Fetal loss in goats

D.G. Pugh
College of Veterinary Medicine, Auburn University, Auburn, AL

Loss of the embryo, fetus, or conceptus during gestation is referred to as fetal loss or wastage or abortion (Note: these terms will be used interchangeably during this discussion). Loss rates of five percent are commonly encountered in goat flocks. Infectious agents, stress, some drugs, malnutrition, and toxic materials (plants, chemicals, mycotoxins, etc) may all be causes of this condition.

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Non-infectious fetal wastage

Stress (malnutrition, predator attack, weather changes, etc) can be a common cause of pregnancy loss in the doe due to her dependency on progesterone from the corpus luteum. Angora goats may be more prone to stress related abortions than other breeds. Periods of excessive heat can also cause pregnancy wastage, particularly during the early embryonic period. Malnutrition (energy/protein/vitamin/mineral deficiencies, excesses, or inappropriate nutrient ratios) can in some instances result in fetal wastage. Maintaining an optimal body condition score for the doe(s) while insuring adequate dietary intake will help maximize normal pregnancy, fetal development, and parturition. Some drugs have been associated with fetal losses (phenothiazine, levamisole, xylazine, acepromazine, corticosteriods, estrogenic compounds, prostaglandins, etc.) and thus should be either avoided or used in a very judicious fashion during gestation. Plants that accumulate nitrate (jimsonweed, Johnson grass, lamb's quarter, oat hay, pigweed, sorghum, sweet clover, sunflower, and many others) and can cause nitrate-nitrite toxicosis resulting in fetal losses.

Some common causes of infectious fetal loss

Chlamydiosis (*Chlamydophila abortus*)

Chlamydophila abortus (a gram-negative intra-cellular organism) is one of the most common causes of infectious fetal loss in goats in North America. When introduced into naive goat flocks, fetal loss rates as high as 25% to 60% may be encountered. Chlamydial organisms can also cause epididymitis, keratoconjunctivitis, pneumonia, and polyarthritis. Most commonly the transmission of *C. abortus* is via oro-nasal contact of aborted tissues, vaginal discharges or contaminated neonates. Aborting does shed the organism in the uterine discharge, fetus, and placenta, particularly during the first three weeks after abortion. However, some birds (pigeons, sparrows) serve as reservoir hosts, while ticks and other arthropods may be vectors for disease transmission. Signs in the infected doe may include: late term abortions (100d to near term), anorexia, fever, bloody vaginal discharge, delivery of a fresh, autolyzed fetus, and/or weak kids, and possibly retained fetal membranes. The placenta should be examined for thickened, white, gray, yellow, or red cotyledons. Cytologic or histologic evaluation of cotyledonary impression smears (Gimenez or modified Ziehl-Neelsen stain) for elementary bodies, or necrotizing vasculitis of placental vessels will aid in the diagnosis. Aborted kids may have white spots on the liver, grossly. A definitive diagnosis can be made by culturing the organism or with polymerase chain reaction (PCR) from fresh placenta, stomach content or fetal tissue. Serological testing may also be of value, particularly if using paired serum samples of aborting does (two to three weeks apart), or by finding antibodies in blood/serum of the aborted kid. The prophylactic use of tetracycline in all pregnant does may be of value in controlling, preventing, or arresting the continued spread of abortions in a herd. Sheep vaccine may be used (extra label) in goats, but the efficacy is not completely known. Quarantine of aborting does and proper disposal of aborted fetuses and tissues is critical in order to minimize the spread.

