Worms vs. Drugs: The Fundamentals

Research over the past 10 years has confirmed that indiscriminate deworming leads to selection for worms resistant to common deworming compounds. Because of this, “targeted deworming” based on fecal analysis results has become the industry standard. This approach reduces the total amount of chemical used and better matches drug to worm. But when it comes to equine parasite control, controversy and confusion remains, and there are still many people still “doing it the old way”.

In order to be part of the solution to the resistance problem, and at the same time to give your horses the best care, it is important that you know the basic characteristics of the common equine parasites, as well as the basic mechanism and effects of the common deworming compounds.

THE ‘CLASSIC’ PARASITE LIFE CYCLE

While there are great differences among the important internal parasites, they share a fundamentally similar life cycle. They all spend part of their lives in the horse, and part of their lives in the environment.

The adult worms live in the intestine of the horse, where they lay their eggs. These eggs are passed from the horse into the environment in the manure. On pasture, the eggs hatch over time into larvae. The larvae develop to a point at which they are “infective” and are once again ingested by a horse. The infective larvae mature within the horse into adult worms, and the cycle repeats itself.

Martin Nielsen, DVM PhD, a leading researcher in equine parasitology, and assistant professor at the University of Kentucky Gluck Equine Research center says: “In the environment, parasite eggs flourish and develop into infective larvae when temperatures are between 45° and 85° Fahrenheit. When these conditions exist during the year depends on location but one thing we know is that eggs actually survive much better in cold than hot conditions. There is no such thing as a killing frost for these parasites."

THE WORMS

LARGE STRONGYLES. Historically, large strongyles were considered the most important equine parasites. They were common, and they caused a particularly severe problem in horses called thrombo-embolic colic, in which worms enter, damage and block the arteries that supply blood to segments of intestine. Over the past 40 years, much of our parasite control effort went into eliminating these worms, and to a great extent, we were successful. Thrombo-embolic colic, and these parasites, are now rare in managed horse populations. But those same efforts have caused severe drug resistance in other worm populations.

SMALL STRONGYLES (Cyathostomins). These worms are common in almost all horses. They are small, threadlike worms that can sometimes be seen in manure after deworming. Small strongyle and large strongyle life cycles have similar "classic" life cycle as described previously, but small strongyles show one important difference. Their larvae can burrow into the wall of the intestine and stay there for extended periods in a dormant state, until the environment is optimal for reproduction, at which time they emerge. This makes the species more adaptable. It also protects them from most of our worming compounds, which cannot penetrate the intestinal wall well enough to kill the larvae there. Small strongyles are now resistant to many of our common worming compounds. The only good news is that these parasites do not cause severe disease unless they are present in very large numbers.

ASCARIDS. The most important Ascarid roundworm in horses is Parascaris equorum, a large, pale worm that looks like a large bean sprout. Ascarids can grow to 15" long but are usually smaller. They are considered the most important parasite of growing horses.

Ascarid eggs are extremely resistant in the environment, living for years on pasture. When temperatures warm above 45 degrees, the larvae develop within the egg to an infective stage. The horse then ingests these infective eggs.

The eggs are coated with a sticky substance that enables them to adhere to all types of surfaces, including the mare’s udder. Mouthy, curious foals pick them up from these surfaces. The eggs hatch in the small intestine, and the larvae penetrate the intestinal wall there and enter the bloodstream. They enter the liver, then go to the lungs, then back to the intestine, where they grow to be adults and lay eggs. The whole cycle takes about 2½ months.

In large numbers, these parasites can cause ill thrift and poor growth. When a de-wormer is given to a heavily parasitized youngster, large numbers of these worms can die suddenly in the intestine and drift downstream, forming a tangled mass that blocks the intestine and causes severe abdominal pain. This life threatening episode is known as “Ascarid Impaction”.

Cleaning up the environment helps reduce the number of eggs a foal ingests, but it is almost impossible to prevent infection in young horses.

Craig Reinemeyer, another internationally respected equine parasitologist and researcher says: “The de-wormers used against ascarids are not effective against early stages of the parasite; they only kill adults, so it is important to wait until 60-70 days before worming young horses.” Foals should receive about four anthelmintic treatments their first year, probably all benzimidazole. Ascarids are showing increasing resistance to the ivermectin class and so it may be inadvisable to use it in youngsters.

PINWORMS. Unlike the worms discussed above, pinworms do not cause serious disease. Pinworm adults live in the large intestine near the anus. Instead of laying eggs that are passed into the environment in the manure, female pinworms actually leave the intestine and lay the eggs on the skin of the anus. The eggs are irritating to the skin there and cause itchiness. In rubbing their tail base and anus on stall walls, fences, trees, etc, horses deposit the eggs in the environment. The next horse to lick the object will ingest the eggs and the cycle will repeat itself.

Historically, pinworms have been more of a problem in younger horses, but today they are seen much more in adult horses too. According to Reinemeyer "There is evidence that pinworms are developing drug resistance and new approaches to managing them are needed."

TAPEWORMS. These are very different from other equine internal parasites and are not affected by most of the common de-wormers. One important difference is that tapeworms have an indirect life cycle. To complete their life cycle, they must spend some time within a second "indirect host", a tiny Oribatid mite. These mites live in large numbers on pasture and are regularly eaten by horses when they graze. The mites ingest the tapeworm eggs shed by the horse. These eggs hatch into larvae within the mites, and the larvae grow.

