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Can the cycle be broken?*

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Tapeworms UNCOVERED

Why should you care about tapeworms or oribatid mites? Because the former can threaten your horse's life, and he acquires them by eating the latter! Now learn what you can do about it.

BY KIMBERLY S. BROWN

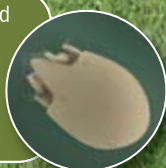
The mites containing the tapeworm cysticercoids follow the GI tract to the small intestine, where they are fully digested and release the developing tapeworms.

The tapeworm cysticercoids develop into adults and attach to the lining of the GI tract with sharp hooks at the junction of the small intestine and cecum, while they mature. This can cause colic in the horse.



Mature tapeworms have a series of proglottids (body segments), which detach and release—these are filled with eggs. The eggs are released in the manure and then onto the pasture.

The horse picks up oribatid mites containing infective tapeworm larvae (cysticercoids) while grazing, eating hay, or in bedding.



Oribatid mites ingest the eggs, which will hatch and develop into larvae, thus continuing the cycle. The eggs develop to an infective stage within the body of the oribatid mite in about two to four months.

When veterinarians learned that by keeping fleas off dogs and cats they could reduce (and nearly eliminate) the animals' problems with tapeworms, it was a huge breakthrough in animal care. Knowing the life cycle of the tapeworms that commonly infect dogs and cats has made a significant difference in how owners care for their animals.

Unfortunately, the oribatid mite is the intermediate host for equine tapeworms, and it's nearly impossible to keep oribatid mites away from horses (see tapeworm life cycle on page 3).

Before we get into tapeworm prevention, let's review what we now know about how horses get tapeworms so we might better understand how to break that cycle (much like was done with fleas and dog/cat tapeworms).

While having a large number of oribatid mites is a good thing for the fields, the more mites there are, the more opportunities your horses have to potentially ingest tapeworm-infected mites while grazing and, thus, complete the life cycle of the equine tapeworm. Some research has shown that hundreds of thousands of mites can live in one square meter (3.281 square feet) of soil. In one study, it was reported that oribatid mites existed in populations of 400,000 per square meter in forests. Another cited an analysis of one square meter of mixed temperate hardwood or boreal coniferous litter that harbored "upwards from one million mites representing 200 species in at least 50 families."

YIKES! A million per square meter? Even if the populations were just thousands per every 3 square feet your horse grazes, that's a lot of exposure to oribatid mites, which, depending on the species of mite, could translate into a lot of exposure for horses to tapeworms.

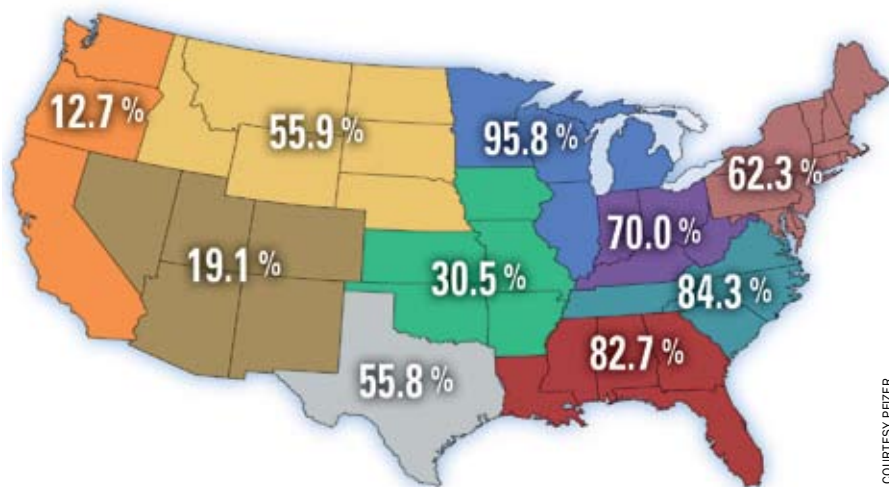
Is that a problem? Only if your horses graze on good pastures, eat hay, or are bedded on straw or wood products. Therefore, it looks like breaking the life cycle for equine tapeworms (as can be done with dogs and cats) isn't practical.

(Note, the presence of the types of oribatid mites associated with the equine tapeworm life cycle has not been proven in hay, straw, or wood products, or in aquatic environments, but there has been research showing that various species of oribatid mites are found in water, barley, wheat, and rice straw.)

Why Are Tapeworms a Problem?

