



## Get Rotation *Right*:

A horse owner's guide to reducing parasite burdens and resistance issues in the horse.

**ONLY WITH VETERINARY  
INVOLVEMENT WILL  
WE CONTROL PARASITE  
POPULATIONS, COMBAT  
RESISTANCE AND GET  
ROTATION RIGHT.**



## Get serious about deworming.

Deworming has come a long way in the past 50 years – from products that were nearly toxic and required complicated tubing to the easy-to-administer dewormers we know now. As more and more people recognize the value of timely and effective deworming, past troublemakers such as large strongyles (bloodworms) have become much less of a threat. Still, deworming is nothing to take lightly. Together with vaccinations and sound nutrition, deworming is one of the most important preventive measures you can take to ensure the health of your horse.

Heavy parasite burdens literally rob your horse of good health. Besides stealing nutrients from your horse's digestive system, parasites can cause a variety of other problems, including colic, intestinal rupture and even death. Luckily, most available dewormers do a very good job of reducing your horse's parasite population – IF you know when to use which product and which products are effective against which parasites. That's where expert help comes in.

Your veterinarian is the ideal partner for tackling parasite problems. As internal parasites become more resistant to dewormers, your veterinarian can help make sure your deworming program remains effective. In addition to having the tools to monitor your horse's parasite burden and measure the effectiveness of different dewormers (anthelmintics) on your farm, your veterinarian also understands the different chemical classes of dewormers and which parasites they target best.

You depend on your veterinarian for vaccinations and treatment of illnesses and injuries. Now is the time to turn to your veterinarian for a customized deworming program. Only with veterinary involvement will we control parasite populations, combat resistance and get rotation right.

### **Your veterinarian is critical.**

*You depend on your veterinarian for vaccinations and treatment of illnesses and injuries. Now is the time to turn to your veterinarian for a customized deworming program.*



## Resistance on the rise.

### 10 SIGNS OF A PARASITE-INFECTED HORSE.

1. Dull, rough hair coat.
2. Weight loss, ribby appearance, underweight.
3. Potbelly, commonly called “hay belly.”
4. Listlessness, anorexia (poor appetite).
5. Anemia.
6. Recurring colic.
7. Diarrhea.
8. Peripheral edema (swelling).
9. General impression that your horse isn't looking good.
10. Decreased performance.

By now, you've probably read articles on the increasing numbers of drug-resistant parasites. Some farms that have used only one class of dewormer for an extended period of time are experiencing extreme resistance issues – meaning that there's limited ability for certain dewormers to reduce the horse's parasite burden.

Resistance is a real problem and isn't limited to one location, one class of dewormer or one type of parasite. In fact, there have been documented cases of parasite resistance for every chemical class of anthelmintic.

Most owners have no idea resistance exists on their farms since affected horses may not show any outward signs of heavy parasite burdens. Resistance happens when a small portion of a parasite population survives deworming due to a genetic mutation. As the unaffected parasites continue to reproduce and shed eggs, more and more resistant parasites appear on a property.

With the right parasite-control program, resistance can be managed. Farms that have resistance to a certain dewormer may be able to use that dewormer successfully again if a proper deworming protocol is followed. **Get Rotation Right** is about using the *right dewormer at the right time on the right horses* – to maximize effectiveness and minimize resistance issues.

# Get to know the parasites.

***Different parasites have different modes of operation. Understanding their life cycles and how they impact your horse's health will help you better understand how and when to target them.***

**Ascarids** (roundworms): These hardy parasites are typically found in foals, weanlings and yearlings. Ascarids can cause respiratory disease, weight loss, diarrhea, impaction colic and bowel rupture. Parasite transmission can occur on pasture or in confinement. Immature ascarid larvae migrate through the foal's liver and lungs before returning to the small intestines to complete their development. Most foals develop natural immunity against ascarids before 18 months of age.

