Ticks Are Still Bugging Our Horses!
Review of Tick Borne Diseases

Ocean State Equine Associates
2205 Providence Pike
North Smithfield, RI 02896
www.oceanstateequine.com
Overview

• Tick-borne Diseases:
  -- Lyme Disease
  -- Anaplasmosis/Ehrlichiosis
  -- Potomac Horse Fever??

• Modes of Transmission
• Clinical Signs
• Diagnostic Tests
• Treatment
• Prevention
Disease Nomenclature

• **Lyme Disease**: *Borellia burgdorferi*

• **Equine Granulocytic Ehrlichiosis**: *Anaplasma phagocytophilum*

• **Potomac Horse Fever** aka Equine Monocytic Ehrlichiosis: *Neorickettsia risticii* (formerly *Ehrlichia risticii*)

Confused yet?
Lyme Disease

- *Borrelia burgdorferi* – helical-shaped gram-negative spirochete
- Very common in Northeast and Mid-Atlantic States
- *Ixodes* tick is the vector.
- Deer and white-footed mouse involved in 2-year life cycle.

*Borrelia burgdorferi* spirochetes
Lyme Disease Transmission

- Tick feeds on mammal
- Certain genes in the tick allow for transmission and survival in different hosts.
- Organism resides in connective tissue, collagen, skin, joints and does not need iron (blood) for survival.
- Seroconversion occurs in 2-10 weeks post infection.
Lyme Transmission Cycle
Distribution of Lyme Disease in Horses

44.6% of adult horses in Connecticut are seropositive.
Lyme Disease Clinical Signs

- Shifting lameness
- Stiffness
- Behavioral Changes
- Inability to Perform Work
- Neurological Signs
- Has been linked to uveitis
- Fever is \textit{not} a common clinical sign.
Lyme Disease Diagnosis

- Clinical examination with presence of signs in an endemic area
- **Exclusion of other causes of lameness**
- Bloodwork:
  -- Enzyme-Linked Immunosorbent Assay (ELISA)
  -- Western Blot (WB)
  -- 4DX Snap Test
- Tissue Sampling?
Science 101

- Antibody = Proteins in the body that identify and neutralize foreign objects
- Antigen = Substances that trigger the production of antibodies
- Pathogen = An infectious agent that causes disease in the host’s body
Diagnostic Tests

ELISA

• Numerical value that measures antibody response to organism

• Organism stays in skin for 9 months, even after treatment. Therefore, antibodies persist for a long time!

• High percentage of horses have strong ELISA with a negative WB.

• **Take home message**: ELISA has very little correlation to active infection in the body and therefore is of poor diagnostic value alone!
Diagnostic Tests

Western Blot

- Most specific test (Gold Standard)
- Measures several antibody “bands” that the horse produces and reported as Strong, Moderate or Low level of exposure
- Will differentiate if horse received commercial canine vaccine.
- Interpretation on its own is difficult if “Moderate” response.
Diagnostic Tests

C-6 4DX SNAP Test
• Quick and easy stall-side screening test
• Measures one antibody, the C-6. This is the fastest rising and falling antibody.
• Good sensitivity (67% determination of TRUE POSITIVES)...some false negative results
• Excellent specificity (% of TRUE NEGATIVES)
• Can be useful in detecting concurrent Anaplasmosis.
• Not licensed for horses!
Challenges in Diagnosis

• Serological tests do not distinguish between active infection and previous exposure.

• Many infected horses are infected for a long duration, even life.

• There is no protective immunity so horses can become re-infected repeatedly.

• Test horses with high ELISA values rarely have a marked decline even 3 years later!

• Treatment rarely results in a decline in antibodies.
We do not recommend treating horses based solely upon a positive test!

