CEH HORSE REPORT

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Intestinal Parasites in Horses

What Every Horse Owner Should Know

A horse is dangerous at both ends and uncomfortable in the middle.

— Ian Fleming (1908–64)

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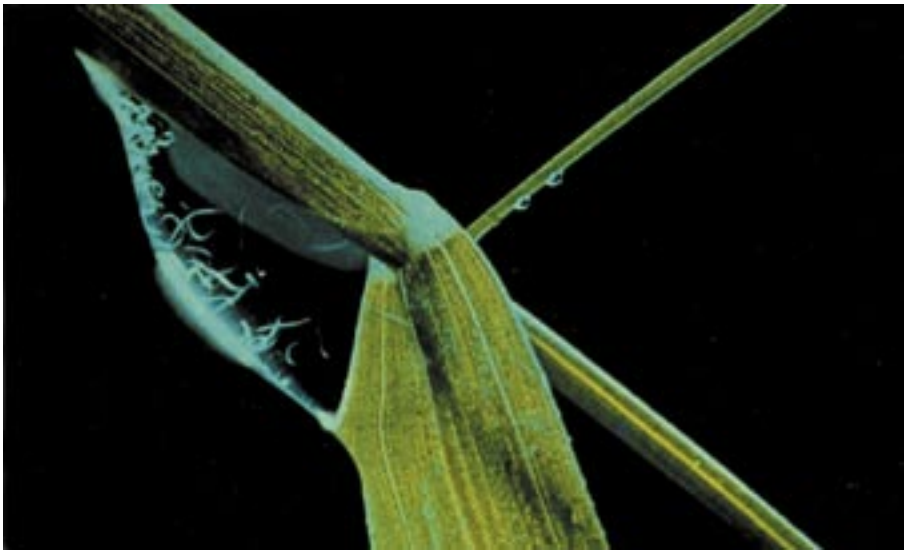

Suspended in a drop of dew at approximately 200X magnification, one can see the infective third-stage larvae of nematodes.

Reading about parasites is a little like looking at pictures of skin cancer. It's an unappealing undertaking necessary for the sake of becoming informed. The fact is that parasites are widespread and can cause a tremendous burden of disease in both humans and animals. In humans, there's a tendency to think that parasitic infections occur elsewhere—in distant, underdeveloped areas of the tropics and subtropics, but in fact they occur in more temperate climates and in highly developed countries, including the United States.

• *Trichomonas* is the most common parasitic infection in the U.S., accounting for an estimated 7.4 million cases per year.

• *Giardia* and *Cryptosporidium* are estimated to cause 2 million and 300,000 infections annually in the U.S., respectively.

• There are an estimated 1.5 million new *Toxoplasma* infections in the U.S. each year.

• Children are particularly susceptible to certain types of parasites including *Giardia*, lice and pinworm. Pinworm is the most common worm infection in the U.S. School-age children have the highest rates of infection. In some groups nearly 50% of children are infected. These facts are mentioned to underscore the global prevalence of parasites. In horses, internal parasites are very widespread.

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UC DAVIS SCHOOL OF VETERINARY MEDICINE

DIRECTOR'S MESSAGE

Good Parasite Control Requires Doing Your Homework

Dr. Gregory L. Ferraro

The marketing of pharmaceutical products to animal owners has continued to rise over the past two decades. Horse enthusiasts find themselves bombarded daily with a wide array of promotional advertising for drugs and nutritional supplements of all types. When it comes to one product that almost all horse owners use—deworming medication—it is understandable that many people are confused, misled and often ill-advised.

Given the countless magazine ads, direct-mail promotions and flashy in-store displays touting the qualities of a multitude of vermicidal preparations, I contend that the purchase of these products by many people is akin to selecting a toothpaste. Do I want one that whitens my teeth, fights plaque or tastes good? Should I stay with my favorite brand or try one of the new ones? Perhaps it's the one in the fancy package that catches my attention. But then again, my favorite singer promotes this other brand. Oh well, its all too confusing, I'll just buy what's cheapest!

In the case of dental cleanser, this method may be as good as any, since there probably isn't much difference between any of them. Besides that, everyone knows when and how to use toothpaste and that the object is to accomplish the same task over and over and over again for the rest of your life.

Unfortunately, these parameters for effectiveness do not apply when it comes to the control of intestinal parasites in your horse. Good deworming practice is not just giving some kind of oral paste preparation or providing some feed additive repeatedly at some specified interval of time. The proper selection of vermicides depends on conditions that vary over time—when climatic conditions are favorable for the hatching of eggs and development of larvae of different parasites. And finally, unlike our toothpaste analogy, one brand will not necessarily cover everyone in the household.

