

Drug-Resistant Parasites: Is Your Horse at Risk?

New research shows equine parasites might be becoming resistant to common dewormers. Here's how to combat the problem.

BY DREW RUSH

Parasite control is an important part of every horse's health-care regimen, and as a responsible owner, you've no doubt followed your veterinarian's recommendations for a rotational deworming schedule. However, research is uncovering a serious problem involving deworming chemicals — drug-resistant parasites.

"Resistance is growing rapidly among most of the major equine parasites," says Wendy Vaala, VMD, DACVIM, the equine technical services specialist for Intervet/Schering-Plough Animal Health. "This is an issue affecting everyone from backyard horse owners to trail riders who travel nationwide."

Two of the most dangerous parasites affecting horses, small strongyles and roundworms, are standing up against some of the drugs in over-the-counter dewormers. This is alarming news, as there are no new classes of drugs on the horizon, so we have to learn to work with what's available now.

While veterinarians and researchers are still learning about these developments, they're offering steps you can take to protect your horse, both at home and on the road.

Here, we'll first give you a rundown of parasite basics. Then we'll outline the current situation, based on scientific reports. Next, we'll give you ways to manage your horse's deworming regimen, including a smart rotation schedule and pasture-management tips. Finally, we'll tell you what might be on the horizon on the research front.

Along the way, we'll provide information on current deworming products (page 4), show you Intervet's sample rotation chart (page 3), and list deworming-drug-manufacturer resources (page 5).



Deworming Basics

There are a number of dangerous internal parasites; dewormers work by disrupting the lifecycle of these parasites while they're inside your horse. There are three classes of dewormers approved for use in horses:

- **Macrocyclic lactone** (ivermectin/moxidectin). Dewormers in this class kill roundworms, some stages of large and small strongyles, pinworms, large-mouth stomach worms, lungworms, intestinal threadworms, neck threadworms, hairworms, and bots. "This drug group is the most commonly used overall," says Andrew Peregrine, BVMS, PhD, DVM, associate professor of pathobiology at the University of Guelph Ontario Veterinary College.

- **Benzimidazole** (oxibendazole/fenbendazole/oxfendazole). These drugs are effective against roundworms, some stages of large and small strongyles, and pinworms.

While grazing, your horse ingests parasite eggs shed in manure. You can reduce his parasite load through improved pasture management; researchers are finding that some internal parasites are becoming resistant to ingredients in common dewormers. Read on for specifics.

- **Pyrantel** (pyrantel pamoate/pyrantel tartrate). These drugs kill roundworms, some stages of large and small strongyles, and pinworms.

"Know which drugs are in which class, because if you get resistance to one of the drugs in that class, you almost certainly will get resistance to other drugs in that class," says Dr. Peregrine. (For the products available in each class, see "Deworming Options" on page 4.)

There are also two types of dewormers:

- **Daily dewormers.** Added to a horse's feed, daily dewormers provide a continual presence of the drug in the horse's gastrointestinal tract to prevent certain parasites from living there.

- **Purge dewormers.** These one-time paste or on-feed treatments affect the adult parasites in the horse's intestinal tract. When this drug leaves the horse's body in a few days, the parasites will return.

The Resistance Picture

When a parasite is *resistant* to a drug, that means the drug is no longer effective in controlling it. Drug resistance among internal parasites is very real and frightening. Once it occurs, you can't reclaim the drug's effectiveness. "You can't reverse resistance, because it indicates a genetic change in the parasite," says Dr. Vaala.

There are reports of resistance among equine parasites all over the world. In fact, last summer, there was a two-day Equine Parasite Drug Resis-

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tance workshop in Denmark for top parasitologists and equine veterinarians to bring everyone up-to-date on the research.

Today's findings raise red flags for breeders and owners of young horses. A 2007 study by Eugene Lyons, PhD, of the Gluck Equine Research Center Department of Veterinary Science in Lexington, Kentucky, found ivermectin and pyrantel pamoate resistance in roundworms in foals on five central Kentucky farms. The benzimidazole chemicals were still effective, although researchers question how long it'll take before we see resistance in this class, too.

Roundworms can invade horses of all ages, but are the primary parasite of concern in foals, where they can become life-threatening. Roundworm larvae lurk in manure, where they can be easily ingested by a horse or foal.

