

SUGGESTED WORM CONTROL PROGRAM FOR ADULT HORSES IN FLORIDA

OCTOBER 01: START OF WORM CONTROL CYCLE

Which Horses? Treat all horses regardless of FEC

Drug(s) of choice: ivermectin or moxidectin, may want to choose a product that contains praziquantel for tapeworms

Why these drugs? Both ivermectin or moxidectin will kill bots that were acquired since the spring, the stomach worms *Habronema* and *Draschia* that are transmitted by flies and cause summer sores, and will sterilize *Onchocerca* females preventing transmission. Pinworms (*Oxyuris equi*) should be killed as well, but there are increasing numbers of reports of failures to control pinworms with these drugs. These drugs will also kill migrating large strongyles and any strongyles (both large and small) that are in the intestinal lumen.

Is there a reason to use one over the other? Moxidectin has the advantage of also killing large numbers of the encysted small strongyles and prevents worm eggs from reappearing in the feces for 4-8 weeks longer than ivermectin. However, at this time of the year there is little in the way of larval refugia on pasture. Therefore some parasitologists are concerned that using moxidectin at this time of the year may be placing more pressure on drug resistance. If FEC are performed ahead of treatment, using moxidectin only in horses with FEC >500 or in horses known to have chronically high FEC (High Contaminators), and using ivermectin on the remainder would be a rational decision.

Should I perform FEC? Yes – on all horses. This is probably the single most important FEC to perform all year (assuming that you follow this program and have not dewormed in the past few months). The reason for this is that by not deworming for several months, the FEC seen will be a strong indicator of each horse's strongyle contaminative potential. Based on this FEC you can then categorize your horses to low (<200 EPG), moderate (200-500 EPG), and high worm egg shedders (>500 EPG). This characteristic of individual horses has been shown to be repeatable between years.

DECEMBER 01: ONLY IF TREATED WITH IVERMECTIN. IF MOXIDECTIN WAS USED WAIT UNTIL JANUARY 01 TO TREAT AGAIN.

Which horses? All those with FEC > 500 EPG on October fecal check, horses in the 200-500 range in October may be reasonably treated or can be left untreated.

Drug(s) of choice: Oxibendazole and/or pyrantel (if effective on your farm), or both together at same time.

Why these drugs? To reduce the amount of ivermectin and moxidectin used thereby helping to slow down the development of resistance to ivermectin and moxidectin. However, resistance has been shown to be fairly common to oxibendazole and pyrantel so if using these drugs, before and after FEC should be performed. Also recent data suggests that using both oxibendazole and pyrantel together at the same time improves the effectiveness of treatment over treatment with the individual drugs.

Is there a reason to use one over the other? No – unless resistance to one of these drugs is detected.

Should I perform FEC? Yes – it would be a good idea, but only on the horses that are being considered for treatment (FEC >200 in October). If you haven't performed FECRT previously for oxibendazole and/or pyrantel, FEC should be checked again 10-14 days after treatment.

JANUARY 01:

Which horses? Treat all horses regardless of FEC

Drug(s) of choice: ivermectin/praziquantel or moxidectin/praziquantel

Why these drugs? Tapeworm transmission likely peaks in autumn so treatment with praziquantel at this time will remove all the tapes acquired over the summer and autumn. Since praziquantel is only available in combination with ivermectin or moxidectin, it makes most sense to just use one of the combination products. Most bot activity will have ended in northern Florida, so treatment with ivermectin or moxidectin now will remove all the bots acquired since October and few new bots will infect horses until next spring when the bot flies become active again (to this authors knowledge, in central and southern FL the epidemiology of bot transmission has not been studied, so it is difficult to make other recommendations). Lastly, any of the other worms targeted in the October treatment, that were picked up in the intervening few months will once again be killed.

