Decoding Dewormers: Types, Resistance Concerns, and Use for Horses

Using dewormers is a common treatment for internal parasites in horses. It is important that horse owners use the correct type of dewormer at the appropriate dosage to ensure dewormers remain effective on their farm.

This article is part 2 of a 3-part series on equine internal parasites. Here are the links to part 1, Prevalent Parasites: Common Types of Equine Internal Parasites, and part 3, Whole-Farm Management Strategies for Equine Internal Parasites.

A dewormer is an antiparasitic drug (known as an anthelmintic) given to an animal to destroy or inhibit the development of internal parasites. All domestic horses have some level of internal parasite load, and dewormers are given to help manage these loads to avoid undesirable health issues that can accompany large parasite populations. Many dewormer products are available for treatment, so it is important that you consider the type of dewormer needed, and current resistance to that dewormer when selecting which product you will use. The goal of treatment with dewormer is not to eradicate the parasites, which is almost impossible, but instead to manage the internal parasite load at a level that your horse will remain healthy.

This article will explain the types of dewormers currently available, why we are concerned about parasite resistance to dewormers, and the current veterinary recommended protocol for deworming horses.

Types of Dewormers

There are many brand names of dewormer products available for horses, but the listed active ingredient is the key component to consider when determining which type to purchase. There are only three main drug classes used for internal parasite treatment in horses:

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Parasites Targeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzimidazoles (fenbendazole/oxibendazole)</td>
<td>Large strongyles, small strongyles (not encysted), ascarids, and pinworms</td>
</tr>
<tr>
<td>Pyrimidines (pyrantel)</td>
<td>Large strongyles, small strongyles, ascarids, tapeworms (if given as a double dose), and pinworms</td>
</tr>
<tr>
<td>Macrocyclic lactones (ivermectin/moxidectin)</td>
<td>Large strongyles, small strongyles (including encysted – moxidectin only), ascarids, pinworms, and bots</td>
</tr>
</tbody>
</table>

An additional minor class drug is also available, called praziquantel, which may be listed as an active ingredient in combination with one of the three classes above. Praziquantel targets tapeworms. Each of these drug classes targets specific internal parasites to kill them (see chart above) and cause expulsion from the horse’s body. The drugs do this by preventing the parasites from obtaining nutrients, causing them to starve to death.

Since there are only three main drug classes, maintaining efficacy (ability of the drug to be effective) of these drugs is critical to ensure they keep working to reduce parasite burdens. If all three become ineffective on parasites, we (horse caretakers) will have no
more options to control these parasites. Therefore, in order to best manage parasite loads of horses, we should be strategic about our deworming practices and use them in combination with other farm management practices (such as removing manure from dry lots or rotating pastures) to reduce parasite burdens.

**Concerns about Resistance to Dewormers**

Anthelmintic resistance, or the ability of parasites in a population to survive treatment with a dewormer, is a growing concern in internal parasite management. Some parasites have become highly resistant to current drug classes, making the drugs less effective. This resistance occurs at the farm level, rather than the horse level, meaning that resistance to particular drug classes varies from farm to farm and even country to country. This is not just a local problem, but an international one for the equine industry. Therefore, steps to slow the rate of anthelmintic resistance must be implemented on each farm to ensure drugs remain effective.

The rate of anthelmintic resistance in a parasite population is determined by how frequently the parasites are exposed to dewormers (selection pressure) and how effectively surviving parasites pass their genes to the next generation. In other words, the more you use a drug class on a parasite population, the faster resistance develops. This is because parasites that are still susceptible to the drug class are killed and only the resistant parasites are left to reproduce. The previous “standard” practice of deworming all horses every 8 weeks created strong selection pressure for small strongyles to develop resistance to the drugs.

If all parasites in a population become resistant to a drug class, then the drug class will not be able to reduce the parasite burden in a horse. Our goal then is to keep susceptible parasites alive so that when we use the drug class, it will have an effect on the horse’s parasite load. To do this, we have to make sure there is a population of parasites that are not exposed to dewormer, called refugia. Any parasites not exposed to the dewormer (those on pasture, encysted in the gut, and in horses that are dewormed less frequently) will not benefit from developing resistant genes and will remain susceptible, which dilutes the resistant parasites within the population. This susceptible parasite population is maintained by deworming some horses less than others and allowing them to shed a small number of susceptible eggs back into the environment. Once resistance is present in a parasite population on a farm, it will not go away, but the rate of developing resistance can be slowed using refugia.

If parasites develop widespread resistance to all 3 drug classes, we will be left with no effective options for controlling parasites. So what can we do to slow down resistance? The best thing you can do is make strategic deworming decisions to increase refugia by reducing the dewormer treatments for horses that have good natural immunity, which is determined by fecal egg counts (FEC). Consistently monitoring the efficacy of dewormers used on your farm through a fecal egg count reduction test (FECRT) every three years can also help you make decisions on which treatments should be used.

