



November 2022

# The “Other” Worms that infect small ruminants

The major pathogenic worm of small ruminants worldwide is *Haemonchus contortus*, the barber pole worm. Management programs have generally been focused on this worm, but there are other worms of minor importance that can and do contribute to production loss.

## ABOMASUM

### **Brown stomach worm** ***Teladorsagia circumcincta***

Other than *Haemonchus contortus*, another abomasal worm of importance in small ruminants is *Teladorsagia circumcincta*. This worm thrives in cooler wet environmental conditions which are encountered in the more temperate northern regions of the US, but can be found occasionally in southern regions. Adult *T. circumcincta* are smaller than *H. contortus* and is not readily visible. The worms feed mostly by consum-

ing nutrients in mucous and do not feed on blood, per se, but can ingest some blood if present.

Infection causes direct damage to the abomasal lining as they mature from larvae to adult worms thereby interfering with digestion and appetite. Entwined masses of worms are found on the lining of the abomasum, which is thickened and red and is also covered with whitish nodules. Hypobiosis (dormancy) occurs when environmental conditions are too cold (winter) or too dry (summer) with lesions on the mucosal wall of the abomasum which give it a “Moroccan” leather appearance. Infection is usually considered a production disease as animals do not grow very well with the primary symptom being diarrhea and emaciation.

Commonly, brown stomach worm causes production loss in the absence of obvious signs of





disease. Affected animals have reduced appetite and protein loss into the gut resulting in a drop in weight gains. In sheep, wool growth and milk production can each be reduced before signs become apparent. However, under very high infection conditions, death can result. In the absence of *H. contortus*, mixed infections of brown stomach worm and black scour worm are more lethal than infection with only one of the worms.

### **Stomach hair worm** ***Trichostrongylus axei***

*Trichostrongylus axei* occurs commonly in small ruminants, often in association with the brown stomach worm but appears to be relatively harmless. Adult worms are very small (smaller than *T. circumcincta*), slender, hair-like and reddish-brown. Heavy burdens may intensify inflammation of the abomasal mucosa caused by *T. circumcincta*.

## **SMALL INTESTINES**

### **Black scour (Bankrupt) worm** ***Trichostrongylus colubriformis***

*Trichostrongylus colubriformis* is very small and is the most predominant small intestinal worm. It is the next most common and important after *H. contortus*, and on some farms can cause considerable problems. It is found throughout the US, but seems to thrive better under cooler and wetter conditions similar to *T. circumcincta*. As with *T. circumcincta*, this worm feeds by consuming nutrients in mucous and interferes with absorption, resulting in diarrhea. It is called the bankrupt worm because death is seldom the end result and animals just become poor doers exhibiting lethargy and

***Trichostrongylus colubriformis*  
is the next most common and  
important after *H. contortus*.**



collapse, weight loss, damage and inflammation of the gut, resulting in diarrhea, leading to loss of production and income, sometimes death.

### **Cooper's worm** ***Cooperia* spp.**

*Cooperia* spp. can be found in small numbers throughout the US. They are coiled close along the mucosal wall of the small intestine and are not considered a major parasite. Infection does not usually cause disease or any characteristic signs, but may contribute to the severity of disease in mixed infections and may worsen the effects of the brown stomach worm and black scour worm.



### Thin-necked intestinal worm *Nematodirus* spp.

*Nematodirus* spp. are relatively large (easily seen) worms and can be found throughout the U.S. although usually in rather small numbers. Problems are rare in the Southeast, but in cooler areas of the US, there is a possibility of greater numbers of worms accumulating. These worms usually do not cause any specific lesions in the mucosal, although there may be mild inflammation. Serious problems occur in young animals in cool regions or after dry periods when grazing short, green forage. Heavy infection can result in lethargy and collapse, weight loss, damage and inflammation leading to diarrhea. Production and income losses similar to that of *T. colubriformis* can occur. While *Nematodirus* spp. can cause disease in adult sheep, it is not very common as sheep develop a strong immunity. In contrast, adult goats do not develop such a strong immunity and disease is possible. The eggs of this worm are larger (2-3x) than the others and “football” shaped.”

### Threadworm *Strongyloides papillosus*

*Strongyloides papillosus* is often seen in pastured animals throughout the US. They are small threadlike worms that can result in mucosal inflammation and diarrhea typified by weight-loss. Its life cycle is complex. It may be direct by oral ingestion of larvae from forage or by skin penetration usually through the foot. Under moist conditions, a separate reproductive cycle may take place in the soil where multiplication can also occur. Infection is associated with moist unhygienic conditions and high stocking rates. The eggs of this worm differ from others as they are smaller and larvated when deposited.

