

The Moredun Foundation

News Sheet Vol. 4, No.10

Toxoplasmosis in Sheep

(Published February 2006)

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Summary

- *Toxoplasma gondii* is a parasite that causes abortion and barrenness in sheep resulting in significant economic losses.
- *Toxoplasma* can infect all warm-blooded animals.
- Following infection *Toxoplasma* will persist (alive in “tissue cysts”) in the brain and muscles of animals, including sheep.
- *Toxoplasma* oocysts (eggs) are produced by cats in their faeces.
- Infection in sheep in early pregnancy kills the fetus and ewes may present as barren.
- Infection later in pregnancy may result in abortion, still births and weakly lambs, often accompanied by a mummified fetus.
- Following infection sheep are immune and should not abort again due to toxoplasmosis.
- Sheep become infected if they eat feed (pasture, concentrates) or drink water contaminated with cat faeces that contain *Toxoplasma* oocysts. Unlike chlamydial abortion, toxoplasmosis is not directly transmitted between sheep.
- Cats can become infected by eating small animals (especially mice) persistently infected with *Toxoplasma* tissue cysts.
- There is an effective vaccine available to prevent toxoplasmosis in sheep.
- *Toxoplasma* can cause serious disease in pregnant women and immunocompromised people, such as AIDS patients.
- Infection in pregnant women may seriously damage or even kill the unborn child.
- Humans can become infected by eating raw or lightly cooked meat that contains *Toxoplasma* tissue cysts or following contact with oocysts in cat faeces or by contact with infected sheep and lambs at lambing time.
- Pregnant women and immunocompromised people should not be involved with ewes at lambing time and should not handle clothing that may be contaminated.

Introduction

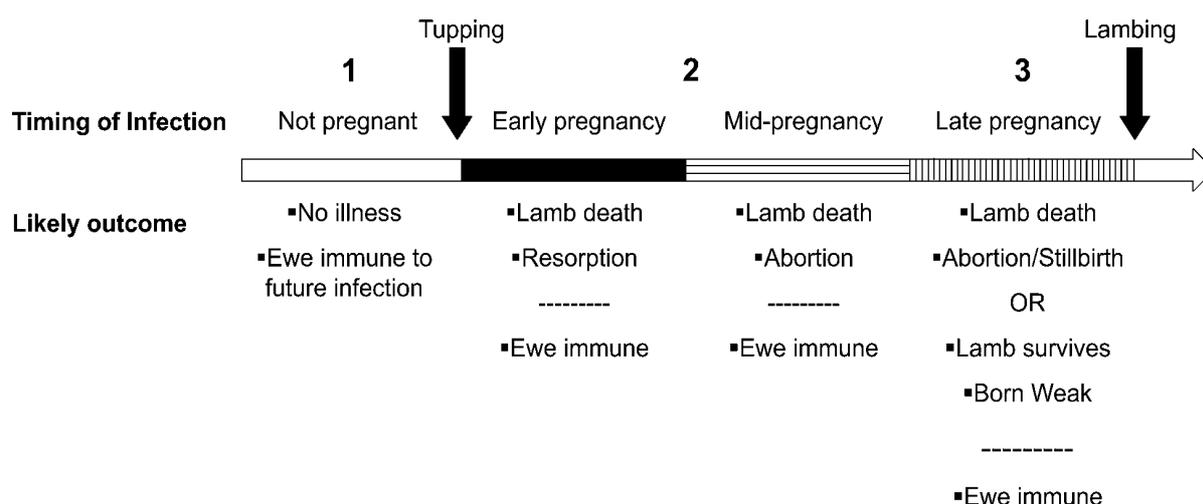
Toxoplasmosis is caused by infection with the parasite *Toxoplasma gondii*, which is one of the oldest and most successful parasites in the world. Not only is it present worldwide, but it is capable of infecting a huge range of warm-blooded animals including sheep and humans. It is very small, is invisible to the naked eye, consists only of a single cell and belongs to a group of organisms called *protozoa*.

According to data from the Veterinary Investigation Diagnosis Analysis (VIDA), 27% of all diagnosed cases of ovine abortion in the UK between 1995 and 2003 were due to *Toxoplasma gondii*. This makes toxoplasmosis the second most frequently diagnosed cause of abortion in sheep in the UK with *Chlamydophila abortus* responsible for 46% of cases submitted to the veterinary investigation (VI) centres over the same period. For further information about *C.abortus* infections and their control please refer to newsheet Volume 4 Number 9 entitled ‘Chlamydial (Enzootic) Abortion in Ewes’.

