

Common Internal Parasites of Goats in Florida ¹

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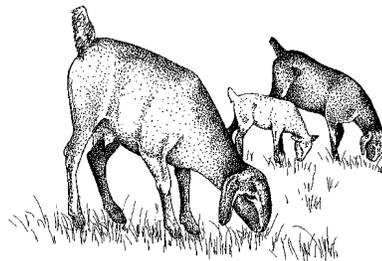
Internal parasites are a problem and hazard to all classes of livestock because of the inapparent, unrecognized loss from subclinical parasitism. They are especially detrimental to young animals in that they reduce performance and resistance to other diseases. They may also cause disease and death in animals.

Parasitism is a herd problem or disease. Measures to control the problem must be applied to the total herd as though it was a single animal.

Every parasite has a relatively fixed cycle and rate of development, despite the abundance of different species. Each species has its own forms, habits, modes of life, and potentialities for causing disease and injury. The strongest attack is an effective prevention program made on the parasite's stage of development which is most vulnerable.

In a goat herd, young animals under 6 months of age are by far the most susceptible to parasitic infection. This group of kids is highly susceptible since they have had very little exposure to parasites and thereby have very little resistance of immunity.

The second most susceptible animals in the goat herd are the yearlings and 2-year olds. The growing



goat herd.

animals, with their rapidly expanding blood volumes, are susceptible to blood loss due to the actions of certain species of the stomach worms. This age group also is the most likely to suffer malnutrition which will make them more susceptible to parasitic disease. It is an accepted fact that animals receiving an adequate, balanced ration are less susceptible to parasite infection.

The older members of a herd will generally be resistant to parasitism due to prior exposure to the various parasites. However, they will harbor subclinical numbers of the common parasites and thereby serve as reservoirs of infection for the younger, susceptible members of the herd.

There are three major internal parasites affecting goats that are a constant threat to good herd health management. These are the stomach worm (

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Haemonchus contortus); a protozoa of the genus *Eimeria* , which causes coccidiosis; and the potential of liver flukes in certain areas. Recognizing infection with these parasites and knowing how to control infection by them, is important to any goat owner wishing to maintain animals under optimal care. Goat owners need also to be aware of how to prevent debilitating infection with these parasites and how to reduce the potential of these parasites becoming resistant to currently available drugs. Most information in this publication can also be applied to sheep since problems with parasites are similar for both animals.

Major Internal Parasites

1. *Haemonchus Contortus*

Haemonchus contortus , also known as the barber's pole worm, stomach worm, blood worm and "humongous," worm, is the major limiting factor for the successful survival of small ruminants in the subtropics. This is because the stomach worm is very prolific and replicates very rapidly, and has a vicious ability to suck blood from its host. A single worm lives for approximately 25 - 50 days, during which time it may produce 250,000 eggs. This is enough to infect and cause debilitating disease in many other goats.

H. contortus thrives under Florida weather conditions, and is a potential threat all year round (Figure 1). During the summer months the eggs hatch readily in the warm, humid and rainy climate, releasing viable larvae into the environment. This is the time of greatest exposure and highest incidence of disease. During the winter months most of the worms recognize the cooler weather and have developed the ability to "hibernate". This is called hypobiosis. During this time the worms are metabolically very inactive and quite resistant to treatment. When spring comes the dormant worms become active again, resulting in a "spring rise" in the number of eggs excreted, and a seeding of the environment just before optimal summer conditions occurs.

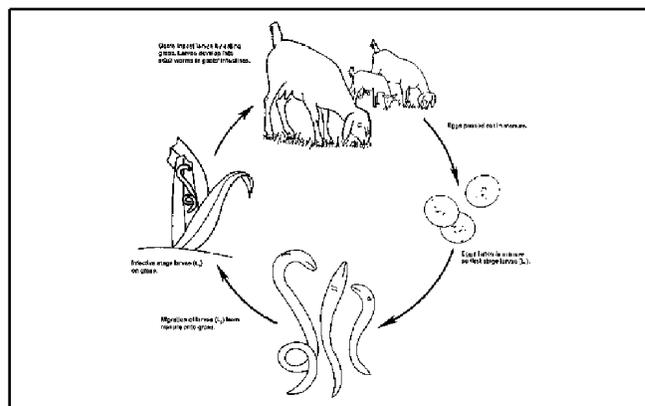


Figure 1.

