Introduction to Goat Internal Parasites

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Parasites come in many different models. Some travel through the liver making holes. Some are ingested into the intestine where they cause diarrhea and damage the lining. Some find their way into the spinal chord and cause paralysis. However, we are going to restrict this talk to roundworms which cause 90% of the parasite problems in goats and furthermore we will restrict it to one genus and species of roundworm, Haemonchus contortus, which is responsible for most small ruminant morbidity and mortality. However, the same principles apply to other species of roundworms. In this talk, we will cover the life cycle and how animal management can have an affect at different stages of the lifecycle. We are going to talk about determining how badly infested an animal is with worms. Then we will talk about dewormers and their use.

Roundworm eggs are passed in the feces from an infected animal. When the temperature is above 60F and it is moist from dew or rain, the eggs hatches. Therefore, no hatching taking place in the dead of winter. No hatching taking place when it is dry like during a drought. Eggs may actually dry up and die during dry hot periods of time. In 4-60 days, the egg hatches. Rotate animals off pasture in less than a week and they don't get infected. Eggs hatch into first stage larva, L-1, and feed on bacteria in the feces. It then molts to L-2 and continues to feed on bacteria. L-1 and L-2 are most susceptible to environmental effects. The L-2 molts to L-3, but outer layer (cuticle) of L-2 is not shed so there are two layers. As a consequence L-3 cannot feed and must live off its energy reserves until it is ingested by the goat. Hot temperatures cause a cold blooded organism to burn up energy rapidly. Infective L-3 larvae can only last 30-60 days in a hot summer. However, they can last for 4-8 mos at 40-50F because the cold slows their metabolism down. The L-3 must be ingested by a goat if it is going to survive. It won't get picked out of a pellet by a goat, so when the pellet is disrupted by moisture as a rain, the larvae crawls out and is carried up a blade of grass by a film of water. Most are carried only 2-3 inches up the grass, a very few get as far as 4-5 inches, but most are concentrated at lower levels. Heavier stocking rates cause goats to graze closer to the ground, picking up more larva. Also, larvae may hide under leaves and trash that have fallen on the ground and when a goat picks the trash up, they pick up the larvae. This is why goats pick up more worm larvae when they graze

with sheep than the sheep do. Until the L-3 is eaten by the goat, all the stages are affected by environmental factors, such as temperature, humidity and sunlight, but the L-3 is more resistant to drying out.

Management by the producer includes rotating animals off of grazed plots. Disking or making hay will remove most larvae. Higher stocking rates cause more larvae to be excreted on pasture and as a consequence, more larvae picked up by the goats. Animals that are badly infected produce more eggs and affect number of larvae available to be picked up. Research has shown that 20% of the goats produce 80% of eggs on pasture. Culling wormy goats will help the others.

Once the L-3 is ingested by a sheep or goat, it attaches in the abomasum and develops into a real blood sucking machine. However, if a cow or horse ingests a L-3 from a goat, it will fail to develop and die. Grazing the pastures with another animal species is like running a vacuum cleaner over your pasture. There is an exception in that sheep and goats share the same parasites. If the L-3 is in a goat, it develops to L-4. The L-4 which sucks blood can decide to develop into a L-5 blood sucker producing eggs or it can decide to enter hypobiosis which is like hibernation or suspended animation where it burrows into the lining of the stomach and sleeps waiting for an opportune time to awaken and suck blood. There are two major reasons for doing this-the animal is already extensively infested with worms and another would kill the host, or when it is cold outside-the eggs and larvae wouldn't survive anyway. The haemonchus primarily overwinters in the goats stomach. Only a few dewormers at higher than normal doses can kill hypobiotic worms. The worm is triggered out of hypobiosis by spring warm up or by kidding. This is why you should deworm in the dead of winter with a dose of dewormer to get arrested larvae. The L-5 sucks blood and produces eggs rapidly beginning about 2.5 to 3.5 weeks after the L-3 was ingested and continuing for several months. Therefore, by counting the number of eggs in the feces, we can get a handle on the number of larvae. However it is possible that a massive dose of infective larvae could result in the loss of a lot of blood before there are many eggs present in the feces, but this is rare. The parasite sucks blood removing the red blood cells and the body adds fluids to make up for the blood loss whereas red blood cells are only slowly replaced. We can monitor the amount of blood loss by hematocrit or packed cell volume which measures the quantity of red blood cells. Measure of packed cell volume is a measure of the damage the

parasite is doing to the animal and a better measure than fecal eggs, but more difficult. The loss of red blood cells causes anemia, pale, watery blood. The color of blood can be monitored by the color on the inside of the lower eyelid or gums, although the animals skin pigment may interfere to some extent. We are working on a color chart from South Africa for comparing the eyelid color to. Potential for an instrument to measure hematocrit. Wormy animals may also need a shot of iron to help replace red blood cells.