There are three species of tapeworms that can use the horse as a host, but the one most commonly found in the United States is *Anoplocephala perfoliata*. Studies have demonstrated that *A. perfoliata* is the most common tapeworm in the horse, followed by *A. magna*, with *P. mamillana* being quite rare.

Tapeworms generally are ingested when the horse picks up oribatid mites while grazing, eating hay, or even in bedding. The oribatid mites pick up the tapeworm eggs from equine feces while ingesting organic material. The eggs develop to an infective stage (the larval, or cysticercoid stage) within the body of the oribatid mite in about two to four months. Horses



COURTESY PFIZER

Map of the United States with regional prevalence of tapeworm antibodies established by a survey done by Dr. Craig Reinemeyer.

Oribatid Mites

Oribatid mites are kin to spiders and ticks, but instead of feeding on insects and blood, they feed on fungi, algae, and dead plant matter in the soil. (Note that some species of oribatid mites do eat tiny insects and worms that live in the soil.) Oribatid mites are very small—only about a millimeter long (about 0.039 inches; you would need a microscope to see one).

Oribatid mites have been studied quite a bit in the last decade around the world because of their importance in healthy forests, pastures, and soils. They are considered the "recyclers" of the ground because they break down organic materials that plants then can utilize for growth. What has been found in recent research is that the healthier the pasture and the environment, the more oribatid mites that can be found. (They are also found to be good

indicators of environmental conditions and air quality, specifically ozone.)

There are 45,000 known species of oribatid mites, which are considered ancient species. Mites are among the oldest of all terrestrial animals, and scientists have discovered fossils dating to the early Devonian Period of the Paleozoic era, nearly 400 million years ago. There are examples of oribatid mites being found that date back to the late Paleozoic and Mesozoic eras. (Mesozoic includes the Jurassic Period, for you movie-goers.)

Oribatid mites don't burrow through the soil; they depend on the tunnels of other critters to make their way around. They are long-lived, taking from several months to two years to develop from egg to adult, depending on the species. Mites are very powerful, with some species studied having the ability to pull 530 times their weight.

swallow infective mites and the worms mature within the horse in six to 10 weeks.

The tapeworm cysticercoids develop into adults that attach to the lining of the gastrointestinal (GI) tract with sharp hooks. (A tapeworm's mouthparts contain a scolex, which has four suckers enabling it to attach tightly to the horse's gut wall.) Tapeworms usually take up residence at the junction (or valve) of the small intestine and cecum (ileocecal junction, see the image on page 6).

Tapeworms are shaped differently than most other internal parasites: they are flat, segmented worms that are called cestodes, making them different from most equine parasites, which are nematodes (roundworms). Tapeworms get their name because the body of an adult worm typically is flat and segmented at regular intervals, like a measuring tape. Each tapeworm body segment (proglottid) is a separate unit (think box cars on a train).

Tapeworms can cause problems in two ways: They cause inflammation in the gut lining where they attach, and if large quantities of tapeworms are present, they can actually block passage of food through the GI tract, as these tapeworms can grow from 1.5 to 3 inches in length. (Picture a straw with thousands of small rubber bands stopping it up.)

Tapeworms don't "suck" the nutrients or blood from the horse's gut wall; instead, they absorb nutrients through their skin.

The tapeworms complete their life cycle in the horse's gut and eggs are passed out through the feces.

How Do You Know if Your Horse Has Tapeworms?

If your dog or cat has tapeworms, you might see the segments in their feces or stuck to the hair under their tails. The same might be true of your horse. However, the tapeworm segments in horses are much smaller than those in dogs and cats.

You can do a fecal exam in the lab, but the eggs in equine feces are hard to detect, are shed intermittently, and by the time the segments pass through the horse's digestive tract, they are usually unrecognizable in equine feces. You can do a blood test to detect antibodies to tapeworms, but that only tells you if your horse has been exposed, not if he has an active infection.

The only way to know if your horse has

ORIBATID MITES

- Kin to spiders and ticks
- 45,000 known species
- Feed on fungi, algae and dead plant matter in soil
- Important in healthy forests, pastures and soils because of their "recycling" abilities
- Among the oldest of all terrestrial animals (400 million years old!)
- Can live from several months to two years, depending on the species
- Studies have found 400,000 to one million living in one square meter
- Serve as intermediate hosts for equine tapeworms

tapeworms and how bad the infection is would be to open him up and look.