### Hookworm *Bunostomum phlebotomum*

*Bunostomum phlebotomum* prefers warmer, higher rainfall regions, but is rarely a problem in sheep and goats. They are stout, readily visible worms with a large mouth and a body that may appear to be hook shaped. They are blood feeders that can contribute to anemia being caused by *H. contortus* and diarrhea caused by other worms. Infection can be by oral ingestion during grazing or skin penetration, usually around the feet which can lead to sore feet.



Tapeworm segments in the feces

### Tapeworms *Moniezia expansa*

Producers may be concerned about tapeworms because they can see the white grain-like moving segments (containing eggs) in freshly deposited feces. Field mites ingest released eggs and infection is transmitted when mites are consumed while grazing forage. In the small intestine, adults are maintained by absorbing nutrients from surrounding digested materials and grow longer by adding new segments. Eventually, the egg containing segments break off and move out with the feces. Tapeworms are usually few, in number, and do not cause much physical damage. However, infected young animals may not grow well and, rarely, intestinal blockage may occur due to the worm mass. Diagnosis is by finding segments and/or characteristic eggs on fecal examination.





**Camelids can be infected with the same parasites as sheep and goats.**



## LARGE INTESTINES

### **Nodular worm** ***Oesophagostomum* spp.**

*Oesophagostomum* spp. can be found throughout the US, usually in rather small numbers. Adult worms are large and clearly visible. They feed on blood and can contribute to the overall anemia being caused by *H. contortus* and other worms. Although adult worms are found in the large intestine, the larvae are found in the mucosa of both the small and large intestine where they form nodules that are clearly visible to the naked eye, thus, the name nodular worm. Once the larvae leave these nodules they mature to adults and reside in the large intestine. If present in large numbers, they can cause severe disease: lethargy, weight loss, damage and inflammation of the mucosa (redness, thickening and edema) resulting in marked and persistent green mucoid diarrhea. Typically, weaners show ill-thrift, lose condition, and become weak and scour intermittently.

## OTHER

### **Whipworm** ***Trichuris* spp.**

*Trichuris* spp. can be found throughout the U.S., usually in rather small numbers. The posterior end of the worm is rather large and can be easily seen. The anterior end of the worm is thin (hard to see) and threadlike, thus, the name whipworm. These worms imbed in the mucosa and cause damage which can result in hemorrhage. They feed on fluids and blood and can contribute to the overall anemia being caused by *H. contortus* and other worms. Female worms produce characteristic dark colored "football" shaped eggs with protruding plugs at each end.

### **Lungworm** ***Dictyocaulus filaria*,** ***Muellerius capillaris*** ***Protostrongylus* spp.**

Problems with lungworm infection are usually sporadic. Adult *Dictyocaulus filaria* (most pathogenic lungworm) live in the lungs and eggs deposited there are coughed up, swallowed, and hatched during transit through the gastrointestinal tract. The released larvae are then passed in the feces. The free-living larvae develop to the infective form on pasture and are consumed by grazing animals. Infection results in respiratory distress (chronic coughing), unthriftiness, and sometimes death. Because larvae, not eggs, are found in feces, the Baermann technique, which extracts the larvae from feces, is used for diagnosis. There are two other lungworms (*Muellerius capillaris* and *Protostrongylus* spp.) that require land snails/slugs as intermediate hosts to complete the life cycle, but their effect on the animal is minimal.



