



# Other worms

## Hookworms (*Bunostomum spp.*)

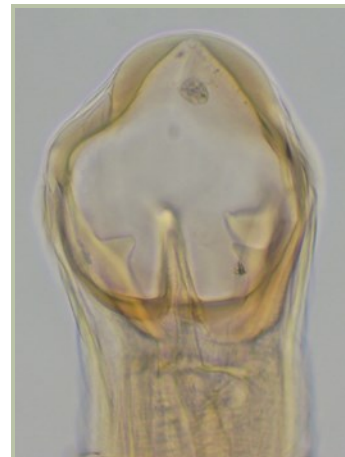
Hookworms can be found in many species, including sheep and goats. Hookworms are not considered one of the major parasitic concerns in sheep and goats in the United States. However, these parasites may contribute to and worsen clinical signs associated with other parasitic infections.

The hookworm of sheep and goats belongs to the genus *Bunostomum*. This parasite is a nematode or worm, which has a characteristic rounded mouth with two distinct tooth-like structures (Figure 1). These mouthparts and teeth allow the adult parasite to attach to the lining of the small intestine. Once attached, the hookworm will suck blood from the host.

### LIFE CYCLE

Hookworms have a slightly different life cycle when compared to other nematodes such as the very common *Haemonchus contortus* or barber pole worm. Adult hookworms can be found in the small intestine where they lay eggs. Eggs are passed into the environment where they hatch and develop to infective third-stage larvae (L3). This is where the life cycle of the hookworm diverges from that of the barber pole worm. Instead of the sheep or goat consuming the larvae and the larvae maturing to adults in the abomasum (the fourth compartment of the stomach), hookworm larvae penetrate the skin or oral mucosa (gums, palate, etc.) of the sheep or goat. The larvae then travel via the bloodstream to the lungs, where they mature to the fourth-stage larvae (L4). The sheep or goat cough up L4 which are then swallowed. Finally, L4 migrate to the small intestine where they mature to adults.

It takes approximately nine to ten weeks for the hookworm to become an adult and cause clinical



**Figure 1.** Image of *Bunostomum spp.* (hookworm). Notice the rounded mouth and two teeth-like structures.

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signs after the animal is infested. These adults produce eggs contaminating the environment and pastures on which the sheep or goat live.

### CLINICAL SIGNS AND DIAGNOSIS OF INFECTION

Adult hookworms suck blood from the host making anemia the most common clinical sign associated with hookworm infection. Of course, the most common parasite in the United States associated with anemia in sheep and goats is *Haemonchus contortus*. Co-infections of barber pole worms and hookworms can have deadly consequences leading to extreme blood loss, weakness, and death.

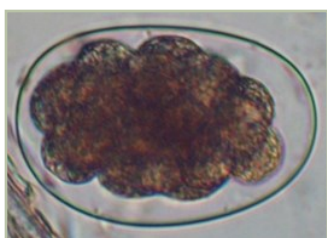
Diagnosis of clinical disease associated with hookworm infection can be made by assessing both the animal itself and the feces of the animal. Tools such as the FAMACHA© (Figure 2) scoring system and the Five Point Check© (Figure 3) can be used to assess individual animals. Signs associated with hookworm



**Figure 2: FAMACHA<sup>®</sup> score card**

infestation would include a pale (high) FAMACHA<sup>®</sup> score (score of 3, 4, or 5), thin (low) body condition score (score of 1 or 2 out of 5), and/or signs of bottle jaw (submandibular edema).

Diagnosis also involves assessment of the feces. Eggs produced by strongylid parasites (adult hookworms included) can be identified in the feces when performing a fecal egg count. Utilization of a McMaster slide will assist in the quantification of the parasite eggs and shed light on the severity of parasitic infestation. Unfortunately, hookworm eggs appear very similar to other parasitic eggs including the barber pole worm. Figure 4 shows the hookworm egg while Figure 5 shows the barber pole worm egg. The similar appearance of these two parasitic eggs makes it difficult to differentiate solely on a fecal egg count and may lead to errors with identification.

