

# The worms that turned



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Horses play host to many types of internal parasites. Worldwide, roundworms (nematodes) are the most important. Many of these worms are found in the gastrointestinal (GI) tract and often the adult stage worms are located in the large intestine, or gut. Virtually all horses that graze pasture experience some level of

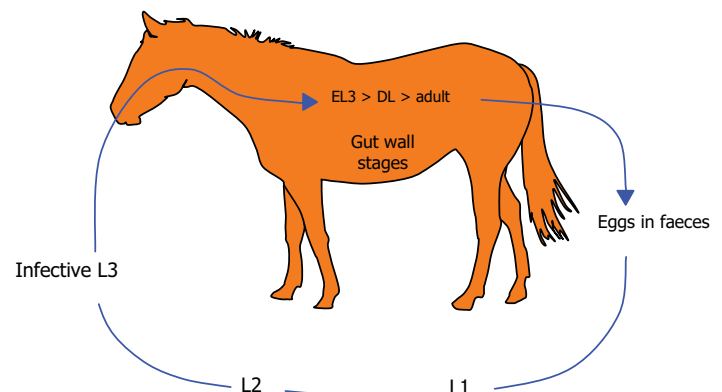
GI parasitism and, in some cases, the infection is continuous throughout the horse's life. In most animals, roundworm infection does not lead to obvious signs of clinical disease; however, in a low number of animals, serious illness can occur. Because of where the worms live, clinical signs are most often manifest as colic, severe weight loss and/or a life-threatening colitis with diarrhoea. It is a general rule that the higher the level of worm infection, the more likely it is that an animal will develop disease. Therefore, it is important to identify animals that are predisposed to higher burdens of worms, so that management practices can be put into place to ensure that they do not develop substantial levels of infection. The parasites that primarily cause GI symptoms fall into three broad categories: cyathostomins (small strongyles), *Strongylus* species (large strongyles) and tapeworms (primarily *Anoplocephala perfoliata*). Additionally, the large white roundworm, *Parascaris equorum*, can cause respiratory and GI signs in foals. Of the parasites listed above, the cyathostomins are the most important. This is because they have a high prevalence and have the potential to cause fatal disease.

The control of cyathostomins in horses has relied heavily on anti-worming drugs (also known as anthelmintics). Currently, three types of drug are licenced for use against cyathostomins; the macrocyclic lactones (MLs – ivermectin and moxidectin), the tetrahydropyrimidines (THPs - pyrantel) and the benzimidazoles (BZs - fenbendazole). There are now numerous reports of worm resistance to both BZs and THPs. Worm resistance to MLs is far less common but there have been recent reports of resistance to this drug type. This is alarming because no new types of anthelmintic are under development for use in horses. Worryingly, in some parts of the world, single populations of cyathostomins that show resistance to all three drug classes have been identified in horses. The widespread incidence of drug resistance is reducing long term options for equine roundworm control, so it is essential that an understanding of the risk factors for infection and development of resistance are identified: researchers are actively investigating these areas. It is also imperative that the efficacy of any currently effective drugs is preserved for as long as possible.

Research indicates that drug resistance develops within worm populations because these populations are huge (up to 1,000,000's of worms per horse population) and because, at the genome (DNA) level, these parasites are extremely diverse. These characteristics mean that worms can respond to, and adapt under, selection pressure. When powerful treatments are applied, the drugs act as a very potent trigger for selection. Even if 1-2 worms in a million have differences in their DNA, this allows them to survive and carry resistance conferring 'mutations' onto the next

**The life cycle of cyathostomin worms of horses. Eggs are released in dung and these hatch to release larvae which moult through several stages before reinfection of the same horse or another horse grazing the same pasture.**

Abbreviations: L1: first stage larvae;  
L2: second stage larvae; L3: third stage larvae;  
EL3: early L3; DL: developing larvae



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generation of worms. These resistant worms produce eggs that are excreted onto pasture and larvae that develop from these are then ingested by the same or a different horse sharing the grazing. Roundworms exist as males and females and if surviving drug resistant males mate with resistant females at the next round of infection, further, and potentially more, resistant progeny are produced. This effect builds up over time so that if the same drug type is administered time and time again, a significant proportion of the overall worm population will harbour drug-resistant genes. At this point the drug will become ineffective: this is either observed wither as a faster appearance of eggs in dug post treatment, an inability to reduce faecal egg counts after treatment (to levels described when the drug was first licensed) or as parasite-associated clinical disease in a group of horses which have a 'good worming history'.

It's therefore important to use deworming drugs rationally by treating horses at the appropriate time of year with the correct time of wormer. Also, at certain times of year, it is imperative to target those horses carrying high burdens of worms and to leave those with lower burdens untreated. Remember that not all horses carry similar sizes of burdens: a reasonable rule of thumb is that 20% of horses harbour 80% of the burden. This means that worm control strategies can be based on targeting anti-adult worm treatments to individual animals based on worm egg counts (WECs).

This will act to reduce contamination onto pasture without overusing anthelmintics. In the UK, targeting treatments based on WECs is best done in the spring and summer. Encysted cyathostomins in the gut wall, usually at highest levels in autumn and winter, cannot be detected by WECs so it is important that all horses should be treated at this time of year with an appropriate anti-larval treatment (i.e. moxidectin). The Worm Egg Count Reduction Test can be used to assess sensitivity of worms to a particular drug. This is best done in partnership with your veterinary surgeon who will be able to advise on the most appropriate timings for this.

In summary, horse owners need to be more aware of the possibility of drug resistance in worms and should consider targeting horses for treatment in the spring and summer months. They should also think about undertaking tests to see if the worms on their premises are sensitive to the drugs they are using - this can be done in conjunction with their attending veterinary surgeon.