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<http://horsesidevetguide.com/the-hsvg-smartphone-app>. The HSVG app has been downloaded in 60 countries and is the most highly rated equine health app in the world.

PARASITE MANAGEMENT IN HORSES: A NEW PARADIGM

Internal parasites can cause serious disease in horses without leading to external signs obvious to horse owners. Parasite eggs and worms are tiny or microscopic and rarely visible in manure. Significant parasite loads cause all sorts of problems for horses. They can reduce immunity, cause gastrointestinal irritation and damage, reduce nutrient uptake and cause generalized unwellness. While these “hidden” problems are more common, parasite damage can also lead directly to colic and death.

Because of their hidden nature and their great impact on horse health, it is very important for horse owners to have a general understanding of the complex nature of equine parasitism and take an intelligent approach to parasite control. In the last few years, evidence for worm resistance to common dewormers has emerged. This is a serious problem and requires a re-examination of our current methods of parasite control in horses.

ABOUT THE PARASITES

There are more than 150 species of internal parasites that afflict horses. Some frequently discussed groups include:

- Ascarids (Roundworms)
- Large strongyles (Bloodworms)
- Small Strongyles
- Pinworms
- Bots
- Tapeworms
- Lungworms

Internal parasites have a life cycle that involves stages within the horse, and stages in the environment. Parasites released into the environment take time to develop to infectious stages. The climate and season are key factors affecting the survival and development of these stages. Management must take into account the life cycles and the geographic region’s climate.

Most species have stages (eggs or larvae) that are passed from horse to pasture in manure. Any or all of these parasites may be present in the horse at one time, but they may be at different stages in their life cycles. Some worm species can lay hundreds of thousands of eggs per day, so parasite loads can grow quickly both on pasture and in horses. The different dewormers have varying effectiveness against the types and stages of parasites. Intelligent control of parasites must take all these factors and many others into account.

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PARASITE DAMAGE

Different parasites harm the horse in different ways, depending on their location within the horse and life cycle. Some parasites cause severe, life threatening damage. An example is the large strongyle, the adults of which localize in the large arteries supplying blood to the intestine. These worms cause damage to the arteries and result in loss of blood supply to segments of intestine, a potentially fatal problem which results in colic signs. Certain parasites damage vital tissues like lungs or liver. This usually occurs as larval stages migrate through the horse's system to complete their life cycles.

Parasites can cause obstructions and ulcerations within the horse's digestive tract. The most common example of this is obstructions caused by large roundworms (Ascarids) in young horses. Bot flies cause irritation to skin as they lay eggs. Pinworms cause skin irritation and itching to the area around the anus and tail head. The most common species of Tapeworm lives in a specific segment of small intestine and causes irritation and blockage at that site. Lungworms are common in donkeys and cause clinical signs of coughing, usually in horses stabled with donkeys. These are just some examples of the many syndromes that parasites can be involved in.

More common than the obvious diseases discussed above is low-grade disease in horses that might otherwise appear to be perfectly healthy. Signs of infestation may include:

- Dull, rough hair coat
- Lethargy or decreased stamina
- Weight loss
- Coughing and/or nasal discharge

- Tail rubbing and hair loss
- Resistance to the bit due to mouth lesions
- Colic
- Summer sores
- Depression
- Loss of appetite
- General unwellness or loss of condition
- Diarrhea

THE PARADIGM SHIFT

Over the past half-century, deworming compounds have been developed which have drastically reduced parasite problems in horses. This has been a blessing for horse health. There are far fewer severe parasite-related problems than there were before. There have been several main "chemical classes" of dewormers that have been developed over that time. However, parasites have gradually developed resistance to these compounds, resulting in their growing ineffectiveness.

Recently, researchers have shown that this resistance is a greater problem than we thought, and that it is progressing rapidly. We are beginning to see resistance to even our newest and most potent chemical class. Before the advent of paste dewormers, veterinarians were very involved in equine parasite control. Veterinarians typically tube wormed horses, meaning they passed a stomach tube and dosed a large quantity of the chosen chemical directly into the stomach. In the last 25 years, paste formulations of the common chemical classes have become increasingly available and very cheap, especially through the internet.

