

## PARASITE 101



# A Clinical Overview of Whipworms

By Dwight D. Bowman, PhD

Whipworms (*Trichuris* spp) are parasites that live in the cecum and colon of mammals,<sup>1</sup> although some species can be found in the stomach of a few primates, such as the colobus monkey, with gastric fermentation.<sup>2</sup> The worms live with the anterior end threaded through a cellular syncytium within the mucosa, while the posterior end is free within the lumen. The eggs leave the female from the vulva, which is located at about the level where the body thickens behind the esophagus. The males have a coiled tail and a sin-



Figure 1. This slide contains three *Trichuris vulpis* eggs from a naturally infected dog. The two smaller eggs on the right are typically sized *T. vulpis* eggs. The 1-g fecal sample, processed with sugar flotation, contained hundreds of similarly sized eggs. The egg on the bottom left is an oversized *T. vulpis* egg that measures slightly more than 100  $\mu\text{m}$  long. The scale bars each represent 100  $\mu\text{m}$ , with each line representing 10  $\mu\text{m}$ . (Courtesy of Alice Che Yu Lee, Cornell University)

gle spicule. Both males and females have a glandular stichosome esophagus, and the anus is terminal rather than subterminal, as in most other nematode parasites.

Research on the life cycle of this parasite has been sparse, but Campbell<sup>3</sup> has summarized the three potential life-cycle scenarios after egg ingestion:

1. Larvae enter the mucosa of the small intestine for 8 to 10 days before reentering the lumen and moving to the cecum, where they complete development.<sup>4</sup>
2. Larvae enter the mucosa of the small intestine and migrate within the mucosa to the cecum.<sup>5</sup>
3. Larvae enter the mucosa of the cecum and remain there to maturity.<sup>6</sup>

The eggs, which are not developed when passed (Figure 1), will contain infective first-stage larvae in 9 to 10 days at 33°C to 38°C and in 25 to 26 days at 19°C to 25°C.<sup>7</sup>

The prepatent period is around 70 to 100 days, adult worms live months to years, and females produce between 4,000 and 8,000 eggs per day.<sup>3</sup>

The thick-shelled egg of whipworms is not as buoyant as many other parasite eggs. Therefore, most parasitologists agree that diagnosis is best achieved by finding eggs using centrifugal sugar flotation (specific gravity of 1.27 to 1.3) with a swinging bucket rotor.<sup>8</sup> This provides much greater recovery than stationary flotation in a solution of sodium nitrate (specific gravity of 1.2) or centrifugal flotation in zinc sulfate (specific gravity of 1.18 to 1.2). Light infections — 50 eggs or so per gram — usually can be detected routinely with sugar flotation, but the consen-

## Protecting Pets and People from Parasites

The Companion Animal Parasite Council (CAPC) is an independent council of veterinarians and other animal health care professionals established to create guidelines for the optimal control of internal and external parasites that threaten the health of pets and people. It brings together broad expertise in parasitology, internal medicine, public health, veterinary law, private practice, and association leadership. Initially convened in 2002, the CAPC was formed with the expressed purpose of changing the way veterinary professionals and pet owners approach parasite management. The CAPC advocates best practices for protecting pets from parasitic infections and reducing the risk for zoonotic parasite transmission. Sponsoring the peer-reviewed Parasite 101 column is one more avenue for reaching veterinarians on important topics and issues related to the prevention of parasitic transmission and disease.



sus is that very light infections — fewer than 50 eggs per gram — may not be diagnostic when a single flotation is performed on one fecal sample.

Little work has been done on the survival of *T. vulpis* in soils. With *T. suis*, a species that affects pigs, eggs can survive under field conditions for 11 years.<sup>9</sup> In addition, many *T. suis* eggs applied to pastures in

### It's All in the Name

In 1761, Roederer named the genus *Trichuris* because the worm looked like a bullwhip with a thin anterior end (the whip, "trich" = thread) and a thickened tail (the handle, "uris" = tail). Unfortunately, Roederer initially misidentified which end was which, and for a while some called the worm more correctly *Trichocephalus* (thread head). However, in 1941, a committee decision based on the rules of priority set the name to be *Trichuris*. The species that affects the dog and fox, *Trichuris vulpis*, was described by von Frölich in 1789.

