



Strongyloides (threadworms)

Strongyloides papillosus or threadworms are often not considered pathogenic and thus not a parasite of concern for most sheep and goats. In most animals, infections are moderate without any signs of disease. However, the worms can pose a significant threat to the health of lambs and kids at first exposure. In a minority of lambs and kids, disease can be severe and cause death. *Strongyloides* should not be confused with “strongyles” of the Order Strongylida (*Haemonchus contortus*, *Trichostrongylus* spp., *Teladorsagia* spp., and others) which have a completely different life cycle.

LIFE CYCLE

Strongyloides has alternate free-living and parasitic generations. The species that affects small ruminants is *Strongyloides papillosus* (also affects cattle, though may be a different strain). The parasitic form of *Strongyloides* occurs as a female that can reproduce alone, without egg fertilization (parthenogenesis), embedded in the lining of the small intestine. These females lay up to 2,000 eggs per day inside the host animal with larvae already developed within the egg (first stage larvae). When deposited on the pasture inside the feces, the eggs can have two different life cycles.

Larvae in the eggs are male or female. In the first lifecycle, female larvae develop to third-stage larvae that can infect their host by skin penetration, starting the lifecycle over (direct development). In ruminants, this usually occurs through the oral mucosa after ingestion or through the skin of the udder and/or the soft part of the foot. In the alternate second life cycle, the female larvae develop into adults along with the male larvae and are free living in the soil/on pasture. The adults mate and produce all female offspring



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which develop into the infective third stage larvae which also starts the lifecycle over (indirect development).

After the initial infection is established, larvae can encyst/arrest development in tissues including mammary tissues of the dam. Larvae can be activated (i.e. during lactation) and then be passed to offspring in the colostrum and milk. In young animals, *Strongyloides* penetrating through the skin (often through the feet) migrate by blood to the lungs, penetrate the alveoli, are coughed up and swallowed and mature in the small intestine. Larvae are capable of arresting development in the musculature for up to 12 weeks in sheep.



The prepatent period (period of time from infection to egg laying) is estimated to be about 8 to 14 days. Warm temperatures and humidity hasten development of eggs in soil or moist bedding to the infectious stage.

IMPACT IN THE ANIMAL

Strongyloides infection of lambs and kids can cause diarrhea, dehydration, anorexia and anemia. In infected goats, there may also be grinding of teeth, foaming at the mouth, respiratory distress, and nervous signs, and in a small number, death. In a Japanese study, death of lambs was reported due to cardiac dysfunction, and it was not always preceded by presence of diarrhea. Often a high *Strongyloides* fecal egg count was indicative of signs of disease, but not always. In other words, sometimes a high *Strongyloides* fecal egg count was not correlated with disease, but other animals with a low fecal egg count were symptomatic. In addition, infection of the animal through the interdigital and/or coronary area of the foot can predispose the animal to foot rot.

After the initial infection with *Strongyloides*, most animals will elicit a strong immune response or acquired resistance will come into play which is why this parasite mostly affects young animals. It should be noted that lambs identified as genetically resistant to gastrointestinal nematodes (predominantly *H. contortus* and *Trichostrongylus* spp.) in Arkansas

succumbed to *Strongyloides* infection, including death.

TREATMENT

Broad spectrum dewormers are effective against *Strongyloides* and include macrocyclic lactones (ivermectin, moxidectin) and albendazole. Levamisole, pyrantel, and some benzimidazoles are not effective against migrating larvae but can kill adults. Routine treatment for prevention should be avoided in order to minimize development of dewormer resistance to other more pathogenic worms (*H. contortus*, *Trichostrongylus* spp.) and even *Strongyloides*, which has been reported.

The developmental stages of *S. papillosus* can seriously damage some vital organs during migration within the animal. Some drugs/dewormers can be harmful to the oxidant-antioxidant equilibrium, provoking oxidative stress, particularly to the heart, lungs, and liver in sheep (and likely goats).

It has been reported that administration of albendazole to *Strongyloides*-infected sheep damaged the liver and led to death in a small number of animals. Thus, it is important to give a strong antioxidant such as a commercial electrolyte and/or vitamins (such as Nutri-Drench™) at the same time as the dewormer, if *Strongyloides* is suspected or confirmed.





PREVENTION

Avoid poor hygiene (wet, muddy pens), overgrazing, or grazing too many animals in the same area to minimize *Strongyloides* infections. Rotational grazing may be beneficial. However, resting pastures to minimize infection can take weeks or months in cooler weather, but much less time in dry, hot weather. *Duddingtonia flagrans* (BioWorma®) may help control larval stages of *Strongyloides* in feces but will not aid in the control of free-living larvae.



IDENTIFICATION

The eggs found in freshly collected feces are similar to strongyles, but smaller (56 – 64 μ in length; 34 – 42 μ in width), thinner-shelled and larvated. The larvae can be seen within the egg. To avoid confusing *Strongyloides* eggs with larvated strongyle eggs, samples need to be refrigerated immediately after collection to avoid *Strongyloides* eggs from hatching (and not observing any eggs) and strongyle eggs from larvating. *Strongyloides* larvae can be identified in fecal cultures by experienced veterinarians or technicians. In Arkansas, eggs have been observed in periparturient ewes in December/January and their offspring in April to June and possibly outside of that time frame. Note that when conducting a fecal egg count to submit for genetic evaluation, *Strongyloides* eggs should *not* be counted.

The larvae can be seen within the egg.

Image credit: Anne Zajac



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