Once ingested, larvae burrow into the horse's intestinal walls, then travel via the bloodstream to the liver and lungs. He then coughs up the larvae and swallows them, sending them to the intestines, where they mature into adults.

Larvae in the bloodstream can cause coughing, fever, pneumonia, bleeding lungs, and respiratory infections. Adult roundworms can cause *colic*, abdominal pain that indicates a mild to life-threatening disorder, including an intestinal blockage that can lead to death.

In older horses, small strongyles are the main threat. "The resistance in these [parasites] is much worse," Dr. Peregrine says.

According to a study published in the *Journal of the American Veterinary Medical Association* in 2004, Ray Kaplan, DVM, PhD, DEVPC, an associate professor in the Department of Infectious Diseases at the University of Georgia College of Veterinary Medicine, conducted research involving horses on 44 farms in the southeastern United States.

This study revealed levels of small strongyle resistance higher than previously suspected. Small strongyles were 97.7 percent resistant to fenbendazole, 53.5 percent resistant to oxibendazole, and 40.5 percent resistant to pyrantel pamoate.

The small strongyles in Dr. Kaplan's study showed no resistance to ivermectin, although researchers are starting to see small strongyle eggs returning more quickly than they did previously after treatment with ivermectin.

Lyons's 2007 central Kentucky study, in fact, found egg counts returning about twice as quickly as they did when ivermectin was introduced in the early 1980s. Around the world, researchers are reporting similar findings. Early

Five Treatment Tasks to Control Parasitic Worms

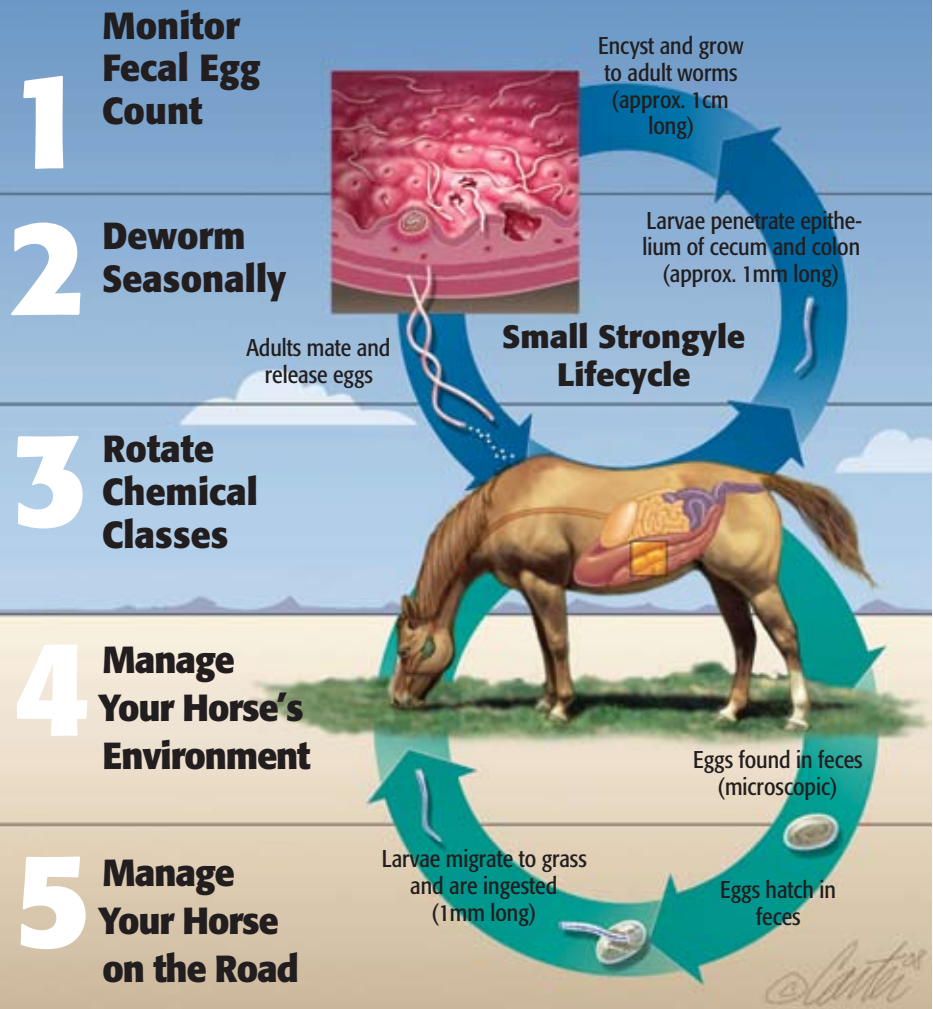


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return of eggs after deworming treatment is an indicator that resistance among these parasites may be mounting.