Grazing horses eat the mites containing what are now infective larvae. The larvae are released in the intestine as the mites are digested. They travel to a specific location within the horse's intestine, the point at which the large and small intestines meet (called the ileo-cecal valve). Here the larvae mature into adults over 6-10 weeks, and begin shedding segments containing eggs which again are passed in the manure.

Our ability to diagnose these parasites is poor. "They are usually not diagnosable using fecal floatation techniques and the available blood tests have some problems too." says Dr. Reinemeyer.

The mite hosts are found only on moist, growing pasture.

Tapeworms are thus more common in these areas and should not be a problem in dry lot situations and arid environments. Tapeworms are thought to contribute to a condition causing colic- irritation and blockage of the ileo-cecal valve area where they gather. But they can live in small numbers there and usually not cause a problem.

BOTS. Bots are not actually worms, but are the larval stage of a fly that at first glance looks like a honeybee. Bot flies buzz around horse’s legs and lower bodies, depositing their sticky pale eggs on the hair. The adhered eggs irritate the skin, causing the horse to lick the area and ingest the eggs.

Once eaten, the eggs quickly hatch within the mouth, and the larvae stay there for several weeks until they are swallowed and attach to a very particular location within the stomach.

The bot larvae spend the winter months attached to this location in the horse’s stomach. When conditions are right in the spring, the larvae release and are passed into the environment in the manure. They burrow into the soil and pupate, finally emerging later as adult flies to lay eggs and repeat the cycle. The internal larval stages of bots probably cause no real problems for horses. It is not uncommon to find hundreds of the larvae attached to the stomach in a healthy horse. Probably the biggest problem associated with bots is the annoyance caused by the egg-laying adult flies.

The only wormers that control bots are moxidectin and ivermectin. But aggressive use of these drugs to eliminate bots probably also increases resistance in other parasites.

THE DRUGS

Management techniques are the true cornerstone of effective parasite control – even more important than drugs. The most important aspect of management is prompt removal of manure from the environment, before worm larvae can be ingested by horses. There are many other management points to consider, but they are discussed elsewhere. Here are the common drug types used in horses.

BENZIMIDAZOLES. A class of compounds called “Benzimidazoles” have been a mainstay of equine parasite control for over 40 years. These chemicals interfere with a worm’s energy metabolism on a cellular level, causing a slower kill of the parasites than the so-called “paralytic compounds”. Familiar examples of benzimidazoles are fenbendazole (Panacur®) and oxibendazole (Anthelcide® EQ). These continue to have good activity against Ascarids, but small strongyles are now mostly resistant to this class. For this reason, these drugs should probably only be used in young horses.

Another class of de-wormer includes pyrantel pamoate and pyrantel tartrate (the familiar trade name Strongid®). These drugs act at the junction between nerve cells and muscle cells, again causing paralysis and rapid kill of worms. Pyrantel does not penetrate the intestinal wall and so will not kill encysted strongyles. There is now significant resistance to pyrantel among strongyles.

Pyrantel comes in several forms, a paste, suspension for tube worming, and at low levels in a pellet (continuous wormers like Strongid-C®). Pyrantel at very high dose may have activity against tapeworms. It is generally very safe for all age classes of horse. While continuous wormers have been implicated in resistance, they still may have a niche role in Reinemeyer’s estimation “for selected horses on the farm, for a selected time period, but never for life.”

MACROCYCLIC LACTONES (Ivermectin & Moxidectin). Ivermectin has been around for about 30 years and has been our most relied upon wormer, but there is evidence now that certain parasites are developing resistance.

Ivermectin and Moxidectin are potent at even low levels. They work by blocking nerve transmission and paralyzing worms. Unlike the other drug classes, macrocyclic lactones also kill external parasites like lice, mites, and larval skin forms involved in summer sores. They kill bots very effectively.

Moxidectin is a more recently developed drug, and has the ability to penetrate into the intestinal wall and kill encysted strongyles. It probably is the most effective compound for this purpose. This drug is not recommended in horses less than 2 years of age, and for smaller equines. One to two treatments of macrocyclic lactone per year will probably control both large and small strongyles, bots and other important parasites in most horses.

PRAZIQUANTEL. This drug only kills Tapeworms. It is currently marketed only in combination with either Ivermectin or Moxidectin . Praziquantel is probably also being overused, especially in regions that have very few tapeworms.

According to Reinemeyer "Diatomaceous earth and other "natural" products have to date not been shown to effectively kill parasites." If you rely on these products, you may be putting your horses at risk.

CONCLUSION

With these basics in mind it may be helpful to consider your own unique circumstance and ask yourself some questions. What is your current deworming program and how do you evaluate its efficacy? Have you changed your approach as the industry has become more aware of drug resistance? Have you done all you can do to reduce the number of worms ingested by your horses? What worms are likely to be a problem for your horses, given your geographic region and management?

With a stronger understanding of the worms and their life cycles, and the drug used to combat them, you can take a smarter approach to parasite control and help slow the onset of drug resistance while still ensuring the health of your horses. Work with your veterinarian to develop a targeted parasite control plan that is tailor made for your situation.

By Douglas O. Thal DVM Dipl. ABVP
Board Certified in Equine Practice

Thal Equine LLC
Originally Published in The Horse Magazine April 2014