Vet Med 517: Equine Medicine:

Eastern (EEE), Western (WEE), and Venezuelan (VEE) Equine Encephalitides

Category: Equine Neurologic Viral Diseases
Agents: EEEV, WEEV, VEEV (Family: *Togaviridae*, Genus: *Alphavirus*)

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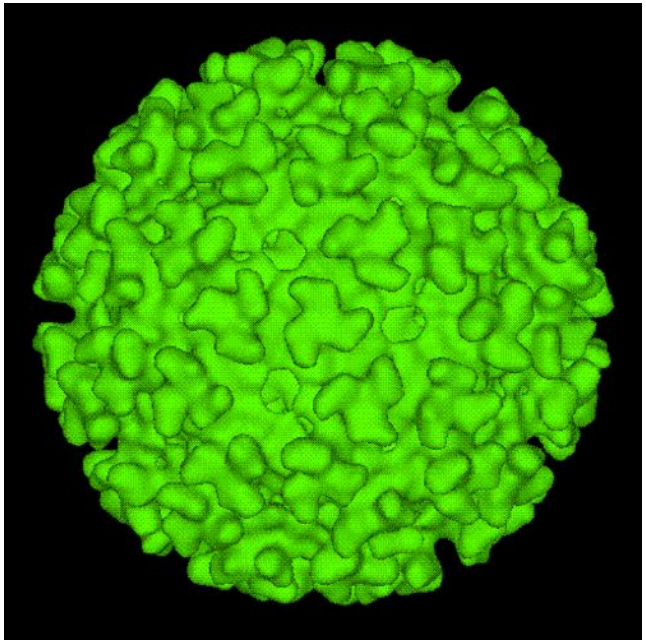
I. Introduction

- Arboviral encephalomyelitis affecting horses and humans.
    - Occur in *North* and *South America*.
- Transmitted from **sylvatic reservoirs** to horses and humans via *mosquitoes*.
- South American EEEV variant now designated as **Maradiaga Virus (MDV)**.

II. ETIOLOGY

- **EEEV, WEEV, VEEV:** Single-stranded, enveloped, positive-sense RNA viruses.
  - **Family:** *Togaviridae*
  - **Genus:** *Alphavirus*
- **Reservoirs:**
  - Birds → EEEV
  - Rodents → Endemic VEEV
- In epizootic VEEV, mutations occur causing equids to become reservoirs.



A computer-generated model of the surface of an *Alphavirus* derived by cryoelectron microscopy.

III. Pathophysiology

- Causes **destructive encephalomyelitis** from **neuronal viral replication**.
- Leads to *severe inflammation* with polymorphonuclear infiltration.
    - **EEEV**: Most neurovirulent, causing rapid neuronal damage.
    - **WEEV**: Milder disease; Highlands J variant persists in Florida.
    - **VEEV**: Unique—**horses act as amplifying hosts** during outbreaks.

IV. Epidemiology

- **Endemic to North & South America.**
  - Outbreaks fluctuate with weather and mosquito populations.
- Expanding northward (USA & Canada).

  - **EEEV:** Eastern USA.
  - **WEEV:** Western USA.
  - **VEEV:** Southern Texas, Central & South America.

V. Signalment

- No breed or sex predisposition.
- **Young horses** more at risk for EEE.
- **Risk Factors:**
  - Poor vaccination coverage.
  - High mosquito density.
  - Undervaccinated horses entering endemic regions.

A foal (young horse) with its mare (adult female horse). ***Young horses*** *are more susceptible to Eastern Equine Encephalomyelitis (EEE).*

VI. Clinical Signs (Early/Prodromal Stage)

- During the **early (prodromal) stage**, occurring 48–96 hours before neurologic signs, horses may show:
  - **Fever;**
  - **Depression;**
  - **and** **inappetence**

- Some may also exhibit *mild lameness* or *abdominal discomfort* prior to the onset of neurologic disease.

