WHAT’S REALLY IN OUR WATER?

Is our water safe?

Cryptosporidium and you

Giardia in our waters

Water filtration systems
Letter from the Editors

Emily loves fitness magazines. Whenever she sees a new issue of *Women’s Health*, she has to buy it. Emily takes all of the fitness tips to heart and uses them in her everyday life. One of the tips that is reiterated in almost every magazine is to drink water, and lots of it. Water is an essential nutrient for life and is necessary in order for the human body to function.

When we go to get our water, the last thing on our minds is the safety of the water we drink. We always assume that it is safe for us to drink. After all, it is a main source of life. This source, however, can also bring death. *Giardia lamblia* and *Cryptosporidium parvum* are two water-dwellers that cause violent diarrhea in the infected hosts. Every year, 3.4 million people lose their life due to water-related disease.

Thankfully, our water filtration systems remove these microbes from our tap drinking water. For those in developing countries, those living without filtration systems, campers, lake and ocean swimmers, and animals that drink from water reservoirs, these pathogens are a very large and real threat. This is because 90% of our wastewater goes untreated and goes directly into our rivers, lakes, and oceans. This makes our natural reservoirs very dangerous to drink from.

In order to avoid the disease caused by these pathogens, we made this newsletter to inform the reader about these water-related pathogens that effect humans as well as animals in order to allow them to avoid and prevent disease from these dangerous villains in many different situations.

Sincerely,

The German Dream Team:

Emily Driessen, Liz Schultz, and Erika Wehmhoff

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How Safe is U.S. Drinking Water?
by Liz Schultz

Water – an essential part of our everyday lives. We use it to shower, cook, wash our hands, hydrate our bodies, and even clean our pets. We often turn on the faucet without a second thought as to how pure it is, but could there be something more sinister lurking in that glass of water?

From 1971 to 2002, there were 764 cases of waterborne outbreaks from drinking-water in the U.S., resulting in 575,457 cases of illness and 79 deaths. While these numbers may not seem very large scattered over many years, the question remains as to why there are any outbreaks at all. Shouldn’t the U.S., with its sophisticated scientists and top water treatment facilities, be able to stop all of these outbreaks from happening in the first place?

Most municipal (city) water facilities go through more than one measure to rid the water of most microbiological activity. This process usually includes filtration, chlorination, and/or disinfectants. These systems do a fairly good job of ridding almost 99% of all types of microbes – viruses, fungus, bacteria – from the water. We can thank these systems for not giving us diarrhea on a daily basis.

The trouble, however, begins with the treatment facilities themselves. The U.S. has an aging infrastructure, which includes many of its water treatment systems. Often facilities cannot get enough funds to keep up with the demands for repairs in the plant. As a result, equipment becomes outdated or run down. This becomes a perfect opportunity for pathogens to infiltrate our drinking water.

To combat this, the Environmental Protection Agency (EPA) and state governments have regulations that require water treatment facilities to sample the water coming out of the plant for things like fecal coliforms – a test of how much poop contamination there is in the water – and other known pathogens. These tests are often available online and can be found through your state government website. If a plant fails the water sample tests, they are often shut down or a “boil water” warning is sent out to the public until the problem is taken care of.

While these tests are often a great indicator if treatment for microbes is being performed properly, not all pathogens can be detected through these means. Some microbes, such as Cryptosporidium and Legionella, actually survive fairly well through some of the standard water treatment processing.

This news may seem a little scary, but the good news is that the U.S. is lucky to have one of the cleanest drinking water supplies in the world. If you are still wondering how clean the water is in your area, check out your state government’s web page for more information.
Cryptic Cryptosporidium
by Emily Driessen

In the early 1990’s, there was a massive water contamination crisis. During this two-week debacle, 403,000 citizens were infected with a water-related pathogen. Of the infected, 104 died. The culprit of this event was a small pathogen, known as Crypto, which was able to pass through the public drinking water filtration systems.

In more recent news, you may have heard multiple reports about Crypto. The summer of 2013 held many Crypto outbreaks that traced back to outdoor public swimming pools in Utah and Iowa. Then on October 4, 2013, there was an outbreak of Crypto in Milwaukee. The suspected origin for this outbreak was five people who had recently travelled internationally.

So, we know there are outbreaks, but what exactly is “Crypto?” It is short for Cryptosporidium parvum. To many people, the name Cryptosporidium may sound like a foreign language. Rather, it is the name of a pathogen that is the most common cause of water related disease in humans in the United States. This pathogen is a parasitic protozoan that causes violent diarrhea in its hosts. In order to avoid and prevent infection, it is important to understand Cryptosporidium and the reservoirs it lives in.

Dire Diarrhea?

The disease caused by this particular pathogen is called Cryptosporidiosis. Once Crypto is ingested, it starts settling in and making itself at home in the intestines of the host. This upsets the gastrointestinal tract and diarrhea begins. The symptom of diarrhea in an infected host actually helps to spread the disease to new hosts. This is because Cryptosporidium is spread by the fecal-oral route. This means that Crypto enters the body through the mouth upon accidental consumption of infected feces.