Most conclusive tests are those that detect the spirochete directly (e.g., synovial or skin biopsy, aqueous humor sample from eye).
Treatment of Lyme Disease

**Doxycycline** 10mg/kg orally every 12 hours for one month

- Potent anti-inflammatory properties (esp. for synovial membranes and arthritis)
- Easy for client to administer at home
- Only 9% bioavailable (poor tissue concentrations)
- Diarrhea can result in a low percentage of horses.
- Response to treatment is confusing due to its anti-inflammatory properties.
- Not for use long-term in pregnant mares
Treatment of Lyme Disease

**Oxytetracycline** 6.6mg/kg IV once daily x 7-10 up to 28 days

- Obtains high tissue levels
- More likely to clear the organism
- Must be given IV daily in hospital by veterinarian. (Risks associated when given outside of vein are great.)
- Must monitor kidney values when patient is on this drug long term.
- Not for use long-term in pregnant mares.
- Best if course is followed up by Doxycycline orally.
Treatment of Lyme Disease

Terramycin Powder

• Not licensed for horses (used in honey bees)
• Very poor tissue concentrations (way less than doxycycline)
• Don’t use it.
Prevention of Lyme Disease

Tick prevention!

• Check your horses daily. Ticks must be attached for 24 hours to transmit infection.
• Clip tall grasses.
• Clear shrubs and bushes.
• Don’t let horse graze in forests or woodlands.
• Topical sprays (Frontline) can be used esp. in late summer, fall and early winter.
• Guinea hens!
• Clip long hair coats, feathers, etc.
• Limit intermediate hosts (white-footed mouse and deer).
Prevention of Lyme Disease

Vaccination

• No commercial equine vaccine available. Why? $$$
• Canine vaccine (OspA) has been used off label. Its efficacy in horses is unknown.
• Future: Tick saliva vaccine (pre-exposure with sterile tick salivary proteins).
Anaplasmosis/Ehrlichiosis

• Formerly known as *Ehrlichia equi*
• Now named *Anaplasmosis phagocytophilum*
• Responsible for causing Equine Granulocytic Ehrlichiosis (EGE)

Let’s call it EGE today, but prepare to be confused as we veterinarians are just as confused as you!
EGE: Mode of Transmission

- Transmitted by *Ixodes* ticks
- Variety of intermediate hosts (mice, woodrats, chipmunks, voles, shrews, deer and possibly birds)
- Dogs, humans and horses are accidental hosts. Bacteriemia is short (<1 month) which is unlikely important in disease transmission.
- Seasonality occurs when ticks are around.
EGE: Clinical Signs

• Fever
• Depression
• Limb Edema
• Lymphopenia (low lymphocytes)
• Neutropenia (low neutrophils)
• Thrombocytopenia (low platelets)
• Mild anemia
EGE: Timeline of Events

- Tick attaches to horse: Day 0
- High fever: Days 5-10 post-infection, accompanied by inappetence, depression, icterus, high heart rate, high respiratory rate
- Reluctance to move, limb edema, ataxia: Days 7-12 (usually 2 days post-fever)
- Many people think their horse is “neurological.”
EGE: Diagnosis

- Organism is an obligate intracellular pathogen.
- It “loves” neutrophils (WBC) and lives within them.
- Forms inclusions in WBC called morula.
- Morula present in WBC a few days after onset up to one week.
- Up to 30% of horse’s neutrophils are affected.
EGE: Diagnosis

- Based on seasonal and geographical location
- Fever with CBC changes
- Finding morulae in neutrophils is definitive.
- Must rule out other sources of fever (e.g., respiratory infections, colitis, etc.)
- Often response to treatment confirms presumptive diagnosis.
- Other lab tests available
EGE: Diagnosis

- 4DX Snap Test is ok screening test. It only detects 50% of clinical cases (does not produce rapid antibodies like Lyme)
- Organism difficult to grow in culture.
- PCR in whole blood: Detects organism’s DNA in horse’s blood
- Indirect Fluorescent Antibody Test (IFAT): Detects antibodies in horse’s blood – variable results
  -- Naïve horses develop antibodies 12 days after development of clinical signs.
  -- Natural infections developed antibodies 19-81 days post-fever with a peak around Day 46, waning at Day 203.
EGE: Treatment

• Disease is self-limiting: will resolve in a few weeks without any treatment. Signs are more severe and persist.