Many horse owners rotate dewormers casually, not understanding the problem. In my prior deworming handout, I recommended that a variety of dewormers be rotated. In light of parasite resistance, these recommendations need to be reexamined.

Misconception and lack of awareness by the whole industry has led to the development of a very large problem. It is now time for veterinarians to become involved again in parasite control, with emphasis on targeted deworming.

THE PROBLEM WITH THE OLD PARADIGM

We have learned certain things about equine parasites from doing fecal egg counts. We learned that we can make the worms disappear from the manure by using these compounds. We assumed that if we rotated compounds, that parasites that were not killed by one class, would be killed by the next. This idea worked well when the 3 main chemical classes each killed the majority of parasites. However, in the last 10 years, this has proven to no longer necessarily be true.

KEY POINTS:

- Two out of three main classes of chemical no longer kill parasites adequately. Parasites have become resistant to them. Their continued indiscriminate use will only quickly result in complete resistance.
- Rotation using ineffective compounds ensures complete resistance to them while creating a false sense of security. The effective dewormers “cover up” the inadequacy of the others in the rotation.
- We are already seeing pockets of resistance to ivermectin and it is inevitable that this will increase. Moxidectin (Quest) is a related compound. It is only a matter of time before we see resistance to it too. Use of these compounds without fecal testing will ensure a short effective life for them.
- There are no new chemical compounds in the works right now. Research and development is costly and takes time. Our emphasis should be on extending the effectiveness of what we have.

UNDERSTANDING PARASITE RESISTANCE

Parasites develop resistance to the chemicals used to kill them. Resistance is based on individual worm genetics and selection for these genetic traits, i.e. natural selection. Most parasites are killed by a properly administered and effective dewormer. Out of thousands of worms, there may be a few surviving (resistant) parasites that have genetic differences that allow them to tolerate the chemical.

These few survivors can then occasionally interbreed with other similarly resistant parasites, leading to a higher number of resistant parasites in the next generation. These offspring survive and propagate, and in the next generation there are more resistant parasites. The process is invisible to the horse owner. The more of a chemical there is in the environment, the greater the pressure for the parasite populations to develop resistance against it, and the faster the percentage of parasites becomes the new resistant type. Indiscriminate dewormer use has and will accelerate the onset of resistance. It is inevitable that this process will take place with enough time and exposure to these compounds. Our goal should be to make that period as long as possible for each of our dewormers. How do we achieve this? By minimizing the exposure to these compounds through targeted deworming.

LIMITED DEWORMING & INCREASED FECAL SAMPLE TESTING

The best way to prevent development of resistance to these compounds is not to use them at all. That would completely eliminate any selective advantage to resistance. Obviously this is not feasible because our horses would again succumb to the effects of parasites. However, leaving a segment of the parasite population with minimal exposure to these chemicals will slow resistance. Those susceptible parasites are allowed to go on living and competing with those that have developed resistance. This is known as preserving “refugia” within the population.

We can move toward this concept by only targeting those horses that have higher fecal egg counts. For the others, we would drastically reduce the number of deworming treatments. This requires knowing which horses have higher worm burdens and shed more into the environment. This knowledge requires fecal testing. By using fecal egg count results, horses are broken into 3 groups, those with high parasite burden and shedding into the environment, those with moderate, and those with minimal. Only those in group 1 are dewormed frequently. The others are dewormed far less. The goals of this new approach are optimal horse health for all horses in the herd, reduced dependency on chemicals and reduced contribution to the resistance problem, and improved fecal diagnostics to monitor the effectiveness of the program.

The key to this new approach to deworming is working with your veterinarian. It is no longer acceptable to randomly treat horses or keep horses on a typical deworming rotation calendar. There is no perfect dewormer and no stand-

ard program. Fecal testing guides the program. Horses at different ages and stages have varying needs for parasite control. 20% of horses in a group shed 80% of the total parasites. Young, growing horses have some special needs. Young foals are especially susceptible to ascarid infestation (roundworm), and may benefit from deworming with an appropriate compound at 30-60 day intervals until they build some natural resistance.