**As with barber pole worms, liver flukes can cause “bottle jaw” (submandibular edema) in small ruminants .**

### Liver fluke

#### ***Fasciola hepatica, Fascioloides magna***

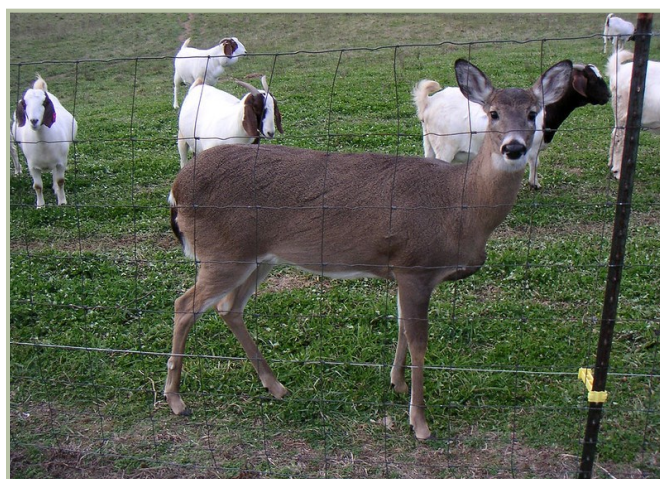
Liver flukes can be a problem in low lying perennial wet areas where the intermediate snail host is present. Fluke eggs are passed in the feces and upon hatching release a miracidium which infects a snail. Asexual reproduction occurs in the snail and develop into several cercaria that leave the snail and encyst on forage as metacercaria. Metacercaria are ingested by grazing animals and develop into immature flukes that migrate through the liver causing damage. Adult flukes then reside in the bile ducts of the liver producing eggs that then pass out with feces. Liver damage can result in unthriftiness, weight loss/reduced gains, and sometimes death. Diagnosis is by finding eggs in the feces using a sedimentation technique. Infection with another liver fluke, the deer fluke (*Fascioloides magna*) is rare, but should be considered where deer have access to pastures grazed by small ruminants. This fluke can kill animals by destroying the liver.

### Meningeal worm (brain, deer worm)

#### ***Parelaphostrongylus tenuis***

The meningeal worm frequently infects llamas, alpacas, goats, and sheep. White-tailed deer are the natural host for this worm, so infection occurs where there is white-tailed deer interaction. Adult worms in white-tailed deer shed larvae in their feces and slugs/snails consume the larvae, acting as the intermediate host. Small ruminants, which are not normal hosts, can ingest the slugs/snails harboring the infective larvae during grazing. The larvae migrate into places where they do not normally reside in the deer. They migrate up the spinal nerves to the spinal cord and then they seem to “wander” throughout the outside lining of the spinal cord and the brain.

The central nervous system is damaged and death may result. Often, only one animal is infected at a time on a single farm. Infected animals will display signs such as rear leg weakness/incoordination, paralysis, circling, abnormal head position, blindness and gradual weight loss. Other than signs of infection, diagnosis is difficult in the live animal and is usually made when the animal dies and where larvae are found on examining the spinal cord and brain microscopically.

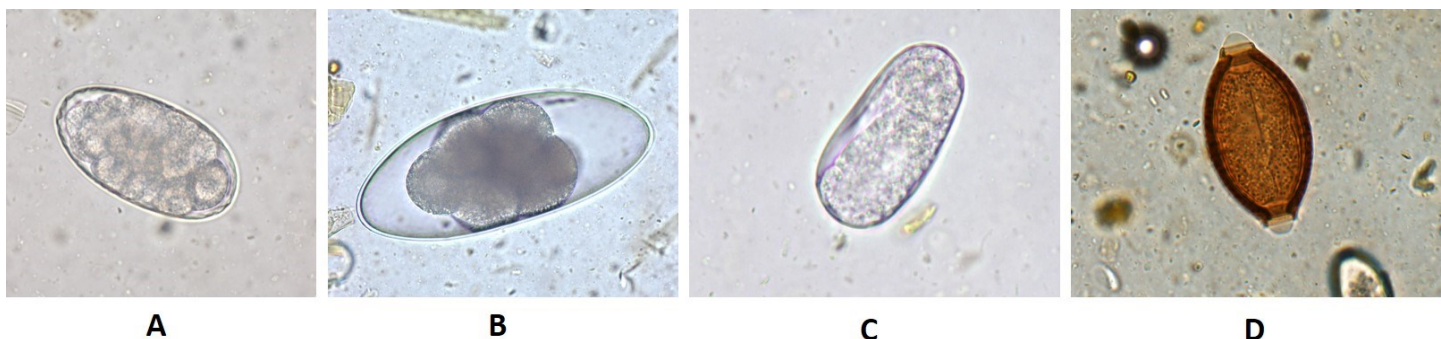


**White-tailed deer are the natural host for the meningeal worm.**



For diagnostic purposes, most of these worms (including *H. contortus*) have similar looking eggs (A). Exceptions, as noted below, are *Nematodirus* (B), *Strongyloides* (C), and *Trichuris* (D). When seen on a fecal exam, identification of specific worm infection is difficult, other than those noted.

**Images are not to scale, e.g., B is much larger egg relative to others.**



*Images of eggs courtesy of Anne Zajac, DVM*

*All other images courtesy of Susan Schoenian*



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