The effective control of intestinal worms requires knowledge of the type of parasite (there are many), the seasonal climatic variations of your area, the housing and feed sources being used, the management practices of the stable or farm, and the age of your horse. Like any endeavor, good parasite control requires effective tools, good timing and sufficient knowledge of the problem at hand if success is to be achieved. Unfortunately, this triad of skills cannot be acquired without some effort and homework on your part.

This issue of our ***Horse Report*** is designed to assist you with that homework. We have attempted to provide you with the information and thought processes required to help you make skillful and informed decisions regarding this aspect of your horse's health care. Ideally, the best approach is to consult with your veterinarian before embarking on a parasite control program. He or she will know the needs of the area and will be able to discuss the merits of the various dewormers on the market, because there is no deworming schedule that fits all horses.

In the pages that follow, we cannot provide the perfect scenario of parasite control for each and every horse, and we may not answer all your questions, but we will start you on the path toward the successful selection of the best brand of vermicidal toothpaste for brushing away those parasites.

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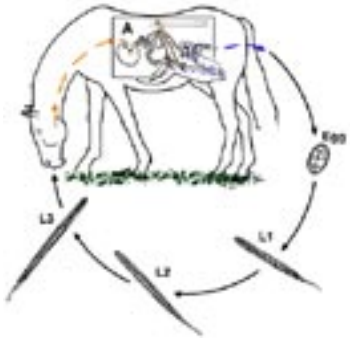
They are a primary cause of colic in horses and can cause or contribute to many respiratory, digestive and performance problems. Unless control measures that include a regular preventive deworming program formulated by your veterinarian and good management practices to control the spread of parasites are practiced routinely, the problem is likely to increase and cause severe injury or death.

This ***Horse Report*** provides information about a variety of intestinal parasites, how they are contracted, how they are accurately diagnosed, appropriate deworming controls, some common misconceptions, and sanitation and management practices to minimize infection.

Parasites come in all shapes and sizes, ranging from microscopic protozoa 1/4000 of an inch in size to giant tapeworms 2.5 feet long. Parasites differ from other organisms living in or on a host in that they are ultimately detrimental to the health of the host. Horses can be host to many different kinds of parasites. Common internal parasites of horses include helminths (worms), arthropods (insects), and protozoa (microscopic organisms). Each parasitic species gravitates to a different part of the body. Horses are most frequently affected by intestinal parasites and less so by respiratory, musculoskeletal or central nervous system parasites.

Although different parasites have different life cycles, the basic pattern involves eggs hatching, developing into larvae, migrating throughout the body of the host (often this migration causes the most damage), and maturing into adults that lay from hundreds of thousands to millions of eggs per day. Horses eat grass, grain or hay contaminated with manure and become infected with the eggs or larvae. Some parasites physically invade the horse via the mouth or skin but the fecal-oral route is most common.



*Life cycle of **Strongylus vulgaris***

Some of the effects of host colonization by parasites include:

• Obstruction of blood vessels, lymphatic channels, or the gastrointestinal tract

• Tissue invasion, including destruction and occupation of tissues

• Depletion of nutrients needed by the host

• Toxic reactions

• Transmission to the host of disease agents carried by a parasite

• Allergic reactions

• Anemia

• Increased susceptibility to other diseases

The importance of good parasite control measures can sometimes be hard to convey. It is often difficult to detect early parasite damage and even more difficult to establish a link to the parasites themselves. Nevertheless, if a horse looks wormy, the problem has gone too far. According to the American Association of Equine Practitioners:

In terms of management priorities, establishing an effective parasite control program is probably second only to supplying the horse with clean, plentiful water and high-quality feed. It's that important.

Because the variety of parasites that can infect a horse is so vast (around 150), we will focus on intestinal parasites that are the most common and present the greatest health risks.

Large Strongyles (*Strongylus* spp.). Commonly called bloodworms or red worms, this species of large strongyles is one of the most harmful parasites of horses. Eggs in manure hatch into larvae that are consumed by the grazing horse. The larvae mature in the intestinal tract and burrow out into blood vessels where they migrate throughout the various organs and eventually back to the intestine.

The larvae can cause extensive damage to the lining of blood vessels as they migrate and are responsible for many of the

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health problems associated with this infection. As the larvae damage the vessel wall, weakened areas (aneurisms) containing blood clots form. The clots may detach and be carried downstream by the blood, eventually lodging and blocking blood flow and resulting in tissue death.

Strongyle egg

Horses with large strongyle infections may experience fever, loss of appetite, weight loss, and constipation or diarrhea. Infection with large strongyles is often seasonally related. Rates are greatest in the spring and summer when weather conditions favor the development of larvae on pasture.

Several anthelmintic medications (drugs that expel parasitic worms from the body by either killing or stunning them) are effective against both the migrating larvae and the adult worms, but there are others that are only effective against the adult worms.

