Moredun
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Infectious Causes of Abortion in Sheep – Part 1

Enzootic Abortion & Toxoplasmosis



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key points

Overview/Summary

Pathogen	Control Measure									
C. abortus										
T. gondii										

Key

 Muck out and disinfect between animals

 Zoonotic Risk

 Diagnose

 Dispose of waste appropriately

 Vaccine available

 Isolate aborted ewes

 Keep a closed flock/quarantine replacements

 Treatment available - speak to your vet

 Control cat access

 Buy accredited replacements

- Abortions should always be treated as infectious until proven otherwise
- Quickly isolate aborted ewe(s) & potentially infectious material (e.g. placenta)
- Submit samples to a veterinary diagnostic lab and identify the cause of abortion
- Put prevention methods in place and use vaccines to prevent disease wherever possible

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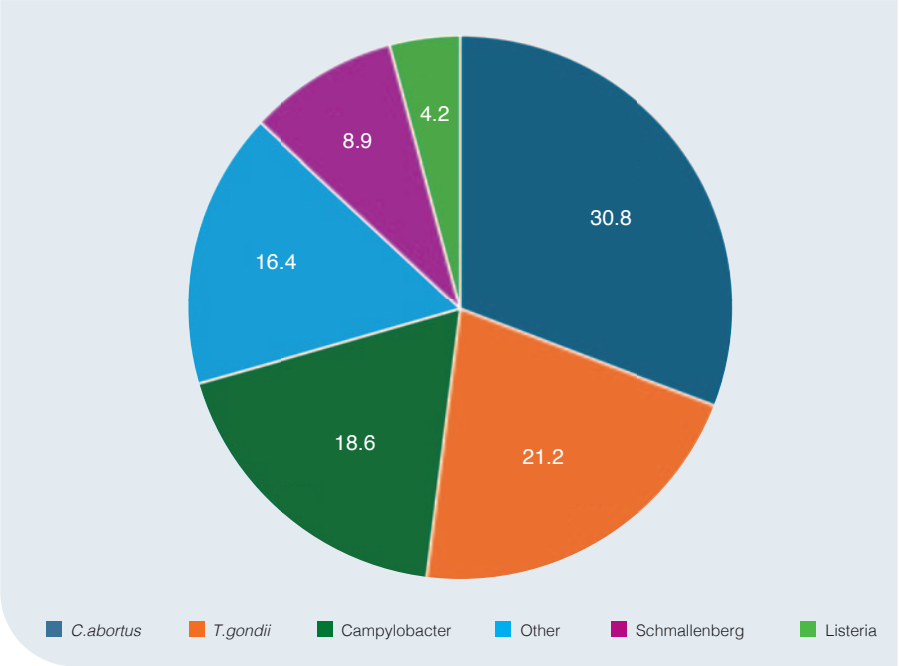
introduction

Infectious abortion is one of the major health problems faced by sheep farmers and has a significant financial impact on production, as well as animal welfare.

A wide range of pathogens, including bacteria, viruses, and parasites, can infect sheep and cause abortions. In the UK, the most important are *Chlamydia abortus*, *Toxoplasma gondii* and Campylobacter Spp. Other pathogens involved in infectious abortion in sheep include Schmallenberg virus, Bluetongue virus, *Coxiella burnetii* (Q-fever), Salmonella Spp, Listeria Spp and other bacteria and fungi.

The most commonly diagnosed infectious causes of ovine abortion in GB between 2020 and 2026, as reported on the APHA sheep Dashboard[1] are shown in Figure 1.

Figure 1:
Diagnosed infectious causes of ovine abortion in GB 2020 – 2026 (accessed 27th July 2026)



[1]*https://public.tableau.com/app/profile/siu.apha/viz/SheepDashboard_/SheepDashboard (accessed 27-07-2026)*

The dashboard is updated on a monthly basis and shows the number of diagnoses made in each county. A higher count may be due to more submissions from a county with a large number of sheep or sheep holdings, better vigilance among the local farmers and vets or more use of the GB diagnostics network in a particular area. The data and maps can't be used to make inferences on the amount of disease within, or between, individual counties.