Resistance to a drug doesn't just happen overnight. Over time, overuse and misuse have contributed to the development of resistance, says Dr. Peregrine. Resistance was able to set in with the continual use of the same class of drugs. Horse owners primarily control deworming programs, whereas it used to be the veterinarians' responsibility.

"Rotation" means — that you must use drugs from different classes, not just different brand-name products. This misunderstanding has led to inadvertent misuse of drugs over time.

There's also debate among researchers about whether the use of a daily deworming dose has contributed to resistance in the pyrantel class. However, Pfizer Animal Health, a top manufacturer of daily dewormers, reports it receives few calls annually of low *efficacy* (effectiveness) of its products.

Adding to the resistance equation is that many horses are being under-dosed with deworming medication. Parasites don't receive enough chemical to affect them, and this low-dose exposure allows them to build up tolerance for the drug.

Under-dosing can happen if underestimate your horse's weight, or if your horse pulls his head away as you're squeezing the paste into his mouth.

One more theory is that as the earth's climate changes, parasites evolve; parasites thrive in warm, moist environments. As average temperatures become warmer, there's potential for them to become more hardy and prolific.

New Treatment Strategy

With drugs no longer the easy answer to parasite control questions, it's critical to implement a new treatment strategy through savvy management. Five tasks make up this strategy:

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(1) Monitor fecal egg count; (2) deworm seasonally; (3) rotate chemical classes; (4) manage your horse's environment; and (5) manage your horse on the road. Here's a rundown of each task.

• **Treatment task #1: Monitor fecal egg count.** Know when to deworm, and know which horse in your pasture to deworm. You'll find this out by monitoring fecal egg count (FEC) through fecal exams.

A fecal gives you an idea of the type and number of parasites infecting your horse. Unfortunately, FECs aren't completely accurate. They measure only eggs shed in each horse's intestinal tract.

Also, FEC tests don't give an accurate picture of the tapeworm population; tapeworm eggs are so heavy they sink. However, an ELISA blood test pinpoints tapeworm populations, says Robert Holland, DVM, PhD, senior veterinarian for Pfizer Animal Health.

You're not looking for a zero egg count in an FEC, because your horse or horses will naturally harbor some level of parasites. There's debate about the acceptable number of eggs per gram, ranging from 100 to 500. Generally, experts say, a horse with fewer than 200 eggs

per gram shouldn't be dewormed. You might be uncomfortable allowing your horses to host a low parasite population, but this may be our only hope of slowing drug resistance.

"Naturally, there are resistant parasites around," explains Dr. Peregrine. "When you apply a drug, you get rid of all of the parasites except that one [resistant parasite]. That's the danger of deworming very frequently." By continuing to knock out the parasites susceptible to the drugs, we're allowing the resistant parasites to take over.

"Your goal is to use only the drugs you need in the horses that need them," says Dr. Vaala. "Try to avoid using too many chemicals in the horses that don't need them. If we deworm more strategically, we'll allow nonresistant worms to proliferate. Then, when it's time to deworm again, we'll kill a higher population of parasites."

An FEC will help you find the "high shedders" in your herd — the horses that naturally harbor more parasites and deposit more eggs in the environment. Most parasitologists agree that 20 to 30 percent of horses fall into this category. These are the horses that need treatment the most. Dr. Vaala says you may need to deworm your low-shedding horses as little as twice per year.

The ideal time to do a fecal exam is mid-

summer or mid-winter, when parasites aren't at their peak. Ask your veterinarian to run the test four weeks after the stated length of effectiveness of your last dewormer.

Don't wait longer than this, though, because you don't want the parasites to come back and make your horse ill.

