Blastocystosis

(Blastocystis 'hominis' Infection)
What is Blastocystosis

Blastocystosis is an illness caused by a microscopic parasite, *Blastocystis hominis* (also known as *Blastocystis 'hominis' hominis*).
parasite lives in the intestine and is passed in feces. Because the parasite is protected by an outer shell, it can survive outside the body and in the environment for long periods in some cases.
Once a person or animal has been infected with *Blastocystis 'hominis*', the parasite lives in the intestine and is passed in feces.
During the past 2 decades, *Blastocystis hominis* infection has become recognized as a common cause of waterborne disease in humans in the United States. *Blastocystis hominis* can be found worldwide and within every region of the United States.
How do you get Blastocystosis and how is it spread?

The *Blastocystis 'hominis'* parasite lives in the intestine of infected humans or animals (e.g., cats, dogs, pigs, horses, cattle)
Millions of germs can be released in a bowel movement of an infected human or animal. *Blastocystis hominis* is found on surfaces or in soil, food, or water that has been contaminated with the
feces from infected humans or animals. You can become infected after accidentally swallowing the parasite; you cannot become infected through contact with blood. 
*Blastocystis 'hominis'* can be spread by:
Accidentally swallowing *Blastocystis 'hominis'* picked up from surfaces (such as bathroom fixtures, changing tables, diaper pails, or toys) contaminated with feces from an infected person or animal.
Drinking water or using ice made from contaminated sources (e.g., lakes, streams, shallow [less than 50 feet] or poorly monitored or maintained wells).
Swallowing recreational water contaminated with *Blastocystis 'hominis'*. Recreational water includes water in swimming pools, water parks, hot tubs or spas,
fountains, lakes, rivers, springs, ponds, or streams that can be contaminated with feces or sewage from humans or animals. Eating uncooked food contaminated with *Blastocystis hominis*. 
. Having contact with someone who is ill with Blastocystosis. Traveling to countries where Blastocystosis is common and being exposed to the parasite as described in the bullets above.
What are the symptoms of Blastocystosis?

*Blastocystis 'hominis'* infection can cause a variety of intestinal signs or symptoms, which include
- Abdominal pain
- Diarrhea
- Constipation
- Gas or flatulence
- Greasy stools that tend to float
- Upset stomach or nausea
Patients also report fatigue, skin rashes, and joint pain. Some people with *Blastocystis* 'hominis'infection have severe symptoms, while others have no symptoms at all.
In this class of disease, researchers have found that people with more severe symptoms may be infected with more virulent types of microbes, and also may have a genetic makeup which causes the microbe to produce more severe illness.
How long after infection do symptoms appear?

That is difficult to say. In animal studies, symptoms of Blastocystosis appear within two weeks after becoming infected.
In humans, some people may have few symptoms when initially infected, but the symptoms may become worse over a period of months or years.
How long will symptoms last?
In some patients, Blastocystosis is an acute illness, meaning that symptoms will last for a short time (several weeks)
In other patients, the disease may become chronic, and symptoms will last indefinitely. Researchers are working to understand why some infections produce chronic illness, while others clear on their own.
Who is most likely to get Blastocystosis?

Anyone can get Blastocystosis. Persons more likely to become infected include
International travelers.

Close contacts (such as those in the same family or in the same household or child care setting) or caregivers of infected people.
People who drink water or use ice made from contaminated sources (e.g., lakes, streams, shallow or poorly monitored or maintained wells). Contaminated water may include water that has not been boiled, filtered, or disinfected with chemicals.
Children in child care settings, including diaper-aged children. Backpackers, hikers, and campers who drink untreated or insufficiently treated water or who do not practice good hygiene (e.g., proper hand washing
People who swallow contaminated water while swimming, especially in lakes, rivers, springs, ponds, and streams. Several community-wide outbreaks of Blastocystis hominis have been linked to drinking water contaminated with Blastocystis 'hominis'. People exposed to human feces through sexual contact
What should I do if I think I may have Blastocystosis?
Contact your health care provider.
How is a *Blastocystis 'hominis' infection* diagnosed?