Enzootic Abortion of Ewes *(Chlamydia abortus)*

Enzootic Abortion of Ewes (EAE) is a highly contagious bacterial disease caused by the bacterium *Chlamydia abortus*, leading to late-term abortions, stillbirths, and reproductive losses in sheep flocks.

The causal agent of EAE (also known as ovine enzootic abortion (OEA), ovine chlamydiosis and chlamydial abortion) was identified by scientists at the Edinburgh Veterinary Investigation Centre and Moredun in 1950.

Infection with *C. abortus* most commonly causes abortion in sheep and goats, but can also cause abortions in other animals, including pigs, cattle and horses. The bacterium is zoonotic (can infect humans) and is dangerous to pregnant women and the developing foetus.

When does it occur?

Typically, EAE abortions in sheep occur in the last few weeks of pregnancy, usually in the last 15 days of gestation. The disease in a flock appears in the last couple of weeks of the expected lambing date as aborted foetuses or a stillborn lamb or weak lamb with low weight that may die within the first couple of days of life.

Usually, the ewe appears fit and well, but in some cases, there may be a red-brown vaginal discharge.

It is also possible for the ewe to produce both dead foetuses and/or live lambs that may be weak or healthy. Ewes are normally healthy following abortion but will still excrete a dirty vulval discharge. The placentas of infected ewes typically, but not always, have a characteristic appearance with discoloured cotyledons, thickened membrane and there are also often partially or completely covered with a cream-coloured exudate. In contrast, a healthy placenta is red with translucent and thin membranes between the red cotyledons.

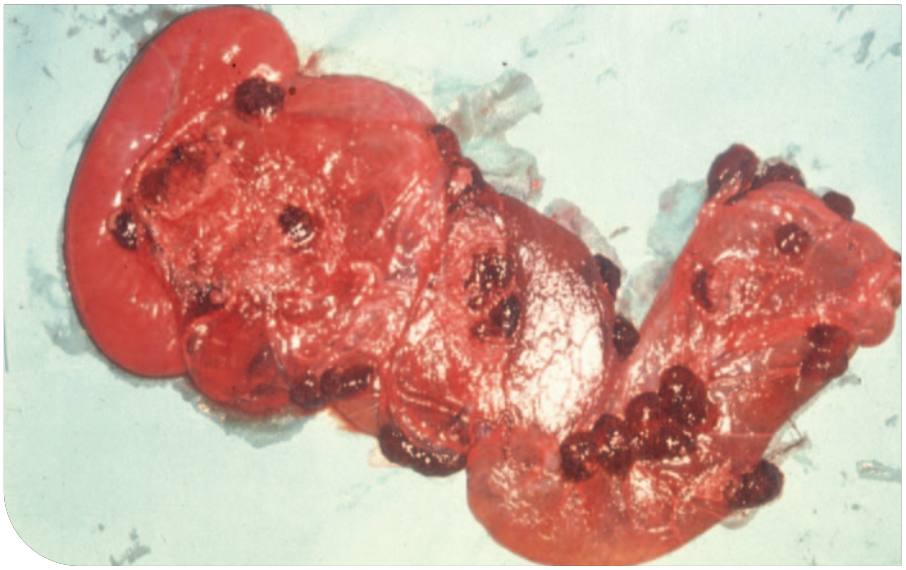


Photo: David Henderson



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How does it spread?

Typically, the introduction of *Chlamydia* into the flock results in low levels of abortion in the first year. However, the following year is when problems will likely occur with an "abortion storm", with up to 30% of the flock affected. The disease may be maintained in the flock through the infected material, such as vaginal discharges, dead lambs, placentas and other birthing materials from aborting ewes, which are heavily contaminated with bacteria or, less commonly, by infected lambs born from infected ewes. As the abortion occurs in the last weeks of gestation, the naïve ewes will have access to them after lambing or just before lambing time, which is why they won't abort in the first year, but in the successive season, maintaining the disease in the flock.