Denmark during different seasons did not become infective until the second summer<sup>10</sup>; large percentages of the eggs did disappear after application, but in soil, some viable eggs persisted in all samples after application.

In dogs with light infections of *T. vulpis*, the worms usually are found in the cecum, and a few worms typically cause no noticeable signs. As adult worm numbers increase toward the hundreds, worms also appear in the mucosa of the colon. Disease occurs primarily with heavier infections and can be associated with severe and bloody diarrhea, dehydration, and anemia.<sup>3</sup>

*T. vulpis* has on occasion been referred to as a zoonotic infection, but

this author is far from convinced that this is the case. *T. trichiura*, the species of whipworms affecting humans, is known to sometimes produce large eggs that are similar in size to those of *T. vulpis*. These abnormal eggs, when placed alongside the regular-sized, smaller *T. trichiura* eggs in a human fecal sample, can resemble the eggs of *T. vulpis*. However, adult worms recovered from these patients have been determined to be *T. trichiura*.<sup>11</sup> The author and coworkers have seen a similar situation in dogs in which some *T. vulpis* eggs are enlarged compared with the average-sized eggs typically produced by this worm (Figure 1).

*Trichuris* spp do not cause lesions external to the gastrointestinal mucosa. Sakano et al<sup>12</sup> reported a case of *T. vulpis* causing visceral larva migrans, with an adult worm being described in a lung biopsy. However, examination of the described morphology and images make it seem likely that this was a misdiagnosed infection with a male *Dirofilaria immitis* (Personal communication, M. Eberhard, division of parasitic diseases, Centers for Disease Control and Prevention, 2008). The author is unaware of any additional reports of whipworms being recovered from sites ectopic to the mucosa of the gastrointestinal tract in other hosts.

Whipworms should not be forgotten as canine parasites. In a national survey of shelter dogs, whipworms were commonly found in dogs of all ages.<sup>13</sup> It should be noted that in this survey, adult dogs were almost as susceptible as younger dogs to infection. In samples from shelter dogs that the author has observed in recent years, whipworm eggs are still one of the most commonly recovered types of eggs. In addition, it should not be

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forgotten that foxes and coyotes are both regular hosts for this parasite and act as reservoirs of canine infections.

Currently, the following prescription treatments are approved for canine whipworms:

- Febantel (stand-alone anthelmintic; formulated with praziquantel and pyrantel in Drontal Plus, Bayer Animal Health)
- Fenbendazole (stand-alone anthelmintic; formulated as SafeGuard Canine Dewormer, Intervet/Schering-Plough Animal Health)
- Milbemycin (heartworm preventative; formulated as Interceptor and with lufenuron in Sentinel, both Novartis Animal Health)
- Moxidectin (heartworm preventative; formulated with imidacloprid in Advantage Multi, Bayer Animal Health)

Because Interceptor, Sentinel, and Advantage Multi are heartworm preventatives as well as anthelmintics, the dog's heartworm status should be determined before using them as whipworm treatment. All five products are highly efficacious against *T. vulpis* and will remove more than 90% of adult worms with a single treatment. However, because the long prepatent period and prolonged viability of the parasite in the environment contribute to the risk for reinfection, more than one treatment may be necessary.

Conducting fecal regular examinations is a good idea — even for well-cared-for pets — as there is a chance that an otherwise-protected dog has acquired an infection by ingesting or mouthing soil contaminated with infective eggs. Regular fecal examinations can ensure that the dog's home environment does not pose a risk for continued self-infection. This is a

good policy that is recommended by the Companion Animal Parasite Council (CAPC). **vF**

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