Small Strongyles (Cyathostomes). The life cycle of small strongyles is similar to large strongyles in that eggs in manure hatch into larvae that are consumed by the grazing horse. The free-living larval stages of all strongyles, small and large, are susceptible to extremes of temperature and drying.

Cyathostome larva

Small strongyles differ from large strongyles in that they do not migrate outside of the intestinal tissues as do large strongyles, and small strongyle larvae may become ***encysted*** (enclosed as if in a cyst) in the large intestine for a period of time. This means that they burrow into the intestinal wall and lay dormant waiting for the proper conditions to emerge. **During this encysted period, unlike adult parasites, small strongyle larvae are not susceptible to most dewormers.**

If large numbers of small strongyles emerge from the intestinal wall simultaneously, severe damage to the intestinal lining may result. Colic and diarrhea may be seen. Other signs of small strongyle infection include loss of condition, weight loss, poor coat condition, and slowed growth.

Infection levels tend to be greatest in the late winter and early spring. Individually, small strongyles are less harmful than large strongyles largely because of the limited migration of the larvae. However, large numbers of worms can cause weight loss, intermittent diarrhea, colic, and occasionally death.

This parasite group has developed extensive resistance to anthelmintics (see discussion on drug resistance in parasites, page 10). **All group-pastured horses should be dewormed at specific intervals.** Also, deworming and separating yearlings from mares and foals is particularly helpful for controlling small strongyle populations since yearlings tend to have the greatest parasite burdens and therefore contribute the most to pasture contamination.

Ascarids (*Parascaris equorum*). Ascarids (large roundworms) affect young horses far more often than mature horses and can cause poor growth, rough hair coats, chronic respiratory problems, and sometimes death. Young horses are the primary source of the infective stage of the parasite (the egg) in the environment. The 6- to 12-inch-long worms can number in the hundreds in the horse's small intestine and can adversely affect its nutrition. Colic, coughing and diarrhea are common clinical signs associated with ascarid infection. In addition, ascarids may cause blockage of the intestine or migrate through the lungs, causing pneumonia.

Foals acquire ascarid eggs from feces that other foals have passed. These eggs are very resistant to extreme environmental conditions and can survive long, hot summers as well as freezing winter temperatures. The ascarid eggs, swallowed in contaminated feed or water, hatch in the intestinal tract. The young worms burrow

through the intestinal wall and begin their migration. During migration, they enter the bloodstream and end up in both the liver and lung where they eat their way through the tissue.

Continuing their destructive journey from the lungs, the young worms travel up the trachea to the mouth to be swallowed a second time. They mature in the intestine in 2 to 3 months and then lay eggs that are passed in the feces, and the cycle is repeated. Female ascarids can lay up to 200,000 eggs per day.

Ascarid eggs are particularly hardy and will live for years in the environment, infecting foal crops from one year to the next. The eggs are also very sticky and can remain attached to a broodmare's teats and udder, thus serving as a source of infection for the nursing foal. The eggs can also be transported to uninfected areas on clothing and farm implements. **Prompt manure removal and anthelmintic therapy are essential for controlling the spread of this parasite.**

Stomach Worms (*Habronema* spp.). Fly larvae in the manure of horses ingest the larvae of the stomach worm. The fly matures and deposits the worm larvae in the lips of the horse. Alternatively, the horse may ingest the fly. Larvae in the stomach mature into adult worms and lay eggs that are passed in the feces.

Far more serious than the stomach worms are the lesions resulting from deposition of larvae at sites where flies sometimes feed, such as the corner of the eye or in a skin wound. The ensuing inflammatory response is characterized by fleshy masses that bleed easily—a condition known as *cutaneous habronemiasis* or *summer sores*. This highlights the importance of fly control, especially during the spring and summer months.

This photo shows a lesion caused by deposition of ***Habronema*** *larvae in the corner of the horse's eye—also known as a summer sore.*

Tapeworms (*Anoplocephala* spp.). The most common species of tapeworm attains a length of about 2 inches, while *Anoplocephala magna*, a less common species, reaches about 30 inches in length. Mites living in a horse pasture may consume tapeworm eggs from the feces of infected horses. Grazing horses may then swallow the mites and become infected with tapeworms.

Anoplocephala magna*, a species of tapeworm that can reach 30 inches long.*

Heavy infections may cause weight loss, diarrhea and occasionally colic due to partial occlusion of the ileocecal orifice (the point at which the small intestine joins the large intestine) or rupture of the cecum wall.

Pinworms (*Oxyuris equi*). Though less dangerous than other internal parasites, pinworms are annoying to the horse because they cause intense itchiness of the region around the anus—the perineum. A characteristic of pinworm infection is rubbing of the tail and the perineum, causing broken tail hairs and bare patches around the tail.

