

Sheep Diseases

Abortion

Abortion is when a pregnancy is terminated and the ewe loses her lambs or gives birth to weak or deformed lambs that die shortly after birth. There are both infectious and non-infectious causes of abortion. The most common infectious causes of abortion in ewes are Chlamydia (Enzootic abortion), Campylobacter (Vibrio), and Toxoplasmosis. These organisms may also cause abortion (miscarriage) in women). Pregnant women should not handle placental fluids.

Brucellosis

Brucellosis is an infectious disease caused by bacteria of the genus Brucella. Various Brucella species affect sheep, goats, cattle, pigs, dogs, and several other animals. In infected ruminants, brucellosis commonly induces abortion during the second half of gestation. Sheep are less susceptible than cattle, and it is not considered a common cause of abortion. Ovine brucellosis mainly affects rams, causing lesions in their reproductive organs.

Cache Valley Virus

Cache Valley Virus is an occasional cause of abortion outbreaks in sheep. It is spread by mosquitoes to pregnant ewes. The timing of infection in relation to gestation has a major effect on clinical effects. If a ewe is infected at less than 28 days of gestation, the embryos usually die and are reabsorbed. If infected after 45 days, there are usually no adverse effects.

If infection occurs between 28 and 45 days of gestation, the fetuses usually develop the "A-H syndrome," resulting in various congenital abnormalities affecting the central nervous system. Ewes that are infected usually show no signs of disease and develop a good immunity that lasts for several years. Cache Valley virus is similar to Akabane Disease except that it only affects sheep.

Chlamydia (enzootic abortion, EAE)

In the U.S., chlamydia is the most common cause of abortion in ewes. It is transmitted from aborting sheep to other susceptible females. Ewe lambs are usually the most susceptible on farms where the organism is present. The bacteria which causes enzootic abortions in ewes is called Chlamydia psittici. Chlamydia causes abortion during the last month of pregnancy and may also result in the birth of lambs that die shortly after birth.

The organism may also cause pneumonia in young lambs, but the chlamydia species that causes abortion is not associated with conjunctivitis or arthritis. Chlamydia abortions can usually be stopped or reduced by treating the entire flock with tetracycline. A vaccine is available. It should be administered 60 days prior to breeding and repeated in 30 days, then annually just prior to breeding.

Leptospirosis

Sheep are generally more resistant to leptospirosis than cattle, swine, and most other domestic animals. Abortion due to this disease may occur during the last month of pregnancy. A blood test of aborting sheep will confirm diagnosis. The problem can be prevented with annual vaccination with a 5-strain leptospirosis vaccine.

Q Fever

Q Fever is a disease caused by the bacterium, Coxiella burnetti. The disease is found worldwide except for New Zealand. Sheep, goats, and cattle are most likely to get Q fever. The most common sign of Q fever is abortion during late pregnancy. However, most animals do not show any signs of illness. Animals get Q fever through contact with body fluids or secretions. Q fever is zoonotic (transmissible to people).

Rift Valley Fever (infectious enzootic hepatitis)

Rift valley disease is a viral disease of sub-Saharan Africa. The virus attacks the liver and causes symptoms ranging from fevers and listlessness to hemorrhage and abortion rates approaching 100% in pregnant sheep. It is transmitted by mosquitos. There is no specific therapy for infected animals.

Vaccination of animals against RVF has been used to prevent disease in endemic areas and to control epizootics. Rift Valley fever has not occurred in the United States. However, there has been concern that it could become permanently established in the U.S. if it does enter the country. Rift Valley fever is more deadly than West Nile virus.

Salmonella

In the U.S., salmonella abortion is a distant fourth in frequency as a cause of abortion in sheep, but probably occurs more often than recognized. The two major factors determining whether a pregnant ewe will abort from Salmonella are stress on the ewe and the number of Salmonella bacteria the ewe ingests.

Abortions may occur earlier in gestation, but are most common in the last month of gestation. Most of the ewes show diarrhea and some will die from metritis, peritonitis and septicemia. Healthy lambs may also contract the disease and die.

Toxoplasmosis

Toxoplasmosis is common cause of abortion in ewes. It is caused by *Toxoplasma gondii*, a protozoan parasite which causes coccidiosis in cats. *Toxoplasma* abortion in ewes follows ingestion of feed or water that has been contaminated with oocyte-laden cat feces. The organism migrates to the placenta and fetuses causing their death and expulsion. Ewes will abort during the last month of pregnancy or give birth to dead or weak lambs that usually die from starvation.

Infection in the first two months of gestation results in embryonic death and reabsorption. There is some evidence that Rumensin® and Deccox® will partially prevent toxoplasmosis in pregnant ewes. Limiting cat populations and preventing contamination of sheep feed and water with cat feces will help to prevent disease outbreaks. There is no vaccine available in the U.S. for toxoplasmosis.

Vibrio Campylobacteriosis (vibriosis, vibrio)

Vibrio is the second most common cause of abortion in ewes. Abortion during the last month of pregnancy, stillborn lambs, and the birth of weak lambs are common signs of vibrio abortion. The organisms which cause vibrio abortion are *Campylobacter jejuni* or *Campylobacter fetus*. Ewes are infected by oral ingestion. The incubation period from the time of infection and abortion is only two weeks. Vaccination can be effective in the face of an outbreak.

Feeding of antibiotics has also been shown to be effective. Disease spread can be prevented by isolating the aborting ewe, disposal of the fetuses and membranes and disinfecting the affected area. Infected ewes usually recover after aborting and are immune to reinfection. A vaccine is available. It should be administered prior to breeding and repeated in 60 to 90 days, then annually.

Acidosis (lactic acidosis, ruminal acidosis, grain overload, grain poisoning)

Lactic acidosis is caused by excess consumption of concentrates (grain) which results in high levels of acid being produced in the rumen. Affected sheep appear depressed and listless and may have abdominal pain. They should be drenched with an antacid such as carmalax, bicarbonate of soda, or products containing magnesium carbonate or magnesium hydroxide.

Acidosis is prevented by proper feeding management. Concentrates (grain) should be introduced to the diet slowly and increased incrementally to give time for the rumen to adjust.

