

Prevention and control of ovine abortion: test, don't guess



In this article, Elisabeth A Innes, David Longbottom and Morag Livingstone from Moredun Research Institute and Sarah Campbell from MSD Animal Health, focus on the two main causes of ovine abortion, *Toxoplasma gondii* and *Chlamydia abortus*. They present the transmission routes of the pathogens and explore diagnostics, disease prevention and control strategies

Losses occurring from infectious causes of abortion in sheep can be devastating for farmers due to the economic and welfare impacts associated with the diseases. It is vital that you make best use of the diagnostics available to understand more about the problem you are dealing with and to develop an appropriate treatment and disease-prevention plan. The economic losses associated with abortion can be significant and a recent paper looking at the impact of enzootic abortion of ewes (EAE), one of the leading causes of infectious abortion, reported that losses can be as high as 26% of a flock (Carson and Reichel, *Veterinary Record*, 2019). Such losses have resulted in some farmers deciding to stop breeding sheep, although they are often unaware of the options open to them to help in the treatment or control of infections and the associated cost-benefit of applying such options. Thus, it is important to maximise current available knowledge on the causes of disease and work with their vets to develop and apply appropriate health planning and preventive measures. It has been reported that the average cost of losing a neonatal lamb is around £25, whereas the cost of vaccination is approximately £2.40 per ewe (Carson and Reichel, *Veterinary Record* 2019), illustrating the significant cost benefit of applying appropriate disease-prevention strategies, as well as providing clear welfare benefits for the animals.

The key to developing an effective health plan is to understand the disease issues you are dealing with and this involves the application of appropriate diagnostic tests to find out as much as you can about the pathogens present in your flock. This will: enable informed choices about the best disease prevention strategies for the flock to improve the health and welfare of the animals; improve production efficiency leading to economic benefits; and reduce the potential for zoonotic transmission of certain pathogens associated with abortion in sheep.

CAUSES OF INFECTIOUS ABORTION

Surveillance data from the *All-island Animal Disease Surveillance Report* in 2016 [<https://www.afbini.gov.uk/publications/all-island-animal-disease-surveillance-report-2016>], covering information from the Agri-Food and Biosciences Institute (AFBI) and the Department of Agriculture, Food and the Marine (DAFM) showed that the leading diagnosed causes of infectious ovine abortion in Ireland were, *Toxoplasma gondii* (40.2%), *Chlamydia abortus* (26.1%) and *Escherichia coli* (16.5%). Other microorganisms that can be associated with ovine abortion include *Campylobacter* species, Schmallenberg virus, *Salmonella* species, *Listeria monocytogenes*, Border Disease Virus and *Coxiella burnetii* (Q-fever).

OVINE TOXOPLASMOSIS

Toxoplasma gondii is a protozoan parasite that can infect a large number of animal species, including humans. The cat is important in the life cycle of the parasite as *T. gondii* develops in the cat gut and oocysts (eggs) are shed in the faeces where they can persist in the environment for many months and are a source of infection for sheep and other animals. Work at Moredun has shown that as few as 200 of these *T. gondii* oocysts can cause infection and abortion in susceptible ewes. Infected cats can shed millions of oocysts in their faeces over a one-to-two-week period following a primary infection and then the cats develop immunity and are less likely to shed the parasite. Young cats are the main shedders of the parasite and, therefore, it is good practice to have resident, neutered and healthy cats on the farm.

T. gondii is transmitted to sheep through the consumption of infective oocysts on pasture or in contaminated feed. If infection occurs in a naïve ewe while she is pregnant, serious disease and abortion of the foetus may occur, due to the parasite invading the placenta and infecting the developing foetus. See Figure 1.

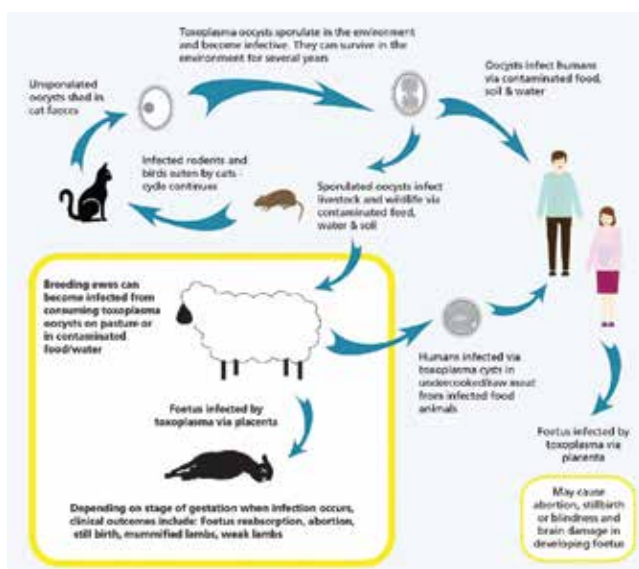


Figure 1: Transmission routes of *Toxoplasma gondii* and disease risk.

