

Causes of Infectious Abortions in Goats

Goat herds generally have a 2 to 5 percent abortion rate. Any percentage above this is a serious problem because abortions can lead to economic losses. Indeed, infectious abortion in a doe herd can be a public health concern because infectious agents that cause abortions in goats can also infect and cause diseases in humans. Infectious abortions should be taken seriously by the producer and herd manager.

The most common microorganisms that cause abortions in goats are:

- Chlamydiosis (*Chlamydia psittaci*)
- Query or Queensland (Q) fever (*Coxiella burnetii*)
- Listeriosis (*Listeria monocytogenes*)
- Leptospirosis (*Leptospira spp*)
- Toxoplasmosis (*Toxoplasma gondii*)
- Brucellosis (*Brucella melitensis*)

These infectious agents are associated with abortion outbreaks that range from 25 to 30 percent in a season.



Chlamydiosis (Chlamydia, Enzootic Abortion)

Chlamydiosis, commonly known as chlamydia, is the most frequent cause of abortion in goats in North America. It is associated with pneumonia, pink eye, inflammation of epididymis (a part of the buck's reproductive system), and inflammation of the joints. It can be transmitted to does through the direct contact of feces from infected pigeons and sparrows. Chlamydia can be also transmitted to goats by ticks or other blood-sucking insects.

Chlamydia multiplies in the blood and is located in the reproductive organs of the doe. In pregnant does, this microorganism can be found in the fetus and placenta, leading to an inflammation of the placenta that prevents normal transfer of nutrients from the doe to the fetus. It can also lead to miscarriage or abortion. Abortions can occur any time between days 100 and 130 of gestation. Does may show no symptoms other than a bloody vaginal discharge two to three days prior to aborting. During the first three weeks after abortion has occurred, the doe will have uterine discharge containing chlamydia. If chlamydia is not diagnosed and treated, the infection will persist and the infected doe may abort again during the next pregnancy.

Diagnosis

A diagnosis of chlamydiosis is based on the history of the herd, clinical signs, and characteristics of the placenta. When chlamydiosis is suspected, aborted fetuses and fresh placenta should be packed in ice, marked with correct identification of the doe, and sent to a lab for positive diagnosis. Up to three days after abortion, a vaginal swab should be taken by a veterinarian and sent to a diagnostic laboratory for isolation of the microorganism. Serum samples from the aborting doe can also be used for immunological tests, such as the enzyme-linked immunosorbent assay (ELISA) or the indirect inclusion fluorescence antibody (IIFA) tests for diagnosis.

The presence of chlamydial antigens in ground placenta or vaginal swabs collected just after abortion may be detected by ELISA with diagnostic kits developed for human *C. trachomatis* infections. In human medicine, polymerase chain reaction (PCR) or its variation, ligase chain reaction (LCR), are considered to be the most sensitive diagnostic methods available for diagnosis of chlamydia. But this is expensive.

Treatment and Prevention

Infected does should be treated with tetracycline, oxytetracycline, and chlortetracycline. The injection of 20 mg/kg of oxytetracycline given by intramuscular route at 105 and 120 days of pregnancy can prevent abortion but cannot prevent chlamydial shedding at kidding. Tetracyclines affect the replication of chlamydia and can be effective in preventing abortions. *Chlamydia psittaci* are susceptible to chlortetracycline. In an infected herd, abortion can be prevented by administering 80 mg/head/day during pregnancy. In an outbreak, 250 mg/head/day for 3 weeks has been recommended and appears to be effective.

Listeria

Listeriosis is caused by the bacteria *Listeria mono-cytogenes* (Lm), which can be found in soil, contaminated water, and spoiled, concentrated hay or silage. It can live in soil and fecal contents for a long time. After infecting, the bacteria multiply and spread throughout the animal's body, causing fever and decreased or loss of appetite. Lactating does show reduced milk production. Infected does show neurological disturbance due to encephalitis (inflammation of the brain). Abortion can occur at early stages of pregnancy and infected does can produce stillborn or weak kids.

The prevalence of Lm on goat farms is seasonal. Management practices are associated with listeriosis and fecal shedding of Lm. Awareness of risk factors may be used to develop control measures to reduce disease and introduction of Lm into the human food chain. Listeria is a public health concern and may affect humans. It primarily affects people whose immune systems are inefficient, including newborns and the very old. In pregnant women, listeria may cause infant deaths, meningitis, or spontaneous abortions.