Arthritis

Arthritis in sheep is an inflammation of the joints of the legs, resulting in loss of production, loss of carcass value and deaths. The main cause of arthritis in sheep is when bacteria enter the body via broken skin. The common times when a lamb will be susceptible to arthritis in this way are: 1) at or soon after birth with infection through the umbilical cord; 2) during docking, castration, and ear tagging; 3) through shearing wounds; and 4) other wounds.

There are several bacteria that may be implicated in arthritis. The most common is *Erysipelothrix rhusiopathiae*. Signs appear 2 to 14 days after infection. Affected joints become swollen, hot, and painful, resulting in the lamb becoming reluctant to move. For most types of arthritis, the only treatment is a course of massive doses of antibiotics. Prevention is the result of good sanitation and hygiene.

Bent leg (a form of rickets)

Bent leg is a form of rickets and is due to a malfunction of bone metabolism during growth. It occurs during the rapid growth phase of the lamb, usually between 6 and 12 months of age. It occurs primarily in rams, but can occur in ewes. It is more common in Rambouillet and related breeds. Similar conditions occur in cattle, horses, dogs, poultry, and people.

It can be prevented by 1) feeding balanced rations; 2) avoiding the use of too much high energy or high protein feeds (rapid growth and nutritionally "pushing" animals for growth is a factor in all species for increased incidence of rickets); 3) providing a calcium to phosphorus ratio of at least 1.5 to 1; 4) supplementing the ration with 300 IU of vitamin D (per 100 lbs of body weight per day); 5) providing adequate magnesium; 6) shearing young rams in early winter to allow more skin surface for vitamin D conversion; and 7) providing housing that provides good exposure to sun during the winter.

Bloat

Bloat occurs when rumen gas production exceeds the rate of gas elimination. Gas then accumulates causing distention of the rumen. The skin on the left side of the animal behind the last rib may appear distended. Bloat can be a medical emergency, and timely intervention may be necessary to prevent losses. It is a common cause of sudden death. Bloat is usually results from nutritional causes. There are two types of bloat: frothy and free gas.

Frothy Bloat (pasture bloat)

Frothy bloat is usually associated with the consumption of leguminous forages, but may also occur in sheep grazing lush cereal grain pastures or wet grass pastures or consuming grain that is too finely ground. Animals with frothy bloat can be treated with anti-foaming agents such as cooking oil or mineral oil or a commercial product such as Poloxalene.

Free Gas Bloat (feed lot bloat)

Free gas bloat is associated with grain feeding and occurs when animals would not given enough of an adjustment period. Many of the same factors causing acidosis are associated with free-gas bloat. Simple passage of a stomach tube may be effective at relieving free gas bloat. Inserting a trochar or needle into the abdomen is a life-saving procedure that should only be attempted as a last resort.

Bluetongue

Bluetongue is an insect-transmitted, viral disease of sheep, cattle, goats, and other ruminants, such as white-tailed deer and pronghorn. It is particularly damaging in sheep; half the sheep in an infected flock may die. In cattle and goats, however, bluetongue viruses cause very mild, self-limiting infections with only minor clinical consequences. A bluetongue virus infection causes inflammation, swelling, and hemorrhage of the mucous membranes of the mouth, nose, and tongue.

Inflammation and soreness of the feet also are associated with bluetongue. In sheep, the tongue and mucous membranes of the mouth become swollen, hemorrhagic, and may look red or dirty blue in color, thus giving the disease its name. Bluetongue viruses are spread from animal to animal by biting gnats. In the United States, the disease is most prevalent in the southern and southwestern States.

Animals cannot directly contact the disease from other animals. The bluetongue vaccine for sheep is only effective against certain serotypes, will not prevent the disease, and may cause adverse reactions. Pregnant ewes should not be vaccinated.

Border Disease (hair-shaker disease, fuzzy lamb syndrome, BD)

Border disease is often seen in the newborn lamb which has a hairy coat and trembles uncontrollably. It is caused by a virus and causes a wide variety of symptoms depending upon the stage of pregnancy when the ewe becomes affected. Sheep affected by border disease are characterized by open ewes, abortion, weak and frail lambs, abnormal hair coat, and nervous symptoms that cause the lamb to shake.

The most common clinical symptom is abortion of macerated or mummified lambs. Border disease is usually brought into a flock by new additions that are carriers or when sheep are mixed with cattle that are shedding the Bovine viral disease virus. Bovine viral diarrhea vaccines for cattle cannot be recommended for use in sheep because border disease viruses most commonly isolated from sheep are antigenically distinct from bovine viral diarrhea viruses most common in cattle. There is no treatment and the disease will not respond to antibiotics.

Caseous Lymphadenitis (CLA, boils, abscesses, cheesy gland)

Caseous lymphadenitis is an infectious, contagious disease that involves primarily the lymphatic system, though other organs can be affected. It is caused by the bacteria *Corynebacterium pseudotuberculosis*. Infection results in abscess formation in the lymph nodes which when cut or ruptured, discharge pus containing the bacteria into the immediate surroundings. When the nodes spread internally, affected ewes slowly lose weight and eventually become emaciated.

CLA is the third leading cause of carcass condemnation. CLA is controlled by culling visible infected animals and practicing good hygiene at shearing time. There is a vaccine licensed for sheep. It has been shown to both decrease the number of abscesses in sheep and the number of sheep that develop abscesses.

Clostridial Diseases

Clostridial organisms of various types are found in the soil, where they can survive for a very long time. Most clostridial organisms can also occur quite naturally in the gut of healthy animals. Sheep can be infected with various clostridial diseases – black leg, botulism, malignant edema, red water disease, enterotoxemias (several types), and tetanus – but the most common are enterotoxemia types C & D and tetanus.

Enterotoxemia type C (hemorrhagic enteritis, bloody scours)

Enterotoxemia type C is caused by *Clostridium perfringens* type C and affects lambs during their first few weeks of life, causing a bloody infection of the small intestine. It is often related to indigestion and predisposed by a sudden change in feed such as beginning creep feeding or sudden increase in milk supply. Treatment (antitoxin injected under the skin) is usually unrewarding. Vaccination of pregnant ewes 30 days before lambing is recommended as prevention.