**Horse botflies:** The telltale sign of bots are tiny, yellow eggs on horses' legs, manes and flanks. Bots enter the horse through the mouth and travel down the esophagus to attach to the stomach wall. Clinical signs can include an inflamed mouth, stomach irritation, gastric ulcers and possible colic.

**Large strongyles** (bloodworms): The larval stages of these worms migrate through the walls of certain abdominal arteries resulting in inflammation and blood clots that can block circulation to the large

intestines or result in rupture of the arteries. These parasites can also damage the liver and other internal organs. Transmission occurs mainly through ingestion of larvae on pasture. Clinical signs include weight loss, anemia and fatal thromboembolic colic.

**Pinworms:** Tail rubbing may be a sign of pinworms since the female lays her eggs in the perianal area of the horse. Transmission can occur in confinement or on pasture. Most horses develop immunity with age.

**Small strongyles** (cyathostomes): Small strongyles are considered the #1 internal parasite problem in horses today. This is primarily due to their overall prevalence, their ability to burrow and encyst into the lining of the large intestines for up to three years and the fact that this encysted stage is able to evade the effects of most dewormers. Transmission occurs through ingestion of larvae on pasture. Clinical signs can include poor performance, dull hair coat, recurring colic, diarrhea, weight loss and even death.

**Tapeworms:** These internal parasites take four to six weeks to mature to egg-laying adults after your horse ingests the eggs. Tapeworm segments do not appear in the feces since they disintegrate prior to being passed. Tapeworm eggs are difficult to detect unless a sensitive fecal analysis is performed. After tapeworm eggs are passed in the manure, they are ingested by a mite. The tapeworm undergoes further development in the mite, the horse ingests the mite while grazing and the cycle continues. The prevalence of tapeworms varies by region of the country. Clinical signs include colic and intestinal blockage.

**Threadworms:** These are most likely the first parasites to affect a foal since the eggs are passed through the mare's milk. High numbers of threadworms can cause persistent diarrhea in foals around two to four weeks of age. Older foals may have high fecal egg counts but no clinical signs.

*Small strongyles are considered the #1 nematode problem in horses due to their ability to burrow and encyst into the intestinal lining for up to three years.*



# Small strongyles – the #1 parasite problem.

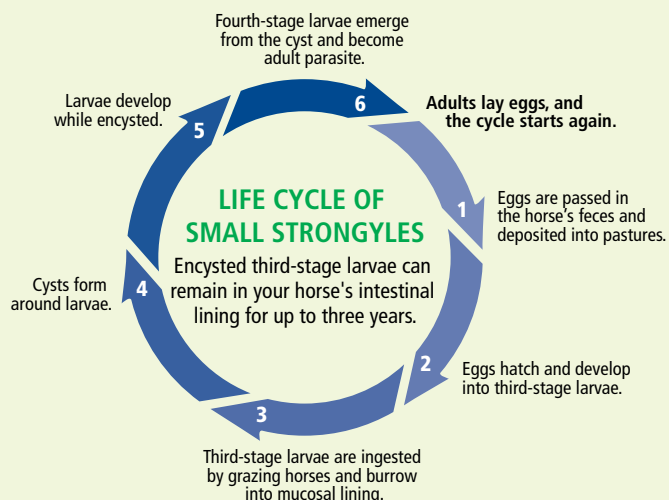
## THE LIFE CYCLE OF SMALL STRONGYLES.

1. Adult small strongyles lay eggs that are passed in the horse's feces and deposited into pastures, paddocks, etc.
2. While in the pasture, these eggs hatch and develop into third-stage larvae (L<sub>3</sub>).
3. L<sub>3</sub>'s are ingested by grazing horses and can burrow into the mucosal lining of your horse's colon in as little as six hours.
4. Cysts form around L<sub>3</sub>'s in the intestinal wall. The encysted L<sub>3</sub> has two stages: early (EL<sub>3</sub>) and late (LL<sub>3</sub>).
5. EL<sub>3</sub>'s may remain in the intestinal mucosa for up to three years before developing into LL<sub>3</sub>'s and then fourth-stage larvae (L<sub>4</sub>).
6. L<sub>4</sub>'s emerge from the cyst and enter the lumen of the colon where they become fifth-stage larvae (L<sub>5</sub>) and then the adult parasite.
7. Adults lay eggs that pass in the feces. The eggs develop into infective third-stage larvae on the pasture and the cycle starts again.

