Herpes and equine pregnancy

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Equine Herpesvirus-1 (EHV-1)
- Respiratory
- Abortion
- Paralysis

Equine Herpesvirus-4 (EHV-4)
- Respiratory
- Abortion
- Paralysis

EHV abortion/neonatal foal death
- Mainly EHV-1
- Last 3rd of pregnancy
- May affect individual mares
- May occur as abortion storms
- May occur after vaccination
- May be linked to yearlings or horses out of training
- Typically unexpected and rapid

‘Red bag’ delivery
- EHV-1 PCR positive in c.85% of cases
- A few placenta PCR positive, fetus PCR negative

EHV abortion/neonatal foal death
- May be expelled red side out ('red bag' delivery)
- Fetus may be enclosed within intact membranes
- Placentae often grossly normal
- Rapid diagnosis important for herd health
  – Gross/Histopathology & PCR

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**Gross pathological features**

- Fresh fetus
- Meconium staining
- Blood stained fluid in body cavities
- Pulmonary oedema
- Enlarged, spotty liver
- Prominent splenic follicles

**Immunohistochemistry**

- Infected fetal lung
- Infected fetal liver
- Infected endometrium

**qPCR probe assay read out**

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**EHV-1 infection process**

- Primary infection via respiratory tract
- Virus transmission across submucosa
- Infection of endothelial cells and leukocytes
- **Dissemination via cell associated viraemia**
- Induction of disease or subclinical infection
- Establishment of **long term latency**

**EHV-1 Pathogenesis**

(Allen et al 1998)

- Solid = establishing latency
- Green = Trigeminal ganglia
- Lavender = Lymphocytes
- Broken = reactivation

\[ y = -3.756x + 42.896 \]
\[ R^2 = 0.993 \]
\[ E = 1.846 \]
Proposed pathology process

- Virus is transported to uterine and/or CNS endothelial cells following viraemia
- Infection of endothelial cells results in vasculitis and thrombosis
- Thrombosis results in focal or multifocal infarction at uteroplacental junction and/or involving arterioles within CNS
- Influence of EHV-1 strain variation?

Think of EHV-1, think of cold sores (herpes simplex virus)

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Equine Herpes Virus-1 (EHV-1)

- **Most horses latently infected** with EHV-1
  - Latent = not always infectious
  - But have potential to become infectious
- Appropriate management of index cases can prevent major problems (Codes of Practice)
  - **Mis-management of them can spell disaster!**
  - Disaster may strike despite good management

EHV-1 Epidemiology

- Young animals
- Latent infection
  - Most healthy horses are latently infected with EHV from an early age
- Recrudescence

EHV-1 Latency

- No risk unless virus re-activated
- Reactivated infection
  - Often no clinical signs
  - But infectious to other horses
- STRESS ??
- Abortion can be due to
  - New infection or
  - Reactivation of latent infection within mare
- Mare NOT more likely to re-abort next year
EHV-1 Latency

**Therefore:**
- All newly arriving horses are potentially shedding EHV
- No point in ‘black-listing’ mares that have had an EHV abortion
- Not really feasible to prevent introduction of infection onto stud
- Efforts should be directed towards preventing exposure of pregnant mares

Means EHV-1 is here to stay......
- **EHV-1 latency is widespread** & difficult to control
- **EHV-1 disease may spontaneously occur** due to re-activation of latent virus
- Affects horses attending all types of events/premises
- **Vaccination is currently not optimal** (or perhaps available!) for prevention and/or control of EHV-1
  - **EHV-1 can only be managed and NOT eradicated**
- EHV-1 has ability for significant disease and death with associated financial and welfare consequences
  - Abortion ‘storms’ affecting multiple mares (UK 2016)
  - Large neurological outbreaks (UK 2012/2013; USA)

Control of EHV outbreaks

HBLB Codes of Practice for equine infectious venereal diseases available online at www.hblb.org.uk

General principles adopted:
- Isolate affected animals/groups
  - Split into smaller isolated groups until foaled
- Stop all movements & minimise mixing
- Heighten clinical monitoring if needed
- Vaccination in face of the outbreak ????

