Parasite Control: Keeping up with Evolution

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Of the dozens of internal parasites that can infect horses, only a few are capable of any serious harm. Modern dewormers rank near the top of advances in horse care made in the past 50 years. Horses are living longer, healthier lives because of these advances, making parasitic colic and other life-threatening conditions caused by parasites largely a thing of the past. With all the highly effective dewormers readily available over-the-counter to horse owners, it seems veterinarians are removed from the deworming discussion altogether. And therein lies the problem.

Ivermectin became available in the early 1980s and has had a dramatic effect on the prevalence of arterial larvae and lesions due to parasite migration. It is well known that all three large strongyle species can cause significant tissue damage during migration (Drudge 1966, Drudge 1986). Colic symptoms are the most frequent manifestation of large strongyle infestation (Drudge 1986, Lores 1992). Before modern dewormers, it had been estimated that 90% of colic cases were caused by thromboembolism secondary to *S.vulgaris* infection (Becht 1984). Recent studies have described the decline in large strongyle populations worldwide due to the routine use of highly effective dewormers (DiPietro 1990, Herd 1990a, Herd 1990b). However, horses that are not treated or are rarely treated with dewormers serve as reservoirs for large strongyle infections. The prevalence of large strongyle adults and arterial larvae in these horses has not changed (Torbert 1986, Tolliver 1987, Lyons 1990) since before the availability of modern dewormers. Although the picture of a neglected equine comes to mind, many times it is instead a conscious decision of a loving owner. A loving, under-informed owner. Some horses do have a natural immunity to internal parasites and this can be capitalized on in those individuals. But immunity is not measured by a shiny coat and good body score; it requires a **Fecal Egg Count** (FEC). According to researchers, 20% of horses carry 80% of parasites. And the 20% are 'shedding" (passing through their manure) most of the parasites on your farm. The other herd members are infected when they ingest parasite eggs grazing. If you can figure out which horses those are by doing FECs, you can target them.

You may ask, "What's the harm in deworming the entire herd at the same time in the same way?" Well, the horses with natural immunity to parasites are treated too frequently with drugs they don't need. This increases the possibility for drug-resistant parasites to emerge. Also, some people do a very poor job of getting a full dose of dewormer into their horse. If the horse spits out the product, he has been under-dosed. Under-dosing gives parasites a chance to survive and can also build resistance in the parasite population. It has been slow to gain recognition that drug resistant parasite strains can occur on farms. To help prevent resistance, researchers agree that using FEC results help horse owner's stretch out the period of time between deworming for horses that don't carry high parasite loads. Deworming strategies can be adjusted throughout a horse's life as well. For example, foals and seniors are most susceptible to parasites. Ascarids are problematic for foals and small strongyles are the biggest concern for seniors. Youngsters need more frequent deworming to control ascarids until an age-related immunity to ascarids occurs by their second birthday. The situation is less favorable with strongyles, which affect horses of all ages. There is clear evidence of acquired immunity to *Strongyles vulgaris*, but again, younger horses tend to be less tolerant of the effects of both large and small strongyles (Ogbourne 1985). It appears that the reduced response to dewormers in young compared with adult horses is at least partly due to their lack of immunity and an accumulation of large numbers of encysted small strongyles (Herd 1990c). The encysted larvae later emerge, mature and contaminate pastures. The fact that encysted small strongyle (cyathostomes) larvae can survive in the wall of the large intestine is of great practical importance. Because of this, horses carry pasture contamination with them, even after they have been treated. Hypobiotic small strongyles have been reported to persist in gut tissues for as long as 2.5 years after horses were removed from infected pastures (Smith 1976).

There can be farm-to-farm differences as well. On two identical sized farms in the same county with the same number of horses you can have different manure management, turn-out, age groups, et cetera – giving two completely different parasite profiles. Performing FECs at frequent intervals for 1-2 years (at every scheduled deworming) will show some important things: which drugs are effective on your farm, which horses are always low (less frequent deworming), which horses are always high, and if egg counts are getting lower over time. Once a pattern is identified, periodic re-checks are performed thereafter. Money spent on proper diagnosis will lead to less money spent on dewormers, less drug resistance and better control. We only have so many drugs to play with, so use as few as possible to get the job done.

How are Fecal Egg Counts (FEC) performed?

There are two basic tests that are performed on manure samples to check for evidence of parasite burdens. One test is the **Modified Willis**, or fecal flotation test. This is a highly sensitive test that helps identify the presence and species of parasites involved from only a very small sample of stool. There is no quantification, however, and no ability to measure the severity of the infestation. Quantitation of strongyles and ascarids eggs is achieved with the **McMaster** method. This uses a larger stool sample, a specialized grid viewed under a microscope, and yields a fecal egg count (FEC) in eggs per gram (epg). Horses with FEC greater than 500 epg are shedding numerous parasitic ova on pasture and are contaminating the environment for the other members of the herd. High counts (>1000 in adults; >1500 in young horses) suggest that health and immune status of the horse should be evaluated. It is important to identify these animals and manage them so they don't become a source of continued re-infection for the rest of the herd.