There are several ways to diagnose worm damage in goats. The first is general appearance of a poor doing animal, thin, rough haircoat. Look at the underside of his eyelids and compare to some of your better doing animals. Is it pale? Somewhat subjective, but may save your animals. Fecal egg counts are more objective. Get fecal counts in eggs per gram of feces. Deworm at 1,000 eggs per gram, except for mature dry does which may tolerate up to 2,000 eggs per gram and young animals and lactating dairy does at 500 eggs per gram. We are teaching our producers to do their own fecal egg counts because of the difficulty of getting a veterinarian to do them. Hematocrit or packed cell volume is good, but usually only run by a vet when an animal is seriously sick. Two weeks after two inches of rainfall in a month with mean temperature greater than 60F means that conditions have been favorable and it is time to deworm..

Genetics plays a role in parasitism as well as nutrition and stress. Some animals appear to have immune systems that prevent the establishment of worms in the host or they may help to expel established worms. There are herds of goats that have not been dewormed in years. In the absence of worms, the immunity to worms does not develop, therefore, we want a low level of infection to maintain acquired immunity. Poor nutrition depresses the immune system and makes animals more susceptible to worms becoming established. A high producing dairy goat may have her immune system depressed from the stress associated with high milk production and be more susceptible to worms. Also, animals that are stressed from other diseases such as coccidiosis are more susceptible to worms.

Dewormers work by either killing or paralyzing worms so they drop loose and go out the digestive tract. They work well, but with repeated use, worms adapt to dewormers and become resistant to them. Based on work in New Zealand, it may be best to stick with a dewormer until

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it no longer works and then change. There is very little applied knowledge on dewormer resistance and some thumb rules may not be working as we think they ought to. It appears that after several years worms lose their resistance to a dewormer and it will work again, but resistance will build very quickly. The best way to reduce dewormer resistance is to reduce the frequency of deworming consistent with animal health. That is why it is important to try to use management as much as possible to reduce worm problems. There are no new dewormers that have been developed and when we have resistance to these animals without genetic resistance will die.

Goats require 50% more dewormer than sheep for two reasons. They move digesta through the digestive tract faster and they have bigger livers which metabolize the dewormer faster. However, Cydectin appears effective at the cattle dose. Goats should be given dewormer orally Why inject and damage the meat? Pour-on dewormers were designed for cattle and are poorly absorbed by the goat and not very affective. Use appropriate dewormers. Valbazen causes problems in early pregnancy. Winter deworming with dewormer to get hypobiotic worms.

Another problem with dewormers is that only two are approved for use in lactating animals, Safeguard or Panacur and Rumatel. We think that we have resistance to panacur in our dairy goat herd, but that has been the only dewormer used for 15 years.

Anthelmintics in goats. Most of the products listed are not approved for use in goats in the United States. However, they are used in other countries.

Chemical Name	Chemical Family	Trade Name(s)	Treatment Level mg/lb given orally	Haemonchus[5] Adults	Haemonchus[5] Larvae	Other G.I. Nematodes[5]	Flukes[5]	Tapeworms[5]	Lungworms[5]
Thiabendazole[1]	Benzimadazole	TBZ	40	+[4]	+[4]	++	-	-	-
Fenbendazole[2]	Benzimadazole	Safeguard Pancur	7.5	++	++	++	-	+	++
Oxfendazole	Benzimadazole	Synathic Benzelmin	4	++	++	++	+	++	++
Albendazole	Benzimadazole	Valbazen	8	++	++	++	++	++	++
Levamisole	Imidothazole[3]	Levasole Tramisole	5.5	++	-	++	-	-	++
Morantel[2]	Pyrimidine[3]	Rumatel	6.6	++	-	++	-	-	-
Pyrantel	Pyrimidine[3]	StrongidT	14	++	-	++	-	-	-
Ivermectin	Macrolide	Ivomec	0.2	++	++	++	-	-	++
Doramectin	Macrolide	Dectomax	0.2	++	++	++	-	-	++
Moxidectin	Macrolide	Cydectin, Quest	0.4	++	++	++	-	-	++
Clorsulon	Sulfonamide	Curatrem	3.2	-	-	-	++	-	-

[1]None of the listed drugs may be effective on a given property. [2]Can be used in lactating dairy animals. [3]Imidothazoles and pyrimidine have similar effects on worms. [4]Only non-resistant populations considered. [5]Relative efficacy.