Detailed Giardia

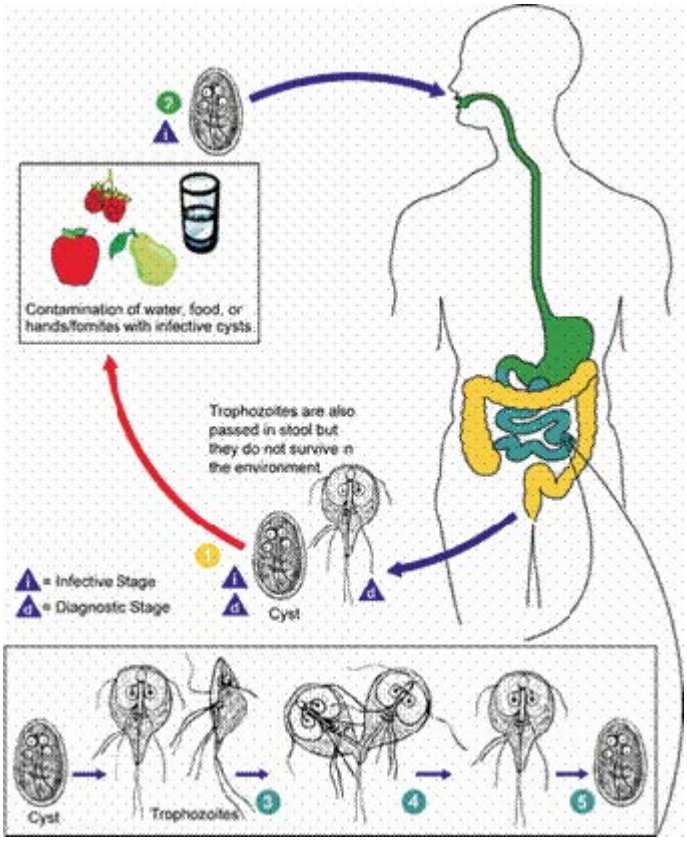
DETAILED GIARDIA FACT SHEET

Giardiasis is an infection of the small intestine caused by the protozoan (single-celled, microscopic organism) *Giardia intestionalis* (also referred to as *Giardia lamblia*). For general information what a protozoa is please see the fact sheet "Protozoan Parasite." *Giardia* is a good example of an animal disease that can be transmitted to humans (this is called a zoonosis) as it infects many other animals, particularly beavers, besides humans. It is because of this that giardiasis is often referred to as "Beaver Fever." During the past two decades, *Giardia* has become recognized as one of the most common causes of waterborne disease (drinking and recreational) in humans in the U.S. and Canada and is the most frequent cause of non-bacterial diarrhea in North America. It is found around the world, and is one of the most common causes of traveler's diarrhea. The World Health Organization suspects that 200 million people are infected every year.

LIFE CYCLE

Giardia has a simple life cycle with two different stages. The protozoa are present in the feces of an infected host. When present in the feces, they are referred to as "cysts." A cyst is a small capsule-like sac that encloses the organism in its dormant or resting stage and is resistant to extreme environmental conditions. This stage – the "life-stage" – is responsible

for the spread of the organism. When the cysts are swallowed by someone, they will break free from their capsule (hatch) once they pass from the stomach to the small intestine. Once hatched, the second stage begins. The hatched organisms will multiply and attach to the lining of the small intestine causing diarrhea. Once diarrhea in the infected person (the host) starts, the protozoa will detach, produce a new cyst and exit the body back into the environment where they will find a new host to infect. This is how the cycle continues.



GIARDIA OUTBREAKS

Endemic (belonging to a particular group) risks of waterborne giardiasis are high among people who consume untreated water. In the U.S., Canada and New Zealand, endemic risks are also high among populations that use unfiltered surface water when compared to those that use filtered surface water. Since 1971, Giardia has been the most commonly identified pathogen reported in U.S. waterborne outbreaks. From 1965-1996, 133 waterborne outbreaks with over 28 000 confirmed giardiasis cases have occurred. Of these 133 waterborne outbreaks, 108 were associated with the consumption of contaminated drinking water from public systems, 10 cases were linked to individual and non-potable water sources, and 15 outbreaks were traced to recreational water. It is estimated that 250 infections per 10 000 people occur each year. From 1979-1988 an estimated 4600 people were hospitalized due to Giardia infections, with the majority being children under the age of five.

