Equine herpesviruses (EHV): from EHV-1 to EHV-5 and more.

What does tell us the number with regards to clinical signs and epidemiology?

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Introduction
  – Herpesviruses: structure and classification
  – Equine alpha- and gammaherpesviruses

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**Herpesviridae: general properties**

- Viral enzymes involved in nucleic acid metabolism and protein maturation
- Viral DNA synthesis and capsid formation in the nucleus
- Productive infection leading almost always to the cell death
- Establishment of latent infections
The family *Herpesviridae*

- **Alphaherpesvirinae**
  - Epithelial and neuronal tropism
  - Latency in neurons (but also in lymphocytes)

- **Betaherpesvirinae**
  - Cytomegalovirus

- **Gammaherpesvirinae**
  - Lymphocytic tropism
  - Latency in mononuclear cells
Horse and related species

- Horse
- Donkey
- African wild ass
- Zebra
### Alphaherpesviruses

<table>
<thead>
<tr>
<th>Virus Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equid herpesvirus 1</td>
<td>(Equine rhinopneumonitis), Abortion, Myeloencephalopathy</td>
</tr>
<tr>
<td>Equid herpesvirus 4</td>
<td>Equine rhinopneumonitis</td>
</tr>
<tr>
<td>Equid herpesvirus 8</td>
<td>Asinine herpesvirus 3, homologous to EHV-1</td>
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<tr>
<td>Equid herpesvirus 3</td>
<td>Coital exanthema</td>
</tr>
<tr>
<td>Equid herpesvirus 6</td>
<td>Asinine herpesvirus 1, homologous to EHV-3</td>
</tr>
<tr>
<td>Equid herpesvirus 9</td>
<td>Thomson gazella (encephalitis) Zebra (subclinical infection)</td>
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# Gammaherpesviruses

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<thead>
<tr>
<th>Virus Type</th>
<th>Description</th>
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<tr>
<td><em>Equid herpesvirus 2</em></td>
<td>Subclinical infection; respiratory disease (?)</td>
</tr>
<tr>
<td><em>Asinine herpesvirus 4</em></td>
<td>Associated with lethal pneumonitis; related to EHV-2</td>
</tr>
<tr>
<td><em>Asinine herpesvirus 5</em></td>
<td>Associated with lethal pneumonitis; related to EHV-2</td>
</tr>
<tr>
<td><em>Equid herpesvirus 5</em></td>
<td>Subclinical infection</td>
</tr>
<tr>
<td><em>Asinine herpesvirus 6</em></td>
<td>Related to EHV-2 and EHV-5</td>
</tr>
<tr>
<td><em>Equid herpesvirus 7</em></td>
<td>Related to EHV-2 and EHV-5</td>
</tr>
<tr>
<td><em>Zebra herpesvirus</em></td>
<td>DNA in blood cells; related to EHV-2 and EHV-5</td>
</tr>
<tr>
<td><em>Wild ass herpesvirus</em></td>
<td>DNA in blood cells; related to EHV-2 and EHV-5</td>
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Respiratory infection with EHV-4 or EHV-1: equine rhinopneumonitis

- EHV-1 and EHV-4: closely related
- Acute upper respiratory disease (rhinitis)
- High prevalence
  - Infection during the first year of life
  - Numerous subclinical infections
  - Respiratory outbreaks in two-years old horses
    » In training centres
- General signs: fever and anorexia
- Respiratory signs: serous to mucupurulent nasal discharge
- Broncho-pneumonia: complication of rhinitis
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EHV-1

Virémie

Lymphocytes T
Monocytes

Infection généralisée du foetus

Angéite endométriale

AVORTEMENT
Abortion caused by EHV-1

- **EHV-1**
  - First 2/3 of pregnancy: risk of myeloencephalopathy
  - Last 1/3 of pregnancy (6-11 months): risk of abortion

- **Winter time**

- **First abortion contaminates the other mares**
  - Abortion storm: very rare
  - Sporadic occurrence

- **No clinical sign in the mare**
Abortion caused by EHV-1

- Aborted foetuses before 6 months
  - Diffuse cellular necrosis, without inflammation
- Aborted foetuses after 6 months
  - Macroscopic inflammatory lesions
EHV-1: neonatal disease

- Infection in late gestation
- Perinatal systemic disease
- Fever, depression
- Lymphopenia
- Respiratory distress
- Death
Introduction

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Épithélium respiratoire

Virémie

Lymphocytes T
Monocytes

Complexes immuns

Endothélium vasculaire

MYÉLO-ENCEPHALOPATHIE
Myeloencephalopathy mediated by EHV-1

- After reinfection:
  - In the presence of antibodies
  - Immunopathology (?)
- After infection or re-infection
  - Vasculitis, thrombosis and anoxia
  - In spinal chord
- Latency
- Low incidence
- Sporadic or epidemic form
- Association with abortion or respiratory form
- No general sign
- Ataxia, posterior paresis, paralysis
- Full or partial recovery, or death or euthanasia
- Introduction
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- Respiratory infection with EHV-1 and EHV-4
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Equine coital exanthema (EHV-3)

- EHV-3: no antigenic relationship with any other equid herpesvirus
- Thermosensitive virus
- Venereal infection
  - Infections of stallions and mares
- Isolated from nasal swabs
- Local dissemination of the virus
- Latent virus (undetermined site of latency)
- Papular then vesicular lesions on the mucosa
- No general clinical sign
Introduction

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Conclusions
Equine gammaherpesviruses: EHV-2 and EHV-5

- Equid herpesvirus 2 (EHV-2)
  - Respiratory infection
  - Lymphotropism
  - Latency in B lymphocytes, lymph nodes, CNS
  - Widespread
  - Numerous subclinical infections
  - Associated with acute upper respiratory signs

- Equid herpesvirus 5 (EHV-5)
  - Respiratory infection
  - Lymphotropism
  - Latency in mononuclear cells
  - Widespread
  - Subclinical infections
  - No association with any disease
  - Closely related to EHV-2
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- The number of equine herpesviruses is increasing
- Besides the « well-known » equine herpesviruses:
  - Newly recognized viruses in other equids
  - Cross relationships between several herpesviruses (asinine & equine)
- Crossing of the species barrier
  - Thomson gazella: encephalitis by EHV-9
  - New world camelids: encephalitis (blindness) by EHV-1
- Complex pathogenesis
  - EHV-1: epithelial cells, lymphocytes, endothelial cells
  - EHV-3: genital versus respiratory infection
- Further work of the pathogenesis
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  www.abcd-vets.org