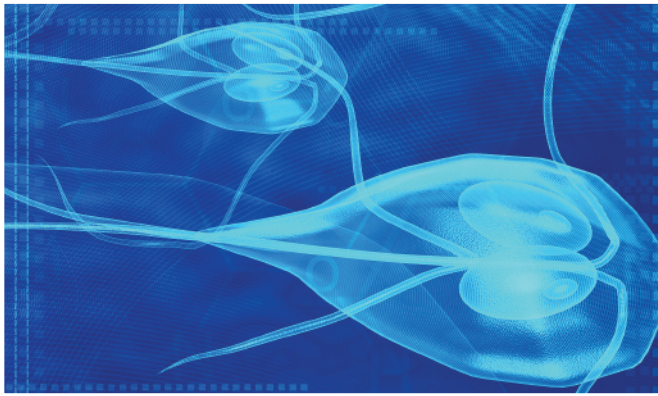


Giardiasis

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Colorado State University



Giardiasis is a protozoal infection that can affect a wide variety of vertebrates, including cats, dogs, and humans.

P Profile

Definition

- Based on genetic studies, *Giardia duodenalis* is a species complex composed of 8 assemblages (A–H).
 - Some assemblages are host specific, but others can be harbored by several species and may be considered potentially zoonotic.¹
- Dogs are most commonly infected by host-specific assemblages C and D, while cats harbor host-specific assemblage F.
- Cats and dogs also harbor zoonotic assemblages A-I, A-II, A-III, A-IV, and B.²

Systems

- The infection can be asymptomatic or produce GI signs (ie, diarrhea, malabsorption, weight loss).

Prevalence

- Prevalence is 5% in healthy cats and dogs, and 15% in clinically ill animals.³
- Prevalence is greater in young cats and dogs than in mature ones.

Geographic Distribution

- Giardiasis is diagnosed worldwide.

Signalment

- Giardiasis can occur in humans, domestic animals, livestock, and wild animals.
- There is no breed or sex predilection.

The prevalence of giardiasis is 5% in healthy cats and dogs and 15% in clinically ill animals.¹

MORE ►

Causes

- Transmission occurs via the fecal–oral route by direct or indirect ingestion of contaminated water, food, or fomites.
- Infection with *Giardia* spp occurs in 2 stages: the trophozoite and the cyst.
 - The cyst (**Figure 1**) is responsible for transmission and can survive several months outside the host in wet, cold conditions; it can dehydrate in dry and hot conditions.
- The prepatent period ranges from 5 days–16 days in cats and 5 days–12 days in dogs.
- Peak periods of cyst shedding can occur on days 2–7.

Risk Factors

- Immunosuppressed animals and animals living in crowded environments are at highest risk for exhibiting GI disease.³
- Younger animals are more likely to show clinical signs.³

Pathogenesis

- The mechanism of infection can involve:
 - Production of toxins
 - Disruption of normal flora
 - Induction of inflammatory bowel disease
 - Inhibition of normal enterocyte enzymatic function
 - Blunting of microvilli
 - Induction of motility disorders
 - Induction of intestinal epithelial cell apoptosis⁴

- As a result, diarrhea can be caused by a combination of intestinal malabsorption and hypersecretion of electrolytes.

Signs

- Most dogs and cats that shed *Giardia* organisms are asymptomatic.
- In clinically affected animals, diarrhea can be mucoid, pale, and soft and have a strong odor; steatorrhea may be present.
 - Mild to moderate discomfort from abdominal inflammation can occur with diarrhea.
- Immunosuppressive disease or coinfection with other pathogens can exacerbate clinical signs.⁵
- Whether different assemblages cause different signs remains unknown.

Dx Diagnosis

Definitive

- In cats and dogs with diarrhea, the Companion Animal Parasitic Council (CAPC) guidelines recommend testing by direct smear, fecal flotation with centrifugation, and a specific fecal ELISA.

Direct Smear

- Trophozoites are rarely seen in solid feces but can be observed in a small sample of fresh diarrhea when mixed with a drop of 0.9% saline solution on a microscope with a coverslip.

- At 100× magnification, active falling leaf motion of trophozoites can be observed.
 - Trophozoites can appear very active within a small area of the slide and can be easily kept in the field of view.
 - At 400× magnification, structural characteristics can be observed.

Fecal Flotation with Centrifugation

- If *Giardia* trophozoites are not detected in direct smears, cysts should be examine by fecal flotation using Sheather sugar (1.25 SG) and zinc sulfate (1.18 SG).
- Zinc sulfate is considered the flotation medium of choice for *Giardia* cyst detection.