Parasitism Recognition

The pathogenicity of the stomach worm lies in its ability to invade the intestines and suck blood. Any age of animal can be infected and the severity of clinical signs depends on the parasite burden. The clinical signs of disease are all secondary effects of blood loss. In most cases, a relatively small dose with constant exposure results in chronic blood loss. These goats do not thrive or grow well, and milk production is reduced. As the depletion of blood continues, the goat develops hypoproteinemia (deficiency of blood proteins) and anemia. The first sign of serious low blood proteins is edema under the jaw (bottle jaw) (Figure 2 , Figure 3). Anemia is manifested by pale membranes of the eyes and gums, exercise intolerance, panting and lethargy. If the infection is not treated, the goat will continue to lose blood to the parasite and eventually die. Heavy, sudden worm infestations will cause disease in a relatively short time period, and may kill the goat within days due to massive bleeding into the intestines (Figure 4). *Haemonchus* worms cannot be seen in the manure. A diagnosis is made by finding worm eggs under the microscope (Figure 5). If worms are seen in the manure, then they are likely to be tapeworms, which are not a major cause of disease.



Figure 2.



Figure 3.



Figure 4.

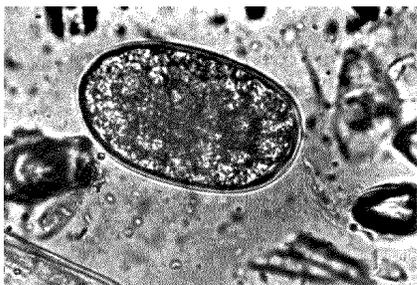


Figure 5.

Control by Sanitation

Control of parasites is nearly impossible without good sanitation. Sanitation is anything that improves the standard of hygiene of the herd. In the case of parasitism by roundworms and coccidia, sanitation must concentrate on minimizing the contamination of the feed areas with fecal material, as these parasites are transmitted through the manure and by ingestion. Every goat owner must find the optimal solution to this problem by observing their goats to identify and control the areas where the goats feed, which may be contaminated. Common areas are feed troughs, water troughs and areas where the goats graze.

To improve hygiene at feeding time the goats should be fed only as much as they will eat at a time. Once the feed has been eaten, the goats should be denied further access to the feeding area until the next feeding time. If feed troughs are used they should be turned upside down to prevent goats from defecating into them. If possible the feeding area should also be

moved periodically, especially during the wet seasons, so that the goats are not exposed for long periods to mud that may harbor parasite eggs.

Another effective way of improving the hygiene of the kids' environment is to provide climbing pedestals for the kids to play on. This will encourage them to stay off the ground which may be contaminated. Movable and washable structures are best; they should be constructed in such a way that the kids cannot injure themselves. General recommendations for improved hygiene are to improve drainage of the areas where the goats are kept. Improved sanitation will also reduce exposure to other diseases such as listeriosis, toxoplasma, salmonellosis and caseous lymphadenitis.

Control of Roundworms

Anthelmintics (dewormers) are the most common method for controlling round worms. To be effective they must be applied properly. All goats of one month of age and older must be dewormed regularly, and all animals should be dewormed on the same day. The most important time to deworm goats is at the beginning of the year (kidding season), because the worm is so prolific. A light contamination of the environment at the beginning of the rainy season (early summer) has the potential to become a heavy parasite burden later in the year, when conditions are ideal for the spread of the worm. Reducing the number of worms in the environment at the beginning of the summer is, therefore, a crucial point of control of this parasite.

During the warm season, it is important to deworm at intervals of 4 weeks, as the life cycle of the *Haemonchus* takes less than 3 weeks to complete. Most goat owners deworm their goats throughout the year, but this is not necessary in the northern part of the state, when average temperatures drop below 50°F (9°C) in the winter months. If these temperatures persist it is often only necessary to deworm every three months. The exact months when to start and stop deworming will vary a little from year to year and the discerning goat owner will make adjustments accordingly.

