

American Consortium for Small Ruminant Parasite Control

Best Management Practices for Internal Parasite Control in Small Ruminants

MANAGEMENT OF COCCIDIA

March 2019

When we think about internal parasites that infect small ruminants, we think about stomach worms, including the devastating *Haemonchus contortus* (barber pole worm). However, one of the most economically important internal parasite infections is not caused by a worm. Coccidiosis results from single-cell protozoal parasites (*Eimeria* spp.) that damage the lining of the intestines and are especially harmful to young animals less than six months of age.

While there are many different species of *Eimeria* that can result in coccidiosis, most, even in high numbers, will not cause disease in sheep or goats. Infection and transmission of coccidiosis is species-specific and cannot be transferred between species. Even sheep and goats are not affected by the same *Eimeria* species.

Coccidia are opportunistic parasites, flourishing in warm, wet environments. They are most likely to cause disease during times of high stress. Stressors can include weaning, unsanitary conditions, overcrowding or stocking, poor health, transportation, and poor nutrition. Even though infection is not often seen in adults, they still shed a few oocysts, and at stressful times, they (especially goats) can become overwhelmed by large numbers and become symptomatic.

Adults generally serve as the source of infection for young animals. Younger animals are simply more vulnerable because of their small size and immature immune systems, which become more developed over time with exposure to the parasite.

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Healthy lamb

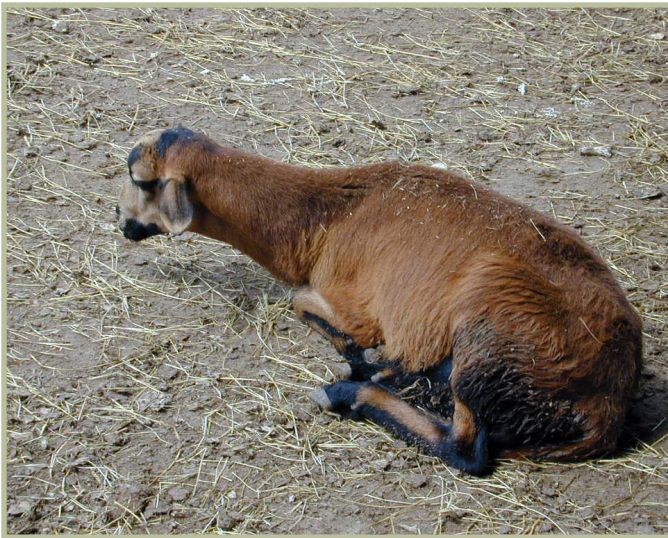
Image by S.Schoenian

LIFE CYCLE

Compared to nematodes (roundworms), the life cycle of coccidia is more complex. There is a free-living phase that takes place outside of the animal's body and a parasitic phase that occurs in the intestine of the animal. Depending on the species, the typical life cycle can range from 10 to 20 days. Generally, non-infective oocysts (egg-like structures) are released into the environment in the feces of infected animals.

If environmental conditions are right (moist and warm; 75 to 90°F, with good oxygen flow), eggs will sporulate (mature) into infective oocysts. Sporulation takes 2 to 7 days, depending on environmental conditions. Animals ingest infective oocysts in the feces, bedding, contaminated water or feed, or by licking themselves or another animal.

Once in the host's digestive tract, oocysts undergo further maturation and gain the ability to reproduce. At this point, they penetrate the lining of the intestines (destroying millions of cells) and begin producing new oocysts which are then shed in feces, and the cycle starts over.



Lamb with obvious clinical signs

Image by S. Schoenian

Infective oocysts can survive in extreme environmental conditions and are generally hard to kill, allowing them to live for years outside the animal's body. Elimination requires very strong disinfectants or direct exposure to sunlight.

SYMPTOMS

Coccidiosis is a disease of young lambs and kids, from a few weeks old, up to about six months of age. It is most commonly observed in recently weaned animals. Coccidiosis can be manifested in a subclinical (chronic) or clinical (acute) form. Subclinical coccidiosis is more common, generally not observed immediately, and the animals may appear normal at first glance. However, this form of coccidiosis is associated with lower feed consumption, poorer growth and weight loss, poorer utilization of nutrients from feed, and soft feces. In most cases, subclinical coccidiosis is viewed as a persistent long-term infection, with reduced productivity.

On the other hand, clinical coccidiosis has more obvious symptoms and requires immediate intervention to prevent permanent damage or death. The most common symptom is diarrhea, which may be watery, with or without mucus and/or blood, yellowish-green to brown in color, and foul-smelling. Other symptoms include failure to thrive, loss of weight, abdominal pain, and a rough hair coat. Additionally, animals may strain to pass feces, become anemic (in severe infections), have hollow flanks, be depressed, become susceptible to other

diseases, get dehydrated, and die. It is important to pay close attention to all animals in order to assist with timely diagnosis and treatment.