While we don't want to do that with healthy horses, there have been post-mortem surveys conducted in various countries that looked at tapeworm populations in horses. Several have reported that 50-60% of horses examined were infected with tapeworms. The most thorough investigations in the United States were done in Kentucky, where three surveys found the prevalence of tapeworm infection in adult horses to be 53% (1983), 54% (1984), and 64% (1992).

A 2002-2003 survey using blood samples submitted for equine infectious anemia testing in 19 states found that more than 54% of all horses sampled had antibodies to *A. perfoliata*. Prevalence estimates ranged from below 12% in California to higher than 98% in Minnesota; in all, the prevalence of tapeworm antibodies was greater than 30% in 15 out of 19 states.

Since that time veterinarians and researchers have come to the conclusion that perhaps the lower levels of tapeworm infestations in some areas were due to lack of pasture/grazing time of the sampled population. In other words, based on this study, just because you live in California doesn't mean your horse doesn't have tapeworms.

Analysis of the results of that same study found that horses older than 15 years of age were significantly more likely to have tapeworm antibodies than younger horses. Researchers have known that foals rarely have high numbers of tapeworms before

forage becomes a major portion of their diets.

Horses Have Tapeworms; So What?

Parasitologists used to not be concerned about tapeworms in horses because they didn't see evidence of problems caused by tapeworms. As time progressed and evidence of high numbers of tapeworms became evident, so did the realization that horses exhibited health problems associated specifically with tapeworms. Specifically, tapeworms have been linked in research to ileocecal intussusceptions (see below), ileal impaction colic, and spasmodic (gas) colic.

An ileocecal intussusception is a long title for a condition in which one piece of intestine gets pushed into another piece of intestine (like a collapsible telescope), which causes inflammation and blockage. In this case, tapeworms like to set up housekeeping in the equine GI tract at the area of the ileocecal junction. The irritation of the tapeworms sinking their hooks into the intestinal wall causes exaggerated peristalsis (waves of muscle contractions that move food through the GI tract). This results in the small intestine getting pushed through the opening into the cecum.

Ileocecal intussusceptions can only be corrected surgically, and the prognosis of complete recovery is guarded.

Tapeworms also can cause the wall of the ileum to become thickened and inelastic, slowing or blocking the movement of food through the GI tract. These blockages can only be corrected with surgery. In severe cases they can cause rupture of the small intestine.

A 1998 study by Chris Proudman, MA, VetMB, PhD, CertEO, FRCVS, of the University of Liverpool, estimated that some 81% of ileocecal impaction colics were tapeworm-related, and he demonstrated that horses with tapeworms were 28 times more likely to experience this condition than uninfected horses.

Tapeworms also have been shown to cause spasmodic colic. One study showed the presence of tapeworms made horses eight times more likely to experience spasmodic colic than horses without tapeworms. Spasmodic colic is common, can be caused by many different factors, and can be treated medically.

Authors of a recent study disputed some

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of these findings of tapeworm association with colic, but they put forth caveats. “Our results do not rule out tapeworms as an important cause of certain types of colic in horses,” emphasized Andrew Peregrine, BVMS, PhD, DVM (Hons) Glasgow, Dipl. EVPC, MRCVS, a veterinary parasitologist in the Department of Pathobiology at the Ontario Veterinary College in Canada. “Furthermore, in light of the variation in climate across North America, more research is necessary elsewhere in Canada, and the United States, to determine whether our findings are applicable to horses outside southern Ontario.”

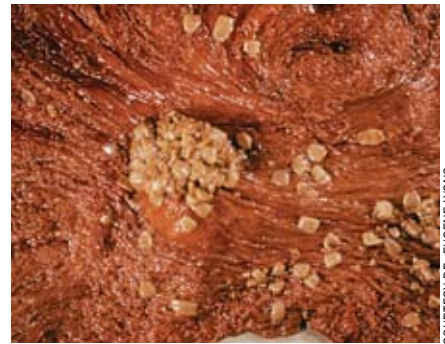
So, How Can I Get Rid of Them?

It wasn't until the deworming active ingredient praziquantel came off patent that equine pharmaceutical companies developed products against equine tapeworms. This ingredient had been proven effective in treating tapeworms in dogs and cats, and Gene Lyons, PhD, at the University of Kentucky's Gluck Equine Research Center in Lexington, had demonstrated several years prior to the patent ending that praziquantel was highly effective against *A. perfoliata* infections in horses at all dosages greater than 1 mg/kg.