Some data suggest that minimizing exposure to parasitic larvae by controlling FECs improves the health status of horses. In one study, control programs designed to keep the herd average FEC below 200 epg resulted in markedly decreased risk of colic (Uhlinger 1992a). In addition, the owners reported an improvement in horse's condition and a reduction in feed intake. A parasite control program based on use of daily deworming treatment minimized FEC values and improved condition and decreased feed intake (Hackett 1992). But a worm-free environment is not the goal; low-level exposure to strongyles is necessary to create a natural immunity. Horses raised without such exposure can experience life-threatening disease when exposure and infection does occur. High FECs are most common in young or older, debilitated animals. From the standpoint of preventative medicine, a zero count offers a temporary signal that all is well. Repeated negative exams offer some reassurance that the individual or herd is not currently harboring numerous adult parasites. A positive result establishes that sexually mature parasites are present in the lumen of the gut. A positive FEC also indicates that the horse has experienced all phases of parasitic infection.

Evaluation of individuals:

Results from recent controlled trials have indicated that the antiparasitic effects of ivermectin in horses is as effective as it was at introduction 20 years ago (Klei 2001). This is good news. However, effective dewormers suppress FEC for a variable period in *individuals*. The period depends on the drug administered, the age of the horse, the number and stage of parasites present in the horse, and farm management variables. In one study, ivermectin administered to several herds suppressed FECs for as few as 3 weeks and as long as 19 weeks (Uhlinger 1992b).

Some individuals apparently tolerate numerous parasites very well. An individual horse with high strongyle count may be in good health, while others are relatively intolerant of infection and exhibit signs of disease while herd-mates grazing the same pasture remain healthy. As a result of the variation in the response to infestation, FECs need to be interpreted compared to the patient. Here are a few rules of thumb. Farms with high horse turnover – new horses coming and going – have a greater parasite management problem. New horses potentially carry parasites that might not currently exist on a farm. This puts all horses at risk of becoming infected. Ideally, newcomers should be subjected to a fecal egg count reduction test (FECRT). Conduct a FEC to quantify if the horse has parasites and if it is a moderate

or high burden. Deworm the horse, then count again in 10-14 days, looking for significant reduction in the count before releasing into the herd. However, animals with clinical signs suggestive of strongylosis should be dewormed regardless of FEC. Even if the egg count is zero, treatment should be considered to remove residual and non-egg laying populations of adult parasites and susceptible pre-adult stages, especially in new-arriving horses with unknown deworming history. In addition, it may be advisable to investigate the health and deworming history of the horses that share the pasture with this infected animal. Clinical signs of strongyle infestation include poor weight gain, growth or condition, recurrent diarrhea or colic, and fever of unknown origin. If you acquire a horse that looks like he might be carrying a high parasite load, talk with your veterinarian about the best way to safely deworm and bring him back to health. Horses with extremely high parasite burdens are at risk of becoming ill after deworming due to toxins released by dying parasites. On a large farm, sampling 25-50% of the herd gives reasonable average FECs but does not allow identification of individuals with high counts. The individual approach is still recommended when possible.

***Environmental control measures and good management practices*:**

Horses shed parasite eggs in their manure. Small strongyle (cyathostome) eggs account for 95% of all parasites passed in adult horse manure. Transmission is greatly reduced or ceases in the hot summer, even in areas with abundant rainfall (Courtney, 1985). The seasons and the region of the country factor into the type of parasites found on your farm, so use the weather to your advantage (the hot and cold extremes). Egg counts may culminate with peaks in April or May and August or September (Herd 1986, Herd 1985). These peaks appear to be the parasites' adaptation to environmental conditions. Eggs are laid just before or when the temperature and moisture promote the eggs development to infective larvae. Once summer and autumn pastures become heavily infected with strongyle larvae, these larvae may survive until they are killed by rising temperatures during the subsequent year. Many infective larvae survive subzero temperatures in winter only to die the following spring when rising temperatures cause increased larval activity and food reserves are exhausted. In regions where winter temperatures exceed the 45.5'F (7.5'C) required for egg hatching, the fragile pre-infective larvae are likely to be killed by alternate cycles of freezing and thawing before they reach infective stage. One week of hot, dry weather can result in complete desiccation of a compact heap of horse manure. High temperatures are lethal to eggs and larvae, especially if harrowed. On the other hand, pasture harrowing may spread viable larvae from the roughs to the lawns if done under conditions favorable for larvae survival (Slocombe 1988), so watch when you harrow. Harrow fields when the weather is hot and dry, when it's most detrimental to parasites. Regular and diligent manure removal goes a long way toward naturally reducing parasite population on a farm.