Climatic conditions and season of year influence parasite levels in the horse and on pasture and are critical factors to address. The goal is not to kill all parasites, but to keep parasite loads to a level compatible with health, and leave a reservoir (refugia) of parasites in as many horses as practical.

Based on this new paradigm, we recommend a fecal exam on every horse at least once annually. This is the only way to determine the effectiveness of a parasite control program and to detect the development of resistant parasites.

YOUR ROLE

- Collecting a fecal sample is easy: simply pick up 1 fresh fecal ball in a zip lock bag, label it with your horse’s name, and drop it by your veterinarian’s office. You can store a fresh sample up to 12 hours if you keep it refrigerated. At our clinic, we do this testing in-house. In 24 hours, we will give you a result.
- The sample must be taken at least 8 weeks after deworming, or 12 weeks after deworming with a Quest compound. Otherwise there is still effect from the prior deworming.
- If horses are on a continuous dewormer like Strongid C, they can be tested at any time.

YOUR VETERINARIAN'S ROLE

- Perform a fecal egg count on these samples and determine which horses are low (< 200 epg), moderate (200-500 epg) or heavy (>500 epg) shedders.
- The specific parasite species are identified. From this, a determination can be made of the most effective deworming compound. We then have you deworm the horses with the appropriate compound.
- Two weeks later, fecal samples are again taken. The veterinarian performs a Fecal Egg count reduction test. This is a retest of a manure sample 10-14 days after worming with the recommended compound. Depending on drug class and degree of resistance, there are accepted ranges for the reduction percentage. It should be more than 95%.
- A customized approach is then tailored to the situation. Horses are dewormed with the appropriate compound based on their category. Low shedders are dewormed once or twice annually, spring and fall. Moderate shedders are dewormed three times annually. Heavy shedders are dewormed 4 times annually.
- Testing is recommended at least annually.
- Routinely deworming horses every 8 weeks will become a thing of the past.
- The cost of testing should be offset by big savings in the purchase of deworming compounds.
- Benzimidazole Products. The oldest class and that with the highest resistance in small strongyles. Examples include Oxibendazole (Anthelcide EQ) Fenbendazole (Panacur, SafeGuard).
- Pyrantel Products. Less resistance but a rapidly growing problem. Examples include Strongid paste, Strongid C, Rotectrin 2. These have some effect against Tapeworms.
- Ivermectin/ Moxidectin. Two related compounds. We are seeing the beginnings of resistance problems but these are still very effective against a wide variety of parasites. These products kill Bots in the stomach. Moxidectin is the newest deworming compound, has the fewest resistance problems, and kills encysted small strongyles.
- Praziquantel. This compound is specific to Tapeworms, which are not killed by the above compounds. Praziquantel is added to one of the others to kill tapeworms.

METHODS OF DELIVERY

Oral paste syringe or liquid is the most common method of dewormer delivery. Deworming pastes and feed formulations have been the foundation of de-worming programs because of convenience, cost and ease of administration. It is vital for horse owners to understand that there is a big difference between trade names and active ingredients.

Tube deworming is performed by a veterinarian using a rubber naso-gastric tube. It is less frequently used now but for many years was the preferred method. The technique still has its place and is highly effective because it allows a large dose of chemical to be delivered into the stomach at once.

DEWORMING COMPOUNDS

Currently used deworming compounds can be divided into three basic groups effective against worms other than tapeworms and one compound specific to tapeworms:

There is minimal temporary discomfort for the horse as the tube is passed through the nostril and down the esophagus into the stomach. Because of the skill required, this procedure should be performed only by a veterinarian.

Daily deworming with a feed supplement, most common is Strongid C. Continuous dewormers like Strongid C (pyrantel) are still frequently used and tend to be highly effective in decreasing worm loads in horses and on pasture. They work by inhibiting the larval stages of many worm species. It is recommended that horses on Strongid C still be dewormed with either Ivermectin or Moxidectin, with Praziquantel, in the spring and late fall. This is primarily to kill bots and tapeworms not affected by the Strongid C. Horses on Strongid C should have fecal testing performed 1-2 times per year to assess the effectiveness of the program. Horses are tested while on this supplement. There is a strong argument, however, that Strongid C is contributing to the problem with pyrantel resistance and should be discontinued.

