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## "Beaver Fever" - Giardiasis in Vermont

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# “Beaver Fever”

## Giardiasis in Vermont

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The Health Center – Plainfield, VT

Family Medicine Rotation - April 2017

Mentor: Dr. John Matthew

# The Problem

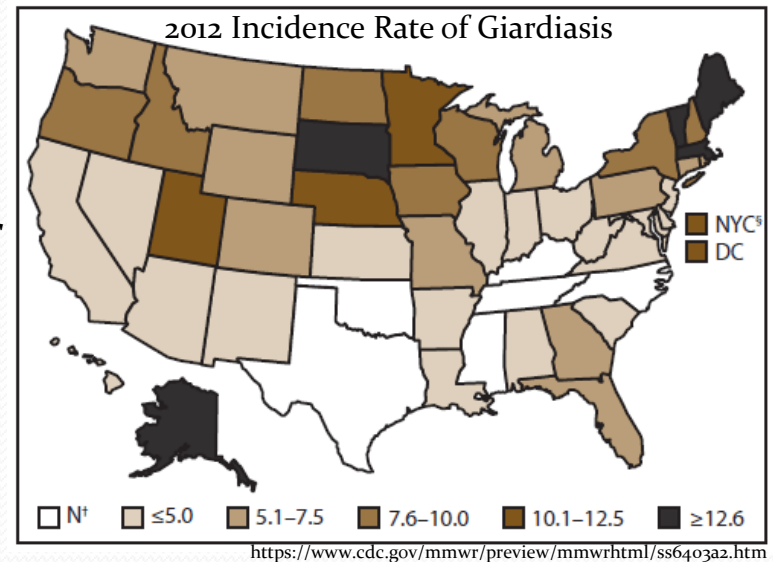
- Many Vermonters are familiar with the term “Beaver Fever” and its association with illness after drinking from streams, ponds, lakes, or other untreated water sources.
- “Beaver Fever,” or Giardiasis, is caused by a single-celled parasite called *Giardia intestinalis*. Giardia is found in every state in the United States and is the most commonly identified intestinal parasite in the world.



[https://commons.wikimedia.org/wiki/File:Giardia\\_intestinalis](https://commons.wikimedia.org/wiki/File:Giardia_intestinalis)

# The Problem, cont.

- According to the most recent reports by the CDC, Vermont consistently has the highest rate of Giardia infection in the nation and has an incidence rate (number of new infections in the population at a given time) that is approximately three times higher than that of Maine, the state that ranks second in Giardia infection.
- Since the risk of infection for Vermonters is so high, it is important for both patients and providers to understand the transmission, symptoms, and treatment of this very common disease.
- The Health Center, Plainfield, VT, has identified Giardiasis as a topic of interest as the providers frequently encounter patients who have been exposed to Giardia.



# Public Health Costs

- There are many public health costs associated with Giardia infection that could be reduced with more patient and provider education
  - Cost of annual hospitalizations – Estimated \$16-63 million annually
  - Cost of medication for treatment of Giardiasis
  - Cost of laboratory testing and resources for Giardiasis
  - Cost of increased number of physician appointments
- There are many Indirect Costs / Considerations:
  - Patients with Giardiasis often have to miss numerous work days
  - Younger patients may need to miss school due to illness
  - One infected individual can potentially transmit Giardia to numerous others, thus increasing overall healthcare costs, if not managed
  - Since Giardiasis can mimic, or even cause, diseases like irritable bowel syndrome, peptic ulcer disease, reactive arthritis, and even some types of cancer, there may be unnecessary healthcare and societal related expenses

# Community Perspective

- “Many of my patients have non-specific gastrointestinal symptoms and certainly have giardiasis due to living in Vermont, where it is extremely common” – **Melissa Houser, MD. The Health Center**
- “The Health Center providers could benefit from a more definitive protocol to address empiric treatment of Giardia in varied gastrointestinal presentations. Research and review of this matter would clarify the widespread use of medications like Tindamax for symptoms that overlap with IBS, GERD, and other diarrheal diseases” – **Jessica Fisch, PA-C. The Health Center**
- “I feel there is a definite need for patient education about Giardia infection. Anything that will help patients recognize the symptoms of Giardiasis and avoid initial infection would be invaluable” - **Emma Kopecky, NP. The Health Center**
- “Because it is transmitted via the fecal-oral route, Giardia can be easily spread not only through personal contact, but via contaminated water where cysts can survive for up to three months. This is an especially important mode of transmission in Vermont where people who enjoy the outdoors may come into contact with water contaminated by infected wildlife.” – **Maeghan O’Neill, PhD. Institute of Parasitology, McGill University**

# Intervention & Methodology

- Providers at The Health Center identified a lack of knowledge and informational resources available to the community about Giardiasis.
  - Created and distributed an informational brochure that can be used in waiting rooms or when discussing Giardiasis with patients (Shown to right)
  - Submitted news articles to two newspapers (**The World and The Times Argus**) that are distributed throughout the Central Vermont community served by The Health Center



### How does Giardia cause illness?

In the environment, Giardia is found primarily in ground water (springs, lakes, ponds, and streams) in the form of microscopic cysts. Giardia infection can be caused by ingesting Giardia cysts. Once Giardia cysts enter the body orally, they release a mature parasite (trophozoite) that attaches to the intestinal wall. It is this attachment which causes symptoms of the disease. The parasite can then multiply and create more cysts which will be excreted in the feces.

