

Drug-Resistant Parasites in Horses

Horses can harbor more than 100 species of internal parasites. About one-half of these species are in the strongyle group. They are separated into two categories - small and large strongyles. These parasites live in the large intestine of the horse and lay eggs that are voided in the feces.

In the environment, the eggs develop into first stage larvae, hatch, and then develop to the second and third stage larvae. Third stage larvae are the infective stages that crawl up on pasture vegetation and are then accidentally ingested by the horse. Inside the horse they develop to the fourth and then fifth (adult) stage.

The large strongyles are composed of three species in the genus *Strongylus*; these are the most pathogenic of the strongyles because they can cause colic and even death of horses.

Detrimental effects of these parasites usually are most evident during migration of immature stages in organs outside the gastrointestinal tract. A few other species have been assigned to the large strongyle group, but they are less important than *Strongylus* spp. because they do not migrate outside the intestinal tract.

The small strongyle group includes about 50 species worldwide. Virtually 100% of horses are infected with at least some species of small strongyles. Numbers of these worms are usually lower in older horses that have had time to develop some immunity. They are much less harmful than *Strongylus* spp. because the infective third stages migrate only into the lining of the large intestine, where they encyst. Here they develop to the fourth and sometimes young fifth (adult) stage and then usually trickle out to the intestinal lumen and mature. Under poorly understood circumstances, massive numbers of larval stages can encyst and emerge, causing severe damage to the intestinal lining and resulting in extensive fluid and protein loss. This occurrence can be related seasonally, especially in late winter or early spring, and also after deworming. The condition is called larval cyathostomiasis and has been reported more commonly in Europe than in the United States. Death can occur from this disease situation. Overall, the small strongyles are not considered very pathogenic except under certain conditions, but they should not be overlooked as disease entities.

Control of internal parasites in horses has been attempted for several centuries. Most of the early medications had tremendous toxic side effects in the horse and were ineffective or effective only on a low number of species of parasites. The first broad-spectrum anthelmintic (dewormer) was thiabendazole, a benzimidazole, marketed in 1963; it was effective on most species of nematode worms. However, soon after its commercial use, small strongyles were observed to be resistant to it. Other similar benzimidazole products came on the market, but cross-resistance by the small strongyles was evident also. Various other classes of dewormers were developed and marketed. Initially, small strongyles were quite susceptible to most of them,

but later resistance occurred with such compounds as pyrantel pamoate. The organic phosphate, dichlorvos, was highly active on small strongyles resistant to other products; however, this compound is no longer on the market.

In the USA, only four chemical antiparasitic classes are currently on the market. They are the macrocyclic lactones (ivermectin and moxidectin), benzimidazoles (fenbendazole, oxfendazole, and oxibendazole), piperazine (piperazine) and pyrimidines (pyrantel pamoate and pyrantel tartrate). Resistance of small strongyles has been documented for all of the benzimidazoles, piperazine, and pyrantel pamoate. There has been no indication of resistance of these parasites to ivermectin and moxidectin. It should be mentioned that there have been no reports of drug resistance of the large strongyles or species of nematodes other than small strongyles.

Opinions vary as to frequency of treatment and usage of compounds. Rotation of different classes of compounds is advocated. Fast rotation is alternation of classes of drugs for each treatment. Slow rotation is using the same compound or class for several consecutive treatments.

Various treatment schedules are used, including every six to eight weeks, strategic times such as spring and fall when parasites are usually present in greatest numbers or only when fecal worm egg counts (EPGs) are above a certain number. Even though there is resistance of small strongyles to all but ivermectin and moxidectin, it seems prudent not to use them exclusively because resistance has occurred after a period of time of usage with most other products. Therefore, it is suggested that ivermectin or moxidectin be used sparingly, for instance in the spring and fall. In between, the other commercially available compounds that are still active on non-small strongyle nematodes can be given.

Several helpful management practices have been advocated for control of internal parasites of horses: exposing larval stages on pastures to detrimental factors such as sunlight by clipping and chain harrowing, composting feces, and rotating horses and cattle on pasture. This rotation is effective because when each eats the larval stages of the other's parasites, except for one species, the larva are killed.

* From a paper by Dr E Lyons. Equine Disease Quarterly, July 2002