

Major Gastrointestinal nematodes

Not all have the same impact

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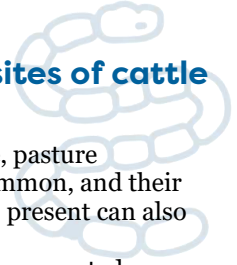
Gastrointestinal nematode infections are common in grazing cattle and are often subclinical. Their impact depends on the species present, the animals' age and immunity, and the level of exposure. Because the eggs of most trichostrongyles are morphologically very similar, parasite identification by qPCR helps characterize the composition and potential significance of a parasitic infection. Table 1 summarizes the main characteristics of the gastrointestinal nematodes targeted by the **Bovine GI Parasite qPCR Profile**.

Table 1. Summary of common gastrointestinal nematodes in cattle*

Parasite	Importance in cattle	Key considerations in cattle
<i>Ostertagia ostertagi</i> — <i>abomasum</i>	Moderate to high. One of the most important GI nematodes of cattle in North America. Gastritis, reduced appetite and digestion, diarrhea, and reduced growth; subclinical infections may affect performance.	Hypobiosis is common. Mass emergence of inhibited larvae can cause type II ostertagiosis. Infective larvae can overwinter on pasture. Anthelmintic resistance has been reported.
<i>Cooperia</i> spp. — <i>small intestine</i>	Moderate to high, but variable by species. <i>C. punctata</i> can cause severe enteritis; <i>C. oncophora</i> is generally less pathogenic but may reduce weight gain and productivity.	Common in young cattle. <i>C. oncophora</i> can overwinter on pasture. Resistance to macrocyclic lactones has been reported.
<i>Haemonchus</i> spp. — <i>abomasum</i>	Moderate to potentially high in heavy infections. Blood-feeding. Heavy infections can cause anemia, hypoproteinemia, weight loss, and decreased performance.	In cattle, <i>H. placei</i> is the predominant species. Overwintering on pasture is limited in cold climates, while hypobiosis contributes to persistence in the host. Resistance to macrocyclic lactones has been reported, as have markers associated with benzimidazole resistance.
<i>Trichostrongylus</i> spp. — <i>abomasum</i> / <i>small intestine</i>	Moderate to high. In cattle, <i>T. axei</i> can cause gastritis, diarrhea, hypoproteinemia, and weight loss; clinical disease is mainly associated with heavy infections, malnutrition, or stress.	Often found in mixed infections. <i>T. axei</i> can overwinter on pasture under Canadian conditions. Hypobiosis is limited; adults may remain active in the host during winter.
<i>Oesophagostomum radiatum</i> — <i>cecum</i> / <i>colon</i>	Low to moderate. Heavy infections can cause enteritis/colitis, diarrhea, and protein-losing enteropathy.	Free-living stages are sensitive to adverse environmental conditions. Larvae form nodules in the intestinal wall before returning to the lumen to mature. Encysted larvae may be less accessible to some anthelmintics.
<i>Bunostomum phlebotomum</i> — <i>small intestine</i>	Low to moderate. Blood-feeding. Low pathogenicity in cattle, but heavy infections can cause anemia, diarrhea, weight loss, and hypoproteinemic edema.	Infection occurs through ingestion or skin penetration. Transmission is favored by warm, humid conditions while free-living stages have poor survival in cold or dry conditions.
<i>Nematodirus</i> spp. — <i>small intestine</i>	Low in cattle. Clinical disease is rare in adults; calves develop strong acquired immunity.	<i>N. helvetianus</i> is the most common species in cattle in North America. Larval development within the egg is slow; eggs containing infective larvae can overwinter on pasture providing a source of infection in spring and serve as a source of infection in spring. Low fecundity.
<i>Strongyloides papillosus</i> — <i>small intestine</i>	Low in cattle. Mainly encountered in young calves following transmission through milk. Heavy burden may be associated with enteritis and diarrhea.	Non-trichostrongyle , with a distinct life cycle. Oral, percutaneous, or lactogenic transmission; the latter being relevant in young calves. Development and transmission are favored by warm, humid conditions.
<i>Trichuris</i> spp. — <i>cecum</i> / <i>colon</i>	Low to moderate. Usually asymptomatic; heavy infections, especially in young cattle, can cause diarrhea, anorexia, anemia, and hypoproteinemia.	Non-trichostrongyle. Direct life cycle. Eggs are highly resistant to adverse conditions and can persist for prolonged period contributing to environmental contamination. Treatment is rarely necessary.