### What should I do, if I believe I have Giardiasis?

If you believe that you may have Giardiasis, or if you would like more information about the infection, please speak with your healthcare provider. Giardiasis can be diagnosed by examining a stool sample with a microscope or immunoassay test.

**Sources:**  
 Vermont Department of Health (2011, April 14th).  
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### "Beaver Fever" Giardiasis in Vermont

### What is "Beaver Fever"?

- "Beaver Fever" is just one of many names for an infection caused by Giardia intestinalis, a waterborne protozoan parasite.
- In addition to "Beaver Fever," Giardiasis is sometimes referred to as "Beaver's Disease" or "Millennium Tummy".
- It is the most common waterborne protozoan gastrointestinal infection worldwide.

### What do I need to know?

- Vermont has the highest incidence of Giardiasis in the nation.
- The Vermont Department of Health has indicated that simply being in Vermont is a risk factor for infection.
- Giardia can be found in almost all ground water in Vermont, including lakes, ponds, streams, and streams.
- Giardia infections can cause other diseases and lead to necessary treatments and costs.

### How can I become infected?

It is possible to become infected by ingesting as few as 10 Giardia cysts. While the parasite is primarily found in ground water, there are many ways that you may come in contact with these infective cysts:

- ingesting water harboring Giardia parasites
- drinking food that has been exposed to water containing Giardia cysts
- coming in contact with people who are infected and have good hand washing practices
- coming in contact with animals or wild animals that have Giardia

### How can I avoid infection?

Because Giardia is so common in the environment in Vermont, it is often difficult to completely avoid becoming infected. A few ways that you can avoid exposure to Giardia are:

- Avoid drinking untreated and untreated water
- Avoid swimming in lakes, ponds and other sources of ground water
- Practice good hand hygiene techniques
- Wash fruits and vegetables that may have been exposed to Giardia

### What are the symptoms of Giardiasis?

While most people will experience some symptoms after becoming infected, a small number of people will exhibit no symptoms. Others may develop chronic Giardiasis, if the infection is not eliminated by the immune system.

- Acute Giardiasis symptoms include diarrhea, abdominal bloating, upset stomach, nausea, and weight loss. Symptoms may last anywhere from a few days to months.
- Chronic Giardiasis may mimic other diseases such as gallbladder or peptic ulcer disease, irritable bowel, chronic fatigue syndrome, and even cancer. It has also been linked to eye lesions, arthritis, muscular weakness, malabsorption, growth stunting, and impaired cognitive function.

### How is Giardiasis treated?

Giardiasis is often easy to treat with a simple oral medication. However, if the infection becomes chronic, it may require other disease making it difficult for a healthcare provider to diagnose and treat the infection.

# Intervention & Methodology, cont.

- Providers expressed an interest in learning more about Giardiasis due to the large number of patients they treat for this parasitic infection.
  - Provided an oral presentation and informational handout about Giardiasis (shown to right) to physicians, physician assistants, nurse practitioners, nurses, and support staff at The Health Center following a thorough literature review, discussion with representatives at the Institute of Parasitology (McGill University), CDC, and Vermont Department of Health

**Giardiasis in Vermont**

**Giardia intestinalis**

- also known as *G. lamblia* and *G. duodenalis*
- flagellated protozoan parasite
- most common intestinal parasite in USA
- associated with untreated surface/groundwater
- 1.2 million reported infections annually

**Methods of Infection**

- Primarily from ingesting water containing Giardia cysts
- Person to person or zoonotic transmission
- transmitted via fecal-oral route
- Low infectious dose — As few as 10 cysts
- Infected individuals/animals shed  $10^5$ - $10^7$  cysts in their stool per day and can excrete cysts for months
- Individual cysts can survive for weeks-months in cold water and are moderately resistant to chlorine treatment

The diagram illustrates the life cycle of Giardia intestinalis. It shows a human host where trophozoites emerge from the small intestine, pass through the large intestine, and are excreted in feces. In the environment, trophozoites encyst to form cysts. These cysts can survive outside the host. A person can become infected by ingesting water containing these cysts. The diagram also notes that trophozoites emerge from the small intestine and that only cysts can survive outside the host.

**Giardia Lifecycle**

Diagram illustrating the life cycle of Giardia intestinalis, showing the transition between trophozoites and cysts, and the stages of infection in the human host.