Diagnosis

Brain tissue, aborted placenta, and fetus specimens should be isolated and identified for the presence of Lm. Tissue must be identified, refrigerated (4° C), and sent to a reference laboratory for isolation of Lm. This microorganism has been isolated from the spinal fluid, nasal discharge, urine, feces, and milk of infected does. Serology is not used routinely for diagnosis because many healthy animals have high *Listeria* titers. Immunofluorescence is effective for quickly identifying Lm in smears from dead animals, tissue from aborted fetuses, milk, meat, and other sources.

Treatment and Prevention

Stop using contaminated food. Generally, procaine penicillin should be administered every 6 hours for 3 to 5 days then daily for an additional 7 days. Administration of 500 mg of chlortetracycline a day per goat is also recommended. Chloramphenicol, oxytetracycline, and ampicillin have shown success in treating listeriosis. Intravenous sodium chloride, glucose solutions, and sodium bicarbonate are also useful.

Leptospira

Leptospirosis can cause abortion, stillbirths, or the birth of premature or weak, infected kids. The most common serovars, a subdivision of a species different from other strains, causing abortions in goats are *Leptospira interrogans*, *grippotyphosa*, and *pomona*. Goats are susceptible to these strains, with abortion occurring after infection at the time when the microorganisms start to multiply in the doe's blood. Some have shown anemia and jaundice (yellowing of the tissues, usually resulting from abnormal liver function) and hemoglobinemia (part of red blood cells that carries oxygen). However, an infected doe may not have fever or jaundice.

Diagnosis

Diagnosis is based on the microscopic agglutination test (MAT) and the ELISA. Isolation and identification of *Leptospira spp* in the doe's urine, placenta, or fetal kidney tissues is the most accurate method of diagnosis.

Treatment and Prevention

Tetracycline and oxytetracycline may be successful if given early in acute cases. Erythromycin, enrofloxacin, and tiamulin are also effective in acute cases. Oxytetracycline, amoxicillin, penicillin G, Tylosin, and doxycycline can be used with success. Treatment has a limited effect on the course of disease once uremia (presence of excessive amounts of urea and other nitrogenous waste products in the blood) has developed.

When abortion caused by *Leptospira* is diagnosed in a goat herd, further abortions can be prevented by promptly immunizing the entire herd and simultaneously treating all animals with antibiotics. Only sick does should be treated with antibiotics. In a zone with a high incidence of leptospirosis, annual immunization of the herd is recommended. Management methods to reduce transmission include controlling rodents, keeping the herd from potentially contaminated streams and ponds, separating goats from wildlife, selecting replacement stock from herds that are seronegative for leptospirosis, and immunizing replacement stock.

Toxoplasmosis

Toxoplasmosis is caused by the *Toxoplasma gondii* microorganism. It is another common cause of infectious abortion in goats, other animals, and humans. Cats can be carriers of *T. gondii*. Cats often defecate and bury their feces in the hay and food storage areas of barns. Does can become infected by ingesting food or water contaminated by feces.

T. gondii enters the bloodstream of the doe and spreads to other tissues. In pregnant does, *T. gondii* can invade and multiply in the placenta and pass to the fetus, causing fetal death, fetal mummification (where the doe reabsorbs the fetal fluid), stillbirth, or the birth of weak kids. In some cases, the pregnancy can progress normally and the doe can give birth to a normal kid. Abortions from this microorganism occur mainly in the last trimester of pregnancy and may occur in does of all ages and in successive pregnancies.

Humans can be infected by *T. gondii* by ingesting meat and milk from animals with toxoplasmosis. Toxoplasmosis can be a public health concern because children who are allergic to cow milk often consume non-boiled goat milk.

Diagnosis

Diagnosis is based on clinical signs and by isolation of *T. gondii* from placental and fetal tissue. Samples for diagnosis should be shipped on ice but not frozen. If the placenta is not available or is decomposed, diagnosis can be done by testing for the presence of the antibody against *T. gondii* in fetal fluid or in doe serum. *T. gondii* can be isolated from the vaginal mucosa, saliva, nasal secretion, and urine from experimentally infected goats and in the milk of naturally infected goats. Toxoplasma infection in both humans and animals can be diagnosed using various serological tests, such as indirect haemagglutination, indirect immunofluorescence (IFAT), or ELISA.

Serological analysis using IFAT and ELISA has been widely employed to detect herds contaminated by *Toxoplasma*, including swine and sheep.

