Endoparasitism, Anthelmintic Resistance, And The Return Of The Fecal Flotation In The Management Of Equine Small Strongyles

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About 40 years ago, a novel approach to equine parasite control was introduced. Called the interval dose system, owners were advised to treat horses every 6-8 weeks to prevent maturation of *Strongylus vulgaris*, thereby minimizing pasture contamination. As part of the movement towards strategic parasite control, this approach not only addressed treating parasites within the animal but, also, addressed the prevention of future infections and disease. Widely accepted, this approach is credited towards the dramatic reduction in equine colics associated with *S. vulgaris*. By the 1980s, *S. vulgaris* was becoming relatively uncommon and a shift in parasite populations occurred with small strongyles (cyathostomes) accounting for the majority of strongyle egg output in grazing horses. Unfortunately, the efficacy of the program in controlling *S. vulgaris*, combined with the availability of safe and inexpensive anthelmintics, led many owners to adopt a zero tolerance towards the presence of any strongyle egg. Consequently, rather than focus on control, over the years, the focus became total eradication. The goal, then, became to keep fecal egg counts (FEC) at or as near zero as possible and rote deworming by the calendar became so ingrained in many management schemes that a lot of owners absolutely refuse to consider skipping a scheduled treatment, whether it is needed or not.

At the time the interval dose system was introduced, cyathostomes were considered to be of minor consequence, especially when compared to the highly pathogenic *S. vulgaris*. However, as *S. vulgaris*-induced colics decreased, the pathogenic effects of cyathostomes became evident and, today, they are considered to be the primary parasitic pathogen of horses. Unfortunately, the suppressive use of anthelmintics has contributed significantly to the increased prevalence of anthelmintic resistant-cyathostomes around the world. Resistance to benzimidazoles is widespread and resistance to pyrantel salts (tetrahydropyrimidines) is becoming more common. Macrocylic lactone-resistant cyathostome populations have yet to be identified, although resistant *Parascaris equorum* populations have emerged. Studies within the US suggest that anthelmintic resistance is a serious situation with 40% of farms studied harboring anthelmintic resistant-cyathostome populations.

What does this mean in the practical sense? First and foremost, we must realize that one size does not fit all. Programs must be developed for each individual farm and monitored to evaluate effectiveness. We must break the decades-old habit of mechanically deworming by the calendar and realize that control, rather than eradication, is the goal. This may seem counterintuitive, but in order to select against resistance, we have to keep the susceptible parasites in the population to dilute out the resistant ones. This will require major adjustments to our thinking because in order to achieve our goal, it means not every horse is dewormed every time – this is called tactical or selective deworming. To identify those horses that need treatment vs those that do not, monitoring with routine FEC, reported in eggs per gram, is necessary. But, before any program is put into place, it is imperative to test all anthelmintics used on a farm to determine whether they still work. At present, the only way to do that is perform a Fecal Egg Count Reduction Test. This is a relatively easy procedure to perform. At the time of treatment, collect a fresh fecal sample from each animal and again 10-14
days after treatment. Perform a quantitative flotation procedure on both samples and determine the individual % reduction as follows:

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\% = \frac{[\text{pre-treatment FEC} - \text{post-treatment FEC}]}{\text{pretreatment FEC}} \times 100
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Then determine the average % reduction for all horses treated with the same compound. For the benzimidazoles and tetrahydropyrimidines, >90% reduction in FEC means the drug is still effective; 80-90% reduction means resistance is suspected; <80% reduction means resistance is present and the compound is ineffective. For the macrocyclic lactones, any reduction in FEC <98% is considered to be cause for concern. It is best if all horses are examined initially. This gives the combined benefit of determining whether any individual horse may be harboring resistant strongyles as well as provides a starting point for the identification of those horses that consistently shed higher numbers of eggs. However, if the entire herd cannot be tested, then 8-12 horses should be examined. Fewer animals can be used, but confidence in the results diminishes as numbers decrease.

Once we know which anthelmintics are working, how do we determine who to treat? Again, FECs are the answer. There is no absolute cutoff in FEC that triggers whether to treat or not to treat. As with all diagnostic tools, FEC must be interpreted in light of the animal’s overall health, management practices of the farm, season of the year, stocking rate, and tolerance of the owner. FECs do not directly correlate to numbers of parasites in the lumen of the gut; however, horses with FECs <200 are unlikely to have ill effects from the infection. Horses with FECs >500 are considered to have high counts and are likely in need of deworming. If farm-wide individual FECs are not performed, then it is generally agreed that most horses do not need deworming until the mean herd FEC approaches 300.

What can Colorado veterinarians expect in terms of strongyle FEC? Review of Colorado State University Veterinary Diagnostic records for the Parastiology section encompassing June, 2010 through June 2012 indicates the average strongyle FEC is <100 eggs/gram - below the recommended cutoff for small strongyle deworming. Given these low egg counts, the choice of technique for use in the FECRT becomes quite important. Because the FECRT compares egg counts, the fecal flotation technique must be quantitative. Numerous quantitative methods have been described, including the McMaster technique, the modified Stoll technique and simple centrifugal techniques. Both the McMaster and the modified Stoll techniques are dilution techniques with minimum detectable limits of 25 and 10 eggs/gram, respectively, although a new version of the McMaster slide with a minimum detectable limit of 8 eggs/gram has been recently released. Even so, in low egg count situations, these methods are not appropriate choices for the FECRT although they would be fine for routine monitoring purposes.

Of course, small strongyles are not the only parasites affecting horses. Parascaris equorum, tapeworms, and bots are usually also addressed in parasite control programs. There are two issues are of particular concern here. First is the increasing numbers of reports of P. equorum populations with resistance to the macrocyclic lactones and, possibly, pyrantel pamoate as well. This leaves benzimidazoles and, perhaps, piperazine, as the only viable alternatives for ascarid control on some farms. Second is the inability to reliably detect tapeworms. Should tapeworms be suspected, the current
recommendation is to conduct a centrifugal fecal flotation with saturated sugar of at least 1.25 sp. g. on feces collected 18-24 hours post-treatment.

So, what does all this mean in terms of equine parasite control? There is no easy answer here. One thing is clear, however; the transmission and dispersal of resistant parasites, including small strongyles, is virtually assured given an industry in which animals from widely separate areas are mixed together, often in communal grazing situations. If we are going to be successful in our battle to minimize the impact of these parasites, we must be willing to re-examine what we are doing and recommend changes where appropriate. Some changes includes discontinuing the practice of deworming foals with macrocyclic lactones for the control of *Strongyloides westeri*. These infections are usually asymptomatic; however, if disease does occur, diagnosis is usually straight-forward because clinical signs are accompanied by the passing of typical larvated eggs in the feces which can be detected through fecal flotation. Additionally, routine anthelmintic treatment of foals should not begin earlier than 60-70 days of age and should be repeated using the greatest interval which minimizes environmental contamination. For foals, treating approximately every 60 days is considered to be the maximum dosing interval for controlling ascarids. This means tolerating some level of ascarid egg shedding, which may be the best we can do. It has been shown that macrocyclic lactone resistance was significantly less prevalent on farms where foals were dewormed at intervals greater than or equal to 8 weeks. Targetted deworming for control of small strongyles could help protect refugia and slow the spread of anthelmintic resistance alleles among these populations.