



Illinois Department of Public Health

Environmental Health

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Giardiasis

Giardiasis, a disease caused by the protozoan parasite *Giardia lamblia*, is characterized by chronic diarrhea that usually lasts one or more weeks. Diarrhea may be accompanied by one or more of the following symptoms: abdominal cramps, bloating, flatulence, fatigue or weight loss. Stools are often malodorous and have a pale greasy appearance. Infection without symptoms is also common.

The life cycle of *G. lamblia* involves two stages: trophozoite and cyst. Trophozoites stay in the upper small intestinal tract where they actively feed and reproduce. When trophozoites pass down the bowel, they change into the inactive cyst stage by developing a thick exterior wall that protects the parasite after it is passed in feces.

People become infected either directly by hand-to-mouth transfer of cysts from feces of an infected individual (as in careless diaper changing and poor handwashing technique), or indirectly by drinking feces-contaminated water. The organism does not invade other parts of the body or cause any permanent damage. In infants and small children, however, the severe diarrhea can lead to dehydration and shock if adequate fluid intake is not maintained.

EPIDEMIOLOGY

Giardiasis occurs worldwide. In the United States, *G. lamblia* is the parasite most commonly identified in stool specimens submitted to state laboratories for parasitologic examination. Other surveys conducted in the United States have demonstrated *G. lamblia* prevalence rates ranging from 1 percent to 30 percent, depending on the location and ages studied.

Most transmission occurs sporadically by direct person-to-person contact in households where a case has occurred and among neighborhood contacts with infected children. Epidemics resulting from person-to-person transmission most often occur in daycare centers for preschool-age children and institutions for the developmentally disabled. Infants and toddlers in daycare centers are more commonly infected than older children who have been toilet trained.

Infections also occur among backpackers and campers who drink untreated stream water. Less commonly, community epidemics caused by contaminated drinking water occur. In such outbreaks, approximately 11 percent of the residents have become infected. Both human and animal (beaver) fecal contamination of stream water has been implicated as the

source of *G. lamblia* cysts in waterborne outbreaks. *Giardia* species in dogs and possibly other animals are also considered infectious for humans.

Why some people become ill when infected with *G. lamblia* and others have no symptoms has not been fully explained. Individual immunity undoubtedly plays a role, but the exact immune mechanisms involved have not been identified. A number of other factors such as number of *G. lamblia* cysts ingested (dose), varying virulence among *G. lamblia* strains, human or animal origin of the parasite, etc., may have an influence on the clinical course of infection.

The cyst form of the organism is hardy and may remain viable for a long period of time (approximately two months), particularly in cold water. The ingestion of 10 to 25 cysts may result in giardiasis, with an incubation period from one to four weeks.

DIAGNOSIS

The diagnosis of *G. lamblia* infection is most commonly made by identifying the causative agent, *G. lamblia*, in the feces. It is also possible to identify the parasite in digestive juices or biopsy material taken from the small intestine. In patients with watery diarrhea, trophozoites are most commonly found in stools, but a few cysts may also be present. After the acute stage has passed, stools are more often formed and contain the more hardy cyst form of the parasite.

G. lamblia cysts are passed in the feces on an intermittent basis. When infection is suspected by a physician, a minimum of three stool specimens (one every other day) is usually obtained and examined to minimize the chance of missing an infection.

TREATMENT

Three prescription drugs are available in the United States for the treatment of giardiasis: quinacrine, metronidazole and furazolidone. Quinacrine is considered the drug of choice for adults and older children. Although quinacrine is effective in young children, the drug frequently causes vomiting in this age group. Metronidazole has cure rates similar to quinacrine and is generally well tolerated by both adults and children. With the onset of any of the symptoms preciously mentioned, a physician should be contacted immediately.

PREVENTION

Giardiasis epidemics have commonly resulted from contaminated drinking water. The long-term solution to waterborne outbreaks involving municipal water systems requires use of water filtration equipment in the water treatment process. Although most large U.S. cities use proper filtration methods, many towns and small cities rely solely on chlorination to disinfect drinking water; the amount of chlorine used often does not kill *G. lamblia* cysts.

How to treat drinking water for the removal of *G. lamblia* has become an important concern over the last few years as outbreaks of giardiasis have occurred. Designs appropriate for

small water systems are particularly needed.

Because the cysts of *G. lamblia* resist conventional disinfection, effective filtration must serve as an additional barrier to prevent disease transmission. Studies have shown that diatomaceous earth filtration is an effective process for the removal of *G. lamblia* cysts. Only diatomaceous earth filters approved by the National Sanitation Foundation for treatment of drinking water should be used.

A properly designed slow sand filtration system is also almost 100 percent effective in removing *G. lamblia* cysts. However, proper construction operation, and sand size are critical to the efficiency of the slow sand filter. The sand should have an effective size of .25 - .35 mm with an ideal effective size of .30 mm and a uniformity coefficient of 1.4 to 1.8 with an ideal coefficient of 1.6. More detailed operation and construction guidelines are given in the Department's Surface Source Water Treatment Code.

Backpackers and campers should not drink water directly from streams or lakes, no matter how clean the water appears. *G. lamblia* cysts can survive in the aquatic environment, especially in cold lakes or streams, for months, and are more resistant to disinfection than most other microbial pathogenic agents. Person-to-person transmission of *G. lamblia* can be prevented by practicing good personal hygiene and maintaining a sanitary environment. Good handwashing and fingernail cleaning should be stressed, especially after using the toilet, handling soiled diapers of infants and before eating. Quick and thorough cleanup of fecal accidents at home or in institutions also reduces the risk of spreading *G. lamblia* to others.

WATER DISINFECTION

Boiling - Except for water treatment methods that include filtration, boiling is the only technique that can be recommended with complete confidence for elimination of *G. lamblia* in polluted water. Boiling (at a rolling boil) for three minutes is adequate to kill *G. lamblia* as well as most other bacteria or other pathogens likely to be acquired from drinking polluted water.

Chemical Disinfection - Disinfection of water with chlorine or iodine is less reliable than boiling for killing *G. lamblia*.

It is not possible to recommend a concentration of chlorine and a contact time that would be effective under all types of water conditions. Therefore, providing continuous chlorination of the water supply will not assure the destruction of the cysts. Chlorine concentrations ordinarily used to disinfect water supplies are ineffective in killing *G. lamblia* cysts.

WELL CONTAMINATION

This Department or local health department should be contacted for further advice when *Giardia* is suspected. Normally, *Giardia* cysts are not found in a ground water supplies. If these cysts are discovered in a ground water supply, immediately discontinue using the

water and check the well for proper construction and location. In addition, all possible sources of contamination must be eliminated. It is extremely important to locate the source of the *Giardia* infiltration into the water supply. A nearby sewage seepage field, buried pump suction pipe or improperly installed well may contribute to well contamination. After all potential problems have been identified and corrected, the system should be thoroughly disinfected and sampled.

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