• Oxytetracycline: 6.6mg/kg IV once daily x 5-7 days shows dramatic and immediate improvement

• Doxycycline: 10mg/kg orally twice daily for 5-7 days also works

• Combination of IV and oral tetracyclines

• Relapses 3 weeks after initial infection are reported.
EGE: Prevention

- No vaccines are available for *Anaplasma phagocytophilum*.
- Prevention must be targeted towards tick control.
Potomac Horse Fever

• Formerly *Ehrlichia risticii*
• Now called *Neorickettsia risticii*
• Causes PHF or Equine Monocytic Ehrlichiosis
• Occurs in late summer to early fall
• Commonly found around rivers and waterways.
• NOT transmitted by ticks! Should I go on?
PHF: Mode of Transmission

• Fresh water trematodes (flukes) use water snails as intermediate hosts.
• Snails release infected immature life stages (cercariae) into water.
• Cercariae infect aquatic insects such as caddisflies, mayflies and dragonflies.
• Horses inadvertently eat dead flies in the grass while grazing or dead insects that contaminate feed, water or both.
PHF: Life Cycle

Potomac horse fever may develop in horses, causing signs such as anorexia, fever, diarrhea, signs of colic and laminitis.

Optional route of infection

Potomac horse fever life cycle

The complex life cycle of Potomac horse fever has been shown to include flukes, snails and sometimes even water-loving insects.

Flukes carrying N. risticii multiply in snails

N. risticii-infected trematodes (flukes)

Neorickettsia risticii is the agent of the disease

Horses ingest infected fluke larvae

Horses ingest adult insects

N. risticii move to aquatic insects (such as mayflies and caddisflies)
PHF: Clinical Signs

- *N. risticii* localizes in the gastrointestinal tract.
- Causes an severe, erosive and ulcerative enterocolitis.
- Fever 5-7 days post exposure
- Depression
- Inappetence
- +/- Diarrhea
- Can turn toxic with high heart rate, red mucus membranes, colic, laminitis (30%), death.
- Variable abortion in pregnant mares
PHF: Diagnosis

- Clinical signs in an edemic area, esp. from June to September
- Must rule out other diseases
- Neutropenia (low neutrophils)
- Dehydration (increased PCV and Total Protein)
- Electrolyte disturbances
- Response to treatment
- IFAT: high titer (>400) supportive
- PCR on whole blood, feces or fetus (detects DNA of organism): Can get false negatives after antibiotics.
PHF: Treatment

- Oxytetracycline 6.6 mg/kg twice daily x 3 days, then once daily x 3 days unless dehydrated.
- Fluid therapy to correct dehydration and electrolyte abnormalities.
- Anti-endotoxin treatment (Banamine, etc.)
- Laminitis prevention: Ice therapy, foot packing, deep bedding

Prognosis is good if detected and treated early.
PHF: Prevention

• Avoid wet swampy areas
• Turn off the barn lights!
• Cobwebs?
• Keep buckets and food stuffs free from insects.
• Vaccination: Not a great vaccine as it does not cover all of the isolates of *N. risticii*. Some say it will decrease the severity of disease.
• Natural infection does protect horses from recurrence for up to 20 months.
In Summary...

- Prevention of tick-borne (and fluke/snail/mayfly-borne) diseases is key!
- All are responsive to the tetracycline family of antibiotics
- Early detection is key to a favorable prognosis.
- Have a thermometer at your barn.
- Don’t wait too long to call!
Winter Facts

Did you know that the number one type of colic we see in the winter is due to large colon impactions?

Did you know that these usually develop because horses don’t drink enough water?

Finally, did you know that it is proven that if horses are provided warm water during the winter, they will drink on average 67% more water?

You can lead a horse to water, and sometimes you CAN make him drink!