PCR (polynucleotide chain reaction) can be effective in the diagnosis of toxoplasmosis. DNA can be extracted from the lung, muscle, and mesenteric lymph node of the doe and lung tissues of the aborted fetus. A direct PCR assay is effective for the diagnosis.

Treatment and Prevention

Feeding decoquinate (2 mg/kg bw/day) or monensin (15-30 mg/head/day) throughout pregnancy may reduce the abortion rate in a herd with a history of toxoplasmosis. Sulfonamides are used to treat toxoplasmosis in goats. Clindamycin (12.5 mg/kg, IM, BID for 3 weeks) is also recommended. There is no vaccine available in the United States. Control of toxoplasmosis is based on management practices; pregnant females should not be exposed to infected cat feces. **Note:** Cats should be tested for the *T. gondii* microorganism routinely.

Q Fever

Query or Queensland fever can cause goats to abort. Q fever is caused by the microorganism *Coxiella burnetii* and is a disease that affects many animals and humans. Ruminants can contract Q fever when grazing contaminated pastures and from tick bites. In a co-grazing system, infected cows and sheep may be a source of infection for goats. Other animal species and humans can be infected by inhaling contaminated dust. In infected goats, the microorganism can be found in the placenta, uterine fluid, and milk. Infected animals show no symptoms of the disease until aborting or having stillborn kids in late pregnancy. Does do not generally show any symptoms of the disease until 1 to 2 days before abortion, when they experience a lack of appetite and depression.

Diagnosis

Diagnosis is based on isolation of *Coxiella burnetii* in the placenta. Be aware of possible infection by *Coxiella b.* Wear gloves when helping the doe at the time of kidding or when handling aborted fetus. Placenta and aborted fetuses should be burned or buried. Detection by PCR and immunofluorescence tests of *Coxiella b.* in parturition products and vaginal secretions at abortion are preferred over serological tests.

Treatment and Prevention

There is no vaccine to prevent Q fever in goats. Feeding 200 mg/head/day of chlortetracycline in the feed for 19 days or using 20 mg/kg of long-acting oxytetracycline every 3 to 14 days should control the infection.

Brucella

Brucellosis, also known as undulant fever or Malta fever in humans, is caused by *Brucella melitensis*. Although brucellosis in goats is considered non-existent in the United States, there was a case reported in a South Texas goat herd in October 1999.

Goats can be infected by *Brucella melitensis* (a specific strain that causes disease in goats) or *Brucella abortus* (a specific strain that causes disease in cattle) by ingesting *Brucella* from contaminated feed, pasture, or water. *Brucella* then spreads through the blood and becomes localized in the lymph nodes, udder, uterus, testes, and spleen. Infected does show signs of fever, depression, weight loss and diarrhea that can also be accompanied by lameness or mastitis, inflammation of the mammary gland. Infected bucks may develop orchitis, an inflammation of the testicles.

In pregnant does, *Brucella* can be localized in the placenta leading to the development of placentitis (inflammation of the placenta) with subsequent abortion, commonly around the last month of pregnancy.

Brucella can be found in milk, urine, feces, placenta, and vaginal secretions that accompany natural birth or abortion. In the case of normal full-term births, kids from infected does are often infected and capable of spreading the disease.

Diagnosis

Diagnosis is achieved by isolating the microorganisms from the aborted fetus, placenta, or vaginal discharge in laboratory tests. Positive animals are identified by serologic examination. The indirect enzyme-linked immunosorbent assay (iELISA) is sensitive and specific, and shows potential for use as a bulk milk test for detecting *B. melitensis* antibodies in goat milk.

Treatment and Prevention

There is no treatment for brucellosis in goats. It is mandatory to eliminate infected animals. Vaccination of goats is not permitted in the United States.

Note:

Ceftiofur and Neomycin are the only two antibiotics approved to use in goats. The other antibiotics mentioned in this article are considered extra-label. Consult your veterinarian for extra-label antibiotic use, side effects, and withdrawn period.