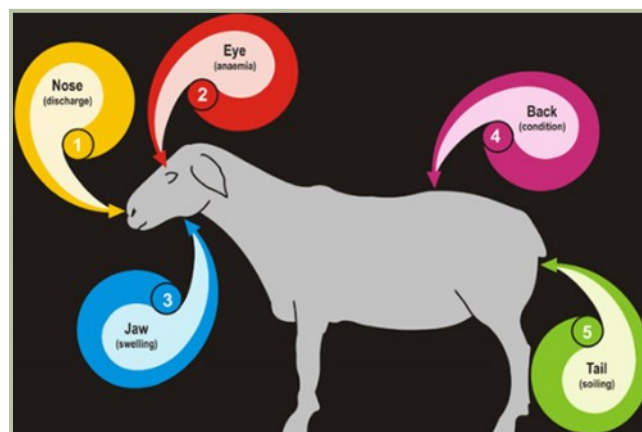
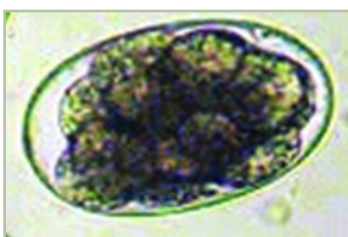


**Figure 4  
Hookworm Egg**

Used with permission from the University of Queensland, Australia

**Figure 5  
Barber pole worm egg**

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**Figure 3**

Five Point Check<sup>®</sup>. Notice the five components used to look for parasitic infestation include the nose (discharge associated with nasal bots), eye (anemia), jaw (bottle jaw edema), back (low body condition score), and tail (diarrheal staining).

Source: G.F. Bath, J.A. van Wyk

## TREATMENT AND PREVENTION

Treatment of hookworms in the small ruminant is similar to treatment of other gastrointestinal nematodes. Dewormers such as fenbendazole (Panacur<sup>®</sup>, Safeguard<sup>®</sup>), albendazole (Valbazen<sup>®</sup>), and levamisole (Prohibit<sup>®</sup>) are all labeled to treat hookworms, specifically *Bunostomum* spp. Although these dewormers may be labeled to treat hookworm infestation, development of resistance is still a concern and some of these dewormers may have decreased efficacy due to overuse. Note that dewormers such as ivermectin (Ivomec<sup>®</sup>) and moxidectin (Cydectin<sup>®</sup>) do not have a label recommending use for hookworms and thus are not an option for treatment.

Due to the immensely concerning resistance development amongst many gastrointestinal nematodes, management practices to help to avoid infection should be used. Practices such as elevating feed off the ground (which helps to avoid contact between the animal and the infective larvae) and enhancing cleanliness in areas of heavy traffic (near feeders, resting areas, within barns) may decrease interaction between the host and parasites.



## The hookworm is a minor gastrointestinal nematode of sheep and goats.

Hookworms prefer a warm and humid climate making the spring and summer months of most importance for proper management practices. Enhancing animal nutrition by providing properly formulated diets, quality harvested or fresh forage, and creep feeding for young stock is also recommended to assist animals in resisting or remaining resilient against all gastrointestinal nematodes.

The hookworm of small ruminants may also be of concern to humans. Various species of hookworms are considered zoonotic, meaning that infection may spread from animal to human. Although the species classically associated with sheep and goats, *Bunostomum trigonocephalum*, is not classically reported as zoonotic, sheep and goats may harbor the cattle

hookworm *Bunostomum phlebotomum*. This parasite has been found to infect humans causing cutaneous larval migrans (larvae that migrate through the skin and may cause rashes or discomfort) and potentially leading to abdominal discomfort and diarrhea.

## CONCLUSION

The small ruminant hookworm is a minor gastrointestinal nematode of sheep and goats. A member of the *Bunostomum* genus, hookworms are blood-sucking parasites that may cause weight loss and anemia in sheep and goats. Hookworms may also contribute to other clinical symptoms caused by parasitic infections such as that of the barber pole worm. Treatment of hookworms includes the use of dewormers (except for ivermectin and moxidectin) and prevention is achieved with proper integrated management practices. Hookworms may be zoonotic, but rarely pose a health risk to humans in the United States.



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