All three methods are effective and likely have their place in the new paradigm. The key is that the deworming product must be given to the proper horses, in the proper dose, at the proper time. Decisions must be guided by testing. Administration must be such that the animal actually ingests the required dose.

ADDITIONAL POINTS TO CONSIDER

- Any deworming today should be based on fecal exam results.
- Some horses may find pastes unpalatable and spit them out. It is best to dose before feeding because horses with feed in their mouths can more easily spit out the paste.
- Some horses are considered difficult for owners to deworm. Any halter trained equine can be taught to easily accept dewormers if the right technique is used. Your veterinarians can advise you if you have any questions. See Thal Equine Client Handout: Giving Your Horse Oral Medications for more details.
- It is critical to get the correct dose to the stomach. Under-dosing is ineffective and contributes to parasite resistance. It is best to err on the side of a very slight overdose, with all compounds except Quest.
- For Quest products, the dose must be calculated based on the horse's weight, as overdose is possible. Overdose is unlikely with the other products. While Quest products are very effective, I do not recommend them for horses less than 2 years or under 600 lbs. I personally do not use these products in pregnant mares either, although they are likely safe.
- Products with Praziquantel are available and have excellent effectiveness against tapeworms and should be used as directed.
- Alternative dewormers like Diatomaceous Earth: I have personally seen horses on these products that still have a high parasite load. As of now, there is little published evidence for their effectiveness. That is not to say that there aren't natural compounds, which might prove very beneficial. But I would like to see the research before I recommend relying exclusively on such alternative approaches.
- Remove bot eggs regularly from the horse's hair coat to prevent ingestion. Bots generally do not cause serious disease but if they can be removed it means less will be ingested.

- Foals should be dewormed the first time at 4 weeks of age, then every 4 to 6 weeks until they are a year old with a compound that kills ascarids (oxibendazole). After that, they are monitored with fecal egg counts and treated as adults.
- Pregnant mares should be dewormed with a safe product a few weeks prior to foaling to decrease the foal's exposure to parasites, unless they are ill or have complicated pregnancies.

PASTURE & STABLE MANAGEMENT

Importantly, chemical control is actually the less important part of a total parasite control plan. Since parasites are primarily transferred through manure, good stable and pasture management is also key. With this in mind, I suggest the following:

- Pick up and dispose of manure from stabled horses on a frequent basis.
- Horses in growing pastures tend to defecate in certain areas in the pasture (the roughs) and graze in between these (the greens). This is likely an adaptive behavior reducing ingestion of parasite eggs. Keep this in mind given your management of the pasture.
- When possible, use a feeder for hay and grain rather than feeding on the ground.
- Harrowing pastures regularly may break up manure piles and expose parasite eggs and larvae to the elements, but may also spread viable eggs out onto the grass so that horses are forced to ingest more parasites. My recommendation in this area is to only harrow horse pasture when the weather is hot and dry during the peak of the summer, then to allow several weeks for the parasites to die before putting horses out.

- While eggs may be slow to develop to infective stages in cold weather, they often survive, awaiting the right conditions. Many parasite eggs survive on snow and ice for the winter and may resume their life cycle in the spring.
- Spreading manure on pastures without first composting it will spread parasite eggs on the pasture and can lead to heavy pasture contamination and re-infestation.
- Composting requires watering (in our climate) and turning of piles. Properly done, this leads to intense heat production and killing of most parasites. With proper management, composted manure can be returned to the land and benefit it.
- Rotate pastures by allowing other livestock, such as sheep or cattle to graze them. This interrupts the life cycles of equine parasites.
- Group horses by age to reduce exposure to certain parasites and maximize the deworming program geared to that group.
- Keep the number of horses per acre to a minimum to prevent overgrazing and reduce the fecal contamination per acre, or use rotational grazing.

CONCLUSION

In the past, it was taken for granted that frequent rotational deworming was the best way to reduce parasite resistance. While rotation has its place in the new paradigm, we are learning that there is more to it than that. Parasite resistance is a real and growing threat. It is a problem that veterinarians and horse owners need to work together to manage. Resistance is inevitable but our goal in changing the paradigm now is to slow the problem, and extend the period of effectiveness of our currently effective compounds.

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