**Current Resistance**

In many locations worldwide, some level of anthelmintic resistance has been documented in small strongyles and ascarids. Small strongyles have widespread resistance to benzimidazoles, moderate resistance to pyrimidines, and early indications of resistance to macrocyclic lactones. Ascarids have widespread resistance to macrocyclic lactones and early indications of resistance to both benzimidazoles and pyrimidines.

<table>
<thead>
<tr>
<th>Chemical Class</th>
<th>Small Strongyles</th>
<th>Ascarids</th>
<th>Large Strongyles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzimidazoles</td>
<td>++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>(fenbendazole/oxibendazole)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrimidines (pyrantel)</td>
<td>++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Macrocyclic lactones (ivermectin/moxidectin)</td>
<td>+</td>
<td>+++</td>
<td>-</td>
</tr>
</tbody>
</table>

 (+++) indicates widespread resistance. (++) indicates moderate or common resistance. (+) indicates early resistance. (-) indicates no known resistance at this time.

*Note.* Information in table gathered from the American Association of Equine Practitioners Internal Parasite Guidelines.

Since horses develop immunity to ascarids at a young age, small strongyles are the main parasite of concern in adult horses because of the growing anthelmintic resistance problem. It is important that horse owners take action to reduce incorrect use and/or overuse of dewormers to ensure drug classes remain effective. The American Association of Equine Practitioners (AAEP) has created guidelines for deworming that focus on increasing refugia and these should be consulted when creating your deworming strategy with your veterinarian.
How frequently does my horse need to be treated with dewormer?

When creating a whole-farm deworming plan, you must evaluate each individual horse and treat it specifically. Horses vary in immunity to internal parasites; therefore, two key factors should be assessed: the horse’s shedding rate and age. These two factors can guide treatment plans and frequency based on the horse’s current parasite load and risk for developing health problems from the parasite load.

**Shedding Rate**

A horse’s shedding rate is the number of parasite eggs it releases into the environment through its manure. This rate provides insight on the horse’s current level of immunity and the amount of treatment needed. To evaluate a horse's shedding rate, a fecal egg count (FEC) is conducted, which analyzes the horse’s manure to identify the type and number of parasites within it. Fecal Egg Counts reveal small strongyle and ascarid eggs primarily; it is rare to find other parasite eggs in a FEC, even if the horse is infected. Horses are then placed in one of three categories (low, moderate, or high shedders) based on the number of eggs per gram (EPG) of feces (small strongyle and ascarid eggs are counted separately).

Most adult horses have good immunity against small strongyles, with 40-60% of adult horses being low shedders, 20 to 30% moderate shedders, and 10 to 30% high shedders. Therefore, about 80% of eggs shed on a horse farm will come from only 20% of the horses. Horses that are high shedders should be targeted with more frequent treatments than horses that are low shedders. This allows for the overall population of small strongyles on your farm to be reduced, while reducing exposure to dewormers in horses with lower shedding rates, thus promoting refugia.

**Age**

A horse’s immunity to parasites varies with age, due to acquired immunity. Young horses typically have a greater risk for parasite infection (most commonly ascarids and small strongyles) and therefore require more frequent deworming treatments. Adult horses (those that are 5 years or older) tend to develop higher immunity that stays relatively consistent throughout their adult life. This acquired immunity will control ascarid infections and, while it won't prevent infection from small strongyles, it will regulate the horse’s risk of disease and egg shedding. In most cases, for mature adult horses, low shedders often remain low, moderate shedders remain moderate, and high shedders remain high. However, as a horse becomes geriatric (over 20 years old) it may start to shed a higher number of strongyle eggs. This may be associated with lower immunity. Therefore, it is important to continue shedding rate evaluations at various ages in adult horses.

Fecal egg counts should continue throughout horses’ life stages to ensure the dewormer drug classes remain effective on that horse and farm (this is known as a fecal egg count reduction test). Foals should not have FECs until they are at least 6 months of age.

**Recommended Deworming Frequency for Adult Horses**

It is recommended by the AAEP that all adult horses be treated with dewormer at least one to two times a year. Even if a horse’s FEC reveals 0 EPG, they should still receive at least one treatment because the test focuses on strongyle eggs and doesn’t always reveal the presence of other parasites, such as tapeworms and bots. Additionally, a FEC cannot account for encysted small strongyles that are within the horse’s intestinal system. There is also a chance the test may be inaccurate if the manure sample was not fresh enough or if the horse was dewormed recently.

Deworming programs for adult horses are typically focused on controlling small strongyles. Therefore, the AAEP recommends more frequent treatments for horses with higher shedding rates. Targeting treatments on horses shedding the majority of the eggs can help reduce the farm’s overall small strongyle load and increase refugia.