In 2003 the FDA approved three new deworming products that include praziquantel (at a variety of dosages) combined with other active ingredients to offer a complete anti-parasitic spectrum that targets tapeworms, bots, and most types of nematodes. Remember that the ivermectins, moxidectins, and other common deworming ingredients are not effective against tapeworms; you must look for the addition of praziquantel on the label.

Take-Home Message

Breaking the life cycle of equine tapeworms hinges on preventing horses from contaminating the environment with tapeworm eggs. Eliminating the oribatid mites in pastures is not possible (and is contraindicated for having healthy pastures). Confirming whether your horse is infected with tapeworms is difficult. Therefore, you should assume your horse has tapeworms and work with your veterinarian to reduce the amount of tapeworm eggs your horse is shedding into the environment. This might mean deworming with a product containing praziquantel



COURTESY DR. EUGENE LYONS

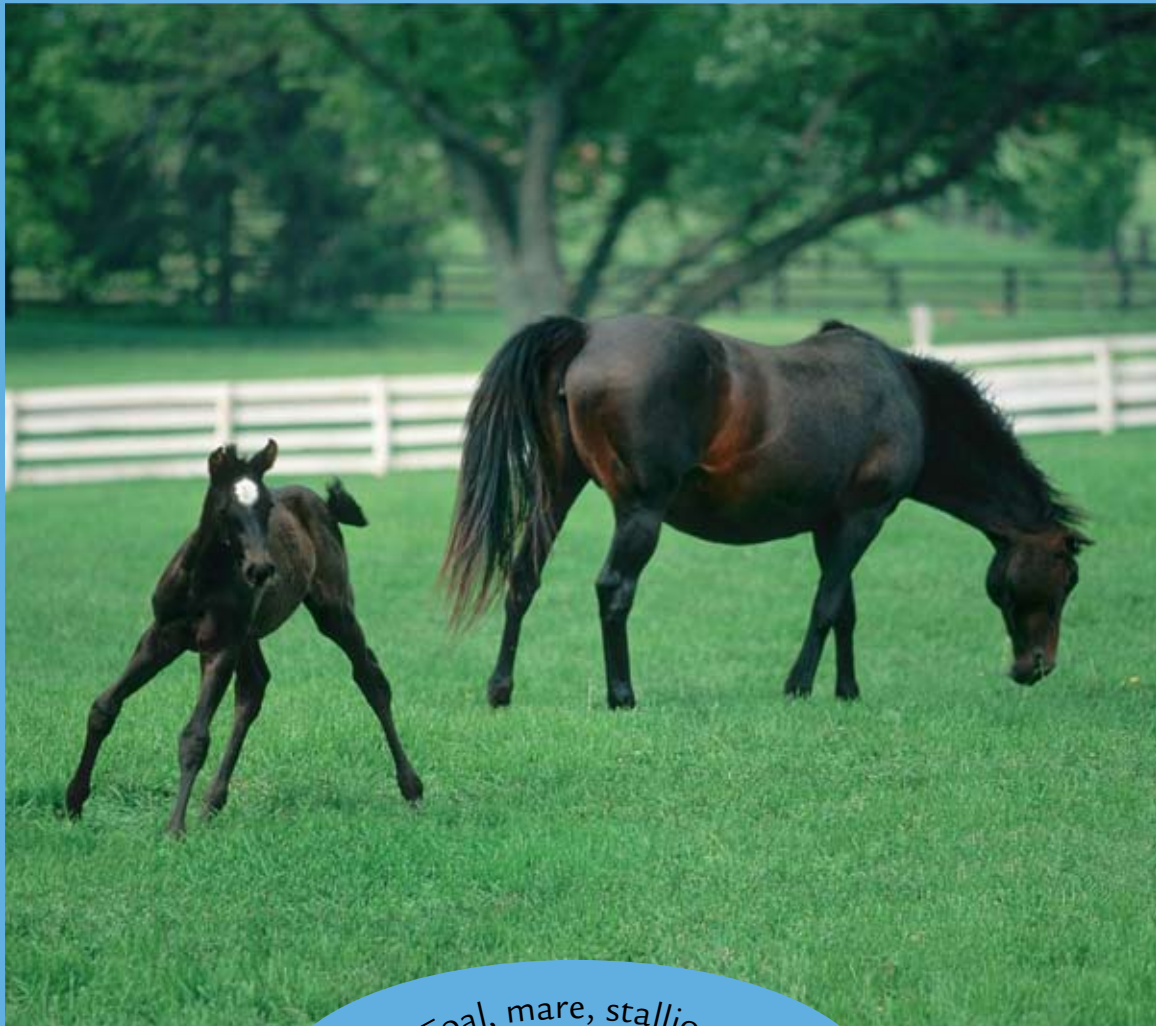
Tapeworms usually take up residence at the junction (or valve) of the small intestine and cecum (ileocecal) junction, seen here.

once or more often per year, depending on your horse's environment, grazing and feeding regimens, and indications of tapeworm infections (your horse or others on the property suffering from the colics associated with tapeworms).