Horses acquire the parasite by consuming contaminated water or feed or by licking the sticky eggs off walls or fences. Young worms mature in the large intestine in 3 to 4 months, then crawl part way out of the anus to deposit their eggs on the adjacent surface. The eggs hatch outside of the horse's body and become infective in a few days, although they can survive unhatched for several months.

Bots. Bots are the larvae (immature flies) of the botfly. Since these flies are common in the horse's environment, it is likely that most horses will become infected.

During late summer and early fall, adult botflies lay eggs on the hair of various parts

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of horses, particularly around the chest, forelegs, throat and nose. Stimulated by the horse's licking, the larvae hatch and enter the horse's mouth, settling in the tissues of the gums, cheek and tongue. After a month, the larvae migrate and attach to the stomach lining, causing irritation and interfering with digestion.

Diagnostic Testing for Parasites

Two important diagnostic tests are often performed together to provide information about what kind of parasite(s) a horse has and how many there are. Both tests are run on fresh manure. These tests are:

Fecal Flotation. This test allows the different parasite eggs that might be present in a fecal sample to be examined at high magnification. The broad group of parasite present (for example, strongyles) can be identified by the characteristic egg type.

Fecal Egg Count or ***McMasters.*** This test uses a dilution technique to quantify the number of eggs per gram of manure. If the parasite infection has proceeded to the point in the life cycle where the adult worms are producing eggs, then this test allows an estimation of the worm burden in an individual horse.

When a veterinarian suspects that the parasite population on a property has developed resistance to the deworming agent being used, they can run the Fecal Egg Count test before and after treatment to assess the efficacy of treatment. This is called the ***Fecal Egg Count Reduction Test***. To do this, a fresh manure sample is analyzed the day the horse is dewormed, and then a second sample is analyzed 14 days after deworming. If the egg count in the manure is not decreased by more than 90%, then it is likely that there are resistant parasites present both in the horse and in the environment. ❄

How to Succeed at Parasite Control

Parasites will eventually find their way into the intestines of almost every horse. Many stabling/housing situations perpetuate high parasite loads by crowding horses together on pasture, thereby limiting their range and allowing their food and water to be contaminated by egg- and larvae-infected manure.

An effective parasite control program tries to decrease the number of mature adults and in turn the number of eggs shed. This can be achieved in a three-step strategy:

(1) Decrease the number of adult parasites laying eggs by **regular deworming**.

(2) Decrease the number of larvae and eggs eaten by a horse by **removing manure from feeding areas**. The pickup and disposal of pasture manure yields dramatic results and longer intervals between deworming—an important benefit considering the increase in drug resistance by parasites. Clean stalls decrease fecal contamination of food and water.

(3) Evaluate the effectiveness of the first two controls twice a year. Do not assume things are working.

Decreasing the Number of Adult Parasites Laying Eggs

The goal of an effective parasite control program is to decrease the number of mature adult parasites and, in turn, the number of eggs that are shed. The first part of this program is done by deworming. Horses should be dewormed regularly in cooperation with a local veterinarian who is familiar with the local geographic variances and specific parasites commonly found in the area. The veterinarian will also know which medications to use to treat infections, what seasonal changes to expect in parasite populations of the area, and which parasites are more likely to be found in horses of different ages.

Generally, horses are treated with anthelmintics to remove the parasites from the intestinal tract. There are many effective products, but caution should be exercised in their selection because they fall under different chemical types. (Note that chemical type is not the same as brand.) The selection of anthelmintic should be based on the specific parasite(s) to be eliminated.

Classes of Chemicals Used as Anthelmintics in Horses

Avermectins/Milbemycins
Benzimidazoles
Pyrimidines
Pyrazinoisoquinolones

All horses on a farm should be included in the parasite control program. New stock or transient boarders should be treated and quarantined for a week before they are placed on pasture or allowed to mingle with resident horses.

Daily dewormer is effective against some parasites and its use has shown some dramatic benefits. **However, it is not recommended for foals and weanlings.** When foals are exposed to intestinal parasites, they develop some natural immunity to the parasites. If they are given daily dewormer, they may never develop any immunity, causing serious reactions and other problems when they eventually are exposed.

One area of concern to veterinarians and parasitologists is that with the widespread use of dewormers, there has been an increase in the varieties of worms resistant to the effects of dewormers. This is a critical consideration in the choice of all dewormers. Hence, we encourage all horse owners to consult their veterinarian in this regard. Without knowing the specific parasite problems of a farm, it is merely a guess to recommend any type of rotation scheme or type of dewormer. (See discussion on drug resistance in parasites, page 10.)