A more sophisticated way of determining the correct time to deworm is to examine the manure of several goats for parasite eggs. If one goat of a representative sample of the herd (usually 5 - 10% of all goats) has more than 500 eggs/gram manure, then it is time to treat the herd. A veterinarian can perform such an egg count for goat owners.

New arrivals should always be dewormed and kept in isolation for at least a week after deworming before introduction to the herd. It is also advisable to deworm all goats being moved onto or into a new area. This reduces the degree of contamination of the new pasture. The need to use dewormers can be reduced if the parasite burden can be kept to a minimum, and by keeping the goats on dry lots or uncontaminated pastures. A pasture can be considered free of *Haemonchus* in Florida if it has been free of sheep and goats for longer than 6 months during the warm season.

Anthelmintics (Dewormers)

There are many drugs on the market to treat worms. Some are more effective than others. Drugs commonly used are ivermectin, morantel, levamisole, pyrantel, albendazole, thiabendazole, fenbendazole, oxbendazole, coumaphos and phenothiazine. The choice of drug depends on personal preference and experience. The full dose of dewormer should always be used to ensure maximum kill, and to prevent resistance from developing. To provide an accurate dosage individual goats should be weighed, e.g., using a weigh tape. Some special comments are necessary: if ivermectin is given orally the injectable dose must be doubled. Morantel holds the best hope for the future of treating lactating goats, as it will probably have no withdrawal time for milk as a minor use veterinary drug. Fenbendazole and albendazole are good for treating tapeworms. Phenothiazine, although licensed for use in goats, is an antiquated product and can no longer be recommended for safe and effective use.

Only few of the products that are effective against roundworms are licensed for use in goats. Therefore, many products must be used extra-label. This is possible with a veterinarian's prescription. As for all drugs, special precautions must be taken to ensure that none of these enter the human food chain.

This is particularly important to the goat industry, that is growing in importance as a supplier of food (meat and milk) for human consumption.

For drugs used extra-label, the withdrawal times for meat and milk have to be extrapolated from other species (usually cattle), in which the drug is licensed. To be on the safe side, a longer withdrawal time than those used in cattle is always recommended.

Drug Resistance

In Florida, roundworms frequently develop resistance to many of the benzimidazoles. These include thiabendazole, fenbendazole and oxbendazole. Therefore, these products have to be used judiciously in this State. To ensure the longest effective use of products currently available, goat owners should aim to keep the potential for resistance to a minimum. The best way to do that is to use the same deworming product for an entire year, rather than using a different product each time the goats are dewormed. This ensures that each generation of worms is only exposed to one drug at a time, so that if a generation of worms has the potential to develop resistance it will only develop resistance to one drug and not several during the same time period. An example of a good deworming program would be then to use ivermectin one year, morantel the next, albenbazole the next; then to return to using ivermectin again. Drugs to which worms have developed a resistance should be eliminated from the deworming program on that farm for at least two full years. Then it should be safe to use these products again.

2. Coccidiosis

The other major parasite that is a problem to goats in many parts of the world including Florida is a group of protozoa collectively called coccidia. The most important of these belong to the genera of *Eimeria*; there are several species that are contagious. Most of these are specific to the animal they cause disease in, although some will infect both sheep and goats.

Clinical Signs

Coccidiosis is usually a problem of the young goat, because this is when it is first exposed and not immune. Older goats have usually become immune to infections, and therefore do not develop clinical disease. Disease is usually seen in kids between 3 weeks and 4 months of age; i.e., after weaning. The most common signs are soft stool, decreased appetite and poor weight gains. These symptoms are usually observed in herds where infection is constant and at a relatively low level. Heavy exposures to young animals (too high stocking rate), animals not previously exposed, and those with a deficient immune system (usually due to poor nutrition) will develop a more serious form of the disease. Symptoms observed under these conditions include bloody diarrhea, straining, dehydration and even death.

The disease takes about three weeks after infection to develop, as the parasite first invades the cells of the intestinal lining, then reproduces in these cells and eventually causes the cells of the intestinal lining to rupture and die. Diarrhea is seen only when the intestinal cells die. Recovery sets in as the intestinal cells regrow, which is why response to treatment is slow once diarrhea has occurred.