Small strongyles can account for as much as 90 percent of your horse's parasite burden. With this parasite, it is the encysted stage that causes most of the problems. Unfortunately, there's no way of knowing how heavy of an encysted small strongyle load your horse is carrying. Your horse may show no outward signs of a parasite problem. Fecal tests only monitor egg counts produced by adult parasites within your horse's intestines. Fecals do not reflect total parasite burdens since larval stages of parasites, including encysted larval stages, do not lay eggs.

By the time you notice outward signs of damage caused by this parasite, it may be too late. Encysted small strongyles can cause severe clinical signs when the thousands to millions of fourth-stage larvae (L<sub>4</sub>) excyst and emerge simultaneously from the intestinal wall. The resulting damage to the intestinal mucosa may show up in your horse as listlessness, weakness, anorexia, recurring colic, diarrhea, weight loss, peripheral edema (swelling) and, in severe cases, even death. In less severe cases, you may notice decreased performance, poor food utilization, dull hair coat and an overall feeling that your horse just isn't doing right.

**FACT:** Most of the horses affected by encysted small strongyles have been dewormed regularly. This is because the encysted small strongyles are able to evade the effects of most dewormers. At any given time, a horse may have a mixed population of encysted larvae and adult small strongyles in the gut – with as much as 75 percent of the encysted larvae existing as early-third-stage larvae (EL<sub>3</sub>).



**ENCYSTED SMALL  
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THE INTESTINAL WALL.**



## The three rights of deworming.

The **Get Rotation Right** program is based on three “rights” – **the right dewormer at the right time for the right horse**. Identifying all of these “rights” will require your veterinarian’s assistance. At first you may be hesitant to spend more money for veterinary involvement on something that seems easy to do on your own. But once your veterinarian helps you design a more efficient deworming program, you’ll find you’re buying fewer dewormers for many of your horses and saving money in the long run.

Up until now, there have been many sources for rotational deworming programs. Most of these programs, however, were developed before parasite resistance became a widespread problem and focused on ease of use rather than a horse’s specific parasite burden or lifestyle.

The **Get Rotation Right** deworming program is targeted to the individual needs of your horse, the right time of the year and the right dewormer. With this program, you can select which horses need to be dewormed.

Some horses may only need to be dewormed two to three times per year, while other, more-susceptible horses may require treatments five to six times per year. When you are more targeted with your deworming, you can be a lot more effective.

### THE RIGHT HORSE.

The first step in **Get Rotation Right** is identifying the high strongyle egg shedders in your herd. Did you know that approximately 20 percent of the horses on pasture shed 80 percent of the parasite eggs? That means there are a lot of horses being treated too frequently for parasites.

Ask your veterinarian to perform a fecal egg count exam on all of your horses two to four months following your last deworming. Tell your veterinarian which deworming product you used so he or she can make sure the fecal egg count occurs at least four weeks after the egg reappearance period (ERP) of the last dewormer used to allow parasite eggs to accumulate. A fecal egg count performed at this time will reflect your horse’s

natural immunity rather than the effect of the last drug administered. The results of this fecal exam will allow you and your veterinarian to identify the high, moderate and low egg-shedding horses and treat them accordingly.