Fever, cramps, and dehydration also accompany a Crypto infection. Typically, in healthy hosts, the disease can be cleared shortly by the immune system. In HIV/AIDS patients, however, this disease can be fatal because of their weakened immune systems.

Where is Crypto?

In rare cases, such as the Milwaukee incident mentioned above, Crypto is accidentally introduced into the water supply. More commonly, however, Crypto is found in swimming pools, shallow lakes, rivers, and oceans. Not all bodies of water contain Crypto, but if an infected host starts experiencing symptoms and they go swimming, their stool can get into the water and introduce Crypto into the environment.

(Continued on pg. 5)
You may be saying to yourself, wait, I thought swimming pools were safe because of the chlorination. While chlorine can kill Crypto if the concentration of the chemical is high enough, if the chlorine concentration is too low the parasite can live in the pool for an extended period of time. This chlorine resistance is due to the fact that Cryptosporidium is protected by an outer shell that allows this pathogen to survive harsh chemical environments.

Just as Crypto compromises swimming pool safety, it also is dangerous in our water supply. Now, before one gets scared and freaks out about this, this is not a common occurrence. But it still is a concern. Run-of-the-mill water filtration systems are unable to filter out the tiny protozoan that is Crypto. There are filtration systems that are able to filter this specimen out of the water, but they are not used at all water treatment plants. Because of this, water treatment plants are highly regulated, and the safety of our water supply is frequently tested. Crypto, however, has contaminated the water supply before and it can happen again.

**Think You Have Crypto?**

If you are experiencing the symptoms accompanied with a Crypto infection as listed above, seek medical help!

**Prevention**

Crypto infection can be prevented with a few practical hygiene tips:

- Wash your hands!
- Do NOT swim if you have diarrhea!
- Do NOT bring your child to daycare if they have diarrhea.
- Check the safety of your water and the filtration systems in your area by visiting [http://water.epa.gov/drink/](http://water.epa.gov/drink/).

Meet Dr. John McEvoy

**What kind of research does he do?**

Dr. McEvoy works with *Cryptosporidium* by studying coevolution with its hosts, examining how Crypto causes disease, and how it moves about in the environment. He also studies how microbes can be used for bioremediation in order to reduce agricultural pollution in the environment.

**What makes him interested in *Cryptosporidium?***

Dr. McEvoy joined a project dealing with Crypto when he was finishing his PhD in Ireland. He had the opportunity to visit many countries in Europe if he took the *Cryptosporidium* project, so the truth is he began studying it for the travel opportunities.

**What brought him to NDSU?**

Dr. Cathy Logue, a previous faculty member at NDSU as well as an old friend, told him of a post-doc opportunity at NDSU. She asked if he would take it. He said he would come for a year, but it’s been ten years now. NDSU is that great!

**What are his interests and hobbies outside of work?**

Dr. McEvoy may lead you to believe he is boring and does not have time for hobbies, but this is far from the truth! He enjoys running when he has the time and has even won the Manitoba Marathon. Dr. McEvoy is the proud owner of a dog named Shep and a not so proud owner of a cat named Diesel. The cat is really for his dog, as his wife believed Shep was lonely and needed company.
Zoonotic Special – Giardia
by Erika Wehmhoff

What is Giardiasis?

Giardiasis is the disease caused by Giardia parasites. Symptoms of Giardiasis will typically appear 1 to 3 weeks after infection, and can last anywhere from 1 to 6 weeks depending on the individual. Symptoms include diarrhea, gas, greasy stools, abdominal cramps, upset stomach, nausea, vomiting, and dehydration. Giardiasis may also cause weight loss and prevent the absorption of lactose, fat, vitamin A, and vitamin B12. Symptoms in animals are similar to those of humans.

If my pet has a Giardia infection, can I get infected?

Luckily, the risk of getting Giardiasis from a dog or a cat is very minimal. The type of Giardia that usually causes disease in dogs or cats is not the same as the type of Giardia that causes disease in humans. The risk of zoonotic transmission can be further minimized by taking proper hygiene precautions (i.e. washing hands, wearing gloves) when caring for your sick pet.

What should I do if I suspect my child, my pet, or I am experiencing symptoms of Giardiasis?

If you suspect anyone in your family has Giardiasis, an appointment should be made with the proper doctor, whether it is an M.D. or a D.V.M. The respective doctor will test several fecal samples for the presence of Giardia cysts, and a treatment course will be pursued. There are several drugs that can treat a Giardia infection and a drug regimen will be determined based off the individual’s medical history.

How do people and animals get infected with Giardia?