Enterotoxemia type D (overeating disease, pulpy kidney disease)

Overeating disease is one of the most common sheep diseases in the world. It is caused by *Clostridium perfringens* type D and most commonly strikes the largest, fastest growing lambs in the flock. It is caused by a sudden change in feed that causes the organism, which is already present in the lamb's gut, to proliferate causing a toxic reaction.

It is most commonly observed in lambs that are consuming high concentrate rations, but it can also occur when lambs are nursing heavy milking dams. It usually affects lambs over one month of age. Treatment (antitoxin injected under the skin) is usually unrewarding. Vaccination of pregnant ewes 30 days before lambing is recommended as prevention.

Tetanus (lock jaw)

Tetanus is caused by *Clostridium tetani*, a soil inhabitant that is a prolific spore producer. This disease is usually related to docking and castrating by elastrator bands, though any wound can harbor the tetanus organism.

Signs of tetanus occur from about four days to three weeks or longer after infection is established in a wound. The animal may have a stiff gait, "lockjaw" can develop and the third eyelid may protrude across the eye. The animal will usually go down with all four legs held out straight and stiff and the head drawn back. Convulsions may occur and the animal.

Treatment consists of the tetanus anti-serum and antibiotics. It is usually unrewarding. Tetanus can be prevented by vaccinating pregnant ewes 30 days before lambing. If pregnant ewes were not vaccinated for tetanus, the tetanus anti-toxin can be administered to lambs at the time of docking and/or castrating. The tetanus anti-toxin provides immediate short-term immunity and can be used at the time of docking and castrating to prevent disease outbreaks.

Other Clostridial Diseases

Enterotoxemia type B (lamb dysentery)

Clostridium perfringens type B causes lamb dysentery. It usually affects strong lambs under the age of 2 weeks. Symptoms include sudden death, listlessness, recumbancy, abdominal pain, and a fetid diarrhea that may be blood-tinged. On post-mortem, intestines show severe inflammation, ulcers, and necrosis. The mortality rate approaches 100 percent. *Cl. perfringens* type B is not common in the U.S., but is frequently found in England, Europe, South Africa, and the Near East.

Black Disease

Black disease occurs in sheep in areas where liver flukes are known to occur. Infections are caused by the bacterium *Clostridium novyi*, which becomes active in the liver tissue damaged by the liver fluke. Control relies on vaccination and elimination of liver flukes.

Blackleg

Blackleg is disease of cattle and less frequently of sheep. It is caused by the soil-borne bacteria *Clostridium chauvei*. The disease develops rapidly in affected animals and often deaths occur before the owner has noticed any sickness. Vaccination is the only means of protection against blackleg.

Malignant Edema

Malignant edema is caused by the bacterium *Clostridium septicum*. In sheep, blackleg and malignant edema are indistinguishable. The disease is not common in sheep in North America. In areas where the disease is known to occur, lambs can be vaccinated.

Cobalt deficiency (vitamin B12 deficiency)

The only known animal requirement for cobalt is as a constituent of Vitamin B12, which has 4% cobalt in its chemical structure. This means that a cobalt deficiency is really a vitamin B12 deficiency. Microorganisms in the rumen are able to synthesize vitamin B12 needs of ruminants if the diet is adequate in cobalt. Ruminants must consume cobalt frequently in the diet for adequate B12 synthesis.

Cobalt deficiency causes lack of appetite, lack of thrift, severe emaciation, weakness, anemia, decreased fertility, and decreased milk and wool production. Weeping eyes, leading to a matting of wool on the face, is another common symptom. Sheep are more susceptible to cobalt deficiency than cattle. Cobalt deficiency also impairs the immune function of sheep which may increase their vulnerability to infection with worms.

The diagnosis of cobalt deficiency is usually based on blood (serum) vitamin B12 concentrations, which reflect immediate cobalt intake. Short-term supplementation of sheep with cobalt is usually achieved through oral drenching with cobalt sulfate or vitamin B12 injections.

Cobalt for animals (source: The Salt Institute)

Copper poisoning/toxicity

Sheep are ten times more susceptible to copper toxicity than cattle. When consumed over a long period of time, excess copper is stored in the liver. No damage occurs until a toxic level is reached at which time there is a hemolytic crisis with destruction of red blood cells. Most outbreaks of copper poisoning in sheep can be traced to feeding supplements containing copper levels that have been formulated for cattle or swine.

Copper is closely related to molybdenum, and copper toxicity occurs when the dietary ratio of copper to molybdenum increases about 6-10:1. Affected animals suddenly go off feed and become weak. An examination of their mucous membranes and white skin will reveal a yellowish brown color. Their urine will be a red-brown color due to hemoglobin in the urine. Treatment of copper poisoning is based on inactivating the copper with molybdate and sulfate.

Diarrhea (Scours)

Diarrhea is defined as an increased frequency, fluidity, or volume of fecal excretion. There are many causes of diarrhea: bacterial, viral, parasites, and diet. It is not possible to definitively determine the infectious organism by looking at the color, consistency, or odor of the feces. A definitive identification requires a sample for microbiological analysis. Diarrhea in lambs and goats is a complex, multi-factorial disease involving the animal, the environment, nutrition, and infectious agents.

Diarrhea should not be considered an illness in and of itself but rather a symptom of other more serious health problems in sheep and lambs. Diarrhea is not always the result of an infectious disease. It can be induced by stress, poor management, and nutrition. Before treating an animal for diarrhea, it is essential to determine why the animal is scouring. Many of the common causes of diarrhea are self-limiting, and the major goals of treatment are to keep the animal physiologically intact while the diarrhea runs its course.

Dystocia (lambing difficulty)

Most ewes deliver their lambs without assistance, however, there are occasions when producers must be prepared to assist with difficult deliveries. Difficult births can be caused by 1) abnormal presentation of the lamb(s); 2) an unusually large lamb; 3) a fat ewe; and 4) a small pelvic area. The normal delivery position for a lamb is the head and two front feet being delivered first. If lambs cannot be delivered after a reasonable amount of time and effort, competent assistance should be sought. A caesarean section is sometimes necessary to deliver lambs that cannot be delivered normally.