**Low egg shedder – treat an average of two to three times per year.** Deworm at least once every six months during peak transmission times (i.e., spring and fall) using a larvicidal treatment that targets migrating large strongyle larvae. One of these treatments should also be effective against all stages of encysted small strongyles<sup>1</sup> (e.g., PANACUR® POWERPAC), and one treatment should be effective against bots (ivermectin or moxidectin) and possibly tapeworms (product containing praziquantel). If indicated, add another anthelmintic treatment during the period of peak transmission in your region. Ask your veterinarian for specific product and timing recommendations.

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**Egg Reappearance Period (ERP)** is the interval between treatment and reappearance of strongyle eggs in the feces.

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#### Moxidectin ERP

10 to 12 weeks

#### Ivermectin ERP

6 to 8 weeks

#### Fenbendazole, Pyrantel ERP

4 to 5 weeks



**DID YOU KNOW THAT APPROXIMATELY 20 PERCENT OF THE HORSES ON PASTURE SHED 80 PERCENT OF THE PARASITE EGGS? THAT MEANS THERE ARE A LOT OF HORSES BEING TREATED TOO FREQUENTLY FOR PARASITES.**

**Moderate egg shedder – treat an average of three to four times per year.**

Two of your deworming treatments should be with a larvicidal dewormer, including one treatment with a dewormer such as PANACUR POWERPAC that targets all stages of encysted small strongyles. Administer this treatment during the peak transmission periods of spring and fall, and follow the recommendations above for low egg shedders.

You should include two additional treatments during the main parasite season for your part of the country

(i.e., summer in the North; winter in the South). Those additional treatments might include pyrantel and oxbendazole if they are still effective on the farm. Again, ask your veterinarian for specific product and timing recommendations.

**High egg shedder – treat an average of five to six times per year.**

Two of your deworming treatments should be in the spring and fall using a larvicidal dewormer, including one treatment with a dewormer such as PANACUR POWERPAC that targets all stages of encysted small strongyles.

Follow the recommendations above for low egg shedders. Add another larvicidal treatment during high-transmission periods (i.e., summer in the North; winter in the South).

Include one additional (non-larvicidal) treatment during the main season of larval transmission and a second non-larvicidal treatment during the “off-season” (low transmission season) in your area. Consult your veterinarian for specific product and timing recommendations based on the parasites present and your geography.

<sup>1</sup> The only FDA approved larvicidal treatment for encysted EL<sub>3</sub>'s and L<sub>3</sub>'s and L<sub>4</sub>'s is PANACUR® POWERPAC. Other products may claim to treat encysted small strongyles, but only Panacur® POWERPAC effectively controls all stages – including EL<sub>3</sub>'s.

<sup>2</sup> Source: DePietro, Klei, Reinemeyer, 1997.

**Special considerations.**

If your horse is on a daily dewormer, it's still important to have your veterinarian perform a fecal egg count twice a year during spring and fall. That way you'll know if your horse needs a supplemental treatment to reduce a specific parasite population. Horses on daily dewormer still need additional treatments to target encysted small strongyles, bots and tapeworms.

When a new horse arrives on your property, you should quarantine the newcomer and monitor the horse for signs of contagious respiratory diseases and fecal parasites. Obtain a fecal sample and treat the newcomer for parasites before turning the horse out on your pastures. For long-term additions to your herd, treat the horse with a larvicidal dose of PANACUR POWERPAC followed

by ivermectin or moxidectin with or without a tapeworm treatment.

**Tapeworms and Botflies**

You'll want to incorporate a tapeworm treatment for “at-risk” horses and a boticide for all horses in the fall. In high-risk areas, you should deworm for tapeworms twice a year. And in Southern climates, a boticide may need to be given biannually.

# The three rights of deworming.

It's important to rotate between the three major chemical classes of dewormers and use them at appropriate intervals based on the drug last used, time of year and your horse's susceptibility.