Toxoplasma Abortion

Although by definition *T. gondii* is parasitic and therefore must infect host animals in order to complete its life cycle, it is also capable of persisting for long periods (months or years) in the environment if conditions are favourable (moist and warm). It is through this environmental contamination that sheep are exposed to infection, typically through ingesting (eating) the parasite in contaminated pasture, feedstuffs or water. The timing of infection in relation to pregnancy is critical (see Figure 1 below.)

Figure 1 Timing of Toxoplasma Infection



1) Infection outwith pregnancy

If sheep become infected before pregnancy they suffer only a transient fever that is not usually noticed by the farmer or stockperson. After infection they develop a solid immunity and are effectively protected from toxoplasmosis in the future. If, however, ewes become infected for the first time while they are pregnant, the consequences can be very serious for the developing lamb or lambs.

2) Infection in early or mid pregnancy

If infection occurs in early pregnancy then the likely outcome is death of the lamb. If this occurs very early then the lamb may be resorbed and the ewe will either return to service or may remain barren (empty). If lamb death occurs later in pregnancy then the dead lamb or lambs will be passed (aborted), usually a few days before the expected lambing date.

3) Infection in late pregnancy

Infection in late pregnancy is less likely to be fatal to the lambs as their ability to fight infection improves as they develop, however they may still die and be aborted or stillborn.

Lambs that survive infection may be weak at birth or die in the first few days of life. It is not unusual for infected ewes to produce one dead lamb alongside one or more live lambs. The dead lamb may be small and mummified.

Ewes which become infected during pregnancy also develop a solid immunity and therefore animals which have aborted once due to toxoplasmosis are very unlikely to do so again.

It has recently been suggested that some ewes may abort repeatedly due to toxoplasmosis and that their ewe lambs may also go on to abort. However, work at Moredun has found no evidence to support this and experience in the field suggests that if this does occur, it is rare. Therefore, it is advised that ewes which have aborted due to toxoplasmosis should be retained for future breeding as they will be immune to future infection.