A few years ago in Canada, the disease gained publicity when there was a giardiasis outbreak in Banff National Park. Since then, surveys of water sources have shown low levels of the parasite, with only a small number of the parasites found being viable. Despite this, outbreaks linked to drinking water have been reported in several provinces, and cases linked to swimming pools have also been reported. Below is a table giving a breakdown of reported giardiasis cases per province from 1990-1998. Both total numbers of cases and cases per 1000 are shown.

Table 5: Reported cases of giardiasis per province from 1990 -1998.

Province	Year									avg	Reported
	1990	1991	1992	1993	1994	1995	1996	1997	1998		
ALTA	1354	1453	1131	941	854	600	545	568	605	896	0.35
BC	2235	2023	1767	1468	1485	1496	1301	1181	1107	1563	0.48
MAN	nr	nr	nr	nr	nr	nr	nr	84	195	140	0.13
NB	134	130	141	138	112	99	111	133	76	119	0.16
NFLD	46	208	167	71	80	67	42	42	54	86	0.15
NWT	42	73	49	56	45	28	22	18	16	39	0.67
NS	119	174	116	108	113	107	138	92	96	118	0.13
ONT	3462	3754	2854	3054	2695	2695	2535	2393	2124	2841	0.28
PEI	18	3	13	11	13	4	9	5	9	9	0.07
QUE	688	641	676	748	701	794	934	899	983	785	0.11
SASK	649	661	523	446	397	359	400	241	236	435	0.44
YUK	39	48	49	22	28	37	22	21	18	32	1.14
Total	**8786**	**9168**	**7486**	**7063**	**6523**	**6295**	**6059**	**5677**	**5519**	**7061**	**0.26**

From Health Canada 2000

In 2015, there were 3736 reported cases of Giardiasis across Canada in people of all ages.

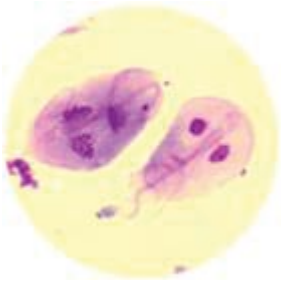
WHAT ARE THE SYMPTOMS AND THE INCUBATION TIME?

When infected with *Giardia*, you may be asymptomatic or have severe chronic (long-lasting) diarrhea. Asymptomatic infection is the most common, but when present, symptoms include: diarrhea, stomach cramps, upset stomach, nausea, vomiting and low-grade fever (99-102°F) which can lead to weight loss and dehydration. It is important to note that even though someone may be asymptomatic when infected with Giardia they can still act as a host or carrier and are still capable of infecting others within their family of household. The incubation period is usually anywhere between three to twenty-five days, with the average being about seven days.

HOW LONG DO THE SYMPTOMS LAST?

Giardiasis usually lasts for two to six weeks in average healthy humans, but there are also chronic cases that last from a couple of months to two years in those who are immunocompromised (those incapable of developing a normal immune response, usually as a

result of disease, malnutrition and immunosuppressive therapy).



HOW IS IT DIAGNOSED?

Giardia is one of the easiest protozoa to diagnose because it has two characteristic appearances depending on if it's in its active or resting stage. The principal method of diagnosing *Giardia lamblia* is by observing the organism under a microscope. The active form of *Giardia* has a teardrop shape with two nuclei at its anterior end that give the impression it's staring at you, and the resting form is oval, also with two nuclei.

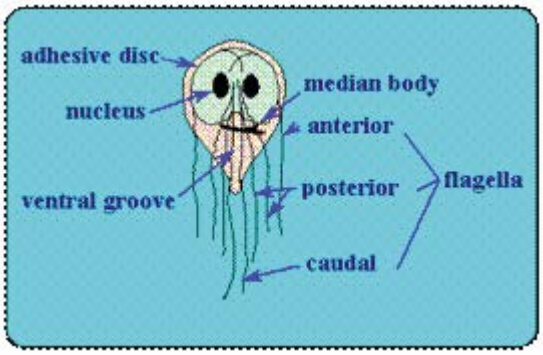


Diagram of the active form

AM I AT SEVERE RISK FOR DISEASE?