In naïve ewes it is also possible for the infection to remain in the body until the following pregnancy, when it is reactivated, resulting in late term abortion. This means that it is possible for a small number of infected ewes to abort and spread the infection unnoticed, leading to the abortion storm in subsequent years.

Once an ewe has aborted due to *C. abortus* she becomes immune and will not abort again but may still shed bacteria in future. While *C. abortus* is not transmitted in milk, fostering orphan lambs onto an ewe which has aborted can result in the orphan lamb becoming infected by contact with infected vaginal discharge.

Biosecurity

Preventing the introduction and spread of *C. abortus* requires strict biosecurity measures, including quarantine and testing of incoming stock and hygienic lambing practices to limit environmental contamination, and vaccination to reduce the presentation of abortions. However, eradication within the flock would take some years because *C. abortus* is a resilient bacterium that can survive for months in the environment.

During an outbreak

During an outbreak, the main aim is to prevent the spread of the infection within the flock. It also should be remembered that it is a zoonotic risk, meaning that it can infect humans. People must wear gloves and use plastic bags to collect any foetus or placenta, avoiding direct contact. Pregnant women and immunosuppressed people should exercise special caution because infection with this bacterium can cause several diseases that may result in death.

Aborted foetuses, dead lambs, placentas, and discharge from the infected ewe are all sources of infection for naïve animals.

Birthing materials and contaminated bedding should be handled carefully and disposed of appropriately. Ewes that have aborted or given birth to stillborn or weak full-term lambs should be isolated from other sheep until vulval discharges dry-up (7 – 10 days).

Pens where ewes have aborted should be cleaned and disinfected thoroughly and, if practical, should not be reused. *Chlamydia abortus* can survive acid or alkaline disinfectants, so isopropyl alcohol or quaternary ammonium compounds may not be effective. To properly disinfect the pens that might be contaminated, it is better to use strong disinfectants like household bleach or chlorophenol-based cleaners.

Infected materials should not under any circumstances be handled by pregnant women or immunosuppressed people, and everyone should take precautions regardless.

Buying replacements

Strategies for controlling enzootic abortion will depend on the status of your flock. In a naïve flock, free from *C. abortus*, the aim will be to prevent bringing the disease into the flock.

Replacement animals should be quarantined until vaccinated, unless purchased from a Premium Sheep & Goat Health Scheme (PSGHS) flock (Scotland). If the flock status is unknown, a proportion of the flock must be tested to confirm antibody levels and determine status.

Treatment

Long-acting oxytetracycline is an emergency measure that may reduce the number of abortions in the current breeding season. However, it is not guaranteed to eradicate disease at the flock level, cannot reverse heavy infections or prevent shedding, and its prophylactic use could potentially lead to the emergence of resistance. You must seek veterinary advice before using antibiotics to treat EAE.

Diagnostics

Accurate and timely diagnosis is crucial for controlling EAE and minimising losses.

The preferred method for diagnosis of EAE is by submission of the placenta, vaginal swabs and/or aborted lambs to a local veterinary diagnostic laboratory for investigation. Examination of the placenta to identify characteristic changes associated with chlamydia, looking for the bacterium in tissues, and molecular testing of samples can provide a definitive diagnosis. Vaginal swabs taken shortly after lambing are a good complementary sample that helps to diagnose, even when the placenta cannot be found.



Vaccines

Vaccination is still the most effective way of reducing environmental contamination and disease spread, and, therefore, protecting sheep from abortion. Several vaccines are available in Europe and the UK (live attenuated and inactivated).

Live attenuated vaccines provide a high level of protection against *C. abortus* and reduce abortion rates. However, they have some downsides: expensive and requires containment facilities to produce, operator safety concerns, and some evidence suggests that the vaccine strain may cause abortion and placentitis in some cases. Live vaccines must be administered prior to tupping and cannot be used in pregnant animals or in animals currently undergoing treatment with antibiotics.