Fecal ELISA

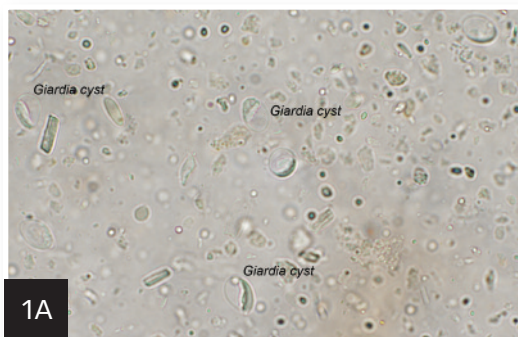
- SNAP *Giardia* Test (idexx.com) is the only commercially available ELISA for detecting *Giardia* spp in cats and dogs.
- Some laboratories use ELISA plate assays that have been internally validated to detect *Giardia* spp in cats and dogs.
- To rule out *Giardia* infection, ≥3 samples should be examined within 1 week.

Differential

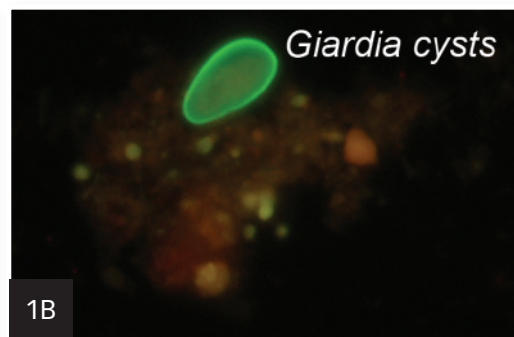
- In dogs and cats, noninfectious and other infectious causes of small intestinal diarrhea, IBD, exocrine pancreatic insufficiency, malabsorption

1

Giardia cysts seen on (A) fecal flotation at 100× magnification and (B) immunofluorescent antibody assay at 400× magnification.



1A



1B

syndromes, and neoplastic intestinal disease need to be ruled out.⁶

- In cats, *Tritrichomonas foetus* infection must be ruled out.

Laboratory Findings

- In general, results of CBC, serum biochemistry panel, and urinalysis will be within reference ranges.
- Any detected abnormalities are likely from dehydration and electrolyte losses associated with diarrhea.

Other Diagnostics

- Immunofluorescent antibody (IFA) assay can detect *Cryptosporidium* spp.
 - IFA assay is more sensitive than fecal flotation (compared with that of performing single fecal ELISA).
 - A fluorescence microscope is needed to read the slide.
- PCR testing currently is only indicated for determining *G duodenalis* assemblages.
 - Multilocus (amplification of more than 1 gene) analysis has been recommended.⁷

Postmortem

- Giardiasis is nonfatal.
- In experimentally infected gerbils, histopathologic findings include reduced jejunal villus height and increased jejunal crypt depth.
- Slight to moderate infiltration of inflammatory cells was noted in the lamina propria and was typically more severe in the duodenum.
- Inflammatory cells included plasma cells, lymphocytes, macrophages, and mast cells.

Tx Treatment

Inpatient or Outpatient

- In general, cats and dogs with giardiasis are treated as outpatients.
- If marked diarrhea occurs and fluid therapy is indicated, animals may require hospitalization.

Contraindications, Precautions, & Interactions

- GI and neurologic toxicity after chronic therapy or acute high doses of metronidazole has been reported in some dogs and kittens.^{9,12}
- Metronidazole USP induces salivation and inappetence in some cats, but metronidazole benzoate is well tolerated.
- Neurotoxicity has been observed after administration of ronidazole.
- Albendazole can cause bone marrow suppression in cats and is not currently prescribed for use in cats or dogs.¹³
- Paromomycin can cause deafness and renal failure in some cats.⁹

- If vomiting and small bowel diarrhea are primary clinical signs, highly digestible bland diets are indicated.
- If large bowel diarrhea is principal clinical sign, high-fiber diets should be used.
- Primary focus of treatment is resolution of diarrhea.
- Treatment of asymptomatic dogs that shed *Giardia* cysts and of cats in general has been controversial.

Client Education

- Because healthy pets are not considered significant health risks for humans, elimination of infection is secondary.
- CAPC guidelines suggest that asymptomatic dogs and cats may not need treatment.