Decreasing the Number of Larvae and Eggs Eaten By a Horse

The second and equally important aspect of parasite control is to decrease the number of larvae and eggs eaten by a horse by minimizing fecal contamination of food and

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Succeed at Parasite Control
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water. Put simply, you must remove manure from stalls daily and from pastures weekly. This aspect of parasite control tends to be less regarded by horse owners because it requires more effort than deworming. However, **breaking the life cycle of parasites is as important as administering dewormers.**

The pickup and disposal of pasture manure yields dramatic results that produce longer intervals between deworming and lower parasite egg counts. Pasture cleanup can be done manually or with large vacuums built for the job. When manure is picked up, the benefit of dewormers is increased because horses do not become immediately reinfected when turned out.

Pastures and paddocks should be well-drained and not overpopulated. Fly control programs help with bot prevention and general well-being.

We strongly encourage learning about composting manure as there are numerous benefits that can be realized. In relation to parasites, some of the benefits include:

• Reducing the possibility of parasite transmission between horses because the heat generated during composting kills both worm larvae and weed seeds.

• Reducing fly problems by eliminating breeding ground.

• Lowering the risk of contaminating surface and ground water.

Local public health departments can provide information on any regulations regarding setback distances from waterways, while the USDA Natural Resources Conservation Service or University of California Cooperative Extension and Master Gardeners can help design or evaluate your compost system.

Evaluate the Efficacy of the First Two Controls

The third phase of parasite control involves monitoring the effectiveness of the previous two control procedures. Measuring the effect of all the control measures is critical in decreasing parasite numbers and damage.

The only known method of measuring the success of parasite control is through microscopic examination of manure samples. A recommended protocol is to examine the manure of 20% of the herd twice yearly. Feces are examined just before a deworming and repeated 14 days after deworming. Fecal exams can either look for the presence of eggs with a fecal flotation technique or measure the number of eggs per gram of feces with the McMaster technique.

Routine monitoring of manure transforms deworming recommendations from a guess to a diagnosis and allows the tailoring of the parasite control program to the individual farm. The greater number of horses living together, the more there is a need for this. ❄

Tips for Controlling Flying Insects

• Stable horses at sunrise and sunset (peak feeding hours).

• Place ultrafine screens in windows (60 sq/in^2).

• Keep horses away from standing water.

• Apply permethrin repellant products to the horse. Sprays should be applied daily initially, which is usually more frequent than recommended on label.

• Install overhead or stall fans to interfere with the flight of flies.

• Use fly masks or other forms of dress that physically obstruct the insects from reaching the skin.

• Remove manure/cover manure piles to eliminate breeding sites.

Efficacy of Anthelmintic Drugs Used in Horses

Anthelmintic	Drug Class	Small Strongyles	Encysted Small Strongyles	Large Strongyles	Migrating Large Strongyle Larvae	Round-worms	Migrating Roundworm Larvae	Stomach Worms	Tapeworms	Pinworms
Ivermectin	A/M	+	--	+	+	+(R)	+	+	--	+
Ivermectin + Praziquantel	A/M+ PI	+	--	+	+	+	+	+	+	+
Moxidectin	A/M	+	+	+	+	+	+	+	--	+
Fenbenzadole ***1 dose***	BZD	+(R)	--	+	--	+	--	+	--	+
Fenbenzadole ***5 double doses***	BZD	+	+	+	+	+	+	+	--	+
Mebenzadole	BZD	+(R)	--	+	--	+	--	+	--	+
Oxibenzadole	BZD	+(R)	--	+	--	+	--	+	--	+
Pyrantel Pamoate	PY	+(R)	--	+	--	+	--	+	--	+/--
Pyrantel Pamoate ***double dose***	PY	+	--	+	--	+	--	+	+	+/--

A/M = Avermectin milbemycins **PI** = Pyrazinoisoquinolones **BZD =** Benzimidazoles **PY =** Pyrimidines **(R) =** Resistance reported

Drug Resistance in Equine Parasites: A Cautionary Tale

by Johanna Watson, DVM

The idea that organisms that cause disease can develop resistance to the drugs we use to fight them is becoming more commonplace, and there is reason for concern. Drug-resistant bacterial infections have been in the news for years, but recently an international story of a person traveling on airplanes, potentially exposing others while infected with multi-drug-resistant tuberculosis, received considerable media attention.

Antibiotics used to treat some of the most common illnesses in humans, such as ear infections, meningitis, sinusitis and pneumonia, are becoming less effective against the bacteria responsible for these infections. Drug-resistant strains of *Streptococcus pneumoniae* are on the rise in the United States, and some researchers predict that a significant number of these bacteria will soon be resistant to two of the most widely used antibiotics. This finding potentially represents an enormous health problem.

In horses, studies dating back to the 1960s have reported drug resistance in small strongyles, a common intestinal parasite in horses. This resistance has been documented worldwide, and resistance in these parasites has been reported to all but one drug class of deworming agent. Consequently, ***anthelmintic resistance is a major threat to the current and future control of worm parasites of horses***. It may be a number of years before a new class of dewormer is discovered and tested for use in the horse.