E. Coli scours (watery mouth)

E. coli scours is an opportunistic disease that is associated with sloppy environmental conditions and poor sanitation. It generally occurs as a diarrhea problem in two to four-day-old lambs. Affected lambs salivate and have a cold mouth; thus, the common name, “watery mouth.” Dehydration, coma and death usually occur within 12-24 hours following the onset of clinical signs of scours.

Treatment of E. coli scours usually involves rehydrating the lamb with oral, subcutaneous or intraperitoneal fluids and treatment with appropriate antibiotics. Prevention of E. coli scours in lambs should really be the key focus for any flock. Lambing barn sanitation and creating a clean, dry environment for newborn lambs are the key factors related to preventing outbreaks of E. coli scours.

Entropion (inverted eye lid)

Entropion is a heritable trait in which the lower eyelid is inverted, causing the eyelashes of the lower lid to brush against the eye. Entropion should not be left untreated. The constant irritation results in tearing and can lead to corneal ulceration, scarring, and blindness. It may affect one or both eyes. Mild cases of entropion can be treated by injecting a long acting antibiotic under the skin of the affected eyelid. Sometimes, staples, sutures, or clips will need to be applied to the skin surface of the affected eyelid. Rams carrying this trait should not be used for breeding.

Epididymitis (Brucella Ovis)

Epididymitis is a venereal disease of rams caused by *Brucella ovis*. Epididymitis means inflammation of the epididymis, the tubular portion of the testis that collects the sperm produced by the testes and stores it until it is ready to transport. Severely affected rams will often have at least one enlarged epididymis and may show pain when the testicle is manipulated.

Epididymitis causes varying degrees of damage. It may cause infertility by affecting the ram’s ability to produce viable sperm. It is the number one ram fertility problem seen in the sheep industry. Epididymitis is contagious and is transmitted during homosexual activity or during the breeding season via the ewe. Only about half of the rams affected by epididymitis respond to antibiotic treatment. Damage is usually permanent. Prevention is to buy virgin or disease-free rams, to subject rams to diagnostic testing, and to cull affected rams.

External Parasites (ectoparasites)

External parasites affecting sheep include keds, ticks, lice, mites, and nasal bots. Mange (sheep scab) in sheep is rare and a reportable disease in the U.S.

Fly Strike (blowflies, wool maggots, fleece worms, myiasis)

Fly strike is the infestation of the flesh of living sheep by blowfly maggots. Of all domestic animals, sheep are most often affected because wool, particularly dirty wool attracts blowflies. Blowfly populations are greatest during the summer months.

Docking, shearing, and removal of dags (wool contaminated with feces) will help to prevent flystrike. Insecticides are another control measure. Hair sheep are less susceptible to fly strike due to their absence of wool. Blowflies are also attracted to wounds, foot rot, weeping eyes, or sweat around the base of the horns of rams.

Sheep Keds (or ticks)

Sheep keds are wingless, reddish brown biting flies that resemble, and are sometimes called, ticks. They use piercing- sucking mouthparts to feed on blood. High ked populations cause unthriftiness and emaciation and make animals more susceptible to diseases and other stresses. Sheep keds are readily controlled with insecticides. Treatment is recommended immediately after shearing. Keds can only survive off the animal for about a week. Keds do not thrive well on the short hair of hair sheep.

Lice

Lice are quite small, ranging from 1/20-inch to 1/10-inch long. They spend most of their time next to the skin, and are difficult to see within dense wool or hair. Three species of lice are found on sheep. The primary animal reaction to lice is itching. Severe infestations can cause anemia. Various insecticides can be used to control lice on sheep.

Nasal bots (bot fly, head bot)

The sheep bot fly is a fuzzy, yellowish-gray or brown fly that deposits tiny larvae on the muzzles or nostrils of sheep. The larvae migrate into the nostrils and head sinuses and develop. A snotty nose is the symptom. Animals will hold their heads down or in a corner to escape the flies. Weight reductions of up to 4 percent have been attributed to bot infestations in some studies. The highest bot levels are seen in November and December. A systemic insecticide formulation containing ivermectin is effective against larval stages of the nasal bot.

Scabies (sheep scab, psoroptic mange, wet mange)

Sheep scab is a very contagious disease, caused by mites feeding on the surface layers of the sheep’s skin. Severe itching occurs, wool or hair falls out in patches, and the skin becomes reddened, crusted with scabs and sore. Positive diagnosis can be made only by scraping lesions and examining the scrapings microscopically for mites. The preferred method of treatment is dipping with insecticides. Scabies has been declared eradicated from the United States.

Facial eczema

Facial eczema is a condition of severe dermatitis in cattle, sheep, and goats caused by a toxin in spores of the saprophytic fungus *Pithomyces chartarum*, which lives in dead vegetative material in pastures, especially perennial ryegrass. Facial eczema is an example of “secondary photosensitization,” in which the skin lesions are really the secondary result of liver damage, rather than the direct result of a plant toxin. The liver damage in facial eczema is caused by the toxin sporidesmin in the fungus spores.

Facial eczema is relatively common in areas of New Zealand and has also been observed in Australia, South Africa, and in irrigated perennial ryegrass fields in the United States (Oregon). Perennial ryegrass is the grass species most associated with facial eczema. *P. chartarum* does not grow well in legumes. The occurrence of facial eczema is also influenced by livestock genetics.

Performance testing programs in New Zealand have identified genetic lines of sheep that can tolerate relatively high toxin situations. Animals suffering from facial eczema should be removed from the contaminated pasture and provided with shade, cool water, and a good diet. Feeding high levels of zinc may help prevent facial eczema.

Fescue Toxicosis

Most Tall Fescue (*Festuca arundinacea*) is infected with a fungal endophyte. The toxins that result from the endophyte create a number of problems for the grazing animal, although sheep appear to be less affected by the endophyte than cattle and horses. However, sheep are prone to “fescue foot,” hyperthermia, poor wool production, and reproductive problems, as well as lowered feed intake and the resulting poor weight gains. Diluting Kentucky 31 tall fescue with legumes and supplementing with other feeds will reduce the toxic effects of fescue on livestock. Alternative tall fescue cultivars are also available.