DIAGNOSIS

Diagnosis of coccidiosis relies mostly on the observation of clinical symptoms, presence of oocytes in fecal samples, and detection of lesions in the small intestine (at necropsy). Since clinical signs are similar to what might be observed in other disease conditions, it is important to eliminate other causes before making a definitive diagnosis of coccidiosis.

Conducting a fecal oocyte count (FOC; modified McMaster technique) is a quantitative way of diagnosing infection. High numbers of oocyte eggs can be diagnostic of infection. FOC of over 100,000 are not uncommon in severe infections. However, some animals may shed oocysts without showing signs of the disease and in other cases severe infection and symptoms may precede expulsion of oocysts. In addition, not all species of *Eimeria* cause disease. .

PREVENTION

Good sanitation

Coccidiosis prevention is based on the adoption of several best management practices. The most critical prevention strategy in any flock/herd is good sanitation. All animals, especially young susceptible ones, should be kept in a clean and dry environment. To accomplish this, clean and replace bedding in any building/shelters where animals gather routinely. Be sure to keep lambing/kidding pens clean. Adding some gravel or absorbent over dirt floors first will help to keep bedding drier.

It is important to prevent overcrowding by all means possible. Follow established guidelines for space requirements (see table 1). Requirements will vary by area, age and species, with horned animals usually requiring additional space. Develop a daily routine of cleaning all feeding and watering equipment and try to keep them protected from fecal contamination (easier said than done with goats!). This can be achieved by using raised feeders and waterers.



Animals tend to gather around feeders and waterers, so consider moving them routinely if the area tends to get wet and muddy.

Also, checking waterers constantly for any leaks and fixing them promptly will aid in keeping the environment dry. If grazing, ensure that pastures are well drained. Avoid overgrazing to reduce exposure to infective oocysts. Also, try to keep grazing to a minimum in areas where sheep and goats congregate (near shade, waterers, and feeders). Finally, do not feed animals on the ground, especially young animals. This will help to prevent ingestion of infective oocysts from feed contaminated with manure.



Clinically-parasitized kid

Image by S. Schoenian

Table 1. Space requirements (square feet)

	Pregnant female	Female with young	Ram	Feeder lamb/kid
Dirt lot	20-25	25 - 30	20-25	15-20
Open shed	8-10	12-15	8-10	8-10
Confinement	8-16	10-20	8-16	8-10

Source: *Sheep Equipment and Housing Handbook, Midwest Plan Service, 1994*

Stress Reduction

There are a number of activities/practices that cause stress in sheep and goats that can affect their immunity and overall health. Every attempt should be made to reduce or eliminate potential stressors. For instance, it can be tempting to grab and move or lift an animal by the horns and/or ears. However, aggressive handling can be extremely stressful. It is recommended that producers practice calm and gentle handling.

Overcrowding not only leads to unsanitary conditions, but close confinement increases aggressive behavior, leading to more attacks on less dominant/smaller animals and triggering stress. This is another reason why guidelines for space requirements should be followed so that overcrowding is avoided.

Weaning is especially stressful to young animals that are most susceptible to coccidia infection. To minimize stress at this time, consider the following: removing the mothers from the area to prevent additional stress from placing weaned kids/lambs in an unfamiliar surrounding; providing fence line contact with mothers for a few days after weaning;

and not mixing weanlings in with unfamiliar groups, especially older animals because they can transmit the infection.

All new animals should be quarantined for at least 28 days prior to introduction to the flock/herd. The introduction of new animals to the flock/herd induces a stress response in animals. A period of quarantine not only allows for you to deworm, vaccinate, trim hooves, and test new animals for disease, it also allows stress levels from the move/transport to decrease before introduction to your herd. Once introduced to the herd, prevent overcrowding, especially since a new pecking order will have to be established. Finally, sheep and goats are social creatures and will experience stress if they are placed in isolation. Allowing even visual contact with other animals will greatly reduce stress in any animal kept in isolation.

Good nutrition

Poor nutrition is an important source of stress on animals. A well-fed sheep or goat is more resistant to disease and infection with internal parasites. Make sure you are feeding a balanced ration, with the required amounts of vitamins and mineral supplementation to all animals. Good nutrition is essential for colostrum production. Adequate intake of colostrum will assist kids and lambs in fighting coccidia infections for the first several weeks after birth.

Coccidiostat Use

In addition to the management practices described above, coccidiostats can be added to feed, mineral,



water, and/or milk replacer to aid in the prevention of coccidiosis. There are several coccidiostats that are FDA-approved for use in sheep and goats. Monensin (Rumensin®) and lasalocid (Bovatec®) are antibiotic ionophores. Rumensin® can be fed to confined goats. Bovatec® is approved to feed to sheep maintained in confinement. Decoquinatate (Deccox®) is non-antibiotic coccidiostat. It can be fed to young, non-lactating lambs and goats.