How does drug resistance occur and how might we unwittingly contribute to this process with our use of deworming drugs?

Early on in the use of a drug treatment—whether in animals or humans—an extremely small number of organisms survive because of their ability to evade the effects of the drug. Over time, with subsequent similar drug treatments, a process of selection occurs so that only those organisms that are resistant to the drug being used survive. Eventually, these organisms express genes that are passed on to allow greater numbers of the species to survive drug therapy.

What does this mean for a horse owner? It does not mean that we should stop deworming our horses. What it does mean is that whenever possible we should deworm our horses ***fewer*** times in a year and we should select the deworming agent with care. **A decrease in unnecessary or inappropriate use of dewormers will decrease the selection pressure on the treated organisms.** In this era of developing drug-resistance, horse owners need to be educated about the types of parasites that may cause disease in their horses and work closely with their veterinarian to customize a parasite control ***program***—one that addresses the parasite problem completely rather than simply choosing a dewormer to use.

Your Horse, Your Strategy

Where your horse lives, how the manure is managed, whether the pastures are irrigated, and many other factors influence the strategy for developing a parasite control program. Management best practice is to remove all the manure form a horse's environment, whether it is in a stall or on a pasture. By doing this, the infective stage of the parasite is removed and the life cycle is interrupted. Manure should be composted or spread on land used for crops or other species of grazing animals. **If your horse has little to no contact with manure, then the number of treatments with dewormers can likely be reduced.**

Selective Treatment

It might surprise you to know that if you put 100 horses in pasture and did not deworm them at all, allowing them to accumulate parasites, that most of the horses would only be mildly affected and perhaps 10 to 20 of them would develop large numbers of parasites. Studies have shown that horses that shed large numbers of worm eggs do so consistently, even if you deworm them, and horses that shed few worm eggs also do so

consistently. This means that **animals to be treated could be selected for treatment by your veterinarian using a simple, inexpensive test—the fecal egg-per-gram count (fecal EPG)**.

Primary Targets

In all adult horses with access to pasture, the small strongyles (cyathostomes) should be the primary target of any parasite control program. This group of parasites can cause an increased incidence of colic and, in heavily parasitized cases, severe diarrhea. The small strongyle egg is passed in the manure and then matures in the environment to its infective stage. If the weather is extreme, very hot (above 90°F) and dry (below 15% humidity), or very cold (below 32°F), the life cycle will be interrupted because the larvae die before they become infective. **A control program targeting this parasite could decrease or cease treatments during extreme weather conditions.**

In all horses under one year of age the roundworm should be the primary target of any parasite control program. This parasite can cause ill-thrift, coughing and nasal discharge, poor weight gain and, in heavily parasitized cases, severe colic. The roundworm egg is passed in the manure and is infective as an egg stage. It is very resistant to environmental conditions and is covered with a sticky coat, allowing it to cling to objects (fences, rails, feed bins) and animals. Horses develop a significant immunity to roundworms after approximately one year of age and after this age do not shed the infective stages in high numbers into the environment. **A control program targeting roundworms should not cease treatments during extreme weather and should include pasture rotation, moving mares and foals to cleaner pastures, those used by non-foals, each season**.

Additional Targets

Knowledge of other parasites and their life cycles can help to choose which of them should be targeted in your horse's control program. For example, a horse would need to ingest an insect that lives on pasture grass, the orbatid mite, in order to develop a tapeworm infection. If your horse has access to a spring or irrigated pasture, then treatment during or just after the grazing season for tapeworms would be appropriate.

Another example of a parasite requiring an insect intermediate, flies, is the stomach worm of the horse known as *habronema*. This parasite's larvae can cause summer sores when they are deposited on the horse in warm, wet places like the eyes, mouth and pre-existing wounds. **If your horse resides on a property with a large fly population that is difficult to control, then all horses on the property should be treated to control stomach worms, even through the hot weather conditions of summer.** (See tips on controlling flying insects, page 8.)

On Alternating Dewormers

Opinions differ on the practice of alternating dewormers in an effort to delay the development of drug resistance. Some veterinarians may advocate this practice while others may prefer to use a single deworming medication until it is no longer effective. Those holding the latter opinion cite studies showing that alternating dewormers may actually accelerate the development of resistance to many compounds. Veterinarians can readily evaluate the efficacy of any deworming medication by comparing the number of parasite eggs in the feces before and after treatment. If the treatment results in less than a 90% reduction in the fecal egg count, the dewormer can be considered ineffective.

The most important concept to understand in approaching parasite control for your horses is that there is no one right answer. You and your veterinarian may develop a program that is very effective for the horses you have and manage, but the same program could represent an ineffective control program for a different group of horses. Bear in mind, one size does not fit all.

In summary, the primary strategies for controlling parasites in horses involve

- Using selective/strategic/minimal drug treatment of all horses on a given property.

