Getting to the Bottom of Beaver Fever

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Giardia lamblia is the most commonly identified intestinal parasite in North America and is found worldwide. *Giardiasis*, otherwise affectionately known as "beaver fever," is the diarrheal illness caused by infection with *G. lamblia*, which is this month's Bug.

What is Giardia lamblia?

Giardia lamblia is a flagellated enteric protozoan parasite that exists in two forms, a trophozoite and a cyst. The trophozoite is kite-shaped, binucleated and flagellated and has a suction disc used for attachment to the intestinal wall; when observed under the microscope, it has the appearance of a face (Figure 1). This is the active free-living form that can cause disease in humans. The thick-walled cyst has four nuclei and is ovoid in shape. Each cyst gives rise to two trophozoites during excystation. Humans and many rodents, including Canada's beloved beaver, act as reservoirs for the parasite.

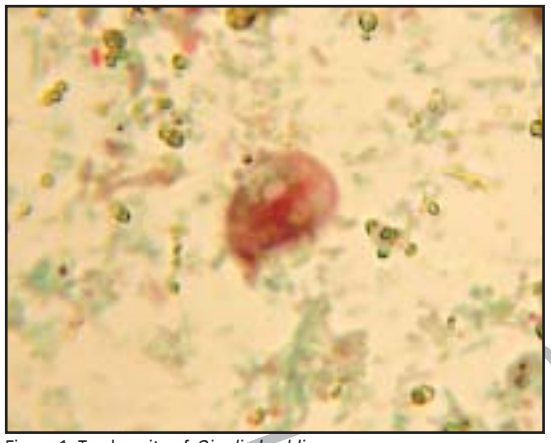

Figure 1. Trophozoite of *Giardia lamblia*.

How is Giardia lamblia transmitted?

The cysts are transmitted via the fecal-oral route, and the infective dose is quite low with only 10 to 25 cysts causing clinical disease (the ingestion of more than 25 cysts causes infection in 100% of cases). Outbreaks can occur through the contamination of drinking water with sewage, while campers also commonly contract giardiasis from drinking untreated lake or stream water. The term "beaver fever" arose from an outbreak in Banff, Alberta, many years ago, which was attributed to beavers defecating in the water reservoir, resulting in many tourists developing giardiasis.

Less commonly, contaminated food can be the cause. There have been reports of transmission of giardiasis in day-care centres, mental hospitals and among men who have sex with other men as a result of anal-oral contact.

What are the manifestations of giardiasis?

After the ingestion of cysts, excystation occurs, followed by trophozoite replication and colonization of the upper small bowel.

The incubation period is approximately one to two weeks before the onset of clinical symptoms. The exact mechanism of the diarrhea is unclear, but it leads to malabsorption of nutrients, resulting in a profuse, non-bloody, foul-smelling diarrhea, which can also include nausea, anorexia, flatulence and abdominal cramps. Fever, vomiting and tenesmus rarely occur. Initially, the stools may be profuse and watery, but later they become greasy and foul-smelling. Blood mucous and pus are absent.

The symptoms of giardiasis are not particularly severe; however, a more aggressive course leading to dehydration may be observed in those who are either very young or very old, immunocompromised or pregnant. In those who have had a long-standing course of giardiasis, weight loss may occur, as may malnutrition due to steatorrhea and malabsorption of vitamins A and B12, proteins, sugars and iron. These latter complications are uncommon.

Diagnosis is confirmed by the microscopic examination of fresh stool.

How is giardiasis diagnosed?

Diagnosis is confirmed by the microscopic examination of fresh stool; however, if the stool is not fresh, the specimen should be submitted to the laboratory using a container with a preservative. This will reveal either trophozoites or cysts or both. In formed stools (*i.e.*, in an asymptomatic patient), only cysts will be seen.

If the stool sample reveals nothing, the string test can be performed. This involves swallowing a weighted string until it reaches the duodenum. Once here, the trophozoites will adhere to the string and can be visualized after removal.

Duodenal aspiration and biopsy are alternatives, albeit more invasive. Serologic analysis for anti-giardia antibodies is not readily available. The complete blood count is usually normal and eosinophilia is absent, as this pathogen is not intro-invasive.

How is giardiasis treated?

Replenishing lost fluids is the first, and most important, step in patients who are dehydrated. Once volume has been restored and giardiasis is confirmed, the treatment of choice is a five- to seven-day course of metronidazole, 250 mg orally, three times a day; however, alternatives include:

- furazolidone (100 mg, four times a day for seven to 10 days),
- tinidazole (2.0 g, orally, single dose) or
- quinacrine (100 mg, orally, three times a day after meals for five days).

In a pregnant patient, paromomycin (500 mg, four times a day for five days) is the drug of choice.

How is giardiasis prevented?

Prevention is best achieved with good hygiene, including hand-washing. Furthermore, water should be boiled, filtered or treated with iodine in endemic areas or when hiking. Caution must be exercised when drinking untreated water from lakes and streams. Although we may be able to limit its incidence through education, beaver fever is here to stay since it is impossible to control animal and human behaviour in the wilderness.

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