Foot-and-mouth disease (FMD, hoof-and-mouth disease)

Foot-and-mouth disease is a severe, highly communicable viral disease of cattle and swine. It also affects sheep and goats and other cloven hoofed animals. The disease is characterized by fever and blister-like lesions followed by erosions on the tongue and lips, in the mouth, on the teats, and between the hooves.

While many affected animals do recover, the disease results in a weakened state, loss of weight, and reduced production of milk and meat. Foot-and-mouth disease in adult sheep and goats is frequently mild or unapparent, but can cause high mortality in young animals. Sheep and goats are sometimes the reservoir of infection. The disease is virtually never harmful to humans, but is highly contagious among those animals which are vulnerable to this virus.

The United States has been free from foot-and-mouth disease since 1929.

Footrot

Footrot is one of the most economically devastating diseases in the sheep industry. It is caused by the interaction between two anaerobic bacteria: *Bacteroides nodosus*, which can only live in the animal's hoof; and *Fusobacterium necrophorum*, which is a normal inhabitant of soil and sheep manure.

Lameness in one or more feet is the most common symptom of footrot, though not all lame sheep have footrot. Footrot has a characteristic foul odor. Footrot can be controlled and/or eradicated by a combination of hoof trimming, vaccination, foot bathing and soaking and culling. Zinc sulfate is considered to be the most effective foot rot treatment. Footrot is highly contagious.

Foot Scald (benign footrot and ovine interdigital dermatitis)

Foot scald causes the tissues between the sheep's toes become blanched or white, or red and swelled. It is caused by a soil bacteria that is present in most environments and manifests itself during wet conditions. It is easier to treat than foot rot. Placing sheep in a dry area away from mud may clear the condition. Individual animals can be treated with Koppertox. Groups of animals may be treated with a zinc sulfate foot bath.

Goiter

Goiter is an enlargement or swelling of the thyroid gland. Affected lambs have a swollen throat. They are often born with little or no wool.

They are weak and often die of starvation. Treatment is usually unrewarding. But if the condition is not advanced, the lamb may survive. Goiter in newborn lambs is due to a deficiency of iodine in the pregnant ewe's diet. It can be prevented by providing iodized salt in the diet of gestating ewes. The salt mixture should contain 0.007 percent of available iodine. An iodine deficiency may also result in reduced yield of wool and reduced conception rate in the flock.

Grass tetany (grass staggers, magnesium deficiency)

Grass tetany is a complex disease traditionally associated with magnesium deficiency. All ruminants are susceptible. Magnesium deficiency in sheep most commonly occurs in acute form within 4-6 weeks of lambing. Affected ewes exhibit sensitivity to touch and trembling of the facial muscles; some are unable to move, others move stiffly; extreme cases collapse and show repeated tetanic spasms with all four limbs rigidly extended.

Low blood magnesium can be caused by low levels of magnesium in lush spring grass or by mineral imbalances such as high potassium and nitrogen or low calcium in the diet. Ewes with grass staggers are often low in calcium as well as magnesium. It is therefore wise to use a combined treatment of calcium borogluconate and magnesium hypophosphite. Producers can add about 10 to 20 grams of commercial or homemade supplemental magnesium to livestock diets to prevent grass tetany. Magnesium oxide is one of the best and cheapest magnesium sources.

Internal Parasites

There are three broad types of internal parasite that can cause significant health issues in sheep: worms, flukes, and protozoa.

Cryptosporidiosis (*Cryptosporidium* sp.)

Cryptosporidium species are minute protozoan parasites closely related to coccidia. One major species, *Cryptosporidium parvum*, infects both farm animals and humans. *C. parvum* has a rapid, direct life cycle and infection occurs when viable oocysts in the environment are ingested by susceptible hosts, usually lambs under a month old. Lambs as young as 3 days can be affected. Lambs are depressed and reluctant to suck while the diarrhea lasts. Very young lambs soon become dehydrated and die. In poor weather conditions, lambs may die of hypothermia. The illness may last for up to 10 days, and relapses after apparent recovery are common.

Coccidiosis (*Eimeria* sp.)

Coccidia are single-cell protozoa that are a natural inhabitant of the sheep's gut. Young lambs are particularly susceptible to coccidia especially during periods of stress (e.g. weaning). Coccidia damage the lining of the small intestine, affecting absorption of nutrients. The most common symptom of coccidiosis is diarrhea. The diarrhea may be bloody or smeared with mucous.

The diagnosis of coccidiosis cannot be confirmed by identification of oocysts in fecal samples. Coccidiosis is mostly a management-related disease, caused by overstocking and poor hygiene. Coccidiosis can be prevented by including Lasolocid (Bovatec®), Monensin (Rumensin®), or Decoquate (Deccox®) in the feed or mineral. Coccidiosis should be treated with Amprolium or sulfa medications.

Stomach worms (*Haemonchus*, *Trichostrongylus*, and *Ostertagia* sp.)

The internal parasites of greatest concern in sheep are usually the stomach worms, with the barber pole worm (*Haemonchus contortus*) being of primary concern and the small brown stomach worm being of secondary concern. The barber pole worm is a blood-sucking parasite that pierces the mucosa of the abomasum, causing blood and protein loss.

The primary symptom of barber pole infection is anemia (blood loss). Anemia can be observed in the sheep by examining its lower eyelid, which will become paler (whiter) with increasing infestation. An accumulation of fluid under the jaw, called "bottle jaw" is also a tell-tale of barber pole infection. The small brown stomach worm also burrows into the lining of the abomasum, but it causes typical digestive symptoms, especially diarrhea. Microscopically, it is difficult to differentiate between the barber pole worm and the brown stomach worm. The eggs only differ in size not appearance.

***Nematodirus* spp.**

The life cycle and transmission of *Nematodirus* differs from that of other sheep worms. Infective *N. battus* larvae generally don't survive for long on pasture when weather conditions are warm and dry, but can survive for several months during cool and damp weather. The symptoms of *Nematodirus* are scours, weight loss, and sudden death.