Is there a reason to use one over the other? By January small numbers of strongyle eggs have been deposited on pasture so now there are refugia built up. Therefore the resistance issue is less of a concern and moxidectin would be a good choice, but ivermectin would also be a rational choice. Treating with moxidectin now has the added benefit that it provides the longest ERP, so that low egg shedders will not need to be treated again until October, and this is also probably true for the moderate egg shedders (who by now with this program may have fallen into the "low shedder" category).

Should I perform FEC? Yes – on all horses. It is important to know if the horses with low FEC in October still have low FEC, and if you have been successful in keeping FEC low in the horses that had moderate and high FEC in September.

APRIL 01:

Which horses? If moxidectin was administered in January, the only horses that likely will need to be treated are the high egg shedders. Remember, that environmental conditions are rapidly changing such that strongyle worm transmission is nearing an end for the year. A few eggs shed by the low and moderate shedders will not survive and accumulate on pasture. Treating the high egg shedders makes sense since the ERP for moxidectin is about up and egg shedding from some of these horses could be high.

Drug(s) of choice: Oxibendazole and/or pyrantel (if effective on your farm), or both together at same time. Though probably not needed unless tapeworms seem to be a problem, a double dose of pyrantel that will also kill tapes might be a reasonable choice. Another alternative for this treatment would be a 5-day double dose of fenbendazole (power-pack). Since we are only treating the high egg shedders, we can assume that these horses also have higher levels of encysted mucosal larvae, and the 5-day double dose of fenbendazole does have good efficacy against these larvae (if not resistant). However, resistance is known to be quite common to fenbendazole at the single dose rate, and there is mounting evidence that the extended double-dose regimen often fails to provide high levels of control. Furthermore, evidence suggests that using the 5-day FBZ regimen on all horses where worms already have FBZ resistance may result in "super" resistant worms being selected. So, this regimen is best used only in selected animals (as per the recommendations of this April treatment), so that adequate refugia are maintained, thus maintaining the relative effectiveness of the 5-day fenbendazole treatment

Should I perform FEC? Not necessary

MAY – SEPTEMBER: No treatments are needed – too hot for transmission. Most worm eggs will not survive and develop to L3, and those few that do make to L3 will rapidly die. So egg shedding is of no concern during this time. Save money and reduce the selection for drug resistance by not treating horses with anthelmintic during the summer months (unless there is a specific clinical need for such treatment).

NOTE: It is critical that all treatment recommendations must be viewed in the proper context. Any single treatment or non-treatment recommendation made within the context of this "evidence-based" strategy only makes sense when horses are on this program. Recommendations based on these principles may not apply to individual horses outside of the context of this program. Furthermore, this treatment schedule serves only as a suggested program; additional treatments can and should be given to particular horses if there is evidence for a clinical need for treatment. The main take home message should be that the program suggested here, should in most cases prevent clinical problems due to parasites from developing. But if a problem does arise, it needs to be addressed. So, if you are presented with a thin horse showing evidence of parasitic disease in the summer, then this horse should be treated – and if the horse showing overt symptoms of intestinal parasitic disease then moxidectin would be the treatment of choice since it is important to kill the mucosal larvae in these animals. In recent years, every case of severe life-threatening parasitic disease (larval cyathostomiasis) that I have been involved with was due to using drugs that were ineffective due to parasite drug resistance and the lack of a surveillance system to pick up on this. Thus horses were treated according to a given schedule that was thought to be adequate, but since many of the treatments were ineffective, large L3 levels built up on pasture leading to severe parasite loads and subsequent severe clinical disease.