Toxoplasmosis

Toxoplasma gondii can cause abortion, fetal mummification, stillbirth, and the birth of weak lambs and kids. Domestic cats develop a transplacental infection after ingesting infected rodents or birds. Kittens that become infected *in utero*, can shed *T. gondii* oocytes in feces. Infected kittens/young/immunosuppressed cats may bury feces in hay and feed bins. Does become infected when ingesting oocyst contaminated feedstuffs. Toxoplasma can invade and multiply in the doe's placenta then infect the fetus, causing necrosis of the placenta, particularly the cotyledons, with resultant abortion, stillbirth, or the birth of weak kids. Does infected prior to breeding usually do not abort, while those infected between one and three months of gestation undergo fetal wastage or mummification. Does which are infected from three to five months of gestation abort. Most non-immunosuppressed does show no overt signs (other than occasional increased rectal temperature) at the time of abortion. Does with concurrent immunosuppression can develop neurologic disease. On gross examination of the placenta, the cotyledons are grey-white to yellow, with focal areas of calcification and necrosis. *T gondii* antibodies in aborted fetal fluids or presuckling blood indicates transplacental infection, and can confirm the diagnosis. The absence of *T. gondii* antibodies by one week after abortion can usually rule out Toxoplasma as the cause. High antibody titers in a doe is not diagnostic of recent infection, but the absence of antibodies can usually rule out toxoplasmosis. A positive diagnosis of toxoplasmosis requires isolation/culture of the *T gondii* from the placenta or fetal tissues. All samples for culture should be transported the laboratory on ice. Toxoplasmosis is best controlled by preventing pregnant doe exposure to infective oocytes. Management protocols useful for prevention should include: (1) fetal membranes and aborted materials not used in diagnostics should be incinerated; (2) kittens and pregnant queens should be kept from pasture and feedstuffs used for pregnant does; (3) spayed queens kept in barns may prevent feral pregnant queens from nesting; (4) keep feedstuffs in areas or containers that minimize cat defecation in the feed, feeders, and/or feed handling equipment. The inclusion decoquinate, monensin, and lasalocid may be useful in toxoplasmosis control, but the clinician should always be mindful to avoid the use of pharmaceuticals in an extra-label fashion. The clinician should also be mindful of the zoonotic potential for toxoplasmosis. People should only consume pasteurized goat milk.

Q (query or Queensland) fever

Q fever is caused by *Coxiella burnetii* (an intracellular rickettsial microorganism), and can be a cause abortion in goats throughout much of the world. *C. burnetti* can be carried and shed in the placenta, uterine fluids, colostrum, and milk of many ruminant animals. These infected animals can serve as sources for infection, as can grazing contaminated pastures, and vector tick bites. Pregnant does that become infected will occasionally develop placentitis, anorexia and depression, and have late term abortions and stillbirths. Does that have aborted develop immunity. Isolation of *C. burnetii* from the placenta or aborted tissues can confirm a diagnosis of Q fever. Identification of the organism via Ziehl-Neelsen staining of cotyledonary or fetal abomasal tissue is also diagnostic. Fluorescent antibody testing of frozen placenta can also be rewarding. Antibody titers >1:20 suggest *C. burnetii* exposure, but are not confirmative of the cause of fetal wastage; however a four fold increase in the aborted doe's acute and convalescent serum titers indicates a recent infection. The infected doe can carry and shed *C. burnetii* indefinitely. As with other causes of abortion, all placentas and aborted tissues not used for diagnostic purposes should be incinerated. The use of some antibiotics (chlortetracycline) in susceptible does may reduce the incidence of abortions. Cats, cattle, and sheep can all serve as a source of infection, thus their monitoring and control may be of benefit in prevention. Because of the zoonotic potential Q fever, all goat milk intended for human consumption should be pasteurized, and infected does identified and culled.

Listeriosis

Listeria monocytogenes (gram-positive non–acid fast facultative microaerophilic organism) can cause meningoencephalitis, abortion, and septicemia in goats. The causal organism can be found in feces, plant material, silage, soil and water. Ingestion by the doe of contaminated feedstuffs in early pregnancy may result in abortion and stillbirth or weak neonates when ingested later in gestation. Both abortion and neurologic conditions may occur simultaneously in goat herds. Fetal wastage will usually occur in late gestation. The abortion may be associated with fever, inappetence, septicemia, and the expulsion of an autolyzed fetus. A confirmative diagnosis can be made by culturing *L monocytogenes* from the placenta, fetal tissues, or uterine discharge. The disease may be minimized or prevented by: (1) avoiding grazing by susceptible animals on contaminated pastures or feeding spoiled silage; (2) inclusion of chlortetracycline in feed supplements; (3) administration of long-acting oxytetracycline preparations during abortions storms; (4) use of a vaccine where available. As listeriosis may be zoonotic, care should be taken to minimize transmission to people by exposure to aborted tissues.