Your health care provider will likely ask you to submit stool samples to check for the parasite.
Because *Blastocystis 'hominis'* can be difficult to diagnose, your provider might ask you to submit multiple stool specimens collected over a few days. Even in that case, the diagnostics may fail to detect the infection.
Researchers have developed more reliable diagnostics, but those are not widely available to patients. BRF is working to make more reliable diagnostics available to patients.
What is the treatment for Blastocystosis?

There is no FDA approved treatment for Blastocystis 'hominis' infection. Physicians have reported success in some patients with
several prescription drugs, but the success rates for treatment of Blastocystis 'hominis' are much lower than for other diseases. Many patients remain symptomatic after treatment.
My child does not have diarrhea, but was recently diagnosed as having *Blastocystis 'hominis'* infection. My health care provider says treatment is not necessary. Is this true?
Because treatments are unreliable, it may not be appropriate to treat an asymptomatic patient. Researchers and patients have also reported that symptoms began after antibiotic treatment, so it is possible that antibiotic treatment could make an
If my child or I have been diagnosed with Blastocystosis, should I worry about spreading the infection to others?
Yes, *Blastocystis* 'hominis' infection can be very contagious. Follow these guidelines to avoid spreading *Blastocystis* 'hominis' to others:
Wash your hands with soap and water after using the toilet and before handling food. Use of a fingernail brush to clean under the fingernails may help. Do not swim in recreational water (pools, hot tubs, lakes, rivers, the ocean, etc.)
while you have diarrhea and for 1 week after your diarrhea stops. You can pass *Blastocystis 'hominis'* in your feces and contaminate the water after your symptoms have stopped.
Avoid fecal exposure during sexual activity. This is especially important while experiencing diarrhea caused by Blastocystosis. Use a barrier during oral-anal sex. Wash hands immediately after handling a condom used during anal sex or after touching the anus or rectal
How can I prevent a *Blastocystis hominis* infection?

Practice good hygiene
soap and water. After using the toilet and before handling or eating food, especially while having diarrhea. After changing a diaper or assisting with toileting, especially if you are caring for diaper-aged children, even if you are wearing gloves.
After touching something that could be contaminated (such as a trash can, cleaning cloth, drain, or soil).

After handling animals or their toys, leashes, or feces
supervise young children and other people you are caring for with hand washing as needed. Protect others by not swimming if you are experiencing diarrhea and for 1 week after your diarrhea stops. This is essential for children in diapers.
Shower with soap and water before entering recreational water. Wash children thoroughly, especially their bottoms, with soap and water after they use the toilet or their diapers are changed and before they enter the water.
1. rivers, the ocean, etc. by taking the following steps
   Take children on frequent bathroom breaks or check their diapers often.
   Change diapers in the bathroom or a diaper-changing area.
Avoid water that might be contaminated.
**Giardia lamblia**

**Multiplication**
- Binary fission
- Encystation

**Cyst (iodine stained)**
- Thick wall (unstained)
- 2-4 nuclei
- Granular cytoplasm
- Remains of locomotor apparatus
- 8-12 μm

**Unstained**
- Colourless
- Motile with jerky movement

**Pathogenicity**
- Common inhabitant of upper part of small intestine
- Enteropathy, diarrhoea, steatorrhoea

**Trichomonas hominis**

**Differential**
- Single organism
- 6 flagellae
- 3 free anteriorly
- 1 in mouth
- 2 surrounding mouth

**Cysts from environment**
Pathogenesis

The mechanisms by which *Giardia* causes diarrhea and malabsorption have not been elucidated. There is no evidence that *Giardia* produces an enterotoxin or that it invades the intestinal epithelial cells.
Electron microscopy shows that the ventral disk embeds the parasite into the epithelial microvillus layer and “footprints” of formerly adherent trophozoites are visible on the epithelial cell surface.
However, even in a heavy infection, the surface area covered and possibly damaged by the adherent trophozoites cannot account for the symptoms.
In humans, biopsy of the infected gut shows little abnormality. In a European study in which over 500 biopsy specimens from Giardia-infected patients were observed,
slightly over 96% had normal looking mucosa and 3.7% had mild villous shortening with a small amount of neutrophil and lymphocyte infiltration.
The lack of histologic abnormalities in the majority of symptomatic patients has also been observed in other, smaller studies.
In one study in which patients with villous shortening and inflammatory infiltration were followed with serial biopsies, these abnormalities all resolved after the infection was eradicated.
In the murine models of giardiasis, similar findings of villous atrophy and inflammatory infiltration of villous epithelium can be observed. However as with humans, the findings are subtle and the inflammatory changes mild.
Giardiasis