VI. Clinical Signs (Neurologic Stage)

- Shows signs of **diffuse brain involvement**, such as:
    - **Somnolence** *(drowsiness)*
    - **Dementia** *(mental dullness)*
    - **Head pressing**, **ataxia** *(incoordination)*, **blindness**, **circling**, and **seizures**

- May involve the **spinal cord or brainstem**, causing **weakness** or **paralysis**.
- **Severe cases** progress to **colic-like signs**, **reduced alertness**, **recumbency**, and **death**.
- Other possible signs: **abortion**, **mouth sores**, **lung bleeding**, and **nosebleed**.

VII. Diagnosis

Serology

- **IgM capture ELISA** titer ≥400 → **confirmatory**.
- **Fourfold rise** in titer between acute and convalescent samples → **positive**.
- **EEEV:WEEV titer ratio** ≥4 = **suspicious**; ≥8 = **strongly indicative** of EEEV infection.
- EEE-affected horses rarely survive long enough for paired sampling.

Cerebrospinal Fluid (CSF)

- **Neutrophilic pleocytosis** *(increased neutrophils)*.
- **Elevated total protein** concentration.

VIII. Differential Diagnosis

- **West Nile Virus (WNV) encephalomyelitis** — tends to cause milder cerebral and more spinal cord signs.
- **Rabies** — consider with acute neurologic signs and behavioral changes.
- **Leukoencephalomalacia** — due to moldy corn ingestion.
- **Hepatic encephalopathy** — associated with liver dysfunction.

VIII. Pathologic Findings

- **Gross:**
  - Congested meninges.
  - Petechial hemorrhages of brain/spinal cord.
  - Cerebral edema with possible herniation of brain tissue.

- **Histologic:**
  - Meningoencephalomyelitis with neuronal degeneration and gliosis.
  - Perivascular and neuroparenchymal infiltrates.
  - Possible cardiac lesions.

IX. Treatment

- **Supportive care only**: *No specific antiviral therapy is available*.
- **Fluid and metabolic support**: Maintain hydration and correct metabolic imbalances.
- **Prevent self-induced trauma**: Take precautions to avoid injuries caused by neurologic deficits.
- **Corticosteroids**: May provide benefit in mild cases (*anecdotal evidence*).

X. Prognosis

- **EEEV:** *85–100%* mortality.
- **WEEV:** *20–40%* mortality.
- **VEEV:** *40–80%* mortality.
    - Survivors may retain neurologic deficits (*ataxia*, *depression*, *behavioral changes*).
- Reinfection possible; *vaccination* recommended.

XI. Prevention and Control

- **Vaccination:** Essential preventive measure.
- **Vector Control:** Reduce mosquito exposure.
- **Reporting:** Notify health authorities of cases.
- Use PPE during outbreaks, especially with VEEV.

XI. Zoonotic Potential

- **EEEV & WEEV**: Horses are *dead-end hosts*; they do not transmit the virus to humans.
- **VEEV**: Horses can act as **active amplifiers**, posing a **risk of transmission to humans** during epizootics.

Biosecurity Measures

- Avoid contact with blood, ocular, or nasal secretions from infected horses.
- Follow strict **rabies necropsy protocols** when handling carcasses.
- Use appropriate **personal protective equipment (PPE)** during treatment, handling, or necropsy.

XII. Key Takeaways

- Equine arboviral infections primarily affect the **central nervous system** and have **high fatality rates**.
- **EEEV** is the most ***virulent***, while **VEEV** poses a significant ***zoonotic risk***.
- **Prevention** relies on **vaccination** and **mosquito/vector control**.
- **Early detection, prompt supportive care, and timely reporting** are critical to saving lives and controlling outbreaks.

References

Lavoie, J. (2019). *Blackwell's Five-Minute Veterinary Consult: Equine*. John Wiley & Sons.

MacKay, R. J., & De Tonnerre, D. (2025, March 10). *Equine arboviral encephalomyelitis*. MSD Veterinary Manual. https://www.msdvetmanual.com/nervous-system/equine-arboviral-encephalomyelitis/equine-arboviral-encephalomyelitis#Key-Points_v73975177