Giardiasis occurs throughout the population, although children are at a higher risk than adults of being infected. On the other hand, chronic symptomatic giardiasis (giardiasis that has long lasting symptoms) is more common in adults than children. Individuals that are at high risk for this disease if exposed include: AIDS patients, organ transplant recipients, malnourished children and individuals receiving certain cancer treatment. Severe disease may result in growth retardation in children or the malabsorption of fats and fat-soluble vitamins within the body causing nutrient deficiencies. Rarely does this disease cause death, although in extreme cases, giardiasis may be fatal.

HOW DOES GIARDIA SPREAD?

Giardia may be found in soil, water, food or on surfaces that have been contaminated by the feces of an animal or human that is infected. Most infections are probably caused by ingesting food or water contaminated by sewage. This is commonly referred to as the fecal-oral route. Person-person contact is also responsible for the spread of the disease, but the disease is not spread by coming into contact with an infected person's blood. Here are a few examples of how *Giardia* can spread:

- By putting something in your mouth or by accidentally swallowing something that has been contaminated with the stool of an infected person.
- By swallowing recreational water that has been contaminated by the stool of someone infected with *Giardia*. Recreational water includes swimming pools, hot tubs, rivers, lakes, etc. These could be contaminated by either animals or humans.
- By eating uncooked foods that have been washed with contaminated water, or by eating uncooked foods that were directly contaminated with *Giardia*.
- By accidentally swallowing *Giardia* picked up from surfaces (i.e. bathroom fixtures, toys, etc.) contaminated with the feces of an infected person.

IS IT EASY TO BECOME INFECTED?

Giardia can be very contagious, and everyone is at risk. As few as 10 disease-causing particles (cysts) have been shown to cause infection. One infected person can shed millions of G. lamblia particles in their feces per day, which makes the probability of the disease spreading very high. As soon as the cysts are shed, they are capable of infecting another animal or human.

When *Giardia* is in its resting form it is able to survive outside of the body and can withstand harsh environmental conditions for long periods of time because they are protected by an outer shell. However, survival is dependant on the temperature; as the temperature increases, the length of survival decreases. Giardia will usually be inactivated if held at freezing temperatures of at least -13°C for a period of 14 days and will be immediately inactivated if subjected to boiling temperatures.

HOW CAN I PREVENT GETTING GIARDIASIS?

All *Giardia* infections are caused by ingesting the pathogen; therefore to avoid getting sick, contact with the organism should be avoided. The best method is prevention, and listed below are suggestions of how to prevent getting giardiasis.

- Practice good hygiene by thoroughly washing your hands with soap and water after using the bathroom and before handling or eating food. If you are in contact with diaper-aged children, be sure to wash your hands after every diaper change.
- Avoid water that might be contaminated.
- Do not swallow recreational water.
- Do not drink untreated water from shallow wells, lakes, rivers, springs, etc...
- Do not drink untreated water during community outbreaks of disease caused by contaminated drinking water.
- Do not use ice or drink untreated water when traveling in countries where the water supply might be unsafe. If this is unavoidable, bring water to a rolling boil for at least one minute before consuming, or use a filter with an absolute pore size of at least 1 micron that has been rated for cyst removal.
- During boil water advisories, use water that has been boiled and cooled, filtered or safely bottled for washing dishes, fruits and vegetables.
- Avoid food that might be contaminated.
- Wash/peel all raw vegetables and fruits before eating.
- Use uncontaminated water to wash all food that is to be eaten raw.
- Do not eat uncooked foods when traveling in countries with minimal water treatment systems.
- Do not consume unpasteurized juice, milk or milk products.
- Avoid fecal exposure during sex.

HOW DO I PREVENT SPREADING IT TO OTHERS?

Giardiasis is very contagious, so to avoid spreading it to others, these guidelines should be followed:

- Carefully wash your hands with soap and water after using the bathroom, changing diapers, and before eating or preparing food. If you have giardiasis, avoid preparing food for others.
- Protect others by not swimming in recreational water while infected and for at least two weeks after diarrhea stops. *Giardia* can be passed in feces and contaminate water for several weeks after the symptoms have ended.
- Avoid fecal exposure during sex.