Dr. Vaala suggests taking the following year to test the effectiveness of every drug class against your horse's parasites. Resistance will differ by farm and even by horse. Ask your veterinarian to perform an FEC before you deworm your horse (or horses), then deworm, and ask your vet to perform an FEC 10 to 14 days later.

If your drugs are working properly, you should see a 96 to 98 percent reduction in strongyle egg counts if using macrocyclic lactones, and a 90 to 95 percent reduction if using benzimidazoles or pyrantels. If you spot drug resistance, switch to other drug classes to properly control the parasites.

After you complete this testing, ask your vet to perform an FEC on every horse in your pasture at least every year thereafter to monitor the effectiveness of your deworming program.

• **Treatment task #2: Deworm seasonally.** Spring and fall are the peak transmission

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Get Rotation Right

Deworming Barn Chart

Why Rotate?

Helps Prevent Resistance
Rotating the chemical class of dewormer — not just the brand name — reduces the risk of worms developing resistance to a specific product.

Treats All Parasites
An effective worm control program targets the most significant parasites at the optimal time with different classes of dewormers to lower the odds of re-infection as it helps relieve resistance.

Pinworms:

- Eggs passed in fecal material
- Common symptom is itching of the tail

Ascarids (fly larvae):

- Primarily a problem in young horses
- Produce migrating larvae
- Damage liver and lungs
- Cause coughing, shortness of breath under work,
- Depresses immune system,
- Can become life threatening

Bots (fly larvae):

- Fly annoyance can interfere with feeding and affect nutrition
- Eggs often found on the legs and muzzle
- Larvae migration may cause lesions of the mouth and esophagus and possibly skin
- Extreme infestations can cause severe damage to the stomach and intestine

Tapeworms:

- Hard to diagnose
- Don't often show up in fecal egg examinations
- May cause sporadic colic, impaction or enterosuperstition,

Large Strongyles:

- Migrating larvae may cause weakening of the arterial wall
- Can lead to aneurysm
- In rare cases, adults can rupture causing rapid death
- May cause thrombotic colic, resulting in serious illness or death.

Small Strongyles:

- U₁, U₂, and U₃ large encysted larvae can survive winter deworming
- U₁ can account for 75% of the parasite burden
- Must be treated to eliminate threat
- May cause poor performance, food utilization, or a dull hair coat
- Extreme cases can result in anorexia, recurring colic, diarrhea, weight loss, edema and death

Time of Year	Deep Freeze (Winter)	Past Thaw (Spring)	Grazing Season (Summer)		First Freeze (Fall)	
Rotation	1	2	3	4	5	6
Compound	Fenbendazole	Ivermectin or Moxidectin	Pyrantel Pamoate	Fenbendazole	Ivermectin or Moxidectin (with Praziquantel)	Pyrantel Pamoate
Product (choose one)	 Safe-Guard® Power-Dose® The ingredient in Safe-Guard Power-Dose® is the only one FDA-approved to treat all stages of encysted small strongyles. <small>Marked in the southern US, should contain Safe-Guard® Power-Dose® during the dormant season of the summer and a regular dosage during the winter.</small>	Ivermectin • IVERMECTIN™ • ZIMECTER™ • ROTECTIN™ LSPH • EQUILL™ • IVERAZE™ Moxidectin • QUEST®	• STRONGID® • ROTECTIN™P • STRONGILECARE™	 Safe-Guard® Paste  Safe-Guard® Equi-Bits®	Ivermectin • ZIMECTER™ BOLD • COMBOCARE™ GEL • EQUIMAX™ Moxidectin • QUEST™ PLUS	• STRONGID® • ROTECTIN™P • STRONGILECARE™
Treats	• General Parasite Control • Encysted Small Strongyles U ₁ , U ₂ , U ₃	• General Parasite Control • Bots	• General Parasite Control	• General Parasite Control	• General Parasite Control • Bots and Tapeworms	• General Parasite Control
Date Administered	Day	Day	Day	Day	Day	Day
	Month	Month	Month	Month	Month	Month

For more information on deworming, rotation and parasites visit www.GetRotationRight.com

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times for parasites, because they thrive in moist, temperate environments.

At 85 degrees and above, larvae in the pasture start to die. Similarly, very cold winters, below 45 degrees, will cause larvae and eggs to go dormant and stop developing. If your climate cooperates in this way, you likely won't need to deworm during these hot and cold periods, because the parasites will die naturally.