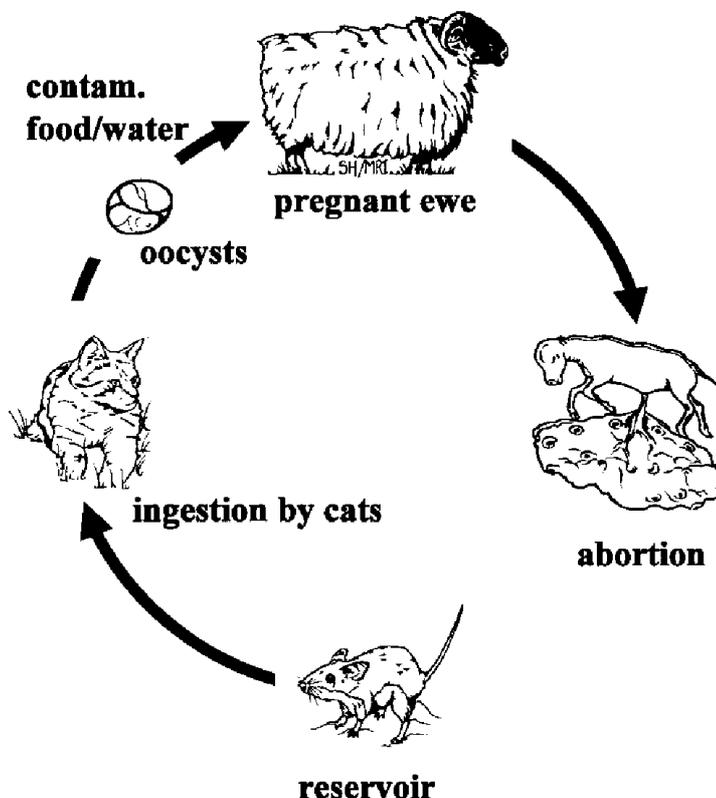
***Toxoplasma gondii* life cycle**

In sheep and other warm-blooded animals *Toxoplasma* multiplies in cells (as tachyzoites) but after the initial phase of infection it can also survive for many months or years inside tissue cysts (as bradyzoites) usually in muscle and brain. If this muscle (meat) is eaten raw or lightly cooked by an animal (or human) that has not “met” the parasite before then it is likely that it too will become infected. Cats becoming infected in this way are special. The *Toxoplasma* multiplies in the lining of the cat’s gut (in much the same way as occurs in coccidiosis in lambs and calves) to produce millions of *Toxoplasma* oocysts (eggs) that can contaminate food stores, pasture and water supplies. *Toxoplasma* oocysts can survive in the environment in this way for months or years, depending upon local conditions such as moisture and temperature. The key source of infection for sheep is oocysts in food and water and the key source of infection for cats is tissue cysts in rodents such as mice and in small birds (see Figure 2 on opposite page).

Diagnosis of Toxoplasmosis in Sheep

If toxoplasmosis is suspected, the key to diagnosis is to submit dead lambs with their placentae (cleansings or afterbirth) to a veterinary laboratory. Tests can be done on this material to confirm if the lamb has been infected with *T. gondii* and to look for evidence of disease caused by the parasite in the lamb’s organs and placenta. Tests to look for antibodies can also be done on blood samples taken from aborting ewes; however this should be discussed with your vet who will advise if it is necessary and when the most appropriate time to sample would be. Care is required in interpreting the results of blood tests as a positive result in a single sample may just indicate infection at some time in the past.

Figure 2 Transmission of ovine toxoplasmosis



Control of Toxoplasmosis in Sheep

It should be noted that, as sheep become infected with *Toxoplasma* by eating oocysts in the environment, maintaining a closed flock is no barrier to this disease. Your veterinary surgeon will be able to advise you on the most suitable control strategy for your flock. There are two main control options available:

Vaccination

The most effective method of preventing *T. gondii* infection in sheep is to vaccinate them against the disease. Like natural infection, vaccination produces a solid immunity and therefore sheep can be given long-lasting protection by the use of a single injection. The vaccine (Toxovax™), which is licensed for use in certain countries in Europe including the UK, is marketed by Intervet. It was developed in New Zealand and work was later carried out at Moredun to establish its efficacy and safety in sheep. Toxovax™ is one of only two parasitological vaccines in the world. Replacement ewe lambs can be vaccinated from 5 months of age and non-pregnant, healthy ewes may be vaccinated at any time, apart from the 3 week period before tuppung (do NOT vaccinate pregnant sheep). Toxovax™ is a live vaccine which is relatively fragile, needs to be handled with care and should not be administered by susceptible people (pregnant women or immunocompromised people – see last section).

Drug Therapy

Research has shown that a significant reduction in lamb losses due to toxoplasmosis can be achieved by feeding the coccidiostat decoquinate (Deccox - Alpharma Ltd) during pregnancy. It should be added to the feed to provide 2 mg/ kg body weight/day from mid-pregnancy. Decoquinate is most effective if it is already being fed to susceptible ewes at the time they encounter infection rather than after infection is established. It is not suited to management systems in which supplementary feed is not given.

***Toxoplasma* in Humans**

Humans may become infected with *Toxoplasma* by contact with oocysts derived from cat faeces or by eating lightly cooked (or raw) meat that contains tissue cysts. Cleaning cat litter trays, gardening and playing in sandpits that have been left uncovered are all activities that may expose humans to infected cat faeces. As the organism may also be present in the placenta (cleansings or afterbirth) of infected lambs these also represent a possible source of infection for humans, via cuts on hands or by splashes of infected fluid in the eye. Infection in healthy, non-pregnant humans usually causes only mild, flu-like illness but infection may cause serious disease in pregnant women and immunocompromised people. Examples of immunocompromised people include AIDs patients and organ transplant patients receiving drugs to prevent organ rejection. Infection in pregnant women can cause death of the unborn child or serious abnormalities in new-born babies such as brain damage and blindness. It is important to remember that lambing sheep may also be infected with other organisms such as those that cause chlamydial (enzootic) abortion, Q fever (*Coxiella*), salmonellosis, *Campylobacter* infections and *Listeria* infections. **ALL** of these pose a real risk to a pregnant woman and her developing baby.

For these reasons, pregnant women and immunocompromised people should avoid all involvement with lambing ewes and should not handle contaminated clothing from those working with lambing ewes or new-born lambs.

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