Protozoan Disease: Giardiasis

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1. Disease
   a. Giardiasis

2. Etiologic agent
   a. Giardia
   b. Giardia is also known as *Giardia lamblia*, *Giardia intestinalis*, and *Giardia duodenalis*. (1)

3. Reservoirs & Transmission
   a. Humans and animals that are infected with *Giardia* carry the troph and cyst forms, both of which can be passed through the animal’s feces. Of the two forms, only the cyst form of *Giardia* can survive outside of the body. The cyst can survive in cold water, which allows it to remain a threat to mountain hikers. (3)
   b. *Giardia* can be transmitted from person-to-person through ingestion of fecal cysts, and it can be passed along through fomites, drinking water, and recreational water sources that contain fecal cysts as well. Any means consistent with the fecal-oral transmission is a possibility for *Giardia*. (1)
   c. Those who are most at risk of contracting *Giardia* are children in daycare environments because of diapers and sanitation as well as those who drink from unsanitary water sources. Developing countries tend to have more frequent water treatment issues, and therefore, they more commonly struggle with *Giardia* outbreaks. It’s most commonly contracted within the US in the daycare and outdoor camping and hiking settings. (1)

4. General characteristics of MO
   a. *Giardia* takes the active, trophozoite form within the intestines of host, and it is expelled from the body and spread to other hosts in the inactive, cyst form. (4)
   b. It’s a parasite that is predominantly infectious among humans but is also infectious to and from animals. (1)
   c. *Giardia* cysts, once in the small intestine, release two trophs, and they reproduce via binary fission in the intestine. (1)
   d. The taxonomy is Genus and species: *Giardia lamblia* within the Family Hexamitidae, of the Order Diplomonadida, of the Class Zoomastigophora, of the Phylum and Subphylum Sarcomastigophora Mastigophora, of the Kingdom Protozoa. (5)
   e. Giardiasis is often referred to as “Beaver Fever” because it’s so commonly a threat for hikers and campers. (1)

5. Key tests for Identification
   a. The host’s stools can be tested for *Giardia*, usually through three different stool samples from different days and identified via microscopy. There are usually at least three different stool samples taken and tested because
the cysts are not consistently excreted from the host enough for one sample to be reliable. (1)

b. Water sources can be tested as well, but that may not be as necessary because the water can be filtered via reverse osmosis to remove the parasite. (1)

c. The stools can be tested for *Giardia* using sensitive immunoassays, ELISA, and it is most reliably detected via PCR, which is the only method that can differentiate subtypes. (1)

d. *Giardia* can be seen with iron-hematoxylin, chlorazol black, and iodine stains as well as DAPI and fluorescent antibody staining with microscopy. (1)

6. **Signs and symptoms of disease**

   a. Symptoms begin between one and three weeks after infection and can last about two to six weeks. The symptoms of Giardiasis are diarrhea, gas, abdominal cramping, greasy stools, and nausea. It can cause general discomfort in the digestive tract because that is where it resides, and it can cause dehydration and weight loss from diarrhea, decreased appetite, and inability of the intestines to absorb the necessary amount of nutrients. It is also possible to be infected with *Giardia* and show few or no symptoms. (1)

   b. The most consequential cases of Giardiasis are those in children with severe or untreated infections because of the level of dehydration and deprivation of nutrients to their bodies.

7. **Historical information**

   a. In 1681 Anton van Leeuwenhoek worked with simple microscopy, and he observed *Giardia*, among other protozoa, in samples of his own feces. (2)(6)

   b. In 1859 Lambl named it Cercomonas intestinalis. In 1882 and 1883 Kunstler viewed Giardia and described it as “tadpoles,” and he named them *Giardia*. In 1915 *Giardia* was named for both of them as *Giardia lamblia*. (6)

8. **Virulence factors**

   a. *Giardia* attaches to the lumen of host’s bowel via ventral sucking disk. In addition to attachment abilities, *Giardia* are flagellated, therefore, they can better evade harmful agents and environments. (1)

   b. Because *Giardia* can take the cyst form, they can survive the acidic stomachs of hosts, and they can survive harsh environments between hosts, including chlorination and cold. A host produces billions of cysts through feces, daily. (1)

   c. *Giardia* also has antigenic variation, VSP (variant-specific surface proteins), which allow it to evade detection by antibodies in the host. (7)

9. **Control/treatment**

   a. Those infected with *Giardia* should drink extra fluids, particularly children and pregnant women, and they can be treated with prescription drugs like metronidazole, tinidazole, nitazoxanide, paromomycin, quinacrine, or furazolidone. (4)(1)
b. To prevent infection people should wash hands and keep clean environments and surfaces, for example, in the case of a diaper changing station in a daycare. People should also treat water sources with filtering, including reverse osmosis filtering, or boiling. (1)

10. **Prevention/Vaccine information, net trials?**
   a. There is no vaccine for *Giardia*, but it can be prevented or avoided by using the methods listed above treating water (filter/boiling) and of keeping sanitary habits and environment to reduce feces that may contain cysts. (1)
   b. The general rule in prevention of Giardiasis is to avoid feces as much as possible.

11. **Local cases or outbreaks**
   a. According to the CDC, the U.S.A. shows a spike in incidences of Giardiasis during the warm summer months of June, July, and October, especially noted in the years of 2006-2008.
   b. Per the CDC, Texas is not a state in which Giardiasis can be reported to the National Notifiable Diseases Surveillance System. (1)
   c. There was a peak of reported incidences of Giardiasis in the U.S. in 1997 at about 13 of every 100,000 people in the reporting states being infected. There was a decline from 1997 to 2002 down to about 8 of every 100,000 people being infected. That number has been relatively steady from 2002 to 2012. Most of those incidences were reported in the summer months of northern states. (1)

12. **Global cases of outbreaks**
   a. Giardiasis is the most common intestinal disease from contaminated (meaning: cyst containing) water sources, worldwide. (4)
   b. According to the CDC, approximately 2% of adults and 6-8% of children in developed countries have had it, and approximately 33% of people in developing countries have had it. (1)

**Work Cited:**