precautions to avoid viral exposure. [Necropsy procedure for suspected cases of zoonotic disease.](#)

Histopathology: Fix at least part of the brain for histopathology. Fresh brain should be submitted for virus detection by virus isolation, PCR and/or immunohistochemical examination. Note: Fresh cerebellum and spinal cord must be submitted for rabies testing. [Document on brain removal.](#)

Practitioners performing necropsies in the field are encouraged to contact a veterinary diagnostic laboratory to which they plan to submit samples for further testing such as histopathology and pathogen identification to be certain they collect the appropriate samples and handle the samples in a manner that will optimize making a definitive diagnosis. For some situations, such as neurologic cases submission of the entire carcass to the diagnostic laboratory for post-mortem examination is recommended due to the time and labor required to perform a complete exam and collection of samples from the equine CNS.

**Shedding of
Virus Following
Resolution of
Clinical Signs**

While horses become mildly viremic 3–5 days post challenge, they do not shed virus nor develop viremia of sufficient magnitude and duration to serve as a source of virus to insect vectors.

**Environmental
Persistence**

This enveloped RNA virus is susceptible to drying, ultraviolet light, and detergent.

**Specific Control
Measures**

Vaccination—killed or recombinant:

- Initial injection of either vaccine is followed in 4 to 6 weeks with a booster. The primary series must be administered to elicit optimal antibody production. Vaccination should be initiated before onset of the mosquito season to allow time for development of the neutralizing antibodies. The initial series should not be expected to provide long-term protection beyond one year.
- Follow vaccine manufacturer recommendations regarding initial immunization series and annual boosters. More frequent boosters (i.e. twice yearly) are recommended in areas with year-round mosquito seasons and in endemic areas. ([See AAEP vaccination guidelines](#))

Limited information is available on long-term immunity.

Vector management

- Use insect repellents frequently; re-apply after rain
- Keep horses in at night when possible, and apply insect repellent
- Eliminate or minimize standing water
- Stock tanks or ponds with mosquito-feeding fish
- Eliminate brush piles, gutters, old tires and litter
- Remove all equipment in which standing water can collect



**Release of
Animals from
Isolation**

No restrictions need be placed on affected or recovered animals

**Biosecurity
Issues for
Receiving
Animals**

None.

**Zoonotic
Potential**

While not a source of virus for insect vectors, an equine case of WNV may be an early warning signal to humans that there are transmitting mosquitoes in an area.

The most serious risk to humans when working with WNV-infected horses is handling WNV-infected tissues, including brain, spinal cord, and CSF. Appropriate barrier clothing must be worn, and exposure precautions taken.

[A Review of Equine Zoonotic Diseases: Risks on Veterinary Medicine](#) (J.S. Weese, DVM, DVSc, Diplomate ACVIM).