Leptospirosis

Goats are more resistant to *Leptospira interrogans* infections and fetal wastage than are other domestic species, but are occasionally infected if exposed to infected/contaminated urine. Of the seven or eight serovars commonly encountered in most domestic animals, only *icterohaemorrhagiae*, *grippotyphosa*, and *pomona* have been associated with fetal wastage in goats. Infected does may present with anemia, inappetence, fever, hemoglobinuria, icterus, neurologic disease, late term abortion, and death. The diagnosis can be confirmed by isolation of the causal organism (which is uncommon), and by using darkfield microscopy, immunofluorescence testing, and silver stains on the placenta and fetal tissues. Paired sera from aborted does showing a four fold increase in serum titer in aborted and convalescent does is very suggestive of leptospirosis. Vaccination in endemic areas may have some value, however the clinician should avoid the extra-label use of vaccines and pharmaceuticals. Avoiding contaminated urine (rodent control, clean water, etc.) and the addition of chlortetracycline to feed supplements may all be useful in prevention. Leptospirosis is potentially a zoonotic disease, thus care should be exercised when handling materials suspected of contamination.

Mycoplasmosis

Mycoplasma organisms can cause arthritis, keratoconjunctivitis, mastitis, and vulvovaginitis and fetal wastage. Fetal wastage occurs in the final trimester of gestation, and aborting does will shed the organism in amniotic fluid, milk and placenta**.** Confirmative diagnosis can be made by culture and serotyping of the organism from placenta or fetal tissues. Some antibiotics (tetracyclines and tylosin) may be of benefit to prevent the continued spread if used during abortion outbreaks.

Salmonellosis

Salmonella abortus-ovis infection in goats can produce septicemia, metritis and fetal wastage. Stressful conditions (overcrowding, malnutrition, parasitism, antibiotic use, etc.) may predispose or exacerbate the incidence of this condition. Birds and other wildlife and domestic ruminants may serve as carriers and sources of contamination. In herd outbreaks up to 70% of the does may have fetal wastage, with retained fetal membranes, metritis and signs of septicemia; all occurring in the final month of gestation. A confirmative diagnosis can be obtained by culturing Salmonella from aborted tissues. The use of antimicrobials, based on culture and sensitivity patterns, and/or autogenous vaccines may be of some benefit in both prevention and control. Salmonella organisms which are associated with abortions should be considered to be zoonotic.

Campylobacterosis (vibrosis)

Campylobacter fetus and/or *C jejuni* (gram-negative microaerophilic rods) are rarely documented in cases of fetal loss of goats in North America. Infection may occur when pregnant

does ingest water or feedstuffs contaminated by the organism; usually after it has been shed from the gastrointestinal tract of sheep, dogs and some birds. Fetal loss is characterized by stillbirths, weak kids, late gestational expulsion of fresh fetuses and maternal diarrhea. Findings of placental edema with necrotic and/or swollen cotyledons, fetal subcutaneous edema, pleuritis, hepatic disease (gray targets on liver surface) and peritonitis would be indicative of Campylobacter. Isolation of the organism from placenta, fetal abomasal contents, and maternal vaginal discharge will provide a definitive diagnosis. Antibiotic therapy (penicillin, tetracycline, streptomycin) during late gestation, the early kidding season, or during an outbreak may decrease the incidence of fetal loss. A vaccine is available for sheep, and may be of use (in an extra-label fashion) for goats. On endemic premises an autogenous bacterin may be of value. *C. jejuni* is associated with mild gastroenteritis in people.

Selected references

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