What to do when abortion occurs:

- Never ignore abortions in a goat herd. Conduct a thorough investigation immediately.
- Isolate the animal from the herd and keep it in a quarantine pen for further examination.
- Consider many different causes of abortion.
- Inform your veterinarian if you suspect infectious abortion in a goat herd; the veterinarian will refer you to a nearby diagnostic center.
- Consult the diagnostic laboratory prior to submitting your sample. The diagnostic center should be aware of the infectious agent most likely to be present in the area.
Note: Diseased tissue requires proper handling.
- To facilitate the diagnosis, keep detailed records and accurately identify each aborting animal and the stage of pregnancy at which the animal aborted.
- Refrigerate (avoid freezing) any fetus and placenta of an aborted kid to send to the diagnostic laboratory.
- Work with the local veterinarian to draw blood and to send serum samples from aborting does to the diagnostic laboratory for immunological tests.
- Consult your local veterinarian when you suspect infectious abortion in your herd. This might constitute a public health issue. Your veterinarian can guide you on the treatment and prevention procedure.
- Ask for performance and health records before purchasing new animals.
- Quarantine any new animals before introducing them into your existing herd.
- Be aware that certain classes of dewormers administered to pregnant does can cause insidious abortion or stillbirths, which can be mistaken as abortions caused by infectious agents.
- Be aware that certain poisonous plants can cause abortions in does. Identify plants in your area that can cause abortion and try to eliminate them from the pasture.
- People who assist does at kidding or collect placental or fetal waste for disposal or diagnostic evaluations should be aware of the danger of infection and are advised to wear plastic gloves. The gloves should be burned to prevent environment contamination.
- Quaternary ammonium compounds are satisfactory disinfectants.



References

- Arricau Bouvery N., Souriau A., Lechopier P., & Rodolakis A. (July-August 2003). Experimental *coxiella burnetii* infection in pregnant goats: Excretion routes. *Veterinary Research*, 34 (4), 423-33.
- Braun, U., Stehle, C. & Ehrensperger, F. (2006). Clinical findings and treatment of listeriosis in 67 sheep and goats. *The Veterinary Record*, 150 (2), 38-42.
- Dubey, J. P. (December 1, 1994). *Toxoplasmosis*. Zoonosis Updates. *Journal of the American Veterinary Medical Association*. Retrieved November 7, 2006, from <http://www.avma.org/reference/zoonosis/zntoxopl.asp>.
- Engeland, I.V., Waldeland H., Kindahl H., Ropstad E., & Andresen O. (December 2, 1996). Effect of *Toxoplasma gondii* infection on the development of pregnancy and on endocrine foetal-placental function in the goat. *Veterinary Parasitology*, 67 (1-2):61-74.
- Funk, N. D., Tabatabai, L. B., Elzer, P. H., Hagius, S. D., Martin, B.M., & Hoffman, L. J. (2005). Indirect enzyme-linked immunosorbent assay for detection of *Brucella melitensis*-specific antibodies in goat milk. *Journal of Clinical Microbiology*, 43 (2):721-5.
- Abortion in goats*. (2006). The Merck Veterinary Manual. Retrieved November 7, 2006, from <http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/110306.htm&hide=1>.
- Marsilio, F., Di Martino, B., Di Francesco, C. E., & Meridiani, I. (2005). Diagnostic of ovine chlamydial abortion by PCR-RFLP performed on vaginal swabs. *Veterinary Research Communications*, 29 (Suppl 1), 99-106
- Mobini, Seyedmehdi. (1997). *Infectious causes of abortion*. In Youngquist (ed.) Current Therapy in Large Animal Theriogenology. Philadelphia, PA: W. B. Saunders Co.
- Sanchez, J., et al. (2006). Experimental *coxiella burnetii* infection in pregnant goats: A histopathological and immunohistochemical study. *Journal of Comparative Pathology*, 135 (2-3), 108-15
- Sreekumar, C., Rao, J. R., Mishra, A. K., Ray, D., Joshi, P., & Singh, R. K. (2004). Detection of toxoplasmosis in experimentally infected goats by PCR. *The Veterinary Record*, 154 (20), 632-635.
- Weissmann, J. (2003). Presumptive *toxoplasma gondii* abortion in a sheep. *Canadian Veterinary Journal*, 44 (4), 322-324.



Maria Lenira Leite-Browning, DVM, *Extension Animal Scientist*, Alabama A&M University

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

Issued in furtherance of Cooperative Extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, and other related acts, in cooperation with the U.S. Department of Agriculture. The Alabama Cooperative Extension System (Alabama A&M University and Auburn University) offers educational programs, materials, and equal opportunity employment to all people without regard to race, color, national origin, religion, sex, age, veteran status, or disability.

New November 2006; UNP-79