<table>
<thead>
<tr>
<th>Strongyle Egg Shedding Category</th>
<th>FEC Results</th>
<th>Number of recommended deworming treatments per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low shedders</td>
<td>0 to 200 EPG</td>
<td>One to two</td>
</tr>
<tr>
<td>Moderate shedders</td>
<td>200 to 500 EPG</td>
<td>Two to three</td>
</tr>
<tr>
<td>High shedders</td>
<td>500 EPG or greater</td>
<td>Three to four</td>
</tr>
</tbody>
</table>

*Note. Information in table gathered from the American Association of Equine Practitioners Internal Parasite Guidelines.*
Treatments should be given during times of peak transmission, typically spring and late fall for those in the northeastern United States. Any additional treatments for moderate and high shedders should be given in between spring and fall. Peak transmission times can vary by region of the United States. Your local veterinarian should be aware of recommendations in your region. Always consult with them when making your internal parasite management plan.

**Recommended Deworming Frequency for Foals, Weanlings, Yearlings, and Two-Year-Olds**

The AAEP has specific guidelines for foals, weanlings, and yearlings which focus on controlling ascarids and small strongyles. Foals should be dewormed at 2-3 months of age, 4-6 months of age (specifically just before weaning), 9 months of age, and 12 months of age. The first treatment should target ascarids, with the AAEP advising benzimidazole as the drug class to use. After weaning, a FEC should be conducted to evaluate small strongyle and ascarid parasite loads. The FEC results should inform the drug classes used for both the 9-month and 12-month treatments. Treatments should focus on targeting small strongyles and the 9-month treatment should also include tapeworm control.

Yearlings and two-year-olds should receive three to four treatments yearly. Drug class type should be selected based on the time of year and parasites found in FECs. Even if FECs reveal yearlings and two-year-olds to have a lower shedding rate, the AAEP recommends they be treated as high shedders. Always work with a licensed veterinarian when creating an internal parasite plan for young horses.

**Which dewormer should I give?**

According to the AAEP, treatment programs for adult horses should ensure treatment for large strongyles, tapeworms, bots, and small strongyles. Typically, this is achieved with one or two treatments per year. However, certain drug classes are recommended during specific seasons. It is recommended that in fall (for northern climates), a dewormer be given that treats *encysted small strongyles* specifically, as this is when the burden will be highest. Additionally, you should treat your horse for tapeworms once per year.

The table below describes which parasites each drug class will treat. Additionally, if the AAEP has recommended a specific season for this drug class to be given, it is listed in the recommended time of year column. Please note the times listed are recommendations for northern climates in the U.S. (this includes Pennsylvania). Any seasonal recommendations are due to the known life cycle of that internal parasite and times when populations are expected to be highest. It isn’t recommended that the same drug class be used every time you treat your horses with dewormer. Talk with your local veterinarian as they can guide you on which drug class you should give based on your horse, farm, and region.

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Internal Parasites Drug is Effective Against</th>
<th>Frequency of Treatment</th>
<th>Recommended Time of Year (For Northern U.S. Region)</th>
<th>Common Trade Names*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzimidazoles (fenbendazole/oxibendazole)</td>
<td>Large strongyles ++Small strongyles (not encysted) +Ascarids Pinworms</td>
<td>Depends on horse’s shedding category</td>
<td>Spring and/or fall, early winter</td>
<td>Panacur*, Safe-Guard*</td>
</tr>
<tr>
<td>Pyrimidines (pyrantel)</td>
<td>Large strongyles ++Small strongyles Ascarids Pinworms Tapeworms (if given as a double dose)</td>
<td>Depends on horse’s shedding category</td>
<td>Spring and/or fall</td>
<td>Pyrantel Paste*, Exodus®, Strongid*</td>
</tr>
<tr>
<td>Macrocyclic lactones (ivermectin/moxidectin)</td>
<td>Large strongyles ++ Small strongyles (including encysted – moxidectin only) +++Ascarids Pinworms Bots</td>
<td>Depends on horse’s shedding category, but at least once per year</td>
<td>Late fall or early winter</td>
<td>Equimax*, Zimecterin*, Quest*</td>
</tr>
</tbody>
</table>
Praziquantel
Tapeworms only
Once per year
Late fall or early winter

Quest Plus ®,
Zimecterin Gold *
Note: Praziquantel is only available in combination with macrocyclic lactones in the United States.

Current concerns with resistance to chemical class indicated by (+++), (++), and (+). (+++ ) indicates widespread resistance by parasite to chemical class, (++) indicates moderate/common resistance by parasite to chemical class, (+) indicates early resistance by parasite to chemical class.

