



Infectious Causes of Abortion in Small Ruminants

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Introduction

Small-scale livestock producers experience severe financial hardships as a result of the significant problem of abortion in pregnant ewes and does. It is a production-limiting factor because it lowers the number of potential replacement stocks for the flock and milk production and raises the number of unproductive females kept in the flock for extended periods. Abortion causes can be divided broadly into infectious and non-infectious causes. *Coxiella burnetii*, *Chlamydia abortus*, *Brucella spp.*, *Leptospira spp.*, *Campylobacter foetus*, *Listeria spp.*, and *Toxoplasma gondii* are the most often identified infectious causes of abortion in sheep and goats. These infections are also zoonotic, which increases the danger of infection for the agricultural community. Non-infectious causes of abortion in sheep and goats include plant toxins, such as broomweed or locoweed poisoning; dietary deficiencies of copper, selenium, vitamin A, or magnesium; certain drugs such as estrogen, glucocorticoids, phenothiazine, carbon tetrachloride, or levamisole (in late gestation); rough handling (winter shearing, pre-housing dipping, vaccination procedures); metabolic diseases (especially twin lamb disease) and transportation.

Infectious causes of abortion in Sheep

1. Enzootic Abortion of Ewes

Enzootic abortion is caused by *Chlamydia abortus* which has a predilection for the pregnant uterus. Purchasing infected ewes of any age is the main source of infection, accounting for more than 80% of new outbreaks in clean flocks. Wildlife, such as foxes, gulls, and crows, may potentially spread the disease. The most frequent method of transmission is from sheep to sheep, and the lambing period is the most dangerous because diseased ewes release a lot of infectious particles into the surrounding



area. The macroscopic signs of placentitis are similar to that after *Brucella abortus* infection in cattle. Those ewes that are infected late in pregnancy do not abort until the next pregnancy. There may be abortions, premature lambs, weak live lambs, and normal lambs with infected membranes. Ewes may retain fetal membranes leading to metritis, but no other clinical signs are seen.

2. Toxoplasmosis

Toxoplasma gondii is the main causative agent responsible for causing abortion in animals. The cats and other closely similar wild species are the main vectors for the spread of toxoplasmosis. Infectious toxoplasma oocysts can persist on pasture, food, or bedding, for up to two years. They are spread through young cat's faeces, which get infected when they first start to hunt. Although toxoplasms have been demonstrated in the semen of experimentally and naturally infected rams, infection of the ewe at tugging would be unlikely to cause abortion. During acute infections, toxoplasmas can also spread through milk. After ingestion an oocyst, toxoplasma can be found in the uterine caruncular septa 10 days later, in placental trophoblast cells 10 to 15 days later, and toxoplasma-specific fetal antibody 30 days later. After infection, sheep are considered to remain persistently infected for life, to be immune to the parasite, and therefore unlikely to abort again with toxoplasmosis. Foetal resorption typically takes place if it happens early in the pregnancy, or before 60 to 70 days, with the ewes either going back into oestrus or remain barren. Cotyledons, often known as "frosted strawberries," are bright to dark red with numerous little white necrotic foci that range in diameter from 1 to 3 mm.

4. Campylobacteriosis:

Campylobacter jejuni and *Campylobacter fetus fetus*, can cause abortion in ewes. In contrast to cattle, where the primary site of infection is the venereal system, the primary site of infection in sheep is through ingesting food or mainly intestinal. Abortions cause lateral spread to additional vulnerable pregnant ewes. The only clinical manifestation of the illness is abortion, which typically occurs in the final six weeks of pregnancy; lambs delivered at term may die or be born weak. Following an abortion, metritis can develop, and some ewes may get sick or even die. For up to 18 months, asymptomatic carriers may expel the bacteria. The aborted foetus appears healthy and lacks any obvious gross pathology, but in around 25% of them, the liver has distinctively shaped, grey, necrotic foci that are 10 to 20 mm in diameter. Aborted materials should be properly disposed off, as the disease is zoonotic in nature. Avoid infecting sheep over 3 months in lamb or wildlife that can later act as reservoirs of infection.



5. Listeriosis

Listeria monocytogenes and *Listeria ivanovii* can cause abortions in sheep, generally in late pregnancy. Often weak lambs are born, and grey/white miliary foci of necrosis may be seen in the foetal liver (so-called 'sawdust liver'). The placental villi are necrotic, and the chorion is covered with a brownish red exudate; there is a heavy brown vaginal discharge, and rarely death of the ewe occurs from metritis or septicaemia. After ingestion in advance pregnancy, the organism penetrates the gut mucosa and infects the fetus, causing a septicaemia and placentitis, both of which may kill the fetus. *L. monocytogenes* is ubiquitous, frequently found in soil but also isolated from foodstuffs and faeces of healthy animals. Penicillin and amoxicillin are the most appropriate and commonly prescribed antibiotics for listeriosis.

6. Border Disease

This disease was first recognised in flocks along the English–Welsh border in the 1950s, affecting newborn lambs that showed neurological symptoms such as tremor and a coarse fleece (so-called 'hairy shakers') and were generally weak with a high mortality rate. Abortion can happen at any stage of pregnancy; however, it is most prevalent around 90 days when a brown, mummified, or bloated anasarca foetus is voided. The condition is brought on by infection with a pestivirus related to that which causes European swine fever and bovine viral diarrhoea (BVD) in cattle.