**Acute Giardiasis**

- develops after an incubation period of 1-14 days
- May last for weeks to several months
- Symptoms include diarrhea, abdominal pain, weight loss, bloating, nausea, and vomiting
- Approximately 84% will self-resolve over time

**Chronic Giardiasis**

- Approximately 16% of all infections result in chronic Giardiasis
- May last for months, years, or lifetime of patient
- Symptoms similar to those seen in acute Giardiasis, but can also include development of allergies, lactose intolerance, chronic fatigue, reactive arthritis, irritable bowel syndrome (IBS) and malabsorption
- Can mimic IBS, peptic ulcer disease (PUD), gallbladder and biliary tract disorders, and some types of cancer

**Asymptomatic Giardiasis**

- Approximately 20% of infections will be asymptomatic
- All infected patients will still release cysts

**Giardiasis-related Facts & Data**

Confirmed Giardiasis Cases by Vermont county:

	AD	BE	CA	CH	EX	FR	GL	LA	DR	OL	RU	WA	WD	WS	Total
2010	14	3	7	54	5	9	0	9	12	4	14	20	16	18	185
2011	12	14	10	74	3	3	0	6	7	6	11	42	20	15	223
2012	15	4	3	70	1	8	1	9	9	7	8	22	32	24	183
2013	11	5	13	38	4	10	3	9	13	9	6	19	27	26	173
2014	7	6	8	57	3	5	0	9	2	4	9	12	7	11	140

- Giardiasis was a reportable disease in Vermont until March 26, 2015
- The CDC identified Vermont as having the highest incidence rate for Giardiasis in the nation in the most recent Giardiasis report
- At the time of the last CDC report, the incidence rate for Vermont (35.6 per 100,000) was approximately triple that of the state with the second highest incidence rate, Maine (12.9 per 100,000)
- The Health Center (Plainfield, VT) treated a total of 39 patients in 2016
  - 7 of these 39 patients were tested for Giardiasis with 1 patient testing positive
  - 34 were treated with Tindazole, 4 with Metronidazole, and 1 with Albendazole

**Testing for Giardiasis**

- Bright field microscopy
- ELISA tests available have sensitivity of 88-98% and a specificity of 87-100%
- Three stool specimens collected on separate days increase test sensitivity due to cysts being shed intermittently
- Per CDC: three separate tests with negative results should be obtained before declaring a patient free of infection
- Central Vermont Medical Center .....

**Treatment of Giardiasis**

- For Symptomatic infections, consider prescribing Metronidazole (Flagyl) or Tinidazole (Tindamax)
- For children over the age of one who need a liquid form, consider Nitazoxanide (Alinia)
- During pregnancy, consider prescribing Paromomycin during first trimester, and Paromomycin or Metronidazole in second and third trimesters
- Mean efficacy of Metronidazole (Flagyl) and Tinidazole (Tindamax) is 92%
- Mean efficacy of Nitazoxanide (Alinia) is 85%



# Results & Response

- Providers and staff at The Health Center responded very positively to the session focused on provider education regarding Giardiasis in Vermont and to both the provider and community resources that originated from this project
  - Many of the providers indicated that they found the material presented to be “extremely relevant” to their practice
  - Many providers stated the presentation included “information that they otherwise would not have known”
  - One provider stated: “This presentation greatly helped the practice come to consensus about treatment approach to Giardiasis and was extremely helpful overall!”
- An informational brochure is available to patients in the waiting area of The Health Center, as well as in electronic format for use by providers when discussing Giardiasis with patients
- A one page quick-reference handout was provided to all providers to enhance knowledge related to Giardia, its prevalence in Vermont, symptoms, testing modalities, and most up-to-date suggestions for treatment
- An educational article was submitted to two local newspapers. At the time of this project’s conclusion, **The Times Argus** published the article “Beaver Fever-- Giardiasis in Vermont” in the April 22, 2017 edition. **The World** newspaper indicated that they would be publishing the informational article about Giardiasis in the May 3<sup>rd</sup>, 2017 edition to promote further awareness in the community

# Evaluation of Effectiveness

- **Effectiveness**

- The goals of this project to promote public and provider awareness about Giardiasis in Vermont was successfully achieved by providing a handout and oral presentation to providers, and an educational brochure and newspaper awareness publication to the patient population
- The primary method for evaluating patient awareness of Giardiasis will be determined by providers going forward. It can be gauged by the level of knowledge in the patient population, if the topic comes up, and also by seeing if patients bring more questions related to Giardia to their provider

- **Limitations**

- The assessment of effectiveness for educating the community about Giardiasis will need to be evaluated over time as people have the opportunity to see the educational resources (brochures and newspaper articles)
- The time constraints of this family medicine rotation do not allow for patient interviews or surveying to assess the impact of the provided educational resources

# Future Directions

- Assess provider perspectives to see if they believe patient awareness of Giardiasis has been enhanced in the patient population of The Health Center
- Survey patients for their perspective and perceived knowledge after educational resources have been available for a given period of time
- Enhanced community outreach could include radio and web-based information, as well as education at local schools and public events
- Encourage offices and providers to identify patients at risk for exposure to Giardia, either by age, occupation, or outdoor activity, and discuss prevention of Giardiasis at office visits

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