- Removing manure from stalls and pastures and composting appropriately before spreading.

- Performing a fecal egg-per-gram test to evaluate program efficacy.

- Deworming foals by 8 weeks of age and repeating every 1 to 2 months depending on the environment.

- Avoiding high stocking rates on pasture (ideally one horse per acre). ❄

CASE STUDIES

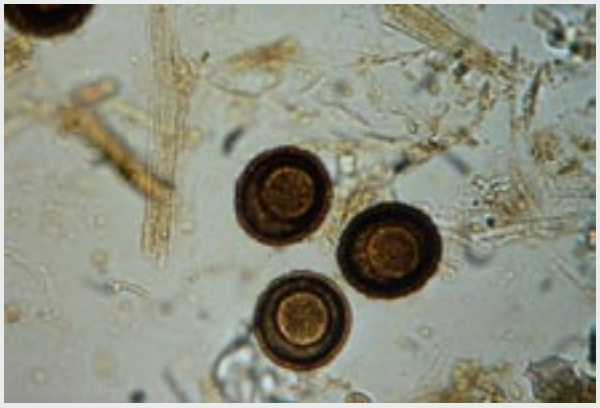
Case Study: Foal with a Serious Parasite Problem

A 5-month-old foal was brought to the UC Davis Veterinary Medical Teaching Hospital (VMTH) with signs of being unwell—poor body and coat condition, a pot-bellied appearance and a cough. The foal lived on a farm with 20 mares and foals sharing a 10-acre pasture. There had been broodmares and foals on this pasture every spring for at least 10 years. The foal had never been dewormed. A parasite problem was suspected and confirmed by tests. A fecal flotation test confirmed the presence of ascarid (roundworm) eggs, while the McMasters egg count test quantified a large worm burden.

Unfortunately, the foal was already at great risk whether it was dewormed or not because of the large burden of adult ascarids in its small intestine that would likely create an intestinal obstruction. In this case, the foal was treated with a small dose of Ivermectin, and in less than 12 hours it required colic surgery to remove the ascarid impaction.

Take-Home Message

Do not ever let this happen to your foal. Early and regular deworming of foals exposed to high infective doses of ascarids is important. Start treatment prior to the time required for adult ascarids to start producing eggs (10 weeks). Minimize the foal's contact with infective ascarid eggs in the environment by removing manure and rotating pastures to significantly reduce environmental contamination.



Ascarid eggs as confirmed by the fecal flotation test.

Case Study: Mare with Encysted Cyathostomes (Small Strongyles)

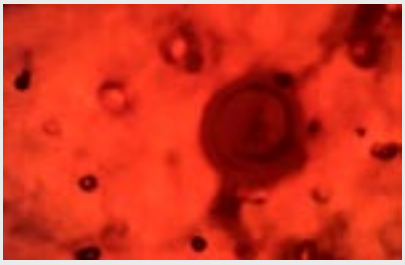
A 6-year-old mare was brought to the UC Davis VMTH in late March with diarrhea, mild to moderate colic, and mild dehydration. The mare had been dewormed with fenbendazole in October and turned out to pasture with nine other adults. No deworming history was available on the other horses. At the time of presentation, the pasture the horses had been on since October had become green winter pasture.

Case Studies

A veterinarian examined the mare for colic and performed a routine rectal examination during which very fluid manure was noted and numerous tiny (5 mm) red-brown worms were observed on the plastic glove used. The worms were submitted to the diagnostic laboratory and were identified as late-stage small strongyle (cyathostome) larvae.

How did this happen? The mare had been dewormed with a benzimidazole dewormer at a dose that would kill adult small strongyles but not the encysted forms and then was put out to pasture with other horses having unknown deworming history.

Small strongyles are reported to have widespread resistance to benzimidazoles, so there was no way to know if this was an effective treatment in this case. In the hot, dry summer, the pasture was likely negative for any infective stages of small strongyles, but as the weather cooled and the winter rains began, the environment became one that supports the development of infective larvae. The horses this mare was with could well have had large burdens of small strongyles. As the infective stages were shed in the pasture and picked up by this mare, they may have encysted until such time as a trigger to excyst occurred. The simultaneous emergence of cyathostome larvae from the bowel wall interrupts intestinal motility and fluid exchange.



Photomicrograph showing encysted cyathostome larvae in the bowel wall.

In this case, the mare was not treated with any anthelmintic drugs until she had recovered from her colic and diarrhea. She received anti-inflammatory and fluid therapy. Any horse that is suspected of having a heavy burden of encysted cyathostomes should be dewormed under the supervision of a veterinarian. This mare received an anthelmintic drug that would target only adult worms in the intestine. This was done twice at a two-week interval. Following these treatments, the mare was treated with a drug that targets the encysted cyathostome larvae.