Diagnosis

Diagnosis can be made based on clinical signs or by a veterinarian who will examine the manure under a microscope. Under a microscope many oocysts can be seen in the manure, which confirms the diagnosis (Figure 6). Once a diagnosis of coccidiosis has been confirmed the farm can be assumed to be infected forever. This is because the oocysts (the coccidian equivalent of eggs) persist and remain infective for a long time after they have been shed.



Figure 6.

Control of Coccidiosis

On farms that have or have had problems with coccidiosis great emphasis must be placed on controlling the spread of disease. It is not possible to prevent the disease altogether, but it can be controlled, so that suffering of the kids is reduced to a minimum and economic losses are reduced. There are two ways to prevent the disease: Sanitation (the most important, see above) and treatment with coccidiostatic drugs.

The use of coccidiostats is advisable on any farm that has had a problem with the disease in the past, and/or cannot put each generation of kids into new holding facilities. There are several drugs available for prophylactic treatment of coccidia. The only drug licensed in goats is decoquinate (Decox®, Rhone Poulenc, Atlanta, GA 30342). Other commonly used drugs include amprolium, monensin, lasalocid and sulfas. None of these coccidiostats prevent infection but instead reduce the rate of growth of the parasite in the intestines. This allows the kids to develop natural immunity to the coccidia without severe disease.

Most products used for preventing coccidiosis are safe to add to the drinking water or milk, while others can be given directly by mouth or in the feed. For best results, start the treatment four weeks before the age at which signs are usually observed and continue the treatment for about 28 days.

Treatment

The goat kid affected with coccidiosis needs to be nursed with a great deal of care. Nursing is the most important aspect of treatment, as, once clinical signs of disease become apparent, the damage to the intestines has already been done. Recovery can be prolonged as it can only occur as the intestinal lining recovers. Special attention must be paid to the kid to ensure that it continues to eat and drink, as both of these aid recovery and prevent dehydration and further deterioration. Even though continuous feeding contributes to the diarrhea in these kids, it is very important that they continue eating, so they may receive the needed nourishment for recovery. Preventing dehydration is also very important when the weather is hot. If a sick kid stops drinking, an electrolyte solution should be given by stomach tube

or nursing bottle. A cheap alternative to commercial electrolyte solutions is "Gatorade®". Kids with diarrhea should drink about 15-20% of their body weight a day. Sulfa drugs are commonly used to treat animals with coccidiosis. Many people think that they are curative, but their main effect is to prevent secondary bacterial diarrhea from developing.

3. Liver Flukes

Liver fluke infection is a potential problem in goats and cattle located in areas where animals have access to streams and wet pastures. In Florida, the area east of St. John's River and most of the state south of I-4 is of greatest concern even though other pockets of infestation do exist. While there is a potential problem in goats, beef and occasionally dairy cattle are more commonly affected by this parasite. Liver contamination by this parasite has been reported in slaughter plants. However, liver contaminations are only a small part of the economic loss caused by liver flukes. The adverse effect of liver fluke infection on growth, production and lowered fertility in the absence of obvious signs of disease is well documented.

Life Cycle of Liver Flukes

The prevalence of liver flukes is limited by the distribution of the snail intermediate host. Low areas such as wet pastures and streams of water through the eating area promote the growth and reproduction of snails, which are infected by the *miracidium*, a motile larva that hatches from fluke eggs shed in goat feces. After a 6- to 8-week development, motile *cercariae* are shed by the snail and encyst as *metacercariae* on vegetation. These *metacercariae* are somewhat resistant to environmental extremes and may survive for several months on pasture. To complete the life cycle, *metacercariae* are ingested by goats grazing on pasture, migrate as young flukes to the liver and after 8 to 10 weeks of growing to adult flukes begin depositing eggs that are excreted in feces.

Control of Liver Flukes

Control of liver flukes includes some sort of treatment procedure as well as a control of the snail as the intermediate host. Snails are carriers of liver flukes, which is why a total parasite control program

should include pasture management. Snail control means providing good drainage for low-lying areas or by fencing off the area favorable for snail habitats.

Treatment

Currently, the only product available for the control of liver fluke is CURATREM® (clorsulon, Merck and Co., PO Box 200, Rahway, N.J. 070650914). It is highly effective against immature and adult liver fluke and has a wide safety margin at the recommended dose.