

Infectious Neurologic Disease

Field Diagnostic Guidelines

A wide range of infectious and non-infectious diseases can give rise to neurologic signs in the horse, some of which have substantial biosecurity, herd health, and zoonotic implications. While the majority of neurologic conditions in the horse are not contagious, neurologic EHV-1, and rarely neurologic EHV-4 ([Equine Herpesvirus Myeloencephalopathy; EHM](#)) spreads rapidly between horses and can result in widespread exposure of in-contact horses by the time a diagnosis is confirmed. Until proven otherwise, practitioners should approach any potentially infectious case of neurologic disease as a 'worst-case scenario', and consider differential diagnoses such as EHM, Rabies, WNV, EEE/WEE/VEE.

[AAEP Neurologic Disease Differential and Diagnostic Flow Chart](#)

Considerations for approaching acute neurologic cases of unknown etiology

The following scenarios are suggestive of underlying infectious disease and should prompt practitioners to implement biosecurity practices and establish a quarantine on the premises:

- Multiple febrile animals (with or without concurrent signs of respiratory, neurologic, or intestinal disease)
- One or more horses with acute neurologic abnormalities and fever

Isolation on-site or removal of affected animal(s) to an isolation facility is highly recommended, [especially if EHM is suspected](#).

State animal health officials (SAHO) should be alerted promptly per state guidelines if acute neurologic disease of potential infectious etiology is suspected, including but not limited to EHV-1 ([EHM](#)), Rabies, EEE, WEE, VEE, and/or WNV.

Further information regarding facility management and establishing a biosecurity perimeter in a potential outbreak can be found in the [AAEP General Biosecurity Guidelines](#).

Differential Diagnoses for Adult Horses with Acute Neurologic Signs

Listed alphabetically

Infectious:

- [Anaplasmosis](#)
- Bacterial meningitis or brain abscess
- [Botulism](#)
- [Eastern Equine Encephalitis \(EEE\)](#)

- [Equine Herpesvirus-1 \(EHV-1\)](#)
- [Equine Herpesvirus-4 \(EHV-4\)](#)
- [Equine Protozoal Myeloencephalitis \(EPM\)](#)
- [Neuroborreliosis](#)
- Parasitic Encephalomyelitis (*Parelaphstrongylus. tenuis*, *Halicephalobus gingivalis*)
- [Rabies](#)
- Tetanus
- [Venezuelan Equine Encephalitis \(VEE\)](#)
- [West Nile Virus \(WNV\)](#)
- [Western Equine Encephalitis \(WEE\)](#)

Non-infectious:

- Anemia with hypoxia
- Cervical Vertebral Stenotic Myelopathy (CVSM, Wobbler Syndrome)
- CNS mass (tumor, cholesterol granuloma, or Pituitary Pars Intermedia Dysfunction/Adenoma)
- Drug toxicity
- Electrolyte abnormalities
- Equine Degenerative Myeloencephalopathy (EDM)
- Hepatoencephalopathy
- Hyperammonemia secondary to hepatic or gastrointestinal (esp. equine Coronavirus, Potomac Horse Fever) disease
- Renal disease with uremic encephalopathy
- Seizure Disorders/Epilepsy
- Temporohyoid osteoarthropathy (THO)
- Toxins, including, but not limited to:
 - Aflatoxins
 - Yellow Star Thistle/Russian Knapweed
 - Mycotoxins
 - Pesticides or herbicides
- Trauma with brain or spinal cord injury

Diagnostic approach for suspected cases of infectious neurologic disease

- **Complete history** (including vaccine history and recent travel)
- **Physical examination**
 - Use personal protective equipment (PPE) if the horse is febrile or infectious/zoonotic etiology is suspected. Avoid contact with body fluids if Rabies is suspected.

- **Neurologic examination**
 - Confirm horse is neurologic and attempt to determine if neurologic signs localize to the brain, spinal cord, multifocal, or peripheral neuropathy.
- **Contact SAHO** if EHV-1(EHM), EEE/WEE/VEE, WNV or Rabies is suspected
- [AAEP Neurologic Disease Differential and Diagnostic Flow Chart](#)
- **Diagnostic Testing**
 - Samples to collect
 - Serum (RTT)
 - EDTA and heparin plasma (LTT and GTT)
 - Nasal swab
 - +/- CSF in both LTT & RTT. (**See CSF Interpretation Chart below**)
 - *Note:* CSF is not required for diagnosis of WNV, EHV-1, and EEE but may be needed for diagnosing EPM.
 - Fresh manure should be collected if intestinal hyperammonemia is suspected
 - Clinical pathology
 - When feasible, blood ammonia should be added to standard CBC/Chem to rule out hepatic/gastrointestinal encephalopathy. Ammonia (Devriendt *et al* 2019) is highly labile. Samples must be collected, processed and frozen promptly or ideally run on an in-house analyzer. Contact your diagnostic laboratory for handling advice.
 - Further information regarding diagnostic sampling can be found at [Diagnostic Sampling, Testing, and Handling](#)

NOTE: Take proper precautions to prevent potential exposure to Rabies or other zoonotic pathogens while collecting samples from a neurologic horse.
- **Post-mortem examination**
 - Rabies, WNV, and EEE/WEE/VEE all pose potential zoonotic risk to personnel performing necropsy examinations.
 - A Rabies protocol should be followed on ALL horses exhibiting signs of neurologic disease which undergo a post-mortem examination. Detailed instruction may be found in the [AAEP Rabies Guidelines](#).
 - The following practices are recommended to reduce exposure:
 - Submit head and/or whole body in its entirety to a local diagnostic laboratory, if possible.
 - Do NOT use mechanical saws to obtain tissue samples, as these tools may disperse aerosolized tissue particles.
 - Wear Tyvek disposable coveralls or (at a minimum) solid-front, water resistant, long-sleeved gown.

- Wear double gloves and consider Kevlar gloves if available to prevent accidental exposure
 - Innermost pair—latex or other disposable gloves
 - Outermost pair—substantial waterproof gloves (Playtex kitchen gloves) long enough for gown sleeves to be tucked inside
- Wear a face shield or goggles to protect mucous membranes.
- Wear a disposable KN95 or ‘half mask’ HEPA respirator (3M 8293) to avoid aerosol exposure. Appropriate fit testing to use a respirator is recommended.

If a definitive diagnosis is not achieved:

- Maintain biosecurity measures for 21-28 days after onset of last clinical case
- Consult infectious disease expert

Cerebrospinal Fluid Interpretation Chart

	EEE	WEE	WNV	Rabies	EHV	Botulism	EPM	Parasite	Bacterial meningitis	Neuroborreliosis
Protein Conc	↑	↑	Normal or ↑	Normal or ↑	↑↑	N	Normal or ↑	↑↑	↑↑↑	Normal or ↑
Total Nucleated Cell count	↑↑	Normal or ↑	Normal or ↑	Normal or ↑	N	N	Normal or ↑		↑	Normal or ↑
Cell Type	P, L	L	L	L	L	N	L	P, E	N	P, L
Color	Normal to xanthochromic		Normal to xanthochromic	Normal to xanthochromic	Normal to xanthochromic				Normal to cloudy	Normal to xanthochromic

N = Normal P = PMN L = Lymphocyte M = Monocyte E = Eosinophil

References

1. Devriendt N, Or M, Meyer E et al. Comparative accuracy and precision of two commercial laboratory analyzers for the quantification of ammonia in cerebrospinal fluid. *Veterinary Clinical Pathology*. 2020; 49:119-124.