*This table is not exhaustive; additional information may be required depending on the parasite and the clinical context.

The qPCR method detects a specific DNA sequence of the parasite being tested. After the DNA in the feces is extracted, test-specific primers recognize the targeted DNA sequence and enable its amplification. With each reaction cycle, the amount of amplified target DNA increases and generates a fluorescent signal. When this signal exceeds a predefined threshold, the target is detected. The number of cycles required to reach this threshold is the Ct value (cycle threshold). The greater the initial amount of target DNA in the sample, the fewer cycles are required to reach the threshold and the lower the Ct value.



The significance of a positive qPCR result depends on the parasite identified, the animals' age, pasture exposure, group performance, and previous antiparasitic treatments. Mixed infections are common, and their effects may be additive, even in the absence of obvious clinical signs. Identifying the parasites present can also help guide the selection of an anthelmintic with appropriate activity.

At present, qPCR cannot determine parasite susceptibility to anthelmintics; resistance may be suspected, particularly following repeated use of the same drug class or an inadequate response to treatment. A low Ct value indicates a greater amount of target genetic material in the sample but does not necessarily correspond to a higher parasite burden in the animal.

Although qPCR is highly sensitive, a negative result does not always rule out infection. It may reflect the absence of the parasite, but it may also indicate an amount of DNA below the detection threshold or a stage of infection during which little or no genetic material is shed in the feces. Interpretation of a negative result should therefore consider the parasite being tested, its life cycle, and the timing of sample collection.

For more information

1. Avramenko, R. W., Redman, E. M., Windeyer, C., & Gilleard, J. S. (2020). Assessing anthelmintic resistance risk in the post-genomic era: a proof-of-concept study assessing the potential for widespread benzimidazole-resistant gastrointestinal nematodes in North American cattle and bison. *Parasitology*, 147(8), 897–906.
2. Beef Cattle Research Council (BCRC). (2023, June). *Parasites – Internal*. BeefResearch.ca. <https://www.beefresearch.ca/topics/parasites-internal/>
3. Charlier, J., Höglund, J., Morgan, E. R., Geldhof, P., Vercruysse, J., & Claerebout, E. (2020). Biology and Epidemiology of Gastrointestinal Nematodes in Cattle. *Veterinary Clinics of North America: Food Animal Practice*, 36(1), 1–15.
4. Craig, T. M. (2018). Gastrointestinal Nematodes, Diagnosis and Control. *Veterinary Clinics of North America: Food Animal Practice*, 34(1), 185–199.
5. De Seram, E. L., Uehlinger, F. D., de Queiroz, C., Redman, E. M., Campbell, J. R., Nooyen, D., Morisetti, A., Pollock, C. M., Ekanayake, S., Penner, G. B., & Gilleard, J. S. (2023). Integration of ITS-2 rDNA nemabiome metabarcoding with Fecal Egg Count Reduction Testing (FECRT) reveals ivermectin resistance in multiple gastrointestinal nematode species, including hypobiotic *Ostertagia ostertagi*, in western Canadian beef cattle. *International Journal for Parasitology: Drugs and Drug Resistance*, 22, 27–35.
6. Gasbarre, L. C., Smith, L. L., Lichtenfels, J. R., & Piliitt, P. A. (2009). The identification of cattle nematode parasites resistant to multiple classes of anthelmintics in a commercial cattle population in the US. *Veterinary Parasitology*, 166(3-4), 281–285.
7. Hildreth, M. B., & McKenzie, J. B. (2020). Epidemiology and Control of Gastrointestinal Nematodes of Cattle in Northern Climates. *Veterinary Clinics of North America: Food Animal Practice*, 36(1), 59–71.
8. VanHoy, G. (2023, June). *Common Gastrointestinal Parasites of Cattle*. Merck Veterinary Manual (Reviewed by A. Abuelo; last updated September 2024). <https://www.merckvetmanual.com/digestive-system/gastrointestinal-parasites-of-ruminants/common-gastrointestinal-parasites-of-cattle>