Sheep develop immunity following a primary infection, which will protect against disease in a subsequent pregnancy. Once sheep become infected with *T. gondii*, they will remain persistently infected with tissue cysts containing very slow-growing parasites and these can be found in the brain, heart and other tissues of the sheep. Consumption of undercooked meat from *T. gondii*-infected food animals is common route of transmission to people.

Abortion storms may occur if a flock of naïve pregnant sheep become infected with *T. gondii* for the first time resulting in high losses. *Toxoplasma* is not spread between sheep in a flock and is only transmitted through consumption of the oocysts.

Accurate diagnosis is really important when dealing with a

disease outbreak in the flock to make sure that appropriate measures are taken to minimise losses and reduce further pathogen transmission. It is good practice to isolate the aborting ewe and to clean up aborted material and any bedding and to get a diagnosis as soon as possible. The dead lamb, foetal fluids and any placental material, if available, should be sent to the regional veterinary. Tissues will be examined for the presence of *T. gondii* and associated lesions using histopathology and molecular based diagnostic tests. Blood samples and foetal fluids can be tested for the presence of specific antibodies against *T. gondii* which would indicate exposure to the parasite.

As the infection is spread from consumption of *T. gondii* oocysts on pasture or in contaminated feed, it is difficult to prevent infection occurring through the maintenance of a closed flock. There is also no risk of introducing toxoplasmosis to a flock through the purchase of replacement animals. Feed bins should be kept closed to prevent cats gaining access. Cats should also be kept away from stored hay and bedding. There are no drugs that can cure infection with *T. gondii* although there has been some research looking at the use of the coccidiostat decoquinate during pregnancy where it may help to reduce vertical transmission of the parasite in susceptible ewes.

Vaccination is an effective means to reduce the risk of *T. gondii* abortion and this works by inducing protective immunity in the ewe prior to mating. Be sure to administer a vaccine by strictly adhering to the manufacturer's instructions to maintain efficacy. Particular attention must be paid to the expiry date and the storage conditions required for the vaccine. Vaccination of breeding and replacement ewes is an effective way of ensuring effective immunity against disease in the flock. As *T. gondii* is also a zoonotic pathogen, pregnant women and immunocompromised individuals are at particular risk from infection and should avoid contact with ewes at lambing time.

ENZOOTIC ABORTION OF EWES (EAE)

Enzootic abortion of ewes is caused by infection with the bacterium *Chlamydia abortus*. Similar to *T. gondii*, *C. abortus* is zoonotic and can also cause serious life-threatening infection in pregnant women, as well as spontaneous abortion of the developing foetus. Infected lambs, placentas and vaginal excretions are the major sources of transmission of *C. abortus*, with infection spreading to other susceptible ewes through inhalation or ingestion of the bacteria. Infected ewes in lambing pens or in fields that have not aborted also pose a significant risk as they may shed live infective bacteria at lambing on the coats of live lambs, on placentas and in the vaginal excretions accompanying birth, which can then contaminate the environment and be transmitted to other ewes.

Following infection, *C. abortus* is dormant in the ewe until pregnancy where a change in the immune response of the ewe causes the bacteria to become active again, following which *C. abortus* will invade the placenta resulting in foetal

death and abortion, or the birth of weak and/or live lambs. Abortions typically occur in the last few weeks of pregnancy, and work at Moredun has shown that regardless of when sheep become infected, *C. abortus* does not actively cause disease until after 80-90 days of pregnancy. A sign that something is wrong is usually the appearance of a stillborn lamb two to three weeks early and the affected ewe may also display a vulval discharge a day or two prior to this. Some of the stillborn lambs may show a pot-bellied appearance due to fluid collecting under the skin. The ewes usually appear healthy after the abortion, although they may still excrete a vulval discharge containing lots of infectious bacteria for a few days. The placenta in a *C. abortus* infection is characteristically discoloured and thickened due to being filled with fluid, as well as necrotic due to the multiplication of the bacteria in the placenta invoking a strong inflammatory immune response. It is this necrosis that severely compromises the ability of the placenta to support foetal growth and survival and ultimately results in abortion occurring.