Tapeworms (*Moniezia* sp.)

There is disagreement as to whether tapeworms cause serious problems in sheep. They are generally considered to be non-pathogenic, though they can cause weight loss, diarrhea, and even death in extreme cases. The only anthelmintics that are effective against tape worms are the benzamidizoles (fenbendazole and albendazole).

Lungworms

Lung worm larvae are passed in the feces, but travel to the respiratory system once they enter the sheep system. The symptoms of lung worm infection are not obvious unless the problem is severe. The same anthelmintics that are effective against stomach worms are also effective against lung worms.

Liver flukes (*Fasciola hepatica*)

Liver flukes are generally not considered to be a problem in the Mid-Atlantic states. Liver flukes require snails and open water to complete their life cycle. The only anthelmintic that is effective against liver flukes (the adult form) is albendazole (Valbazan®).

Meningeal worm (*Paralaphostrongylus tenuis*, deer worm, brain worm)

The meningeal worm is a parasite of the White Tail deer. Sheep, goats, llamas, alpacas, and horses are abnormal hosts for the parasite. After they ingest the larvae, the larvae travel to the spinal cord causing gait abnormalities and eventually paralysis. When the parasite reaches the sheep's brain, it will kill them.

Meningeal worm infection cannot be detected in the live animal. When meningeal worm is suspected, high doses of anthelmintics and anti-inflammatory drugs are recommended. Infections can be prevented by limiting exposure to deer or by controlling snail populations, since the parasite requires snails to complete its life cycle.

Johne's Disease (paratuberculosis)

Johne's Disease (pronounced "Yo nees") is a disease that affects the intestines of mostly ruminants. It is caused by a hardy bacteria called *Mycobacterium paratuberculosis*. Johne's most commonly occurs in dairy cows, but may also affect beef cattle, sheep, and goats.

The strain that affects sheep is different than the one that affects cows, though there is an intermediate strain that sheep are susceptible to. While cattle experience diarrhea, in sheep, Johne's tends to be a wasting disease.

Joint Ill (navel ill, polyarthritis)

Joint ill occurs in lambs up to one month of age. Affected lambs are often lame in several joints, usually limb joints, including fetlocks, knees, hocks and stifles. Affected joints are hot and painful. The lambs are dull, feverish and clearly unthrifty. Some may have swollen, infected navels, while others may have symptoms of pneumonia or meningitis.

The infection is usually caused by strains of streptococci, though coliforms and occasionally *Actinomyces pyogenes* may be isolated. Affected lambs should be treated with a long-acting penicillin. Joint ill is prevented by good hygiene and using a navel dip, such as betadine or gentle iodine.

Lameness

It has been estimated that 80 percent of the flocks in Great Britain have lame sheep. Lameness is a sign of several foot conditions – some of which are very serious – as well as some other problems. They include foot rot and foot scald, strawberry foot, foot abscess, foot-and-mouth disease, bluetongue, ovine interdigital dermatitis (looks like scald), sore mouth, arthritis, nutritional deficiencies, mineral excesses, and physical injuries. The more common foot problems can be avoided or minimized if good husbandry practices are followed. Regular hoof inspection and foot paring will prevent many problems.

Laminitis (founder)

The lameness related to laminitis is caused by inadequate blood flow in the foot. Signs are heat in the feet. It is normally associated with digestive problems resulting from excessive intake of grain (grain overload/acidosis), which usually masks the effects on the feet. Such animals usually die before the feet become involved. Recovered animals may exhibit foot growth and/or permanent lameness. Feeding management is key to the prevention of laminitis/founder.

Listeriosis (circling disease)

Listeria monocytogenes, the bacteria that causes listeriosis is widely distributed in nature and is found in soil, feedstuffs, and feces from healthy animals. It is most commonly associated with the feeding of moldy silage or spoiled hay, but because the organism lives naturally in the environment, listeriosis may occur sporadically.

Listeriosis usually presents itself as encephalitis, but may also cause abortion in ewes. Sheep with the neurological form of the disease become depressed and disoriented. They may walk in circles with a head tilt and facial paralysis. Mortality is high and treatment (high doses of antibiotics) is generally not effective.

Mastitis (hard bag, blue bag)

Mastitis is an inflammation of the mammary gland (udder) which is usually caused by a bacterial infection. The bacteria causing mastitis in ewes are *Staphylococcus aureus* and *Pasteurella hemolytica*. There are two types of mastitis: acute and chronic. The glands of ewes with acute mastitis may be discolored and dark, swollen and very warm. The affected ewe may be reluctant to walk, may hold up one rear foot, and may not permit her lambs to nurse.

Ewes with chronic mastitis often go undetected. Mastitis is treated with intramammary infusions of antibiotics and systemic antibiotics. There is no vaccine for mastitis. It is best prevented by good management and sanitation.

Measles (cysticercosis)

Sheep measles (*Cysticercus ovis*) is the intermediate or larval stage of the cestode (tapeworm) *Taenia ovis*, the adult stage of which is found in the small intestine of dogs (sheep host the larvae stage). Sheep measles lesions are found in the heart, diaphragm and other muscles of sheep and goats. Although not considered to be a human health hazard, carcasses can be condemned on account of sheep measles.

There are no clinical signs of cysticercosis in sheep. Currently diagnosis is only made by finding the cysts at slaughter. To prevent sheep measles, dogs and other canines should not be allowed to feed on sheep or goat carcasses. Dogs should be dewormed for tapeworms. Any dog given access to the farm should be required to be dewormed.

Milk fever (hypocalcemia, parturient paresis)

Milk fever is a metabolic disease affecting mostly pregnant ewes near term when calcium requirements are highest. It is most commonly caused by an inadequate intake of calcium, but can also be caused by a ewe's inability to mobilize calcium reserves prior to or after lambing. Milk fever presents similar symptoms as pregnancy toxemia but can be differentiated by the affected ewe's response to calcium therapy.