## THE RIGHT DEWORMER.

After identifying and deworming your horses, have your veterinarian perform a second fecal egg count 10 to 14 days after the last deworming. Utilizing the results of the first (pre-deworming) and second (post-deworming) fecal egg counts, your veterinarian can measure the percent reduction in the fecal egg count pre- to post-deworming. This is a fecal egg count reduction test (FECRT). This test measures the percent reduction in the fecal egg count from pre- to post-deworming. Ideally, you are looking for a 90 to 98 percent reduction in eggs depending on the dewormer last used. If you do not achieve a reduction of at least 90 percent following benzimidazoles (e.g., Panacur, Safe Guard, Anthelcide) or pyrantel (e.g., Strongid) and at least 98 percent following moxidectin (e.g., Quest) or ivermectin (e.g., Zimecterin, etc.), it means you could be developing resistance problems to that particular class of dewormer. Your veterinarian can advise you on next steps if that happens.

If you have reductions in the 90 to 98 percent range, you can safely plan your next deworming. It's important to rotate between the three major chemical classes of dewormers (ivermectin, benzimidazoles and pyrantel salts) and use them at appropriate intervals based on the drug last used, time of year and your horse's susceptibility. In fact, rotation is one of the most important steps to manage resistance.

## How to get the best fecal sample and results.

1. Conduct when egg excretion is optimal (four months after moxidectin, three months after ivermectin; nine to 10 weeks after pyrantel or benzimidazoles) to allow parasite eggs to accumulate.
2. Sample a sufficient number of horses on the premises ( $\geq 20$  percent), if not every horse.
3. Collect freshly voided feces or per rectum (3-gram minimum).
4. Keep samples cool and in an airtight container until lab analysis can be performed.
5. Repeat fecal egg count exam 10 to 14 days post-deworming to measure dewormer effectiveness and again whenever a new class of dewormer is introduced during a 12- to 18-month period.

Chemical Class	Brand Names	Targeted Parasites
<b>Avermectin (ivermectin and moxidectin)</b>	<p><b>Ivermectin:</b> Equell™, Equimectrin™, IverCare®, Rotectin®, Zimecterin® and Horse Health Ivermectin</p> <p><b>Moxidectin:</b> Quest® Gel</p>	<p>Ivermectin has the broadest range of activity (large and small strongyles, pinworms, ascarids, hairworms, lungworms, threadworms and bots), but does not adequately kill encysted small strongyles and is ineffective against tapeworms.</p> <p>Moxidectin is similar to ivermectin except it is also effective against LL<sub>3</sub>/L<sub>4</sub> stages of encysted small strongyles (not labeled as effective against EL<sub>3</sub> stage).</p>
<b>Praziquantel with ivermectin (tapeworm control)</b>	<p><b>Ivermectin/praziquantel:</b> Equimax™ and Zimecterin® Gold</p> <p><b>Moxidectin/praziquantel:</b> Quest Plus Gel</p>	Targets all parasites according to details above, plus tapeworms.
<b>Benzimidazoles (everything ending “-endazole,” including fenbendazole and oxibendazole)</b>	<p><b>Fenbendazole:</b> Safe-Guard® Paste, Safe-Guard Power-Dose, Panacur® Paste and PANACUR POWERPAC</p> <p><b>Oxibendazole:</b> Anthelcide® EQ</p>	<p>Fenbendazole kills large strongyles, pinworms, ascarids (at 10mg/kg) and (at double-dose for 5 days) kills migrating large strongyles, migrating ascarids and encysted small strongyles, including EL<sub>3</sub>s.</p> <p>Oxibendazole is effective against large strongyles, pinworms, ascarids and threadworms, but not encysted small strongyles.</p>
<b>Pyrantel salts</b>	<p><b>Pyrantel Pamoate:</b> Strongid® Paste, Rotectin® P, Equi-Cide®, Liqui-Care P™, TapeCare Plus™ and Pyrantel Pamoate Paste</p> <p><b>Pyrantel Tartrate:</b> Strongid® C , Strongid® C2X™, Continuex™ and Equi Aid® CW-2W</p>	<p>Pyrantel pamoate controls large strongyles, pinworms, ascarids and, to some degree, tapeworms (at double-dose).</p> <p>Pyrantel tartrate is the basis of daily dewormers and controls large strongyles, pinworms and ascarids.</p>



## The three rights of deworming.

Horses in different geographies managed in different ways will require different deworming protocols. Weather patterns may also affect your deworming program.