Inactivated vaccines can reduce the incidence of abortions, can be used in pregnant animals and can reduce disease spread, but not completely.

Risk to human health

Chlamydia abortus is zoonotic and is a particular risk to pregnant women and immunocompromised individuals. Infection in pregnant women can result in miscarriage and cause severe illness in the mother, including death.

Pregnant women and immunocompromised people should avoid all contact with lambing ewes and should not handle contaminated material or clothing from those working with newly lambed ewes or newborn lambs.

Live vaccines can also be a risk to such individuals and should not be handled or administered by them. There are no vaccines available to protect humans from infection with *C. abortus*.

Work at Moredun

Moredun is developing a next-generation vaccine using several approaches including recombinant antigen-based subunit vaccines, platform-based vector delivery vaccines and genetic whole strain approaches.

A subunit vaccine would also enable a companion diagnostic test which distinguishes between naturally infected and vaccinated animals (DIVA-compatible) to be developed, as well as a rapid, easy-to-use assay to allow for pen-side testing, flock management and surveillance.

Toxoplasma gondii

Toxoplasmosis is an extraordinarily successful parasitic disease caused by the protozoan parasite *Toxoplasma gondii*. It can infect animals and humans and is a major cause of reproductive and production losses in livestock and poses health risks to immune compromised individuals and pregnant women.

Toxoplasma gondii remains widespread in UK sheep populations. Studies indicate that 30–80% of UK sheep have been exposed to the parasite, with regional variations influenced by climate, farming practices, and age of animal.

When does it occur?

If ewes become infected with *Toxoplasma* for the first time during pregnancy, the consequences for the developing foetus can be very severe. The severity varies based on the timing of the infection with infection early in pregnancy resulting in a more severe outcome.

In early pregnancy, infection is likely to result in resorption of the foetus with the ewe returning to service or remaining empty. If infection occurs in mid-pregnancy, foetuses are often mummified or aborted a few days before the expected lambing date. In late pregnancy, infection may not be fatal to the foetus, and lambs that survive are born live but may be weak and many will die shortly after birth.

It is possible for ewes to give birth to a live lamb with a mummified, leathery twin.

The placentas of ewes suffering from toxoplasmosis abortion may have small white, chalky areas in the cotyledons. These are caused by necrosis (cell death) and calcification in areas of the placenta due to damage caused by multiplication of the parasite.

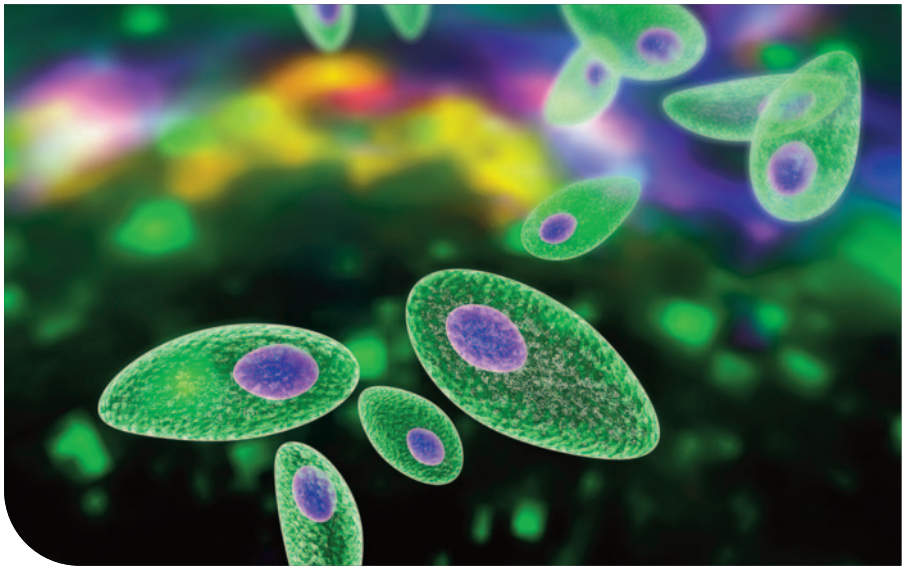


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How does it spread?

