Bovine Astrovirus Encephalitis in a Hereford Steer

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Case History

• Called to farm to see an off-feed backgrounder steer

• Herd information:
  • Closed beef herd
  • Approximately 20 cows with suckling calves: fed dry hay with access to pasture for grazing
  • Approximately 20 backgrounder yearlings housed indoors: fed dry hay and high moisture corn.
  • Low input herd: no vaccinations, no coccidiostats, no implants, no parasiticides.
  • No other livestock on the premises
Examination Findings

• Steer by himself in a pen indoors
• Owner reported off-feed for the past day or two
• Physical Examination Findings:
  • Most parameters within normal limits
  • Some abnormalities noted:
    • Decreased rumen fill
    • Performing repetitive licking and chewing motions
    • ‘Blank’ expression

http://www.flickriver.com/photos/hanneorla/86557460
Examination Findings

• While leaving the pen the steer flipped from standing into dorsal recumbency and had a generalized tonic-clonic seizure.

• Convulsions lasted for 1-2 minutes
  • Frantic paddling motions of all four limbs
  • Extension and flailing of head
  • Nystagmus
  • Apparent lack of consciousness

• Post-ictally the steer laid in lateral recumbency for ~5 minutes

• Then stood up and resumed moving around the pen normally
• Owner reported that this was the first time he had observed this behaviour
• Tried to restrain the steer to collect blood: seized again.
Initial Differential Diagnoses:

- Bacterial Meningitis
- Rabies
- Polioencephalomalacia
- Nervous Coccidiosis
- Neurological Bovine Infectious Rhinotracheitis (Herpesvirus)
- Listeriosis
- Malignant Catarrhal Fever
- Histophilus somni
- Vitamin A deficiency
- BSE
Treatment:

• Treated empirically based on signs of neurological disease:
  • Thiamine
  • Trimethoprim Sulfadoxine
  • Dexamethasone

• Died overnight

• Due to rabies concerns a full post mortem was not performed
  • Head removed and delivered to the AHL for diagnostic testing

• Fecal sample collected: only occasional coccidia oocysts seen
Diagnostic Testing:

• Rabies: Negative

• Histology:
  • Marked non-suppurative meningoencephalitis
    • Throughout brainstem and cerebral cortex
  • Broad perivascular cuffing of blood vessels by lymphocytes

Photo credit: Dr. Maria Spinato
Diagnostic Testing:

Tests for:
• Listeriosis (Listeria monocytogenes)
• Malignant Catarrhal Fever (Ovine herpesvirus-2) = Negative

Tentative Diagnosis:

Idiopathic Non-Suppurative Meningoencephalitis
More Diagnostic Testing:

- Bovine herpesvirus-1
- Bovine respiratory syncytial virus
- Bovine parainfluenza virus-3
- Avian Astrovirus (chicken astrovirus + avian nephritis virus)

  = All Negative

PCR for bovine astrovirus = Positive

Diagnosis: Bovine astrovirus encephalitis
Wait.......Astrovirus?

• Astroviruses were first discovered in humans in 1975 (Madely and Cosgrove, 1975)
  • A common causative agent of gastroenteritis in human infants

• Their role in diarrhea in cattle is not as well established, but enteric strains are thought to be prevalent within the cattle population (Candido et al, 2015)
Astrovirus Encephalitis

• Neurotropic strains first identified in 2010 as a cause of encephalitis in immuno-suppressed humans (Quan et al, 2010; Brown et al, 2015)
  • Caused by a different strain of virus than that involved in enteric disease
• In 2013 a neurotropic strain of astrovirus was identified as causing ‘shaking mink syndrome’ a neurological disease of young mink (Blomstrom et al, 2010)
Bovine Astrovirus Encephalitis

- The first case of bovine astrovirus encephalitis was identified in 2013 in the United States (Li et al, 2013)

- In subsequent years more cases have been reported in Switzerland and Germany (Bouzalas et al 2014, Seuberlich et al 2016, Schlottau et al, 2016)

- This is the first case identified in Canada

- Phylogenetic analyses have shown that these neurotropic strains are most closely related to an ovine strain of astrovirus (Bouzalas et al, 2014; Bouzalas et al 2016)
Astrovirus: Clinical Syndrome

• The published literature reports a variety of clinical signs associated with central neurological disease in affected animals:
  - Head pressing
  - Circling
  - Seizures
  - Stargazing
  - Cortical Blindness
  - Disorientation
  - Opisthotonus

• In all cases histological analysis of the brain showed a marked non-suppurative encephalitis, with lymphocytic perivascular cuffing of blood vessels.

• Most cases involved relatively young animals (1-3 years of age), with only a single animal within a herd affected (Li et al 2013, Bouzalas et al 2014, Seuberlich et al 2016, Schlottau et al 2016)
Astrovirus: An Emerging Pathogen?

• It appears that neurotropic astrovirus infections are not new:
  • Recent retrospective analyses performed on cases previously diagnosed as ‘idiopathic non-suppurative encephalitis’ have found that neurotropic-astrovirus infections represent up to 25% of these cases! (Li et al 2013, Bouzalas et al 2016)
  • The cases examined dated back to 1995, suggesting that this pathogen has been present for a long time (Li et al 2013)
  • It seems that this is not a new disease! We are just learning to identify it now.
Back to our clinical case:

• Information relayed back to the farmer:
  • Your steer died of astrovirus encephalitis
  • We don’t know how it is spread
  • We don’t know how to treat it
  • We don’t know how to prevent it
  • We don’t know why that particular steer was affected
  • We don’t know if there is a risk to your other animals.

• Astrovirus encephalitis is currently a very active area of research, so hopefully soon we will know some of these answers!
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Questions?
References