"Use nature in the cold winter and the hot, dry summer [to help kill parasites], so you can deworm less," says Dr. Vaala. However, she stresses, keep in mind there's no such thing as a "killer frost." As soon as the temperature is right, parasites and larvae will pick up where they left off.

Your seasonal management will vary depending on where you live. "If you live in Florida, for instance, your deworming rotation will be different than in other areas," Dr. Holland says.

Keep in mind that if you go trail riding in the south during winter or the north during summer, your horse is still susceptible to picking up parasites. Monitor his FEC when you return, especially before you turn him out with other horses, to avoid spreading the parasite infestation.

• **Treatment task #3:** Rotate chemical classes. Rotation can be tricky. "There's no one rotation program guaranteed to work in all parts of the country," Dr. Vaala says. "The concept is, you need to use the right drugs at the right time."

With the range of dewormers available, you and your veterinarian can make choices to benefit your particular situation.

Two dewormer manufacturers, Intervet and Pfizer Animal Health, have created sample rotational calendars to help you track the chemical classes you're using in your deworming program. (For Intervet's rotational calendar, see page 3, and visit www.getrotationright.com; for Pfizer's sample rotational calendar, and to sign up for deworming reminders via e-mail, visit www.rotationiskey.com.)

Before you implement a rotational program, talk with your veterinarian about the FEC results of each horse in your pasture. As mentioned earlier, farms in different areas of the country are experiencing varying levels of resistance. For instance, while small strongyles on your property may be resistant to a regular dose of fenbendazole, the roundworms and pinworms may not be. Likewise, your small strongyles may still be impacted by the same drug.

If you were to find benzimidazoles to be completely ineffective, researchers have developed other options. A series of studies at Texas Tech University, sponsored by Intervet, found a rotational program using all three drug classes can still be effective in controlling the benzimidazole-resistant worms. In fact, they saw the proper rotational regimen breaking or reducing fenbendazole resistance.

Depending on what your FECs say about the parasites on your property, Intervet recommends a fast-rotation program, using a different class of drugs every two months, as needed. Some researchers, including Dr. Peregrine, might recommend the slow-rotation program,

using one class of effective drugs every two months as needed for a full year.

Whichever program you and your veterinarian develop, be sure all horses on your property are on the same one, so the parasites are exposed to the same drugs. Revisit this program annually, as what was right for your horses last year may not be right this year due to weather changes, your horses' travels, and your upcoming trail-riding plans.

Dr. Vaala stresses that foals 6 to 8 weeks old need to be dewormed for roundworms. A benzimidazole product appears to be your best bet, according to current resistance studies, unless FECs show your property doesn't have pyrantel or macrocyclic lactone-resistant parasites.

"Overall, if you're going to use daily dewormers, such as pyrantel tartrate, you should use ivermectin with praziquantel twice per year," Dr. Holland says. If the small strongyles on your property are developing a pyrantel resistance, the biannual use of a macrocyclic lactone should take care of them.

Currently, tapeworms aren't showing resistance to praziquantel, a drug introduced for over-the-counter use in 2003, and you can do your part to keep it that way. "We'd like people to avoid using a praziquantel-containing drug, if a product without it will do," Dr. Vaala says.

She recommends using a praziquantel or pyrantel pamoate product only once per year, in the fall, to take care of tapeworms, unless you live in an area with high tapeworm populations. If your horse is at high risk, Dr. Holland

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Deworming Options

Here's a listing of deworming products for each class of parasites, as described under "Deworming Basics" on page 46.

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Class: Macrocyclic lactone.

Drugs: Ivermectin; moxidectin.

Effective against: Roundworms, some stages of large and small strongyles, pinworms, large-mouth stomach worms, lungworms, intestinal threadworms, neck threadworms, hairworms and bots. The praziquantel products are also labeled for tapeworm control.

Resistance: Shown among roundworms.

Products: Agri Laboratories' Agrimectin Equine Paste; Bimeda Animal Health's Bimectin; Durvet's DuraMectin and Ivermectin Paste; Farnam's IverCare, Horse Health Equine Ivermectin, Rotectin, and on-feed IverEase; Fort Dodge's Quest Gel; Merial's

Eqvalan, Zimecterin and Equimecterin; Pfizer Animal Health's Equell. Four products also include praziquantel: Farnam's ComboCare; Fort Dodge's Quest Plus; Merial's Zimecterin Gold; and Pfizer's Equimax.