Pastures grazed by horses are typically separated into areas of short grass (lawns) and high grass surrounding dung (roughs). The lawns are the grazing areas, and the roughs are rarely grazed because of group defecation. There is no regularity in the shape, position or size of the roughs and lawns, but 50% or more of a field may be lost to grazing. The ring of repugnance surrounding feces appears to be part of the horse's adaption to life in a wormy world (Taylor 1954). Strongyle larvae counts have been found to be up to 15x higher in the roughs than in the lawns, although seasonal trends are seen in both areas (Herd 1985b). Young horses frequently graze too close to manure, where larval counts are highest. Ascarid eggs also theaten the young, and they do not require herbage to complete the life cycle. Ascarids have been recovered from animals raised in contaminated drylots and stalls. Once land is contaminated with ascarid eggs, the environment may remain a source of infection as long as 5 years.

In summary, good management practices on a property can help minimize the parasitic challenge that individual horses are facing every day in their environment. Some of these management practices include:

1. rotate pastures when possible: strongyle eggs hatch and without a host will die
2. use the correct dose of product: estimate weight with tape; be sure the horse does not spit product out
3. harrow and mow: harrow in hot weather; strongyle eggs die in hot sunlight
4. minimize exposure to manure: remove manure from crowded pens and paddocks
5. compost before spreading: heat from composting kills strongyle and ascarid eggs
6. deworm new horses before turn out with resident population
7. conduct fecal egg counts on all individuals and develop a program with your veterinarian

Sample program:

The goal of the program should be to keep fecal egg counts (FECs) low, thereby reducing future worm transmission, kill all important parasites at correct time of year and reduce development of drug resistance. Ultimately, each farm should develop a program tailored to its needs.

September 1: FEC on all horses. Deworm all horses with ivermectin regardless of FEC.
Based on this FEC, categorize horses as low (<150 epg), moderate (150-500 epg), or high (>500 epg) shedders [these characteristics have been shown to be repeatable between years]
<u>*Rationale*</u>: Probably the single most important FEC all year because it will indicate a horse's innate relationship with strongyles. This deworming will kill bots and stomach worms (*Habronema* and *Draschia*), and sterilize *Onchocerca* females; it will also kill migrating large strongyles and any large strongyles or small strongyles (cyathostomes) in intestinal lumen. There are few small strongyles on pastures at this time, so moxidectin is not the correct product to use now.

November 1: Treat all horses with FEC > 150 epg (from September count) with oxibendazole and pyrantel together.
<u>*Rationale*</u>: Recent data suggest using together improves effectiveness of treatment with individual drugs. Try not to use ivermectin. Perform a FEC 14 days after deworming. Resistance to oxibendazole and pyrantel individually exists. This FEC determines if your farm has resistant parasites/individuals.

January 1: FEC on all horses. Treat all horses, regardless of count with praziquantel/ivermectin product.
<u>*Rationale*</u>: It will be important to know if horses with low counts in September are still low, and if high horses are now lower. Tapeworm transmission peaks in autumn so treatment at this time will remove any tapeworms acquired over summer and autumn (praziquantel). Ivermectin will remove any bots acquired or any strongyle larvae that are beginning to build up since September.

March 1: Treat horses with FEC > 150 epg (in January) with moxidectin product.
<u>*Rationale*</u>: Horses with chronically high FEC are likely to have many encysted small strongyles (cyathostomes), and moxidectin has the greatest efficacy against them.

April 1: FEC on all horses. This is the last treatment of the cycle and the last time you will need to perform FEC until September.
<u>*Rationale*</u>: Eggs shed after April are doomed to die because temperatures will soon rise to levels that will kill them. This FEC will give a good indicator of how you have done killing worms this year.

June 1: Treat only horses with FEC > 150 epg (in April) with oxibendazole and pyrantel together.

September 1: FEC on all horses. Compare to last years values on individual horses. This has established individual immunity.

This program is designed to target bots, tapeworms, *Habronema*, *Draschia*, *Onchocerca*, large strongyles and small strongyles (cyathostomes). A few less important parasites will also be controlled. Treatment in September and November with ivermectin will control the worms above for the entire year with the exception of cyathostomes. The January deworming controls cyathostomes. Horses with naturally strong immunity to cyathostomes will be identified (by low FEC) and will need no other treatment. In traditional deworming programs, repeated treatment of these horses accomplishes little to nothing. Some horses may need additional treatment for cyathostomes, but only a few (<30%) should need a fourth or fifth treatment, and only 5% or less should need more than that. Many farms are treating all horses six-times each year, and are likely getting less results and less individual information that what is achieved with this program.

For accurate FEC, use fresh, recently voided manure balls uncontaminated by soil or bedding. Process promptly; refrigerate before evaluation or eggs will hatch in 12-24 hours at room temperature; freezing, heating and dessication also decrease ova in sample.

References: (to sort fact from fiction; the things I do for you guys ☺)

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