Ewes in the early stages of milk fever can be administered calcium gluconate subcutaneously. More seriously affected ewes will require intravenous calcium and other supportive therapies. Milk fever can be prevented by providing proper levels of calcium in ewe diets, especially during late gestation.

Ovine progressive pneumonia (OPP, lung disease. Maedi-Visna)

Ovine progressive pneumonia is a slow developing viral disease that is characterized by progressive weight loss, difficulty in breathing and development of lameness, paralysis and mastitis. It is very closely related to caprine arthritis-encephalitis virus (CAE) and is caused by a retrovirus. The OPP virus closely resembles Maedi-Visna which is a similar slow or retrovirus found in other parts of the world.

OPP is transmitted laterally to other susceptible animals or to offspring through ingestion of infected milk and colostrum. Veterinary diagnostic laboratory assistance is required for diagnosis. There is no treatment, but OPP can be eliminated from the herd using annual blood testing and removal of positive animals and removal of the lambs from the ewes prior to suckling.

It is estimated that over 50% of the flocks in the U.S. are infected with OPP with the number of sheep infected within a positive flock anywhere between 1% to 70%. However, the vast majority of infected sheep will never show respiratory disease or a wasting syndrome.

Pink eye (infectious keratoconjunctivitis)

Pinkeye is a highly contagious disease affecting the eyes of sheep. Pinkeye may result from many different infective agents: Chlamydia, certain viruses, and mycoplasma. The disease will usually complete its course in three weeks in individual sheep. The use of eye medications containing antibiotics may be helpful in individual cases. There are no effective vaccines available. The agent that causes pinkeye in sheep and goats is different from the one that causes it in cattle.

Pizzle Rot (sheath rot)

Pizzle rot is an infection in the sheath area of the ram. It is caused by the bacteria, *Corynebacterium renale* or one from that group. The other factor is high protein diets (>16 percent). Ammonia, produced by the excess urea in the ram's urine can cause severe irritation and ulceration of the skin around the preputial opening. The debris from the ulcer form a crust which may block the opening to the prepuce. Pizzle rot can affect a ram's desire and ability to breed.

Pneumonia (respiratory disease complex, pasteurellosis)

Pneumonia is second in importance to diseases of the digestive tract. Pneumonia is a respiratory complex with no single agent being solely responsible for the disease. The most common bacteria isolated from respiratory infections is *Pasteurella haemolytica* or *Pasteurella multocida* or both. Affected animals become depressed and go off feed. They may cough and show some respiratory distress. Temperatures are usually over 104°F. The disease may be acute with sudden deaths or take a course of several days. Pneumonia is treated with antibiotics.

Polioencephalomalacia (PEM, CCN, polio, cerebrocortical necrosis)

Polioencephalomalacia is a disease of the central nervous system, caused by a vitamin B1 (thiamine) deficiency. Since the rumen manufactures B vitamins, polio is not caused by insufficient thiamine, but rather the inability to utilize it. The most common symptom of polio is blindness and star gazing.

Polio most commonly occurs in lambs that are consuming high concentrate diets. Polio can also occur in sheep that consume plants that contain a thiamase inhibitor. Polio symptoms mimic other neurological disease conditions, but a differential diagnosis can be made based on the animals' response to injections of vitamin B1.

Pregnancy Toxemia (ketosis, twin lamb disease, lambing paralysis, hypoglycemia)

Pregnancy toxemia is a metabolic disease affecting ewes during late gestation. It most commonly afflicts thin ewes, overfat ewes, and/or older ewes carrying multiple fetuses. It is caused by an inadequate intake of energy during late pregnancy, when the majority of fetal growth occurs. Treatment is to increase the blood sugar supply to the body by administering glucose intravenously or propylene glycol or molasses orally. In extreme cases, removal of the fetuses is the only recourse to save the ewe. Pregnancy toxemia can be prevented by providing adequate energy to ewes during late gestation, usually 1/2 to 1 lb. of grain per head per day, more for high producing ewes. Adequate feeder space is necessary so that all ewes are able to consume enough feed.

Rabies

Rabies is a viral disease of the central nervous system of mammals, spread by contact with saliva from an infected animal, usually through bites or scratches, abrasions, or open wounds in the skin. Domestic animals may become exposed during normal grazing or roaming. Sheep have symptoms similar to cattle, and sometimes vigorously pull their wool. Livestock and horse owners may decide to vaccinate their animals if they are often exposed to potentially rabid wild or domestic animals.

Generally, production animals, such as dairy cow herds and sheep flocks, are not vaccinated because the potential risks are usually lower than the annual costs of vaccination and because human contact with individual animals is low. Small groups of valuable purebred animals may be an exception. In recent years, a few states have required vaccination for rabies before an animal (including some livestock) is exhibited.

Rectal Prolapse

A rectal prolapse is protrusion of the rectal tissue through the exterior of the body. It usually begins as a small round area that sticks out when the lamb lays down or coughs. In extreme cases, the intestines can pass through the opening and the disease can be fatal. There are many predisposing factors to rectal prolapses, including genetics, short tail docks, coughing, weather, stress, and feeding concentrate diets.

Rectal prolapses tend to occur more in ewe lambs than wether lambs and more in black-faced sheep than white-faced sheep. The link between extreme tail docking and the incidence of rectal prolapses in feed lot lambs has been scientifically established. Usually, lambs with prolapsed rectums are prematurely slaughtered or sent to market. It is possible to repair a rectal prolapse by amputating the prolapsed part of the rectum.

Ringwomb

Ringwomb is failure of the cervix to dilate sufficiently to allow delivery of lambs. While sometimes the cervix of affected ewes can be opened with gentle pressure or the injection of hormones, usually such efforts prove futile and a c-section to remove the lambs is the only viable course of action. Unfortunately, little is known about the cause of ringworm and how to prevent it. There is some evidence to suggest that ringwomb has a genetic cause.

Ringworm (club lamb fungus, wool rot, and lumpy wool)

Club lamb fungus is a highly contagious fungal infection of the skin of sheep. It is primarily a problem with show lambs that are frequently closed sheared. Club Lamb Fungus is caused by fungus of the genus *Trichophyton*. Infection occurs when the fungus invades the skin and hair (wool) follicles. Fungal spores are transmitted by contaminated clippers, blankets, combs, bedding, bunks, and pens. Lesions can appear anywhere, however, most are found on the head, neck, and back. The infection is susceptible to anti-fungal agents. Club lamb fungus causes a nasty ringworm infection in people.