◀—▶
Class: Benzimidazole.

Drugs: Oxibendazole; fenbendazole; oxfendazole.

Effective against: Roundworms, pinworms, and some stages of large and small strongyles. Intervet's Safe-Guard products additionally control all stages of encysted small strongyles.

Resistance: Shown among small strongyles.

Products: Intervet's Panacur, Safe-Guard, Safe-Guard Power-Dose, on-feed Safe-Guard granules, and Safe-Guard Equi-Bits; Pfizer Animal Health's Anthelcide EQ

Class: Pyrantel.

Drugs: Pyrantel pamoate; pyrantel tartrate.

Effective against: Roundworms, pinworms, and some stages of large and small strongyles. Farnam's TapeCare Plus is also labeled for tapeworm control.

Resistance: Shown among roundworms and small strongyles.

Products: Bimeda Animal Health's Exodus; Durvet's Pyrantel Paste, and on-feed Horse and Colt Wormer; Equi Aid Products' Strongyle Wormer and daily on-feed Equi Aid CW; Farnam's TapeCare Plus, Liqui-Care P, StrongyleCare, Rotectin P, on-feed Alfalfa Pellet and Pellet-Care P, and daily on-feed Continuex; and Pfizer Animal Health's Strongid and daily on-feed Strongid C and Strongid C 2X.

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suggests using a tapeworm control two or even three times per year.

Tapeworm-infected horses don't generally show the signs of a horse with worms — weight loss, rough haircoat, diarrhea — and without treatment, infestations can become severe enough to cause colic, the No. 1 killer of horses.

Dr. Holland reports that research shows tapeworm infections cause 22 percent of *spasmodic colics* (a contraction or spasm of a portion of the small intestine) and 81 percent of *ileocecal impaction colics* (a blockage of the ileocecal valve, situated at the junction of the small and large intestine).

If you've only ever used drugs from one class of dewormers, talk with your veterinarian before switching classes. It's possible that a high number of worms will die when you give your horse a dose of a different chemical, and that can cause your horse to get sick.

• **Treatment task # 4:** Manage your horse's environment. You can reduce the parasite load in your horse's environment the following ways.

Reduce horse density. Dr. Peregrine recommends a stocking density of one horse per two acres. Dr. Holland points out that when you put more horses in a smaller area, their manure and feeding areas are more

likely to mix, exposing horses to a higher parasite population.

Provide feeders. Provide hay feeders in stalls and dry lots so horses can't drag their hay through their manure before they ingest it.

Pick up manure. "If you pick up manure twice a week, you can have as big an impact on parasite populations as the most rigorous deworming program," says Dr. Peregrine.

Manage manure. Too often, horse owners spread manure back onto their pastures. If you do this while parasites are still viable, you're just spreading huge numbers of parasites across your horses' grazing area; the same goes for dragging and harrowing pastures.

Horses are naturally designed to create an area for waste and an area for grazing. This is nature's way of not allowing the horses to eat where the parasites are. By spreading manure across the field, you're breaking down that instinctive barrier.

You can spread manure on your pasture if you'll keep horses off the pasture for several weeks after application while the temperature is hot enough to neutralize parasites.

Consider composting manure. The heat produced by the composting process will kill off the parasites. Your local agricultural extension agent can assist you in setting up a composting system right for your property.

Rotate pastures. Don't allow your horses to graze down the field to the point that they're eating among their manure piles.

Quarantine new horses. "Whenever you bring a new horse onto your premises, quarantine him while you look for infectious diseases and perform a fecal to see what parasites he has," Dr. Vaala says. The same holds for horses returning to your property after a trail ride or overnight camping trip. Dr. Holland recommends two to three weeks of separation from your other horses.

Add another species to your herd. "Sheep, for instance, will graze the pasture way down," says Dr. Vaala. This will expose the parasites to damaging sunlight and heat. Let the pasture rest for a few weeks before returning your horse or horses to the pasture.

• **Treatment task #5:** Manage your horse on the road. Horses pick up most parasites by grazing an infected area. Horse urine is toxic to small strongyle larvae, so keeping your horse in a stall at a campground isn't usually a danger. However, roundworms can be picked up in stalls or on pasture.