Rx Medications

Drugs/Fluids

- No drugs are approved in the United States for treatment of giardiasis in cats and dogs, but several drugs are commonly used (Table, next page).
 - In Florida, cats and dogs with acute giardiasis must be reported to the state department of health.⁸
- Metronidazole (USP or benzoate) may be indicated if clinical findings suggest concurrent *Clostridium perfringens* overgrowth.
- Iprnidazole has been shown effective for treatment of giardiasis in 2 dogs.⁹

- Six dogs treated with ronidazole and bathed twice with a chlorhexidine shampoo, along with disinfection of enclosures with 4-chlorine-M-cresol, became negative for *Giardia* cysts and antigen within 26 days.¹⁰
- Fenbendazole can be used, particularly when concurrent infection with cestodes or nematodes is suspected.
 - When fenbendazole was used for treatment of cats concurrently infected with *Giardia* and *Cryptosporidium parvum*, only 4 of 8 cats stopped shedding *Giardia* cysts.¹¹
- Combination of febantel, pyrantel, and praziquantel using different protocols was generally successful when treating giardiasis in dogs and cats.^{8,9}



Follow-up

Patient Monitoring

- Fecal flotation can be used to evaluate treatment success.
- In persistent infections, combination therapy with a second drug from an alternate class is indicated (eg, fenbendazole plus metronidazole).

MORE ►

Zinc sulfate is considered the flotation medium of choice for detecting *Giardia* cysts.

IFA = immunofluorescent antibody

- ❑ At Colorado State University laboratory, paromomycin or nitazoxanide was used in some cats and dogs with resistant giardiasis, but data were not controlled.¹⁴
- ❑ Azithromycin has been used successfully in dogs with resistant giardiasis, but additional studies are needed.¹⁵

Prevention

- Environmental disinfection is recommended.
- Feces should be removed daily and contaminated surfaces disinfected by steam cleaning or use of quaternary ammonium compounds (1-minute contact time).
- Infected animals should be bathed with shampoos to remove fecal debris and cysts.

Complications

- In animals with persistent diarrhea from *Giardia* infection, underlying disorders should be considered.^{11,14}

- ❑ Inflammatory bowel disease
- ❑ Bacterial overgrowth
- ❑ Coinfection with other organisms (ie, *Cryptosporidium* spp, *T foetus*)
- ❑ Exocrine pancreatic insufficiency
- ❑ Immunodeficiency

* In General

Relative Cost

- Treatment and follow-up care for uncomplicated cases of diarrhea: \$
- Diagnostic workup for chronic cases of diarrhea and presence of *Giardia* cysts in fecal flotation: \$\$-\$\$\$

Cost Key

- \$ = up to \$100
- \$\$ = \$101-\$250
- \$\$\$ = \$251-\$500
- \$\$\$\$ = \$501-\$1000
- \$\$\$\$\$ = more than \$1000

Prognosis

- In most cases, diarrhea will resolve after treatment.

Future Considerations

- The role that cats and dogs play in the transmission of giardiasis to humans should be investigated further.

Public Health Considerations

- Most cats and dogs harbor species-specific assemblages of *G duodenalis* and are not considered a significant human health risk, although the presence of zoonotic assemblages in dogs, cats, and humans in the same household has been described.^{1,16}
- Healthy cats and dogs should be screened for infection q6-12mo.
 - ❑ It has been suggested that if *Giardia* cysts are detected in an asymptomatic animal, the animal should not be treated. ■ **cb**

See Aids & Resources, back page, for references & suggested reading.

Table Drugs for Treatment of Giardiasis in Dogs & Cats

Drug	Species	Dose	Route	Interval	Duration
Metronidazole	Cats, dogs	25 mg/kg	PO	q12h	5-7 days
Fenbendazole	Cats, dogs	50 mg/kg	PO	q24h	5 days
Nitazoxanide	Cats, dogs	100 mg/animal	PO	q12h	3-4 days
Praziquantel, pyrantel pamoate, febantel (tablets)	Dogs	25 mg/kg febantel, 5 mg/kg praziquantel, 5 mg/kg pyrantel base	PO	q24h	3 days
	Cats	56.5 mg/kg febantel, 11.3 mg/kg praziquantel, 11.3 mg/kg pyrantel base	PO	q24h	5 days
Ipronidazole	Dogs	126 mg/L	PO	Ad libitum in drinking water	7 days
Quinacrine	Dogs	9 mg/kg	PO	q24h	6 days
		6.6 mg/kg	PO	q12h	5 days
Furazolidone	Cats	4 mg/kg	PO	q12h	7-10 days
Tinidazole	Dogs	44 mg/kg	PO	q24h	6 days
	Cats	30 mg/kg	PO	q24h	7-10 days
Ronidazole	Dogs	30-50 mg/kg	PO	q12h	7 days

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