Felids (domestic cats and members of the cat family) are the definitive host of the parasite (i.e. cats are the only animals where the parasite completes its lifecycle resulting in oocysts being shed in the faeces). Cats usually become infected with the parasite after eating wild birds and rodents that have been infected themselves and have parasite cysts in their tissues. Birds and rodents do not spread the parasite to sheep. Cats can shed millions of tough-shelled oocysts (the egg form of the parasite) in their faeces. The oocysts are very durable and can survive for long periods of time in the environment, especially in temperate, moist conditions. Once infected, cats develop immunity to the parasite and do not usually shed oocysts again unless they have an immune-compromising condition, such as FIV. Provided they have a healthy immune system, cats typically only shed oocysts for a couple of weeks, at which point they will develop protective immunity against the parasite and stop shedding. If cats are present on a farm for rodent control, it is good practice to have older, neutered cats.

Sheep become infected via the ingestion of infective oocysts on pasture or in contaminated feed or water. If infected for the first time during pregnancy the sheep may abort the foetus; however, in non-pregnant sheep infection is usually asymptomatic, or there may be a transient fever or lack of appetite. Following infection, the parasite forms cysts in the tissues of the animal, including brain, heart, and skeletal muscles, and they can remain viable for the lifetime of the host. Like cats, once infected, sheep are immune to further infection with the parasite and are very unlikely to abort due to *T. gondii* in future pregnancies. As few as 200 infective oocysts can cause Toxoplasmosis - not many when you consider that one cat can shed enough oocysts to infect thousands of sheep!

It is not possible for *Toxoplasma* to spread directly between sheep; ewes must ingest infective oocysts to become infected. Abortion storms caused by *T. gondii* are less common than those caused by *C. abortus* but not impossible. An abortion storm caused by *T. gondii* may occur when a flock of naïve sheep are all infected at the same time, for example, via contaminated feed or water.





Biosecurity

It is important to keep feed bins/stores covered to prevent cats defecating in them. Be aware that cat faeces containing infective oocysts can also contaminate fodder and bedding materials too. Implementing an effective rodent control plan on farm can help reduce sources of infection for cats. It is useful to neuter all farm cats to avoid the production of further kittens that can act as a new source of infection.

For *Toxoplasma* specifically there is no advantage to quarantining newly purchased or returning ewes as the parasite cannot be passed from sheep to sheep. However, it is very important to have a quarantine procedure in place for many other infectious diseases.

Retaining ewes that have aborted due to *Toxoplasma* is advisable as these ewes will be protected against future *T. gondii* related abortions. All new sheep can then be vaccinated.

Treatments

There are no effective treatments once an animal is infected.

Diagnostics

Accurate and timely diagnosis is crucial for controlling toxoplasmosis and minimising losses.

The main use of diagnostics is on foetal or placental tissue to determine the cause of abortion. Serological tests such as ELISA and indirect fluorescent antibody tests (IFAT) are commonly used to detect antibodies in blood samples, providing high sensitivity and specificity for assessing past exposure in breeding flocks. However, these tests cannot distinguish between previous exposure and active infection in the ewe.

Detection of *Toxoplasma* antibodies in foetal blood can indicate infection.

Histopathology, which involves examining foetal tissues for characteristic lesions, provides definitive confirmation of toxoplasmosis as the cause of abortion. It is important to ensure that the correct samples are collected appropriately and provided for an accurate diagnosis.

Molecular diagnostic techniques (PCR) can detect *Toxoplasma* DNA in tissue samples.





Vaccines

Vaccination of replacement stock before mating is the most effective strategy for controlling toxoplasmosis in sheep and reducing reproductive losses. There is a licensed vaccine (live, attenuated) in the UK (Toxovax®, MSD) which provides strong protection for two lambing seasons. Sheep should be vaccinated at least three weeks prior to mating, and the vaccine cannot be given to pregnant sheep.