### THE RIGHT TIME.

The goal with deworming is to treat the right horse at the ideal time for the parasite load it's carrying. Generally the ideal time is going to be in the spring and fall for most of the country, but your veterinarian will know the right time for your geography. Weather conditions, including rainfall, may alter your deworming regimen from year to year.

The rule of thumb for treating with a larvicidal dose of PANACUR POWERPAC is to wait for the grass to turn brown – late fall/early winter in the north and late spring/early summer in the south. This helps reduce the risk of reinfestation due to the fact that environmental conditions are most detrimental to the viability of strongyle larvae on grass during this time of year.

When timing your deworming program, you also need to take into account when the horse is on pasture and when he's stalled. A show horse who gets turned out for the winter and is stabled most of the summer will require a different protocol than one who's turned out year-round.

### ESPECIALLY FOR FOALS.

Young foals are generally more susceptible to parasites than adult horses because of their immature immune systems. Additionally, foals are uniquely susceptible to certain parasites that generally do not affect adult horses. These parasites include strongyloides (threadworms) and ascarids (roundworms). Ascarids can cause a lot of damage – such as respiratory disease, persistent diarrhea, colic and stunted growth.

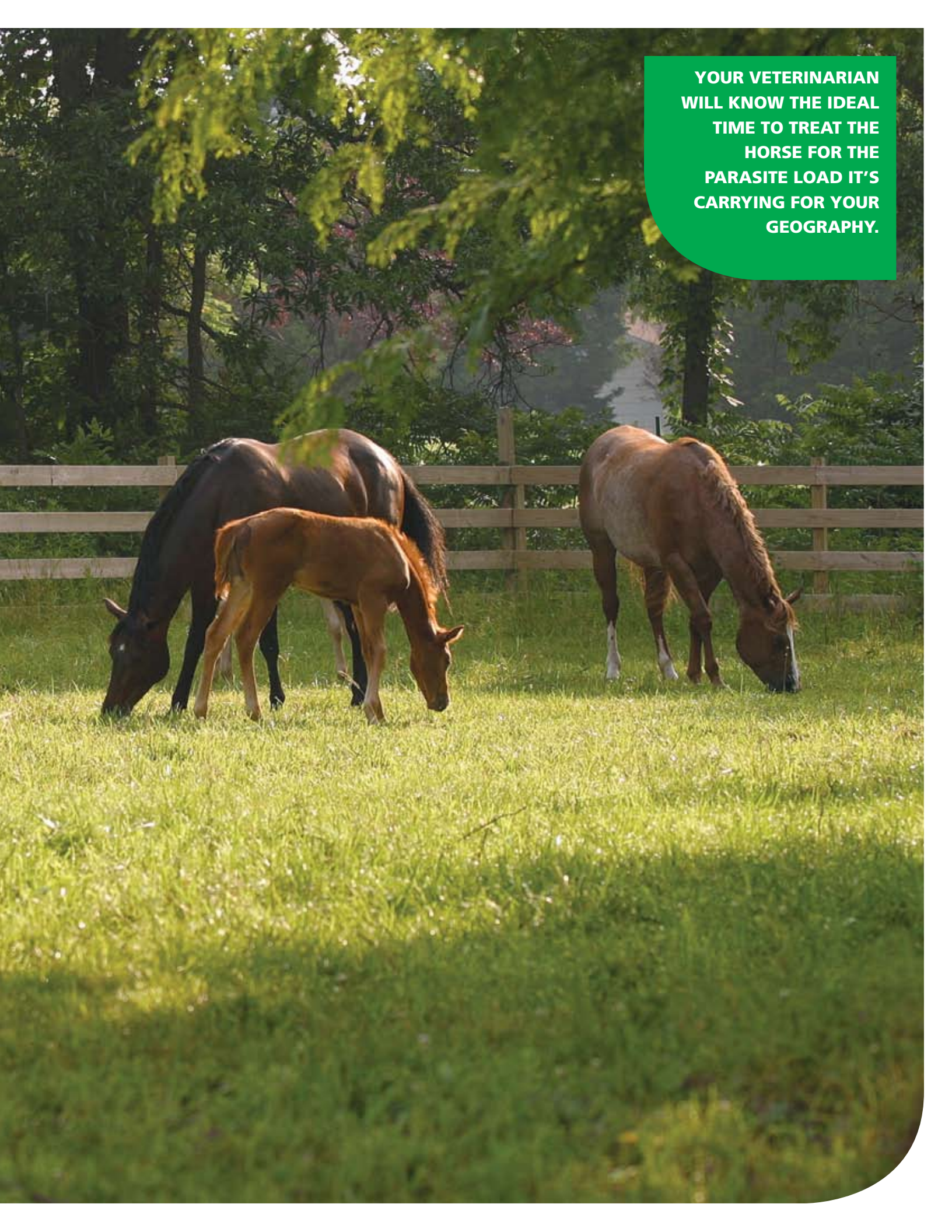
Here are some steps to follow for deworming your foal.