People and animals get infected with Giardia by coming into contact with contaminated food, water, or soil containing Giardia cysts. Cysts are the infectious component of the Giardia lifecycle and are passed in an infected individual’s feces. Common ways people and animals can get infected include:

- Swallowing or playing in lakes, streams, or rivers
- Drinking water from lakes, streams, or wells
- Eating food containing Giardia cysts
- Having contact with someone who is sick with Giardiasis
- Playing in soil contaminated with Giardia cysts
- Coming into contact with an infected dog or cats’ stool

It is important to note that Giardia is not passed through contact with blood.

How can I prevent a Giardia infection?

The best ways to prevent infection by Giardia include:

- Practicing proper hygiene
- Avoiding drinking and playing in water that could be contaminated
- Avoiding eating food that has come into contact with untreated water,
- Cleaning up after people and animals sick with Giardiasis

For pets, the best prevention is trying to keep Giardia out of your backyard environment. This includes removing feces from your yard as soon as possible and eliminating sources of standing water in your yard.
With summer gone and winter staring us in the face, it is prime time to fondly reminisce about the warm, sunny days of summer and to begin the long look forward to next June. For the outdoorsy types, and even for those wanting to become outdoorsy types, the camping trips of next summer are in full planning mode. One of the most important ideas to keep in mind for anything outdoors is safety. One of the biggest dangers to every camper, hiker, and backpacker is unpurified water. Crypto and Giardia and Legionella, oh my! With hundreds of water safety products out there, it is hard to know which to purchase. Find out what you need for your trip with our water treatment product review!

### Water Filters – Which to Use?

by Erika Wehmhoff

<table>
<thead>
<tr>
<th>Water Filter</th>
<th>Effectiveness</th>
<th>Filtering Capacity</th>
<th>Ease of Use</th>
<th>Number of Uses</th>
<th>Price</th>
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<tbody>
<tr>
<td>LifeStraw Water Filter</td>
<td>0.2 micron filter removes 99.9% of bacteria and protozoans</td>
<td>Filters as you drink</td>
<td>Easiest use: Allows you to drink straight from the source or can insert straw into a water bottle</td>
<td>Filters up to 264 gallons</td>
<td>$21.95 including lanyard</td>
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<tr>
<td>Platypus Gravity Works Water Filter</td>
<td>0.2 micron filter removes particles, protozoa, and bacteria</td>
<td>Filters up to 4 liters (~1 gallon) in four minutes</td>
<td>Simple to use: hang one reservoir and place dirty water in. Leave while water filters to other reservoir</td>
<td>Filter has to be replaced every 500 gallons filtered</td>
<td>$119.95 includes two four liter reservoirs and filter</td>
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<tr>
<td>SteriPen Ultraviolet Purifier</td>
<td>Kills 99.9% of bacteria, viruses, and protozoans</td>
<td>16 oz. of water in under a minute or 32 oz. of water in a minute and a half</td>
<td>Most complicated to use: put pre-filter in the mouth of a Nalgene, pour water through, turn on the pen and stir the water</td>
<td>Battery operated: can filter 25 gallons per four lithium batteries; up to 8,000 uses per pen</td>
<td>$69.95 includes Steripen, pre-filter, and carrying case</td>
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And the winner is... All of them! With high filtering efficacy, each of these water treatment products will keep you safe on the trail. Which product you should purchase will depend on your trip’s needs.

**For the day hike:** if you are going on a day long hike, the SteriPen and the Lifestraw will be good options to purchase. You will likely need more than one bottle of water for a long hike, and carrying multiple water bottles gets very heavy. Bringing along a SteriPen or a Lifestraw will allow you to filter water on the trail as you need it instead of using the extra space and extra weight a second or a third water bottle would add.

**For the camping/backpacking trip:** if you are going on a multi-day camping or backpacking trip and will not have access to well water, the Platypus Gravity Works water filter is going to be your best option. With the ability to filter a gallon of water in a short amount of time, the Platypus can provide enough water for the cooking, camping, and drinking needs of the camp. The Lifestraw and SteriPen lack the ability to filter enough water to be useful. Although the Lifestraw and SteriPen are lighter weight and smaller, the Platypus is still extremely portable and lightweight for the amount of water it can filter, making it the best option for large scale water needs.

**For the overachievers:** Buy any combination of these three! The Platypus can be used once camp is made for the night and the Lifestraw or the SteriPen can be used during the hiking trips during the day. Perfect combo!
# Fun Time!

![Image: A cartoon of a child using a water filter straw.](image)

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## What is Going On Around Van Es Hall

### November Vet and Micro Department Events

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<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
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<td>Micro/Biotech Club Meeting</td>
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<td>Bacterial Genetics Presentations</td>
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“Meet Dr. John McEvoy”

“Zoonotic Special: Giardia”
All three images are owned by Erika Wehmhoff

“Water Filters – Which to Use?”
Image owned by Thomas Wehmhof

“Fun Time!” Cartoon
Cartoon was commissioned for this issue of Unseen Foes and was created by Betsy Peterschmidt. More artwork can be seen at: www.betsyillustration.carbonmade.com