In conclusion, the cause of diarrhea and malabsorption in Giardia infection is likely to be multifactorial, involving the host immune response to the pathogen as well as, yet to be identified, cytopathic substances that the parasite may secrete.
Additionally, it has been suggested that *Giardia* may cause pathology by alteration of the bile content or endogenous flora of the small intestine which in turn could affect the absorptive function of gut. These hypotheses must now be formally tested before a more complete picture emerges.
Diagnosis

The traditional method of diagnosis is examination of stool for trophozoites or cysts (stool O&P). Both fresh and fixed stool specimens are usually examined.
Cysts are normally found but motile trophozoites can be observed in a fresh specimen of loose stool. Because the parasites are normally found in the small intestine and are shed intermittently, the sensitivity of one stool specimen is low, in the range of 50 - 70%.
However, examination of three specimens, from three different days, increases the sensitivity to 85 - 90%; specificity is close to 100%.
This assay remains the most widely used method to diagnose *Giardia* infection and is the gold standard to which other newer assays are usually compared.
It is important to note that there can be a delay between the onset of symptoms and the excretion of cysts so that a negative stool sample in someone in whom giardiasis is suspected warrants reanalysis at a later time.
Encystation occurs when the parasites transit toward the colon, and cysts are the stage found in normal (non-diarrheal) feces. The cysts are hardy, can survive several months in cold water, and are responsible for transmission.
Recently, new assays have been developed based on detection of *Giardia* antigens. The direct fluorescent antibody test (DFA), uses a *Giardia*-specific antibody conjugated to a fluorophore to stain stool specimens. Because the parasites are labeled, much larger regions of the slide can be scanned more quickly and the likelihood of detecting the parasite is increased.
On a single stool specimen the sensitivity is between 96 - 100%. Other antigen-detection tests detect soluble *Giardia*-specific proteins in the stool. There are two different types of soluble-antigen-detection
Covering of the epithelium by the trophozoite and flattening of the mucosal surface results in malabsorption of nutrients.
Immunology:
Some role for IgA and IgM. Increased incidence in immunodeficiency (e.g. AIDS).
Diagnosis:
Symptoms, history, epidemiology. Distinct from other dysentery due to lack of mucus, and blood in the stool, lack of increased PMN leukocytes in the stool and lack of high fever. Cysts in the stool and trophs in duodenal content obtained using a string device.
(Enterotest\textsuperscript{R}). Trophs must be distinguished from the nonpathogenic flagellate *Trichomonas hominis*, an asymmetrical flagellate with an undulating membrane.
Because the cysts are infectious when passed in the stool or shortly afterward, person-to-person transmission is possible. While animals are infected with Giardia, their importance as a reservoir is unclear.
Cysts of *Giardia lamblia*, stained with iron-hematoxylin (A, B) and in a wet mount (C; from a patient seen in Haiti). Size: 8-12 µm in length. These cysts have two nuclei each (more mature ones will have four). CDC

Giardia lamblia cyst. Chlorazol black. CDC/Dr. George R. Healy

Giardia lamblia cyst. Iodine stain. CDC

Giardia lamblia. Indirect fluorescent antibody stain. Positive test. CDC/Dr. Govinda S. Visvesvara gsv1@cdc.gov

Giardia trophozoites in section of intestine (H&E) © Dr Peter Darben, Queensland University of Technology clinical parasitology collection. Used with permission

Giardia lamblia. Indirect fluorescent antibody stain. Negative test. CDC/Dr. Govinda S. Visvesvara gsv1@cdc.gov

Protozoa Infection in Human Intestine sp. (Giardia) sp. © Dr Dennis Kunke, University of Hawaii. Used with permission

**Figure 1**
**Treatment:** Metronidazole is the drug of choice.