Vaginal discharges, dead lambs and placentas are all important sources of *C. abortus* for other susceptible ewes, so it is very important to isolate aborted ewes until the infective vulval discharges dry up, which can take up to 10 days. The placental materials and bedding should be disposed of safely to reduce the risk of spreading the infection further to other susceptible ewes in the flock. If susceptible ewes at an early stage of pregnancy come into contact with the infective material they may also suffer an abortion later in pregnancy in the same lambing season, whereas other ewes may harbour a dormant infection which then becomes active in a subsequent pregnancy and lead to subsequent abortion. This can result in a few abortions occurring in the first year and if they are not diagnosed and acted upon, can lead to devastating losses in the flock in the subsequent year due to the spread of infection within the flock.

Getting an accurate diagnosis is essential to enable appropriate interventions. This will usually involve the submission of the aborted lamb and/or placental material to a regional veterinary laboratory for investigation. The lab will examine the tissues for lesions associated with *C. abortus* along with identifying the organism. See Figure 2.

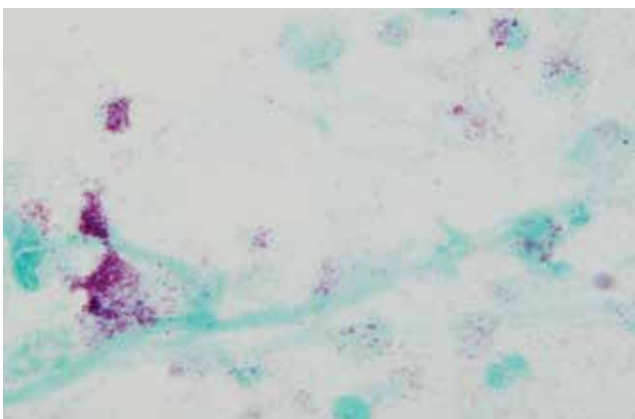


Figure 2: Placental smear stained with modified Ziehl-Neelsen showing the presence of *Chlamydia* (pink stained organisms).

Moredun has recently developed a blood test to detect *C. abortus* antibodies (MVD-Enfer *Chlamydia abortus*-specific ELISA) that can be used to help confirm the cause of abortion. Blood samples can be collected at the time of the abortion, followed by a second sample taken approximately three weeks later, which would indicate an active *C. abortus* infection.

During an active disease outbreak due to *C. abortus*, treatment with long-acting oxytetracycline may reduce the severity of the infection if it is given at 95-110 days of gestation, the timing of administration is important to have the best chance of being effective against the infection. However, it is important to note that antibiotic treatment does not necessarily prevent abortion occurring if the damage to the placenta has already happened, additionally infectious organisms can still be shed during birth if the antibiotics have not killed all the organisms. For these reasons, but also because of the potential for antibiotic resistance, which has already been observed in pigs for another related *Chlamydia* species, the use of antibiotics is not recommended for controlling infection.

Ewes that have aborted due to *C. abortus* develop good immunity, which protects them against subsequent disease and, therefore, vaccination is the best option to help control the disease. Currently, in Ireland a modified live vaccine option is available to protect against abortion due to *C. abortus*. If there is an abortion problem in the flock, vaccination is the most effective way to manage the disease. The vaccine should be administered prior to tupping and should not be used on ewes that are being treated with antibiotics. Live vaccines also have a short shelf life and should be used strictly according to manufacturer's instructions to ensure efficacy. Furthermore, vaccines must not be handled by pregnant women as they are live and could cause infection.

In flocks that are free of infection with *C. abortus*, the best management option is to prevent infection from coming into the flock. Purchasing replacement stock is a very common way to introduce infection. Therefore, care should be taken when buying in new stock to ensure that they are not mixed with the home flock unless they have been vaccinated or come from known accredited flocks.

As *C. abortus* is a zoonotic pathogen with the potential to cause serious disease, it is important that pregnant women avoid all contact with ewes at lambing time. It is also important that farmers, stockholders and vets with pregnant partners practise good hygiene to avoid transmission of infection via direct contact or via contaminated clothing.

In all cases when dealing with infectious agents that cause abortion in ewes, the most important thing is to get an accurate diagnosis. Knowledge of the situation will enable the right prevention and control strategies to be implemented, which will be a significant health and welfare benefit to the animals and an economic benefit to the farm business.