SUMMARY OF SUGGESTED CONTROL PROGRAM FOR ADULT (>2 YEARS OF AGE) HORSES:

This program is designed to specifically target bots (*Gasterophilus*), tapeworms (*Anoplocephala perfoliata*), spirurid nematodes responsible for producing summer sores (*Habronema*, *Draschia*), *Onchocerca*, pin worms (*Oxyuris equi*), large strongyles, cyathostomes. A few other uncommon and lesser important nematode, arthropod, and cestode parasites likely will also be controlled by this program, except in rare unusual circumstances when specific measures may be needed. Some horses with naturally strong immunity to cyathostomes (demonstrated with very low FEC on each fecal exam) will need no other treatments because the two treatments given have covered the needs of the other parasites and these horses are naturally protected from cyathostomes. In traditional worming programs, repeated treatment of these horses accomplishes little to nothing, other than to promote drug resistance. Some horses in the herd will need a 3rd treatment for cyathostomes, but only a few horses (should be less than 30% of the herd) should need a 4th treatment. Now compare this to what you are doing now. Many farms are treating all horses 6 times each year, and likely are getting results that are significantly less than what will be achieved on the program recommended here. When examining the program above it is important to remember that the different drugs have differing egg reappearance periods following treatment. It is important to know these time intervals to understand why the recommendations are made.

If you are concerned that doing all these fecal egg counts will be too expensive, then think again. A recent cost analysis performed by veterinary students at the University of Georgia College of Veterinary Medicine found that the cost of deworming every horse 6 times per year is about the same or more than treating based upon this schedule and performing the FEC as suggested. In addition, using this system you know whether your worm control program is working. By treating blindly there is no way to tell and we know that drug resistance is highly prevalent. Treating a horse with a drug that does not work because of resistance is very expensive – you waste the money spent on the drug and you risk failure of your worm control program. Treating a horse that does not need to be treated wastes money and promotes drug resistance, which will have future adverse consequences to the health of your horses.

This program is very different from what most horse owners are doing now (and vets are recommending) and admittedly is much more complicated. The reason for this complexity is that parasite biology and the horse-parasite-drug-environment relationship is quite complex. The commonly used rotational program where all horses are treated on the same schedule with the same drug at frequent intervals may be easy to manage, but it does not properly address the health needs of the horse, or the biology of the parasites and parasite-host interactions. That program was designed more than 40 years ago when the parasites of importance were much different than they are today, and when parasite drug resistance was not an important concern. A good parasite control program must be based on the most up to date medical and scientific knowledge. This necessitates a program be used that is evidence-based, not convenience-

based or tradition-based. Furthermore, it should be understood by all livestock owners that any recommended parasite control program has a finite life-span. New knowledge, spreading drug resistance, new drugs, changes in parasite prevalence, etc, will cause recommendations to change. The commonly used calendar-based rotational program has been used for more than 40 years – it is time for a change.

RECOMMENDATIONS FOR FOALS AND YEARLINGS (<18 MONTHS OLD):

Parascaris equorum (roundworms/Ascarids) are usually the most important parasite of young horses with cyathostomes next most important. *Strongylus vulgaris* has its greatest effect on young horses so this parasite cannot be ignored, but luckily is very uncommon in managed horses. When addressing the treatment needs of these different parasite species, the issue of drug resistance becomes central. Therefore, it is critical to perform FECRT on all drugs used in foals, and to monitor the ERP following effective treatment. Since there is a high prevalence of ivermectin/moxidectin resistance in *P. equorum*, and there is a high prevalence of BZ and pyrantel resistance in cyathostomes, in many cases it will be necessary to use both drugs together at the same time. Treatments should begin when the foal is 2 months of age. Most treatments for *P. equorum*, if effective should keep eggs out of the feces for 8 weeks (*P. equorum* has a 10 week prepatent period). But ERP for cyathostomes for BZ drugs and pyrantel are only 4 weeks (if they are effective in the first place), and ERP for ivermectin and moxidectin are less in young horses than in older horses. Additionally there are recent reports of very short ERP with ivermectin -- as short as 4 to 6 weeks. Therefore, it is difficult to know what the optimal interval for treatments should be in foals, as it will depend on a number of factors. Treating too often will waste money and promote drug resistance, but treating too infrequently, or with the wrong drugs can result in clinical disease problems. Thus it cannot be overemphasized that FEC surveillance in young horses is critical, including yearly tests of drug effectiveness using FECRT, and monitoring of ERPs. No matter what the program used for *P. equorum* and cyathostomes turns out to be, it is very important in foals to be sure to include an ivermectin or moxidectin treatment at a minimum of 6-month intervals to control any *S. vulgaris* that may be around. Lastly, in young horses, one must be concerned about encysted larval burdens of cyathostomes. Therefore, all horses between 6 months and about 2 years of age should be administered a larvicidal treatment in the late spring or summer. Moxidectin would be my recommendation for this treatment, but 5-day 2X fenbendazole (Power Pack) can also be used.