Ryegrass staggers

Ryegrass staggers is a disease of grazing animals that causes muscle spasms, loss of muscle control and paralysis. It is caused by a group of toxins that accumulates in the leaf sheaths of perennial ryegrass. The toxins are produced by a native fungus called ryegrass endophyte, *Neotyphodium lolii*, that grows within the leaves, stems and seeds of perennial ryegrass. Sheep and cattle are most commonly affected but horses, apalaca and deer are also susceptible.

Ryegrass staggers has not been recorded in goats. Affected animals have a stiff gait or are unable to walk. They may injure or kill themselves in transit. The toxins can induce high body temperatures thus animals will try to cool themselves. Younger animals tend to be worst affected. The symptoms of ryegrass staggers usually develop 7-14 days after livestock stock start grazing the toxic parts of the plant. Prolonged exposure to toxic pasture can lead to permanent neurological damage.

Scrapie

Scrapie is a fatal disease affecting the central nervous system of sheep and goats. It is spread during lambing season when lambs come into contact with infected placentas. While the occurrence of scrapie in the U.S. sheep flock is low, only one in 500 animals and scrapie, it is a disease of regulatory concern. This is because scrapie is a member of a family of diseases called “transmissible spongiform encephalopathies (TGE’s), which also includes chronic wasting disease (in mule deer and elk), mad cow disease (bovine spongiform encephalopathy) and classic and new variant Creutzfeldt-Jacob’s Disease (in humans).

Producers of breeding stock are encouraged to enrolled in the voluntary scrapie flock certification program, which after five years of scrapie-free monitoring, enables a flock to be certified “scrapie-free.” Furthermore, while scrapie is not a genetic disease, a sheep’s genetic make-up influences its susceptibility to scrapie if exposed to the infective agent. Therefore, sheep can be tested for scrapie resistance.

Soremouth (contagious ecthyma, scabby mouth, pustular dermatitis, orf)

Soremouth is the most common skin disease affecting sheep (and goats). It is a highly contagious viral infection that can also produce painful human infections. The virus causes scab formation on the skin, usually around the mouth, nostrils, eyes, mammary gland and vulva. It first appears as tiny red nodules, usually at the junction of the lips.

Effective vaccines are available. The vaccine is applied to a woolless area in the inside of the ear or under a leg where it cannot spread to the mouths of other animals. Once the vaccine is used on the premises, it should be continued yearly. Flocks that have not experienced soremouth should probably not vaccinate for soremouth, since the vaccine introduces the virus to the farm.

Spider Syndrome (spider lamb disease, hereditary chondrodysplasia)

Spider syndrome is a genetic condition that results in lambs with severe malformations of the skeletal system. These animals have very fine bone, crooked legs and a crooked spinal column, distinct lack of muscular development and usually do not survive to full maturity.

The cause of the condition appears to be genetic alteration due to selection for extreme length and height in show sheep. The disease is found predominantly in black-faced lambs: 75% Suffolk and 25% Hampshire. In order to have this disease, lambs inherit a recessive gene from each parent.

Urinary calculi (water belly, urolithiasis, calculosis)

Urinary calculi is a metabolic disease of wethers and rams characterized by the formation of calculi (stones) within the urinary tract. Blockage of the urethra by calculi causes retention of urine, abdominal pain, distention and rupture of the urethra or bladder.

The most common cause of urinary calculi is feeding rations with high phosphorus levels. Grain products tend to be very high in phosphorus relative to calcium, whereas forages have a better ratio. The ratio of calcium to phosphorus in the ration should be at least 2:1. Providing the proper balance of minerals in the ration is preferred to offering minerals free choice, since there is no guarantee animals will consume adequate amounts of free choice mineral.

The addition of ammonium chloride to the ration will aid in preventing urinary calculi. It is also important that animals have an ample supply of clean, potable water. The addition of salt to the ration will increase water intake and decrease stone formation.

Uterine prolapse

A uterine prolapse is when the womb is turned inside out and pushed through the birth canal by the abdominal strainings of the ewe. It occurs immediately after lambing and is a life-threatening situation. A prolapsed uterus must be manually forced back into the ewe. The uterus should be cleaned with a warm, soapy, disinfectant solution prior to replacement and should be replaced before the tissues become dry or chilled. Deep sutures are necessary to keep the uterus in place. Affected ewes should be removed from the flock. Older ewes are more commonly affected than younger ewes.

Vaginal Prolapse

Vaginal prolapses (protrusion of the vagina) are most commonly observed during the last month of pregnancy or shortly after lambing. Many factors have been implicated in the cause of vaginal prolapse, such as hormonal/metabolic imbalances, overfat/overthin body condition, bulky feeds, lack of exercise, dystocia in previous pregnancies, increased abdominal pressure and fetal burden. Prolapses often recur in subsequent pregnancies.

The exposed vagina of affected ewes should be washed with soapy disinfectant solution and forced back into the ewe. A bearing retainer or “spoon” can be inserted and secured in the ewe to prevent further prolapsing. In a ewe that has lambed, sutures are used to secure the prolapse. Affected ewes and their offspring should probably not be kept in the flock for breeding animals due to the possibly hereditary nature of the problem.

White muscle disease

(WMD, nutritional muscular dystrophy, nutritional myopathy, stiff lamb disease)

White muscle disease is a degeneration of the skeletal and cardiac muscles of lambs. It is caused by a deficiency of selenium, vitamin E, or both and can be a problem wherever selenium levels in the soil are low. Symptoms are stiffness of the hind legs with an arched back and tucked in flanks. Treatment is the administration of selenium and vitamin E by injection.

Feed rations should be evaluated to determine if they are providing adequate levels of selenium and vitamin E. When feed supplementation is adequate, preferred, lambs can be given an injection of selenium and vitamin E shortly at birth. Dietary supplementation of selenium is preferred to selenium injections.

