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THE IMPORTANCE OF DIAGNOSIS

The elusive whipworm, *Trichuris vulpis*



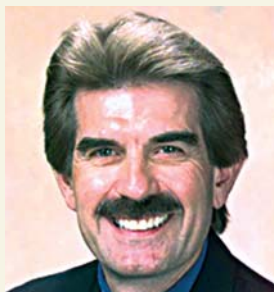
clinician's brief®
THE OFFICIAL PUBLICATION OF NAVC

SUPPLEMENT TO NAVC CLINICIAN'S BRIEF® SEPTEMBER 2008
www.cliniciansbrief.com

Sponsored by an educational grant from Novartis Animal Health

The importance of diagnosis

THE ELUSIVE WHIPWORM, *TRICHURIS VULPIS*



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Recent testing has shown that centrifugation with Sheather's sugar or zinc sulfate solution was significantly more likely to detect whipworm eggs than passive flotation.³

Trichuris vulpis is a ubiquitous intestinal parasite of dogs and wild canids. Although trichuriasis may be subclinical, it is a common cause of large bowel diarrhea in dogs and heavy infections can cause serious, life-threatening disease. In a national prevalence study, *T vulpis* was found in 14.3% of dogs in the United States. This is similar to the number of *Toxocara canis* infected dogs found in the same study.¹

WHIPWORM LIFE CYCLE

The whipworm, *Trichuris vulpis*, gets its name from the whip-shaped appearance of the adult worm. The anterior end is fine and hairlike; the posterior end is stout and resembles a whip handle. The life cycle is direct – only one host is exploited. Whipworm eggs are oval, yellowish-brown, and thick-shelled with 2 polar plugs. *T vulpis* eggs are approximately 72 to 90 μm by 32 to 40 μm . The egg is very resistant to environmental degradation – eggs can remain viable for years, resisting winter freezes as well as summer heat. Environmental contamination can lead to future infection and reinfection.

An infective first-stage larva develops within the egg, but does not hatch until it is swallowed by an appropriate host. Once the larvated egg is ingested, the larva hatches in the small intestine. In experimentally infected dogs, larvae penetrated the small intestinal mucosa and stayed for about 15 days before colonizing the cecum and large intestine.² Once in the large intestine, sexual maturity occurs. The whip-shaped anterior end embeds into the walls of the large intestine and cecum with the larger posterior end free in the lumen. After about 3 months, adult females begin shedding eggs every few days.

DIAGNOSIS

Infected dogs may have periods of diarrheal feces with blood and mucus and periods when normal stool is passed. Identifying the elusive whipworm is challenging for several reasons:

1. The prepatent period is a little less than 3 months, the earliest an egg can be recovered from feces, and clinical signs may be seen before egg production begins.
2. Female whipworms do not produce eggs every day. Compared to many other intestinal parasites, whipworm egg production is fairly small. Because of intermittent egg shedding, it is recommended that fecal samples be collected over a period of days before ruling out trichuriasis.
3. Because whipworm eggs are so dense (Sp Gr 1.15), a flotation solution must have a specific gravity of least 1.20. A study comparing the number of eggs recovered from 2 different volumes of feces set aside for 5, 10, or 20 minutes suggests that a larger volume of feces and a longer set-aside time increases the likelihood of finding *T vulpis* eggs (see **Detecting whipworm infection** on page 4).

Key Points^{4,5}

- *T vulpis* eggs can remain viable in soil for up to 7 years.
- Infected dogs may have periods of diarrheal feces with blood and mucus.
- Infection can lead to weight loss, anemia, and dehydration.
- Environmental contamination can lead to future infection and reinfection.
- Whipworm infection requires specific laboratory methods for correct diagnosis.
- *Trichuris* eggs inhabit contaminated soil in damp, shady areas.
- Cement, gravel, or sand dog runs may help reduce contamination.
- Use of anthelmintics may help reduce the risk of environmental contamination.

Difficulties in diagnosing whipworm infection

- Egg production is small
- Intermittent egg shedding
- Eggs are very dense (Sp Gr 1.15) and don't float easily
- Pseudoparasitism (other similar-looking objects)



Trichuris vulpis adult (canine whipworm)

- Centrifugation with Sheather's sugar solution (Sp Gr 1.27) or zinc sulfate solution ($ZnSO_4$; Sp Gr 1.20) is the recommended technique for fecal analysis, as it increases the chance of finding whipworm eggs.

CONTROL

Because of the longevity of *Trichuris* eggs (up to 7 years), infection may be difficult to control. Preventing trichuriasis is difficult when soil is contaminated with *Trichuris* eggs, which survive best in damp, shady areas. The use of cement, gravel, or sand dog runs may be helpful in reducing risk for infection. Feces should be removed as often as possible. Use of effective anthelmintics can also reduce the risk of environmental contamination.

Whipworm infection can be a persistent problem throughout a dog's life.

