# New Perspectives in Equine Intestinal Parasitic Disease

## Insights in Monitoring Helminth Infections

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**KEYWORDS**

• Equine • Strongyles • *Parascaris* • SAT • TST • Egg counts
• Anthelmintic resistance • Epidemiology

**KEY POINTS**

- Regular anthelmintic treatment schedules have significantly contributed to the spread of anthelmintic resistance in horse helminths, particularly in small strongyles and *Parascaris*.
- This mass (or strategic) anthelmintic treatment—in most cases without prior diagnosis—was originally developed owing to a lack of larvicidal drugs against *Strongylus vulgaris*.
- This high prevalence of AR and shortening of strongyle egg reappearance period after avermectins/moxidectins requires epidemiologically appropriate and sustainable measures.
- As a consequence, (targeted) selective anthelmintic treatment is a much-needed, rational, and therefore highly valuable deworming approach, especially for adult horses.
- This method has been successfully used in several countries and many horse owners show a high degree of compliance.

## INTRODUCTION

Parasites are an integral part of the global fauna, and consequently parasitic infections are ubiquitous in horses. Parasitism represents a significant consideration for any appropriate horse breeding, husbandry, and management program. However, when properly managed, equine parasite infections rarely pose major problems or can be successfully handled and treated. The authors present the most relevant horse helminths with an emphasis on temperate areas, in a priority ranking—according to pathogenic potential and the horse's age—and propose ways of keeping these infections under control by applying evidence-based medicine. Conventional interval treatment

Dedication: In memory of Prof. Gene Lyons, an outstanding equine parasitologist.

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measures that have led to the development of significant drug resistance are contrasted with a more efficacious and highly targeted antiparasitic approach.

## PARASITE SPECIES IN ORDER OF PATHOGENICITY

### *Parascaris spp*

Horses ingest the thick-walled *Parascaris* eggs while grazing. The eggs hatch and larvae begin to migrate from the intestine, through the liver to the lungs (about 1–2 weeks after infection). Subsequently, larvae penetrate the alveolar capillaries to enter the airways, and migrate via the bronchi to the trachea, are coughed up and swallowed. Within 3 weeks, larvae are back in the small intestine and develop into adult worms. The prepatent period is approximately 9 to 16 weeks. Elimination of all eggs from the environment (stables, paddocks, pastures) is virtually impossible; larvated eggs can survive for years.

## STRONGYLES ("LARGE" AND "SMALL" STRONGYLES)

### *Large Strongyles (Strongylus spp.)*

The 3 species of this genus (*Strongylus vulgaris*, *S edentatus*, and *S equinus*) are robust, dark-red nematodes (10–50 mm) residing in the cecum and colon, and undergoing mandatory, parenteral migration in their larval stages. *Strongylus* spp. infections are pasture-associated parasite infections and on pasture, the excreted eggs develop into infective larvae 3 (L3). Ingested L3 undertake a parenteral migration and subsequent development occurs outside the alimentary tract.

*S vulgaris* larvae migrate along arteries and congregate at the root of the cranial mesentery artery, where they remain for several months and undergo a molt to L5 before returning to the large intestine via circulation. *S vulgaris* adults begin to lay eggs approximately 6 to 7 months after infection. In many parts of Europe and North America, *S vulgaris* has become rare.

*S edentatus* larvae move via portal veins to the liver and migrate through the parenchyma before further migrating beneath the peritoneum of the ventral abdomen and flanks and returning to the intestinal lumen. The prepatent period of *S edentatus* is approximately 11 months.

After first forming nodules in the gut wall, *S equinus* larvae also travel to the liver to migrate through the parenchyma before continuing to the pancreas and returning to the large intestine; the prepatent period is approximately 8 to 9 months.

### *Small Strongyles (Cyathostomins)*

Small strongyles encompass more than 50 species, of which about 10 comprise more than 98% of all small strongyle populations. These nematodes (4–25 mm) reside exclusively in the cecum and colon, and may be present in huge numbers, often exceeding 100,000 per horse. The prevalence of small strongyles in young (<4 years), pastured horses approaches 100%, so cyathostomin infections are virtually ubiquitous in grazing horses. Despite their high prevalence, adult cyathostomins generally do not inflict pathology. Owing to similarities of morphology, biology, and epidemiology, these nematodes are usually considered as a single entity, and therefore are discussed accordingly.

Eggs produced by adult cyathostomins develop into infective L3s on the pasture in the presence of appropriate climatic conditions. After ingestion, L3s invade the gut wall and are enclosed in a fibrous capsule of host origin (encysted stages). After intervals ranging from weeks to perhaps more than 2 years, larvae emerge into the intestinal lumen and molt into young adult worms. The prepatent periods vary from 5 weeks