As a live vaccine, special care must be taken to follow the manufacturer's instructions regarding storage and expiry date. The vaccine has a short shelf-life so must be used before the expiry date to ensure efficacy. Pregnant women and immune-compromised people should not administer the vaccine.

Risk to human health

Toxoplasma gondii is a zoonotic parasite and is a particular risk to pregnant women and immune compromised individuals. Primary infection in pregnant women can result in miscarriage or congenital defects, and in immune compromised people infection can cause serious disease, and in severe cases, death can occur. Most of the time infection in immune competent people (those with a normally functioning immune system) is asymptomatic, or in a small number of people it causes a mild, flu-like illness.

However, in other areas, such as South America, there are strains of *T. gondii* that are more virulent than the strains found in the UK and Europe, and infection with these strains can cause eye disease including blindness even in healthy people. The main transmission routes of *Toxoplasma* to humans are via ingestion of oocysts in contaminated food or water or eating undercooked meat containing tissue cysts.

Cooking meat thoroughly (internal temperature of >67°C) or freezing (-20°C for a minimum of three days) it prior to cooking inactivates the parasite removing the risk of infection. Fresh produce should be washed thoroughly before consumption.

Pregnant women and immune compromised people should avoid all contact with lambing ewes and should not handle contaminated material or clothing from those working with newly birthed ewes or newborn lambs. They should also avoid handling or administering the live vaccine to sheep. Care should also be taken when cleaning cat litter trays, gardening, or working anywhere that cats may have defecated.

There are no vaccines available to protect humans from infection with *T. gondii*.

Work at Moredun

Moredun are investigating the use of *Toxoplasma gondii* as a vaccine delivery system (both antigen and adjuvant); such a system would provide protection against *Toxoplasma gondii* and other pathogens that have their antigens expressed as part of the vaccine. We are also investigating *Toxoplasma* vaccine targets for a cheaper, safer vaccine with enhanced shelf life.

Moredun researchers are also engaged in research to identify novel RNA-based parasite molecular markers, to try and establish a diagnostic method that would sensitively and specifically detect an active infection and would not require access to tissue samples.

What can I do now to protect my flock next lambing season?

Now is a good time to start thinking about how you can protect your flock next year.

Actions to take now to protect against toxoplasmosis

Plan vaccination of replacement ewe lambs and gimmers

Vaccinate before tupping, allowing at least three weeks between vaccination and mating → Vaccination provides long-lasting protection and is one of the most effective control measures.

Review cat management

Discourage cats from entering feed stores, straw sheds and lambing buildings.

Cover concentrates and mineral buckets to prevent contamination.

Avoid encouraging large populations of feral cats around the farm.

Store forage, concentrates and bedding where cats cannot access them.

Remove any feed suspected of contamination.

Identify susceptible groups

Homebred older ewes may be immune following previous exposure.

Purchased replacements may be naïve and at greater risk.

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Actions to take now to protect against *Chlamydia abortus*

Review biosecurity before buying replacements

Purchase from flocks with a known health status where possible.

Avoid buying animals from dispersal sales or flocks with an unknown abortion history.

Plan vaccination

Vaccinate replacement breeding sheep before tupping according to the vaccine manufacturer's instructions → Vaccination reduces abortion risk but should complement, not replace, good biosecurity.

Plan isolation facilities

Ensure there is suitable accommodation to quarantine purchased sheep before joining the main flock and to isolate any aborting ewes to protect the rest of the flock.

Although quarantine alone will not detect latent infection, it reduces the risk of introducing other diseases.

The best time to prevent abortion is before ewes become pregnant. Now is an ideal opportunity to review flock health, improve biosecurity and organise vaccination well ahead of tupping. Once ewes are in lamb, opportunities to prevent infection are much more limited.

Plan now, vaccinate where appropriate, and don't wait until lambing to think about abortion control.

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