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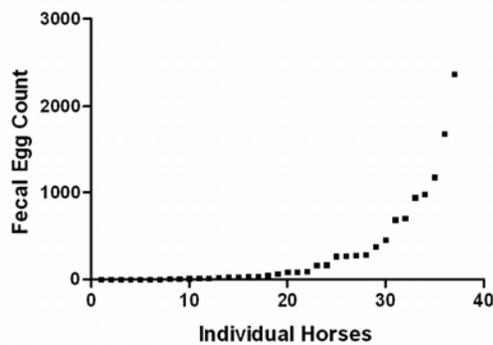
FURTHER SUGGESTED READING:

The Horse Magazine 12-part "Parasite Primer" Series Vol. XXI, No.1-12, JAN 04 – DEC 04

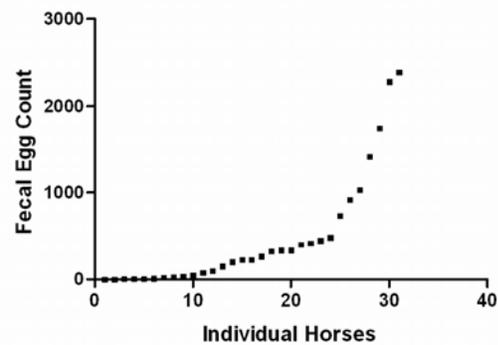
Figure 1: Graphs of the distribution in fecal egg counts (FEC) on horse farms

Graphs of farms 1, 2 and 3 show FEC of horses on 3 individual farms in Georgia and the 4th graph shows FEC of all horses on 44 farms in Florida, Georgia, Kentucky, and Louisiana. Farms 1 and 2 only had adult horses, farm 3 had only yearling horses, and the combined graph represents horses of all ages. Each square represents the FEC of a single horse which is read on the Y axis. On the combined graph the large numbers of data points converge to produce what looks like a solid line. Note that in each case the distribution of FEC is virtually the same. The shape of these graphs shows the aggregated nature of parasite infections, where a small percent of the animals harbor most of the parasites. Data displayed on the combined farm graph reveals that horses with FEC of 500 EPG or greater accounted for 88% of total egg output, yet made up only 31% of the population. In yearlings (Farm 3), because many have not yet reached their immune potential, the shape of the graph is a little less steep, i.e. fewer horses have very low FEC. This aggregated pattern of parasite distribution among animals is always seen. The only thing that changes is the relative magnitude of the parasite level depending on management and parasite control practices. From these graphs it is obvious that some horses need much more attention to worm control than do others.

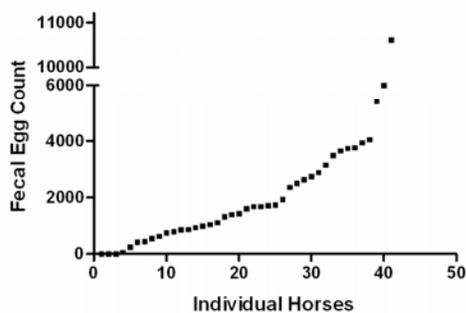
Distribution of FEC in Horses: Farm 1 (Adults)



Distribution of FEC in Horses: Farm 2 (Adults)



Distribution of FEC in Horses: Farm 3 (Yearlings)



**Distribution of FEC in Horses:
1350 Horses on 44 Farms**