WHAT IS THE TREATMENT FOR GIARDIASIS?

After about a month, *Giardia* is usually cleared from healthy individuals without treatment. Women and children are especially susceptible to dehydration resulting from the diarrheal symptoms brought about by giardiasis and should drink plenty of fluids throughout the illness to avoid this.

Anti-parasitic drugs are available and are helpful to those who are immunocompromised. However, drug resistance has been noted in the medications and their toxicity has prevented their use for women of child-bearing age. Further research is being done to improve this scenario.

HOW PREVALENT IS GIARDIA IN SURFACE WATER/WELL WATER?

Giardia is often found in the feces of infected humans, as well as the feces of beavers, muskrats and dogs, all of which are thought to be reservoirs for the disease. Drinking water sources become contaminated when infected feces from any of the above named animals comes in contact with the water. If proper treatment techniques aren't followed, outbreaks of the illness are likely to occur either through the consumption of tainted water or by using the water for recreational purposes.

If your well has not been properly installed, has cracks in the casing or is too shallow, then it is at risk for contamination. Wells that are located at the bottom of a hill, or that are too shallow are at risk of being contaminated by runoff water from rain and flooding draining directly into the water source. Also, wells that are in rural or farm areas may become contaminated if animal manure and sewage seep into the groundwater.

HOW CAN WE PROTECT OUR WATER SUPPLIES?

Filtration techniques that are commonly used in water treatment plants can effectively remove *Giardia* cysts from water supplies. Depending on the concentration and the contact time, water disinfectants also play a role by inactivating the cysts present in the water supply. The EPA requires that public water systems both filter and disinfect any surface water and groundwater that is directly impacted by surface water. 99.9% of *Giardia* must be removed.

IS MY WATER SAFE? HOW CAN I TELL?

Since *Giardia* is invisible to the naked eye, even the clearest and cleanest looking water may be infected with the pathogen. To ensure your water is safe to drink, it is important to be aware of health advisory notices, and to follow the guidelines listed below if ever a boil water notice is issued:

- Boiling water is the best way to ensure that your water is free of infectious cysts. Water should be brought to a rolling boil for at least one minute, with three to five minutes being recommended. After the water cools, it is important to properly store the water in clean containers in the refrigerator. To avoid getting sick during a boil water order, the boiled water must be used not only for drinking, but for cooking, brushing your teeth, making coffee, etc...
- Filter your water with a filter specifically tested for removing *Giardia*. Take care that the pores in the filter are 1 micron or smaller, or cysts may still be able to pass through.
- Chemical disinfectants can be effective for *Giardia*. It is important to carefully follow the directions on the package.
- If you're still unsure of the water quality after filtering and disinfecting, bottled water may be a reasonable alternative, but care must be taken when selecting a brand. When shopping for bottled water, it is important to read labels. "Reverse osmosis treated," "Distilled," and "Filtered through an absolute one micron or smaller filter" ensure that the water will be *Giardia* free.
- Avoid fountain drinks made with tap water during boil water orders. Carbonated water in cans or bottles is usually heated and filtered enough to remove *Giardia*.

WHAT ARE SOME WAYS I CAN TREAT MY WATER TO ENSURE ITS SAFETY?

Municipal drinking water treatment providing filtration and disinfection reduces the risk of getting giardiasis. Protection of the raw water supply is also beneficial, as it puts less stress on the success of the drinking water treatment alone. The previous section “Is my water safe?” has a list of suggestions of how to make sure your water is safe for consumption, especially when a boil water order is in effect.

Did you know that our Operation Water Health program is available free of charge to teachers worldwide and provides the teachers with all of the lesson plans and information they need to teach students about what safe drinking water is, what unsafe drinking water is, and what health problems can be caused by unsafe drinking water? Please help us to keep our Operation Water Health program up-to-date! Please chip in $5 or donate $20 or more and receive an Official Donation Receipt for Income Tax Purposes.

Yes! I want to help students learn this vital information!