

Neospora caninum a Principal Abortifacient Parasite of cattle

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Neospora caninum is a protozoan parasite of canines and responsible for neuromuscular paralysis in them. It was firstly recognized as new genus in 1984 earlier than that it was mistaken for *Toxoplasma gondii* aside from host differences i.e. toxoplasmosis causes abortion in sheep while *Neospora caninum* in cattle population. Neosporosis is a major cause of abortion in cattle in many countries and according to estimates, the annual cost of *N. caninum* infections and abortions ranges from a median of US \$1.1 million in the beef business in New Zealand to an estimated median impact of US \$546.3 million in the US dairy population. In 1988, infections emerged as major global health concern for both dogs and cattle. Abortions and neonatal mortality are two major problems faced by livestock industry due to infection of protozoan. In Humans serum antibodies are found but parasite was not detected. Thus zoonotic transmission of disease is not clear for now.

Epidemiology:

Cattle infected with *Neospora caninum* typically exhibit sporadic, endemic, or epidemic forms of abortion. When abortion is not present as a clinical symptom, illness frequently progresses undetected. Dogs on and around farms are frequently linked to all types of disease patterns. The recurrence of infection in an already-infected host during pregnancy and the transmission of infection from an infected mother to foetus are frequently linked to endemic forms of disease.

The epidemic form is more likely when mixed rations are consumed, increasing the risk of disease transmission relative to an extensive grazing system, or when water tainted with dog excrement is consumed.

Transmission

Within 1 to 2 weeks after ingestion of tissue cyst dogs, wild canids, such as dingoes, grey wolves, coyotes, which are thought to act as definitive hosts, often excrete the unsporulated oocyst in faeces. The oocyst sporulate to form two sporocyst each of which contain four sporozoites after 3 days. Because of resistant oocyst wall it can survive in harsh climatic conditions. Cattle become infected when they consume these sporulated oocysts. Although these intermediate host are unable to spread the infection the infection horizontally to other animals, the infection can still be passed on to subsequent hosts during carnivorousness on them because it remains latent in their tissues.

Transplacental infection transfer between developing foetus and pregnant dam can happen in cattle. The parasite will therefore be present in subclinical form in the heifers born to infected dams. This type of infection will present in herd in absence of canids around farm premises.

Life cycle:

It is an euryxenous protozoan parasite with similarity of life cycle similar to *Toxoplasma gondii*. The three life stages of *N. caninum* are tissue cysts (bradyzoites), oocysts and tachyzoites. Dogs act as definitive host and in some case also



act as intermediate host. It releases oocyst in faeces which on intermediate host cattle mainly acquire the infection by ingestion of sporulated oocyst along with contaminated food and water. After being discharged into the digestive tract, sporozoites enter cells and divide quickly to form tachyzoites, an asexual phase. After dividing, tachyzoites swiftly move to new host cells, which they commonly infiltrate and destroy. Neural cells, macrophages, fibroblasts, vascular endothelial cells, hepatocytes, muscle cells, including those of the heart and the placenta in pregnant cows have all been reported to have tachyzoites. Transplacental transmission is due to tachyzoite stage from mother to her foetus. When a robust immune response is mounted against the protozoa elsewhere in the body, tachyzoites in neural cells can change into bradyzoites (a slowly dividing asexual phase). The bradyzoites form tissue cysts around themselves for protection; they remain latent until the immune system of the intermediate host is suppressed, allowing them to recrudesce. Cysts have been found in the brain, spinal cord, and testicles.

Clinical signs: In canids with *Neospora caninum* infection young ones show musculoskeletal deformities such as myositis or atrophy of muscle, whereas adult animals suffer encephalomyelitis, focal cutaneous nodules or ulcers, pneumonia and peritonitis. In bovine hosts conditions is mostly associated with abortion in both dairy and beef cattle. Abortion due to *Neospora caninum* is common in 2nd and 3rd trimester of pregnancy mainly at 5-6 month of gestation. Infection and abortion is non season specific and can happen throughout the year. Foetus can be resorbed, mummified, autolyzed, stillborn, born alive with deformities, or born clinically normal but chronically infected. The age of dam, lactation number, and history of abortion generally do not affect rate of congenital infection but there are reports indicating that in persistently infected cattle vertical transmission is more efficient in younger than older cows. Most of the transplacentally transmitted infection are subclinical but can cause birth of weak calves and with neurological problems. Clinical signs in such calves which are congenitally infected include underweight, difficulty in rising, both hind and forelimbs remain in either flexed or hyperextended state. Neurological symptoms include ataxia,

decreased patellar reflexes loss of consciousness. Neonatal calves will have birth defects including exophthalmia, hydrocephalus and narrowing of spinal cord.

Diagnosis:

Abortion is main pathology caused by *Neospora caninum*. Histopathology of aborted fetal tissues, serology and PCR are main methods relied on for diagnosis. Aseptically collected frozen lungs, liver, spleen, adrenal gland, skeletal muscle (e.g. tongue and diaphragm) and placental cotyledon, serum from aborting dam, and thoracoabdominal fluid from the fetus for serology used for diagnosis. Pathognomonic lesion related to abortion of cattle is multifocal cerebral necrosis surrounded by nonsuppurative leucocytic infiltration and seropositivity of aborted dam. In case of canines neospora antibody in serum is much higher in clinical affected cases than subclinical cases. Histopathology of clinical affected tissue will show the nonsuppurative inflammation but immunohistochemistry and PCR will be needed to differentiate from other protozoans.

Treatment: No approved Treatment for bovine abortion. Aborting cows should be given symptomatic supportive treatment and isolated until a diagnosis is made or veterinary advice given if no diagnosis is reached.

Control of Neosporosis: No Available neospora vaccine for cattle or dogs. It is common for dairy and beef herds to have at least a small percentage of neospora infected cattle. Although reducing risk of *Neospora caninum* the complete eradication of infection from herd is practically impossible. Contamination of animal ration and other feed stuff should be avoided. Dog proof fences in areas with feedstuff stored outdoors large dairy herd should be implemented.

Zoonotic importance: Although it resembles *Toxoplasma gondii* but the zoonotic potential is still need to be discovered.

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