Researchers will continue work that might enable us to reduce or eliminate the equine tapeworms in our horses. 🐾

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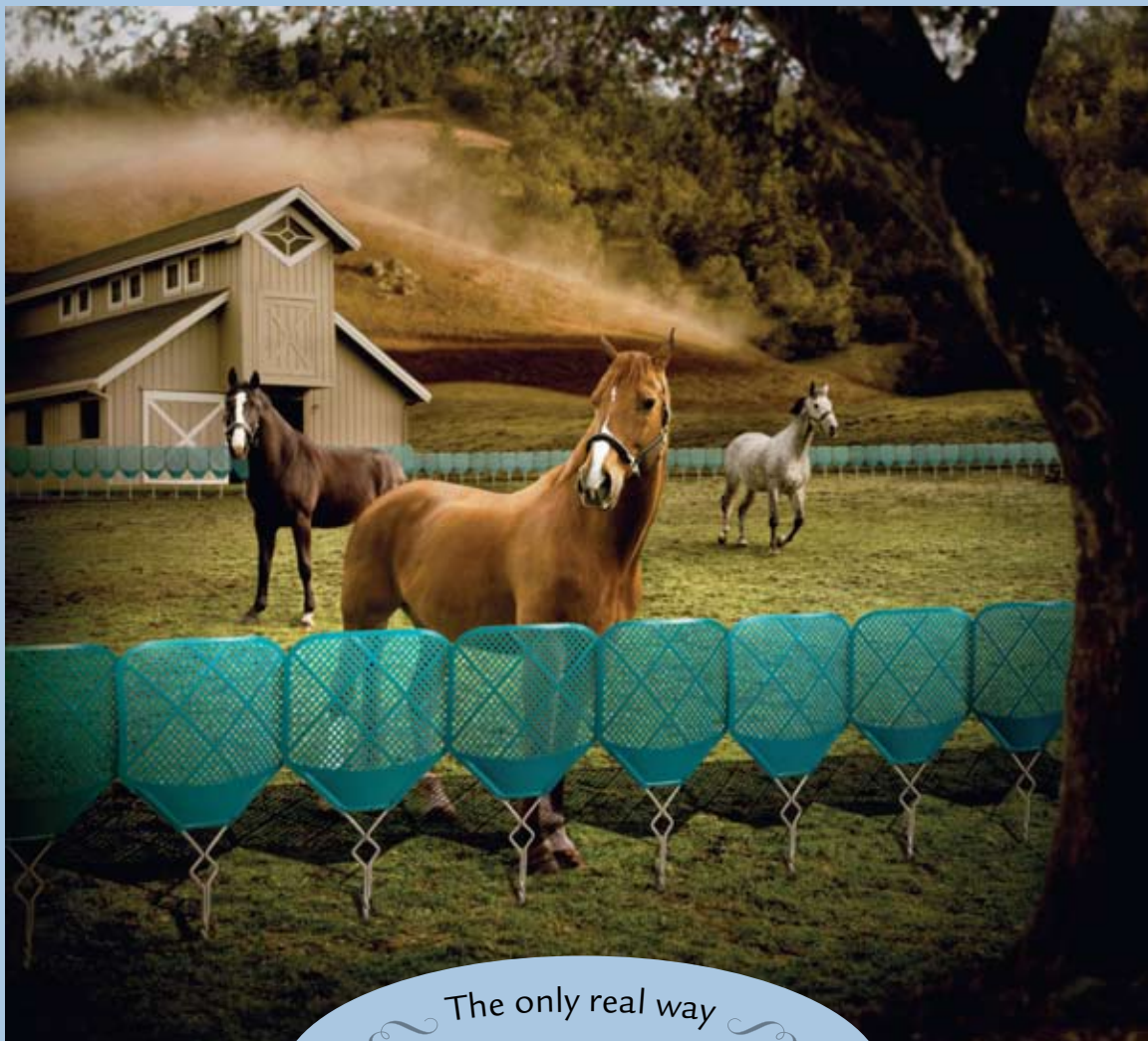
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