Neurological disease outbreaks:
- Extensive and repeated laboratory testing
  - Evaluate initial extent & clearance of infection
  - PCR viral detection & CFT serology

Managing pregnant mares

- Minimise ‘stress’
  - Especially during late pregnancy
  - Maintain in small groups
  - Minimise handling and transportation
- Foaling
  - Foal at home or
  - Move to stud at least 4 weeks before due date
- Isolate from youngstock & competition horses
  - Reliable source of infection
- Routine Vaccination for EHV-1/-4

Preventing EHV abortions

Protection of pregnant mares
- Management of pregnant mares
- Management of abortions
- Investigate sick foals
- Vaccination
If abortion occurs

- Isolate mare & remove aborted material
  - Sealed double bag to avoid contamination
- Disinfect where abortion occurred
- Organise for laboratory investigation of cause of abortion
  - Use specialist laboratory that is experienced with EHV-1
- Restrict movement on & off stud
  - Until laboratory clearance given
  - Less concern for other mares if not EHV-1

If EHV-1 abortion confirmed

- Consult & follow HBLB Codes of Practice
- Continue isolation & no movements on & off stud for at least 28 days from last abortion
  - May be possible to move non-pregnant mares earlier than 28 days (CoP pages 37-38)
- Divide close-contact pregnant mares into small groups
  - Pregnant mares must foal on the stud
- Next year, in-contact mares should foal in isolation, preferably at home

If EHV-1 abortion confirmed

**Good communication!!**
- Notify breed association
- Contact owners of mares at the infected stud or are due to be sent there
- Contact studs to which mares have been sent or are due to be sent

EHV vaccination

- Does not prevent infection
- Does not prevent re-activation of latent infection
- Does not prevent abortion in individual mares
- Does reduce amount of virus shed when infection or re-activation occurs
  - Protects in-contact animals by reducing risk of exposure
  - Vaccinate all in-contact horses to protect pregnant mares
  - Including youngstock & competition animals

Paralytic EHV-1

- Investigate all cases of neurological disease
  - Serology and PCR of affected horse
  - Sampling of in-contacts
  - Post-mortem examination
- Stop movement & covering
- If disease confirmed
  - Maintain movement restrictions
  - Repeated laboratory testing of entire group

The National Stud

- Large public stud farm on edge of Newmarket
- Isolation unit (Heath Yard) for mares arriving from overseas separate from the main stud and with dedicated staff
- Incoming animals routinely bled for health monitoring
4yo maiden filly developed neuro signs on 26/1/16
- Ataxia, bladder dysfunction & periods of recumbency (bleed 2)
- Filly from French pre-training yard travelled by lorry with 2 pregnant mares & another maiden mare
- Consignment had arrived at Heath Yard on 20/1/16 (bleed 1)
- Filly was NP swabbed 4-times in the following days
- All samples NEGATIVE for EHV-1 by PCR
- Paired CFT serology showed seroconversion (1:10 to 1:160) to EHV-1/-4, with samples only 6dd apart between bleeds

The National Stud

- Neurological EHV-1 diagnosed based on serology but case not infectious at time of clinical signs
- Road transport a potential high risk factor for exposure of other horses at Heath Yard
  - 2 co-transported pregnant mares at risk of EHV-1 abortion
  - Inadvertent indirect transmission e.g. isolation unit staff
- Biosecurity measures implemented as per HBLB CoP
- Whole stud closed immediately with press release

The National Stud

- All 24 mares in the isolation unit were screened clear
  - No clinical disease, no seroconversions
  - Post-foaling placentae PCR negative
- Affected filly made good recovery
- 3 mares from France tested negative by PCR on NP swabs on 3 occasions & did not abort or seroconvert
- Main stud re-opened on 15th February 2016 & isolation yard re-opened on 23rd February 2016

Multiple EHV-1 abortions

- Hertfordshire
  - Fully vaccinated & all linked to index abortion case as co-grazers or in the barn when abortion occurred
- Sussex
- Suffolk
  - Index neonatal foal death in early February 2016
  - Abortion in early March after 28dd closed as per CoP
  - Two neonatal foal deaths in early May, again after closing for 28dd

Conclusions on EHV-1

- Patterns of EHV-1 disease are unpredictable!
- American barns pose high risk for exposing pregnant mares to EHV-1 when abortions occur
- This scenario presents considerable challenges for the current licensed EHV-1/-4 vaccine
  - "Disaster may strike despite good management"
- Use of lab clearance tests among contacts in neurological EHV-1 shown to be effective for safe return to normal activity
  - Reliance on time for EHV-1 to clear is unreliable

Some final thoughts on EHV & equine pregnancy

- There is never zero risk of EHV-1 with horses as they can spontaneously reactivate the virus from a latent state
- No pregnancy should be considered safe wrt EHV-1 until there is a healthy foal at foot that is at least a week old
- Always aspire to ‘wrap pregnant mares in cotton wool’ so minimal stress, in small groups & away from other horses
- EHV-1 abortions pose high infection risks to other mares so must deal with them promptly & appropriately
- Separate potentially exposed mares until they abort/foal
- Routine management & index case handling are arguably more important than vaccination of pregnant mares
Acknowledgements