Coccidiostats have an effect on different stages of the coccidia life cycle. The ionophores kill coccidia, whereas Deccox® prevents its growth. When used properly, all can reduce oocyst output significantly, while still enabling young animals to develop immunity (to coccidia). Effectiveness depends upon two factors: timing and dosage. Coccidiostats must be fed continuously before the onset of clinical signs (usually 3 to 4 weeks in advance). They must be consumed at sufficient levels. The latter can be challenging, as coccidiostats are often offered in free choice feeds or minerals. Forage consumption can further reduce intake.

Coccidiostats should be fed strategically. It is common to feed coccidiostats to ewes and does during late gestation. The rationale is to reduce the level of infection in the environment to which lambs and kids will be born. Coccidiostats are typically included in creep feed and rations for growing and finishing lambs/kids. Coccidiostats should not be fed year-round. They do not have any withdrawal periods (for meat), but mixing errors have caused toxicity, especially with Rumensin®. Horses must not be permitted to ingest ionophores, especially Rumensin®, as it is especially toxic to equines. Deccox® has the least potential for toxicity. Be sure to follow product labels for mixing instructions and dosage requirements.

TREATMENT

Once coccidiosis has been diagnosed, treatment should be provided as early as possible. All animals sharing space should be treated. There is no vaccine for coccidia. Dewormers are not effective against coccidia. In addition, the drugs used to prevent coccidiosis are different from the ones used to treat it. Currently, there are no drugs FDA-approved to treat coccidiosis in sheep and goats. Extra label drug use is required.



There is less risk on pasture.

Image by S. Schoenian

Amprolium (Corid®) has been used as both a preventative and treatment for coccidiosis (in sheep and goats). It is added to the drinking water (as a preventative) or administered as a drench (as a treatment). It is considered to be more effective as a treatment. While Corid® is available for purchase over-the-counter, it is not labeled for sheep and goats. Therefore, it requires veterinary supervision. Care should be taken when administering amprolium, as it has caused polioencephalomalacia (polio; thiamine deficiency) with overdose and prolonged use .

Sulfonamides such as sulfamethazine (Sulmet®) and sulfadimethoxine (Albon® and Di-Methox®) have also been used to treat coccidiosis in sheep and goats. As with other water-soluble antibiotics, sulfa drugs must be obtained from a veterinarian and utilized according to the requirements of the extra label drug law. Like Corid®, sulfa antibiotics are usually added to the drinking water or administered as a drench. Drenching is always preferable, as it ensures that clinically-parasitized animals are getting the proper dose of the drug. Sick or nursing animals often do not drink enough water. Animals should be weighed to make sure the proper dose is being given.

Other drugs

Experimentally, ponazuril (Marquis®; approved to treat protozoal myeloencephalitis in horses) has been used to treat coccidiosis in goat kids. A single dose was found to be as effective as a five day treatment of amprolium. In non-US countries, there are additional drug options, including toltrazuril (Baycox®) and diclazuril (Vecoxan®).

Producers should always consult with their veterinarians for treatment options.



EXTRA LABEL DRUG USE

Extra label drug use is when a drug is used in a manner that is not listed on the product label or insert. This could be giving the drug to a species that is not listed on the label or giving the drug at a different dosage or by a different route. Only a veterinarian has the right to use or prescribe a drug extra label. For a producer to use a drug extra label, a valid veterinarian-client-patient relationship (VCPR) is needed. This requires the veterinarian to have familiarity with the farm and animals being treated. Extra label drug use is essential to maintaining healthy flocks and herds. It is important that veterinarians and producers comply with all the requirements of the law.

Natural options

Researchers continue to search for natural methods to control internal parasites, including coccidiosis. One of the most promising is sericea lespedeza (SL; *Lespedeza cuneata*). Sericea lespedeza is a perennial, warm season legume, often called “poor man’s alfalfa.” It can be grazed or fed as hay, silage, or pelleted leaf meal. Studies have demonstrated that not only does sericea lespedeza reduce barber pole worm (*Haemonchus contortus*) counts, but SL pellets have been shown to reduce coccidia oocyst counts (and clinical signs) in sheep and goats. It is recommended that sericea lespedeza be fed at least one week before weaning and be continued for 3 to 4 weeks after weaning to reduce the incidence of coccidiosis during this stressful transition in lambs and kids.

There is some information on the use of oregano essential oil in controlling coccidiosis outbreaks in sheep and goats. However, there is limited data available and more studies with consistent data confirming its effectiveness are needed before this treatment option can be recommended.

SUMMARY

Under any situation that compromises the immune system of sheep and goats, coccidia infections can take advantage and cause illness, permanent intestinal damage, and even death. In order to avoid outbreaks or lessen the severity of infection, producers need to pay attention to management (sanitation and nutrition) and keep environmental stressors as low as possible. Medication can help prevent outbreaks and be used to treat clinically parasitized animals.

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Asymptomatic kid

Image by S. Schoenian

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