"Even if your horse isn't standing on a pasture, you'd be surprised how many parasites he's getting into," says Dr. Holland.

By allowing your horse to graze the area

around a trailhead — the same area 100 or so horses before him have grazed and deposited manure — you're exposing him to all of the parasites the horses before him carried. The same is true for horses in portable corrals. Instead, bring your own hay, and keep him in a stall or on a tie-line.

As mentioned earlier, when you return from a trail ride or trip where your horse may've been exposed to parasites, ask your veterinarian to perform an FEC.

If your travel plans coincide with your horse's next scheduled deworming period, Dr. Holland recommends deworming one to two weeks before departing. Deworming products are formulated for health and safety, but if you wait until the day before you leave, and your horse has a negative reaction, you may have to miss your trip.

A Future Look

Parasitology has been covered relatively lightly in veterinary schools; drug manufacturers and parasitologists are working to reeducate practicing veterinarians with regard to parasite resistance to deworming drugs.


Researchers are working fervently to find a new class of deworming chemical to combat equine parasites. They're also trying to develop detection methods that are more accurate than the FEC.

Product manufacturers are making deworming easier for horses and owners, too. For instance, Pfizer Animal Health is paying attention to the tastes horses enjoy, so they'll be less likely to spit out the deworming product. Pfizer is also looking at how easily the medication dispenses from the tube.

As the true impact of resistance is being realized, it's more important than ever to communicate with your veterinarian, as well as with the drug companies. If your horse's FECs show a lack of chemical effectiveness, let the manufacturer know, and ask your veterinarian for a new plan of attack.

"I think, in the mind-set of the past, we assumed the drugs worked very well," says Dr. Peregrine. "In horses, you can't make that assumption anymore."

"We're looking for a brand-new class of drugs," notes Dr. Vaala. "But even if a drug were to come out two years from now, we need to be smarter about how we use the drugs."

Now is the time to discuss parasite control and the issue of resistance with your veterinarian so you can stay current on developments and keep your trail-riding buddy in the peak of health. 

Resource Guide

Agri Laboratories

(800) 542-8916; www.agrilabs.com

Bimeda Animal Health

(888) 524-6332; <http://us.bimeda.net>

Durvet

(800) 821-5570; www.durvet.com

Equi Aid

(800) 735-3399; www.equiaid.com

Intervet/Schering-Plough Animal Health

(800) 992-8051
www.getrotationright.com

Farnam Companies

(800) 234-2269
www.farnamhorse.com

Fort Dodge Animal Health

(800) 533-8536
www.fortdodgelivestock.com

Merial

(888) 637-4251; <http://us.merial.com>

Pfizer Animal Health

(800) 366-5288; www.pfizerah.com
www.rotationiskey.com



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Over-using dewormer compounds can lessen their efficacy. Recent studies* show how parasite resistance may be better controlled utilizing a rotational deworming program.

Start with **Safe-Guard Power-Dose** (Fenbendazole Five Day Treatment) to help manage the cycle of resistance and **power up** your deworming program.

The Safe-Guard Annual Rotation Plan					
Deep Freeze (Winter)	Past Thaw (Spring)	Grazing Season (Summer)		First Freeze (Fall)	
Rotation 1	Rotation 2	Rotation 3	Rotation 4	Rotation 5	Rotation 6
Fenbendazole 5 Day Treatment	Ivermectin or Moxidectin	Pyrantel Pamoate	Fenbendazole	Ivermectin or Moxidectin (with Praziquantel)	Pyrantel Pamoate



Find out more at www.getrotationright.com and receive a **FREE** Rotational Barn Chart

Your veterinarian can help design a parasite prevention program tailored to your individual horse's needs with consideration given to age, geographic location, environmental conditions, fecal egg counts, housing conditions, and number of horses on your premises.

* M. Blane, H. A. Brady, W. T. Nichols, D. P. Hutcheson, S. P. Jackson, K. R. Pond and K. R. Wilson. Investigation of anthelmintic and deworming regimens in horses. *Professional Animal Scientist*. 22(2006): 346-352
M. Edmonds and J. Edmonds. Efficacy of an Equine Rotation Deworming Program. Data on File. (2008).

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