Abortion in Cattle

*Neospora caninum*
You are called to a local dairy farm to investigate an increased incidence of abortion in the cows.

1. What is ‘abortion’

- Abortion is the loss of a fetus after it develops phenotypic features by 45 days but before it is independently viable. Before 45 days, loss is considered to be Early Embryonic Death. Once the fetus is mature, it is considered Stillbirth.

2. When should abortion be investigated

- Spontaneous abortion occurs in dairy herds normally, however a recent increase in the rate of abortion or an abortion rate over 3-5% is cause for concern.
You decide to take a look at the cow, especially when the producer tells you it’s the third abortion this week in a herd of 50 COWS.

• The cow is in her third lactation and has always been a good producer and has had a normal reproductive history
• Today, the cow appears normal, there are no signs of septicemia or systemic disease
• The fetus is 5-6 months and there are no visible abnormalities in it or the placenta
• As far as you are aware, there have not been any unusual or unexpected illnesses in the barn in the last several months
• The producer has not altered the cows’ diets and the cows are in a free stall barn.
• Barn cats and the farm dog have access to the barn
• There is no previous history of an abortion problem
3. What are causes of abortion in cattle

- Traumatic
- Bacterial -- *Arcanobacterium pyogenes*, *Bacillus* spp., *Listeria monocytogenes*, *E. coli*, *Leptospira* spp., *Brucella abortus*, *Campylobacter fetus venerealis*, *Chlamydia psittaci*, *Haemophilus somnus*, *Tritrichomonas foetus*, *Ureaplasma diversum*, *Coxiella burnetii*
- Viral -- Bovine Herpesvirus-1, Bovine Viral Diarrhea virus, Parvovirus, Enterovirus, Adenovirus, Parainfluenza virus, Pseudorabies virus, Bluetongue virus
- Parasitic -- *Neospora caninum*, *Toxoplasma* spp.
- Nutritional Deficiencies or Malnutrition
- Toxic -- Pine Needle Poisoning, Nitrate Poisoning, Sweet Clover, Poison Hemlock, Locoweed
- Congenital abnormalities of the fetus
- Abnormalities of the placenta
- Maternal Stress
- Twinning
4. What rule outs can we make?

- Many causes of infectious abortion cause primary disease in the cow. A blood-borne component of infection travels to the uterus and placenta causing a placentitis or infects the fetus causing fetal death. Ultimately, abortion ensues. It is important to note that signs of clinical illness and abortion may be offset by several months. Also, gross lesions of the fetus and placenta are characteristic for many bacterial, viral and fungal causes of abortion. In this case, we can tentatively rule out many infectious causes, however, keep in mind that some organisms can produce latent infections and clinical signs including abortion can recur during times of stress.

- Venereal causes of abortion may or may not cause systemic illness, but signs can readily be found on the vagina of affected cows.

- Since the cows are housed indoors and there has been no change in feeding, we can tentatively rule out plant toxicoses and malnutrition causes.

- The fetus and placenta both appear normal in this case, so we can also rule out fetal abnormality and placental abnormality. Twinning is also not an issue in this case.
The producer recognizes there is a problem and agrees to a laboratory diagnosis. You pack up the fetus and placenta and send them to your local diagnostic laboratory.

5. What do you do while you are waiting for results?

• We have determined that there is a herd problem and abortion has a major economic impact on dairy producers. It is important to know the more common causes of abortion in your area. In the face of an abortion outbreak, recognize that often the cause of abortion happened prior to the event and there is likely nothing you can do besides trying to prevent it in the future.

• Recognize that Brucella abortus is a reportable cause of abortion which is also associated with no clinical signs in the cow, although the fetus may show signs of bronchopneumonia and the placenta will be edematous and leathery with necrotic cotelydons. A blood sample should be taken for serum testing. Pseudorabies and Bluetongue viruses are also reportable.
A week later, the abortion storm has slowed and the lab report comes back. Histologic examination reveals a multifocal, necrotizing and non-suppurative encephalitis with a few other vague lesions. This is highly consistent with *Neospora caninum* infection.

Other histologic findings may include necrotizing and non-suppurative lesions in other fetal tissues, particularly liver, lung, and kidney. Tachyzoite cysts may also be observed in the brain.

- Immunohistochemistry of affected fetal tissues provides a definitive diagnosis. Demonstration of serum antibodies in the cow indicates infection, but does not confirm the cause of abortion.
What is *Neospora caninum*?

- *N. caninum* is a sarcocystoid protozoa
- The definitive host is the dog and other wild canids
- Intermediate host species include cattle, sheep, goats, cats, dogs and many other species
- A dog becomes infected when it eats the infected placenta or carcass of another animal and sheds oocysts in its faeces
- Faeces is ingested by cattle, often in feed which has been left accessible to farm dogs, oocysts hatch and the organism localizes to developing brain tissue where it forms tissue cysts
- Infected fetuses can abort or become persistently infected
- *N. caninum* is the leading cause of abortion in vaccinated dairy cows in NA
Transmission Cycle of *Neospora caninum*

Maturation & breeding of congenitally infected heifer

**Endogenous Transmission**

Birth of calf with persistent infection

Birth of healthy, uninfected calf (cycle is broken)

Aborted, premature, or impaired calf

Cross placental transmission infects fetus

Oocysts passed in feces contaminate cattle ration

Ingested by pregnant cow

**Exogenous Transmission**

Infected carcass or placenta ingested by dog

**Sylvatic Transmission**

Deer

Dog (definitive host)

Coyote (definitive host)
Signs, Symptoms, and Pathogenesis

- *Neospora caninum* has a predilection for fetal chorionic epithelium and placental blood vessels. Fetal vasculitis and placental necrosis ensues.

- Tachyzoite cysts form in a number of cells, most notably the brain and spinal cord where they produce neurologic disease. Also macrophages, monocytes, vascular endothelial cells, fibroblasts, hepatocytes, and renal tubular cells can be affected.

- Infected cows are generally unaffected and show no clinical signs besides abortion.

- Calves, when born alive, are typically normal, although they carry the infection in cells within their body.

- Some calves develop neurologic signs when born including ataxia, proprioceptive deficits, and paralysis.

- In dairy herds, the primary outcome of active infection is abortion, while in beef herds, low-weight premature births are more common.
Treatment and Prevention

- There is no known treatment for *Neospora caninum* abortion.
- The best prevention is to prevent fecal contamination of feed.
- A vaccine is available and may prove effective against *N caninum* abortion.
- Once the disease is present in a herd, elimination may be achieved through buying replacement heifers instead of raising them, and serotesting all additions to the herd.
What is the prognosis for our herd, and can the disease be eliminated?

- *Neospora caninum* forms a latent infection. Additionally, infected fetuses can often be born clinically normal but persistently infected. *N caninum* will likely always be present in this herd.

- Persistent infection is believed to have a minimal impact on milk yield but does predispose to future abortion.

- Vertical transmission is the most common method of transmission, so it may be possible to eliminate the disease by buying instead of raising replacement heifers; all heifer calves born to infected cows should be considered infected as well.

- The producer will also have to keep his farm dog and any wild canids away from the cattle feed and prevent the dog from coming in contact with any cow placentas or dead fetuses.
References