7. Brucellosis

The causative agent for brucellosis in Sheep can be both *Brucella melitensis* and *B. ovis*. It causes abortions, stillbirths, or weak lambs in late pregnancy. Similar placental lesions have been linked to *B. abortus* infection in cattle. Vaccines against *B. melitensis* or *B. abortus* S19 can be used to control the disease. The ram is primarily affected by *B. ovis*, which shows epididymitis and eventual infertility or sterility.

Infectious causes of abortion in Goat

1. Brucellosis

In animals those affected with Brucellosis, *Brucella melitensis* is the principal organism involved in abortions as compared to *B. abortus* which is occasionally involved. It causes abortion in late gestation, stillbirths, or weak kids; after the first exposure, abortion may be in the form of a storm. Abortion may be accompanied by mastitis and lameness and is most common in the fourth month of gestation. The placenta is grossly normal, but chronic uterine lesions may develop. Infection in adults is lifelong, with organisms shed in the milk. It is important to remember that *B. melitensis* is of zoonotic importance.



2. Caprine Herpes Virus

Caprine herpesvirus 1 is closely related to infectious bovine rhinotracheitis virus of cattle and causes sporadic outbreaks of late-term abortions often unassociated with other clinical signs. In adult goats the virus may cause vulvovaginitis, balanoposthitis, and respiratory disease also enteric and systemic diseases in neonatal goats. Foetuses can be fresh or autolyzed and do not contain diagnostic gross lesions. Definitive diagnosis is by identification of caprine herpesvirus 1 by isolation, PCR, or immunologic staining methods. Not all foetuses contain lesions or virus, so multiple foetuses should be submitted. During stress period infected goats may shed the virus.

3. Chlamydiosis (Enzootic abortion)

In Chlamydiosis, abortions can occur at any stage of pregnancy, but most of them are in the last month of gestation. Reproductive failure is usually the only sign of *C. abortus* infection, but occasionally there are other signs such as concurrent respiratory disease, polyarthritis, conjunctivitis, and retained placentas in the flock. Aborted fetuses are usually fresh with no gross pathological lesions. Placentitis is usually present and consists of reddish-brown exudate covering cotyledons and inter-cotyledonary areas. The placenta is the specimen of choice, but sometimes the diagnosis can be made by testing liver, lung, and spleen. During an outbreak, aborting does should be isolated, and tetracyclines given orally or parentally. Like sheep, goats that abort are immune. Sheep that abort due to *C. abortus* remain infected for years, if not life, and shed the organism during ovulation; whether this occurs in goats is not known. *C. abortus* is of zoonotic importance, occasionally causing serious disease in pregnant women.

4. Q fever

Coxiella burnetii is increasingly recognized as an important cause of Q fever. Occasional outbreaks also occur in sheep. Late-term abortions, stillbirths, and weak lambs are the common findings. Up to 50% of the flock can be involved. Grossly the placenta is covered by gray-brown exudate and the inter-cotyledonary areas are thickened. Microscopically, there is a necrotizing vasculitis in the placenta, and many chorionic epithelial cells are distended by small, coccobacillary organisms < 1 mm in diameter. Diagnosis is by identification of *C. burnetii* by immunologic staining methods, PCR, or by isolation of the organism.

5. Leptospirosis

The most common serovars of *Leptospira* involved in caprine abortion are grippityphosa, pomona, icterohaemorrhagiae, and autumnalis. Although sheep are relatively resistant to leptospirosis as goats are more susceptible, with abortions occurring at the time of leptospiremia.



Affected does show different symptoms like some have anemia, icterus, and hemoglobinemia; others may appear as afebrile and are not icteric. Diagnosis is by serology or identification of *Leptospira* spp., in dam's urine, placenta, or fetal kidney.

6. Listeriosis

Listeria monocytogenes is a common pathogen in goats which causes sporadic abortions. There are no specific fetal lesions, and the fetus is often autolyzed. Does usually show no signs before abortion but may develop severe metritis after abortion. Diagnosis is by isolation from the placenta, abomasal contents, or uterine discharge. In the rare case of a herd outbreak, preventive treatment with tetracycline is recommended.

7. Toxoplasmosis

Toxoplasma gondii is the responsible for infectious goat abortion. If animal is affected in early period of gestation it results in fetal death with resorption, or abortion of kids, which may be stillborn, alive but weak, or normal, depending on the time in pregnancy that the doe was exposed. During an acute infection, toxoplasma may be excreted in the milk and be a source of human infection if the milk is drunk unpasteurised. As in sheep, domestic cats and wild Felidae play a critical role in the spread of the disease.

8. Campylobacteriosis

Campylobacter spp., probably *C. jejuni* and possibly *C. fetus fetus* is the main cause of infection in animals. Does may or may not show evidence of a systemic illness and may abort in late gestation or produce stillborn or weakly kids and have a postabortion muco or sanguineous purulent discharge.

Conclusion

Infectious agents are the major cause of abortion in small ruminants. The common sources of infectious agent are aborted foetus, placenta, uterine fluids, and vaginal discharge of infected dams which also hold zoonotic risks for farming communities. Therefore, it is of prime importance to monitor the signs of diseased animals in order to follow the treatment of diseased animals as well as management of unaffected flock. Proper vaccination should be followed to avoid infection in the animal. Proper management will ultimately save the farmers from financial crises that arise due to production losses as well as loss of lamb/ kid due to abortion.