Note. Table information is derived from the American Association of Equine Practitioners Internal Parasite Guidelines.

Monitoring Efficacy
After you have selected the dewormer and treated the horse, it is important that you continue to monitor for resistance through fecal egg count reduction tests (FECRT). This test helps determine if resistance is building to a specific drug class, which may warrant changes in dewormer treatment type on your farm. Again, to reduce anthelmintic resistance it is important to continue making sure the dewormer you are using is effective.

Resistance occurs at the farm level (not the horse level), so it is recommended that a fecal egg count reduction test (FECRT) be performed every three years on at least six horses that have moderate to high shedding rates (over 300 EPG). Those with higher shedding rates are preferred for this test, and the more horses evaluated, the more accurate your results will be. If you have fewer than six horses, a FECRT will not be as accurate, but you should still monitor resistance.

To conduct a FECRT, have a FEC conducted before deworming (at least 8 weeks since last deworming, 12 weeks if moxidectin was used) and again after deworming (at least 14 days after the dewormer is administered). Use the results from these FECs to calculate the percent fecal egg count reduction (FECR) for each horse. To calculate the % FECR per horse use the following formula:

\[
\text{% FECR} = \frac{(\text{FEC before deworming} - \text{FEC after deworming})}{\text{FEC before deworming}} \times 100
\]

Each horse’s percentage FECR should then be averaged to determine the farm’s overall reduction. To calculate the average FECR for the farm, use the following formula:

\[
\text{% FECR for the farm} = \frac{(% \text{ FECR of Horse 1} + % \text{ FECR of Horse 2} + % \text{ FECR of Horse 3} + % \text{ FECR of Horse 4} + % \text{ FECR of Horse 5} + % \text{ FECR of Horse 6})}{\text{# of horses being evaluated (6 for this farm)}}
\]

A FECRT should be conducted for each drug class used on the farm to determine current resistance and drug efficacy. Results lower than 85% for pyrantel, 90% for fenbendazole/oxibendazole, or 95% for ivermectin or moxidectin indicate resistance or incorrect dosage (i.e. the dose was measured wrong or the horse spit most of it out). Below is an example FECRT for a farm with six horses with suspected resistance to the drug class benzimidazoles (fenbendazole).

<table>
<thead>
<tr>
<th>Horse</th>
<th>Product</th>
<th>FEC Before Deworming</th>
<th>FEC After Deworming</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucy</td>
<td>fenbendazole</td>
<td>435</td>
<td>25</td>
<td>94.25%</td>
</tr>
<tr>
<td>Duke</td>
<td>fenbendazole</td>
<td>520</td>
<td>145</td>
<td>72.12%</td>
</tr>
<tr>
<td>Sage</td>
<td>fenbendazole</td>
<td>505</td>
<td>100</td>
<td>80.20%</td>
</tr>
<tr>
<td>Dawn</td>
<td>fenbendazole</td>
<td>400</td>
<td>75</td>
<td>81.25%</td>
</tr>
<tr>
<td>Chief</td>
<td>fenbendazole</td>
<td>380</td>
<td>5</td>
<td>98.68%</td>
</tr>
<tr>
<td>Luna</td>
<td>fenbendazole</td>
<td>350</td>
<td>10</td>
<td>97.14%</td>
</tr>
</tbody>
</table>
Conclusion

It is recommended that deworming products with proven efficacy be administered at the appropriate time of year based on the parasite burdens of individual horses. Age and immunity levels can help in determining individual horse’s need for dewormer treatment and can direct which type of drug should be used. Consult with your veterinarian and continue to assess drug efficacy on your farm for best results.

Take Home Messages

- Anthelmintic resistance against all three drug classes is documented in small strongyles and some resistance has also been identified by ascarids. To reduce this resistance, use targeted deworming to increase refugia.
- Anthelmintic resistance occurs at the farm level, not with individual horses, so the entire farm should be considered when making internal parasite management plans.
- Fecal egg counts should be conducted on each horse to determine egg shedding category, and a plan should be made in collaboration with your veterinarian on farm deworming strategies, including frequency and chemical class.
- Drug efficacy should be evaluated on the whole-farm level. A FECRT should be conducted every 3 years for each drug class being used on the farm.

For more detailed information about dewormer treatment and internal parasite management, check out the online course on Controlling Parasite Resistance on Your Equine Farm. Additionally, visit the following websites:

- Internal Parasite Control Guidelines - American Association of Equine Practitioners
- Parasite Control in Horses – Merck Vet Manual

Resources:

- Internal Parasite Control Guidelines - American Association of Equine Practitioners
- Handbook of Equine Parasite Control by Neilsen and Reinemeyer
- Parasite Control in Horses – Merck Vet Manual
- Extension Horses – Management and Control of Internal Parasites

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