Take-Home Message

As a community we need to work together to prevent the further distribution of resistant equine parasites. Working with your veterinarian to develop deworming programs that minimize drug treatments and maximize management practices will help. Do not pasture your horse in areas of unknown contamination level or with horses on inappropriate or unknown deworming programs.

CONGRATULATIONS

Dr. Irwin Liu Receives 2007 Bartlett Award

Dr. Irwin Liu of the University of California, Davis, has been selected as the recipient of the 2007 Bartlett Award by the Society for Theriogenology (SFT) and the American College of Theriogenologists (ACT).*

Dr. Patrick Hearn (L) presenting Dr. Irwin Liu with the Bartlett Award.

The award is intended to cement the efforts of the SFT and ACT toward common goals in animal reproduction, to reward and inspire excellence, improve the visibility of theriogenology, and recognize the efforts of the ACT's and ACT's charter members and diplomats. This award honors Dr. David E. Bartlett, ACT's first president. Among his many accomplishments, Dr. Bartlett was responsible for deriving the terms *theriogenologists* and *theriogenology* and was instrumental in gaining hard-won recognition for ACT and SFT from the American Veterinary Medical Association in 1971.

As this year's recipient of the Bartlett Award, Dr. Liu was recognized at the annual Therio Conference in Monterey, CA, August 7-11. Dr. Liu gave the annual Bartlett Address and received the Bartlett Award presentation. He received a cash award and a Nandi statue with wooden base and engraved panel.

Congratulations to Dr. Liu for this well-deserved recognition!

*Theriogenology is a branch of veterinary medicine concerned with reproduction.

Horse Report is a Winner Again!

The Horse Report was again recognized for excellence by the national organization of equine publishers, American Horse Publications—for the third consecutive year!

The Horse Report was presented with an award for Best Equine-Related Newsletter. The 2007 AHP Awards Ceremony was held in Albuquerque, New Mexico, on June 21–23.

Another publication of the Center for Equine Health — ***Global Health and the Sport Horse*** — also won Honorable Mention in the Speciality Publication category.

We are proud to be making a contribution to the welfare of our equine friends.

CONGRATULATIONS

Robert C. Tryon Wins the 2007 Wilson Award

This year's James M. Wilson Award was presented to Mr. Robert Tryon for his work on hereditary equine regional dermal asthenia (HERDA), an adult-onset skin disease that primarily affects the American Quarter Horse.

Robert Tryon with his friend Torc.

The Wilson Award is given each year to an outstanding equine research publication authored by a graduate student or resident in the UC Davis School of Veterinary Medicine. Mr. Tryon's research culminated in the manuscript, Homozygosity Mapping Approach Identifies a Missense Mutation in Equine Cyclophilin B (PPIB) Associated with HERDA in the American Quarter Horse, and was honored with the Wilson Award.

During the past four years, Mr. Tryon's research has focused on discovering the genetic basis of HERDA. Extensive pedigree analysis was used to establish the disease's heritability and verify an increased level of inbreeding within affected families. This analysis gave strong support for an autosomal recessive mode of inheritance and, based on the relatively recent dissemination of the allele throughout the Quarter Horse population, a homozygosity mapping approach was well suited for use in mapping the disease locus. The disease locus was mapped to a 2MB region in the horse genome, allowing identification of a mutation in the equine PPIB gene that is believed to cause HERDA. Based on this finding, a genetic test for HERDA was developed to allow veterinarians to distinguish HERDA from other skin diseases and owners and breeders to determine the carrier status of their horses so that they can make better breeding decisions.

Ongoing research will focus on ascertaining that deficient PPIB protein function is associated with the HERDA mutation. In addition, an extensive dataset of Quarter Horses will be screened to clarify the distribution of the HERDA mutation in the Quarter Horse population.

Coming Events

UC Davis Department of Animal Science presents

22nd Annual Horse Day Symposium
October 13, 2007

Freeborn Hall
University of California, Davis

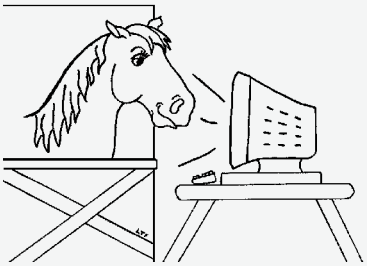
Registration 7:15-8:15 am
Program begins at 8:15 am

Farrier Workshop on Sunday, October 14, consisting of a lecture and a wet lab.

Registration at the door will be $40; lunch will not be available for purchase at the door. The cost for the Farrier Workshop on Sunday is $150 for lecture and wet lab, or $50 for lecture only. Registration fees include refreshments and all course materials.

For more information, please visit ***animalscience.ucdavis.edu/events/horseday/2007.***

VISIT OUR WEB SITE . . .



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