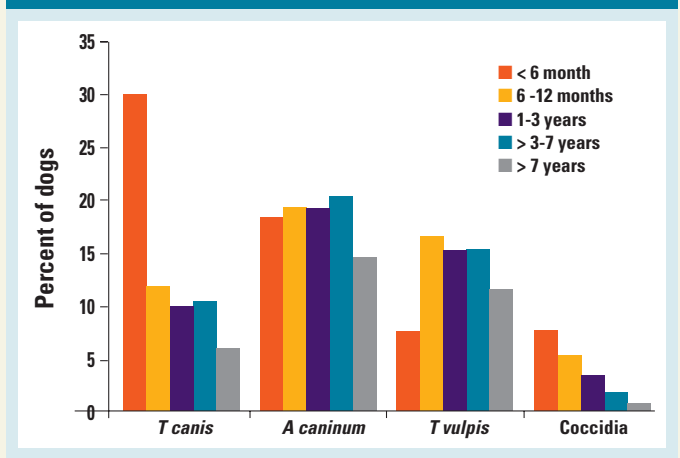
Parasite prevalence in dogs in the U.S.¹

Region	<i>T vulpis</i> (whipworm)	<i>T canis</i> (roundworm)
Southeast	19.9%	17.7%
Central	16.4%	15.8%
Northeast	14.9%	12.6%
West	4.4%	11.1%

Parity of whipworms and ascarids (roundworms)

Whipworms	Roundworms
14.3% of dogs	14.5% of dogs

Prevalence of selected parasites by dog's age¹



Whipworm egg recovery techniques

Flotation technique	Recommended
Centrifugation with either Sheather's sugar or $ZnSO_4$ solution	YES
Assay kit – 5 min	NO
Assay kit – 10 min	NO

Can you identify these look-alike eggs?

<i>Trichuris vulpis</i>	<i>Trichuris ovis</i> – Whipworm of cattle and sheep (canine pseudoparasite from ingested feces)	<i>Eucolus (Capillaria) aerophilus</i> – <i>Capillaria</i> of the bronchi of dogs and cats	<i>Eucolus (Capillaria) boehmi</i> – Nasal worm of foxes and dogs	<i>Pearsonema (Capillaria) plica</i> – Bladder worm of dogs

Detecting whipworm infection

Centrifugation is the recommended fecal analysis technique for detecting *T vulpis* eggs (Sp Gr 1.15) rather than passive flotation with assay kits. Recommended solutions include Sheather's sugar solution* (Sp Gr 1.27) or zinc sulfate (Sp Gr 1.20). Studies have shown that centrifugation can increase the likelihood of finding *T vulpis* eggs.⁶ Whipworms may be difficult to detect under the best of circumstances and may rise to the surface of passive flotation preparations too slowly to allow their detection. Although centrifugation requires an initial investment in equipment and training, the benefits of providing a better diagnostic method are clear.

Laboratory requirements

- Centrifuge capacity of 1200 to 1500 rpm
- Sheather's sugar solution or zinc sulfate solution
- Additional preparation time
- Training and skill in conducting the test

Centrifugation techniques

- **Swinging bucket rotor:** Spin fecal specimens for 10 minutes
- **Fixed angle rotor:** Spin fecal specimens for 5 minutes followed by a 10-minute flotation period

* Sheather's sugar solution is now commercially available from Jorgensen Laboratories

TIP: Debris in a fecal sample can be removed with a water wash - initially mix the sample with water, then centrifuge. Resultant supernatant is discarded and flotation

Egg specific gravity of selected parasites

<i>Ancylostoma caninum</i>	1.06
<i>Toxocara canis</i>	1.09
<i>Toxocara cati</i>	1.10
<i>Trichuris vulpis</i>	1.15

T vulpis egg flotation times using ZnSO₄ solution

Comparison of varying amounts of feces (grams) and flotation times (minutes) in 7 dogs.

Dog #	Grams/minute						EPG*
	0.1/5	0.1/10	0.1/20	1.0/5	1.0/10	1.0/20	
1	+	+	+	+	+	+	25
2	+	+	+	+	+	+	41
3	-	+	+	+	+	+	34
4	-	-	+	+	+	+	10
5	-	-	+	+	-	+	6
6	+	-	-	-	-	+	5
7	-	+	-	+	+	+	5

* EPG = Eggs per gram

solution is added to suspend the remaining pellet. Centrifuge as described below. This is not necessary on a routine basis.

Conducting a centrifugal fecal exam with Sheather's sugar solution



STEP 1 – Thoroughly mix a minimum of 1 g feces with ~15 mL Sheather's sugar solution.



STEP 2 – Strain the resulting mixture through cheesecloth or a tea strainer.



STEP 3 – Pour strained suspension into a 12- to 15- mL centrifuge tube (polypropylene is preferable to polystyrene).



STEP 4a – Swinging bucket centrifuge:

Fill the tube with fecal sample completely to the top until a reverse meniscus forms. Place the tube in the centrifuge with coverslip on top. Spin for 10 min at 1200 to 1500 rpm.

STEP 4b – Fixed angle rotor centrifuge:

Spin for 10 min at 1200 to 1500 rpm; then move the sample tube to a rack and gently add more flotation solution until a reverse meniscus forms. Add coverslip if using. Allow to sit for 10 min.



STEP 5a – Swinging bucket centrifuge:

Remove coverslip and the adhering drop of fluid and place on a microscope slide to examine.

STEP 5b – Fixed angle rotor centrifuge:

If not using a coverslip, collect surface layer of fluid by touching a glass rod, a 3-mL blood collection tube, or a bacteriologic loop to the surface of the meniscus. Deposit on a slide; then add coverslip to examine.

Contact Novartis Animal Health, 1-800-637-0281, for more information on optimizing parasite screening at your clinic.

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