Gastrointestinal Nematodes, Diagnosis and Control

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KEYWORDS

• Ostertagia • Cooperia • Haemonchus • Anthelmintic resistance

KEY POINTS

- Gastrointestinal nematode infection is completely different depending on the species and age of ruminant and the environment. The disease, control measures, and drugs used must be focused on different ages and environments.
- Infection and disease are not synonymous. We try to prevent disease and ensure the animal's immune system is stimulated, not overwhelmed.
- Different drugs should be used against the parasites most likely affected by the specific drug and administered how and when it will accomplish the best sustainable control.
- Nematode larvae undergo hypobiosis in their hosts to evade unfavorable environmental conditions for their offspring and the immunologic response of the host, then emerge to ensure the survival of the species.

Gastrointestinal parasites of ruminants may adversely affect their hosts either clinically or economically; differentiating them is important to the veterinarian and producer. Clinical diseases are manifest as abnormal signs in dermal, gastrointestinal, or cardiovascular systems and are common in small ruminants. Economic disease is the level of parasitism that causes a less than genetic potential rate of gain, feed conversion, development, reproduction, or less than optimum production of milk or meat, as seen in cattle. Most losses in ruminants are economic, not as morbidity or mortality. Understanding the interactions of parasitism, nutrition, and livestock management is the key to understanding losses. Parasitism is not the most important cause of economic loss in the livestock industry but has the potential of being so with increased stocking rates and limited nutritional intake.

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The life cycles of the gastrointestinal nematode parasites of ruminants in temperate areas are direct. Climate determines which parasites will be present in a given geographic region and weather determines when livestock will acquire the infection. The class of livestock and the management of the stock will, to a large extent, determine the magnitude of the infection acquired. The nutritional status of the livestock may determine how adversely the individual animal will be affected by the parasites it acquires.

Because of the way each class of ruminants is managed, the likelihood of parasitic disease varies tremendously among them. Therefore, the parasites of ruminants will be approached as a herd/class problem rather than as a problem in an individual animal. The herd/class problem is a component of individual problems. Control programs for individual host species are addressed, but the anthelmintics used and relative importance of the species of parasites targeted may change over time; however, the general approaches to parasite control will remain more or less constant.

Parasitic gastroenteritis is a term used for the disease complex of nematodes affecting ruminants. Usually 1 or 2 species are more important than others in a given host and situation. The genera most often associated with this complex are *Haemonchus, Ostertagia, Teladorsagia,* and *Trichostrongylus* in the abomasum; *Trichostrongylus, Cooperia*, and *Nematodirus* in the small intestine; and *Oesophagostomum* in the large intestine. The eggs of these genera are thin shelled, segmented, and cannot be readily differentiated with the exception of *Nematodirus,* which has a distinctive large football-shaped egg. The eggs are commonly referred to as trichostrongyle type and are easily differentiated from whipworm or tapeworm eggs in feces.

The general life cycle is the eggs are passed in feces, and in the pasture L_1 larvae hatch in a few days. The larvae feed on bacteria in the feces and develop to the infective stage, which retains the cuticle as a protective sheath for the L_3 in the environment. The L_3 larvae do not feed; they are aquatic and are able to go where a film of moisture exists on surface of soil, underground, or on vegetation. These larvae go where the moisture is and if that is on the vegetation, the larvae are ingested during grazing. The worms complete development to adults in the gastrointestinal tract in approximately 3 weeks.

TRANSMISSION

In the pasture, larval development is temperature and moisture dependent. Larvae are more active at higher temperatures. Optimal development occurs near 100% relative humidity and 22 to 26°C (72–79°F) in 7 days; longer in cold weather. The development is fast in summer but life expectancy is short. Development is slow during the winter, but survival is lengthy. Larvae survive only a month in humid tropics. Larvae may survive in low temperatures on pasture up to 1 year but usually 2 to 6 months. The larvae are susceptible to high temperatures, excess moisture, desiccation, and UV light. During adverse weather conditions, larvae survive by moving into the soil or being entrapped in the dung pat. Another strategy for survival is by remaining within the host as arrested larvae (hypobiosis).

Each species of parasite has its own optimum requirements, minimum and maximum, for development and survival. Because of these differences, certain species of parasites will be important in various geographic regions and at different times of the year, that is, *Haemonchus* is a warm season parasite; O*stertagia* a winter parasite in Texas but a summer parasite in Michigan. It is possible to have transmission of parasites at virtually any time of the year in mild climates if there is sufficient moisture. However, various species of parasites tend to follow a pattern