1. Deworm the mare for threadworms within 24 to 48 hours after foaling. Ivermectin or oxbendazole is a reasonable drug choice. This parasite is transmitted to the foal via the dam's milk.
2. Deworm the foal for ascarids (roundworms) beginning at six to eight weeks of age. Ascarids

are the most significant foal parasite and can cause depression, cough, nasal discharge, poor growth, diarrhea, impaction colic and even bowel rupture leading to death.

3. Continue deworming for ascarids and general parasite control every two months during the first year of life. Consult your veterinarian about a targeted deworming program for your foal.

**YOUR VETERINARIAN  
WILL KNOW THE IDEAL  
TIME TO TREAT THE  
HORSE FOR THE  
PARASITE LOAD IT'S  
CARRYING FOR YOUR  
GEOGRAPHY.**



## Beyond the drugs.

An effective parasite management program includes more than just dewormers. Here are some non-chemical steps you can take to reduce parasite populations on your property:

1. Rotate pastures if possible. Ideally it is best to rest pastures when the weather is hot and dry.
2. Cross-graze pastures with cattle or other ruminants.
3. Remove manure from pastures and paddocks.
4. Harrow pastures only during hot, dry periods and keep horses off for several weeks.
5. Consult your extension agent regarding proper composting techniques.
6. Avoid overstocking your pastures.

## Get with your veterinarian.

Before you make changes to your deworming program, it's best to talk with your veterinarian. He or she can evaluate your farm and your past deworming program and recommend a complete parasite-control program customized to your needs. Most important, your veterinarian knows your horse's health history and can take into account previous colics or internal parasite issues when developing your plan.

Deworming is not as simple as grabbing any paste off the shelf. But luckily, with your veterinarian's assistance, it can be a lot more effective.

## Ask your veterinarian for PANACUR® POWERPAC.



- Administer one 57-gram syringe per 1,250-lb. horse (10 mg/kg) for five consecutive days.
- Controls all stages of small strongyles, including the important early-third stage (EL<sub>3</sub>), along with large strongyles, pinworms and roundworms.
- 98 percent effective in killing encysted EL<sub>3</sub>s.
- Safe for use in foals.

*Before administering any dewormer, make sure you know your horse's weight. That's the only way to ensure you're dosing your horse correctly.*



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**PANACUR® POWERPAC**  
(fenbendazole)