Giardia Myth-Buster: How Delusion Created a False Industry Standard

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There are many things backpackers agree on. A warm meal feels great at the end of the day. Cotton fabric takes forever to dry in the field and should thus be avoided. Mosquitoes and black flies come straight from hell. And all backcountry water must be treated due to the presence of Giardia, a protozoan that has infested backcountry water sources throughout the United States and causes the gastrointestinal illness giardiasis. Now, there's no denying that hot meals are soothing, cotton kills, and camping during bug season is cruel and unusual punishment. But has Giardia infested backcountry water sources? Ask nearly any backpacker, land manager, or outdoor educator this question and you will receive a frantic, "Oh, yes it has!"

I calmly report, "No, it has not." Why do I veer from the backpackers and outdoor professionals who think they're well-informed and the outdoor educators who teach an "industry standard" of treating literally every drop of water? Because I have done my homework and they have not. Qualitative and quantitative evidence that supports not treating backcountry water while addressing hygiene is presented below within five myth-busting arguments that will encourage backpackers to abandon a false standard.

But first, where did this whole "treat your water" thing come from? Amazingly, this myth has been traced to its origin. In 1976, a group of backpackers camped next to a body of water in Utah's Uintah Mountains of Wasatch-Cache National Forest. After their trip, the majority of them became ill. Test results revealed they were suffering from giardiasis. These results marked the end of evidence and the beginning of speculation, which later morphed into delusion. The United States Forest Service, the administrating agency of the land the backpackers had camped on, heard about the incident and made a rash conclusion based on a rash assumption offered by intellectually lazy authors, who wrote about the campers' misfortune in a 1976 *American Journal of Tropical Medicine and Hygiene* article. The authors' conclusion? The culprit was the water.

This very unscientific hypothesis has two serious flaws. One, other groups camped at that body of water at that same time. They all drank the same untreated water, and no one in those other groups got sick. Two, the infection rate of sixty percent among the sick campers was

much too high for water to be the vector. As Tom Welch, MD, summed, "The authors [of the journal article] attributed the outbreak to drinking water at a campsite, although they admitted that they had been unable to prove this and that many others who camped in the same area were unaffected. Today, it is clear that this epidemic was caused by food or poor hygiene." No due diligence regarding analysis of the outbreak was ever completed. Giardia cysts were never isolated from the water source, multiple still-healthy users of the water source were never considered, and the role of hygiene and how it effected sick versus healthy campers was never contemplated. What the Forest Service and the discredited authors did, in one fell swoop, was create a fear of backcountry water not based in any semblance of reality. The rest, as they say, is history.

1. Safety in (Lack of) Numbers

Despite popular myth, water sources are not crawling with Giardia, as proven by a 1984 examination of nearly seventy Sierra Nevada water sources. This research project performed by the United States Geological Survey and California Department of Public Health drew two conclusions. First, data showed that more than 55 percent of high-use sources and nearly 85 percent of low-use sources had no Giardia cysts whatsoever. Second, of those sources in which cysts were present, the amount was ridiculously low, nowhere near enough to make you sick. As a portion of this study, nearly 1,000 gallons were filtered from ten sources. Fewer than 150 Giardia cysts were found, for an average concentration of 0.4 cysts per quart. To develop giardiasis, you must ingest approximately twenty viable cysts. To consume twenty cysts from those Sierra Nevada sources, you would have to drink fifty quarts of untreated water in one sitting. To get sick, all cysts would need to be viable. That is impossible.

If you demand less dated research, look no further than *Backpacker's* December 2003 "What's in the Water?" article. Using the services of Biovir Laboratories, *Backpacker* staff collected three samples from seven sources during that spring and summer. Seventy-one percent of their samples had no Giardia cysts. The most polluted sample had 0.8 cysts per liter.

The New York City Department of Environmental Protection (DEP) maintains trends presented by the 1984 and 2003 studies. As part of their Cryptosporidium and Giardia Monitoring Program, the DEP annually publishes results of their searches for Giardia. During a 360-day test period in 2008, the DEP collected 164 fifty-liter samples of untreated water from six

outlets of their Kensico and New Croton reservoirs. Thirty percent of their samples had no Giardia cysts. When cysts were present, there were fewer than 1 per 25 liters.

If you demand more recent evidence, the DEP collected and analyzed fourteen fifty-liter samples from February to May 2023. Giardia cysts found totaled 0, 6, 0, 0, 0, 0, 3, 2, 0, 0, 0, 0, 0, and 0 for an average concentration of fewer than one cyst per fifty liters. Other datasets gleaned from studies across the United States and Canada display an undeniable three-fold trend. One, cysts are rarely present. Two, when cysts are present they're at ridiculously low concentrations. Three, when cysts are present they're probably not viable. And don't get me started on this whole, "Yeah, these studies didn't find Giardia cysts, but what about cryptosporidium?!" Cryptosporidium is another protozoa. It causes the gastrointestinal illnesses cryptosporidiosis. When the DEP searched for Giardia cysts from February to May 2023, they also looked for cryptosporidium cysts. Within 700 quarts this agency collected and analyzed they were unable to find a single cryptosporidium cyst.

Myth busted: Giardia is ubiquitous in backcountry water

2. Are You Sure it Wasn't the Sushi?

Hikers often tell dubious stories of how they acquired giardiasis on backpacking trips by drinking untreated water. With such self-diagnosis I always ask, "Your doctor told you you had giardiasis?" The answer invariably is, "No… I mean… uh... I didn't get tested. But I'm sure it was giardiasis." Self-diagnosis perpetuates the Giardia myth. Famed long-distance hiker and mountaineer Chris Townsend revealed in *The Backpacker's Handbook*, "People who tend to get a gut disorder tend to blame Giardia in the water because they've been warned about it, even though the cause is probably not either Giardia nor the water."

In "Giardia Lamblia and Giardiasis," Robert Rockwell, Ph.D., agreed. "The diarrhea being blamed on Giardia from that climbing trip a week ago may instead be due to some spoiled food eaten last night or [bacteria] in undercooked chicken four days ago."

Steven Zell, MD, feels the medical community chronically misdiagnoses by "empirically treating [wilderness-acquired diarrhea] cases for giardiasis without demanding laboratory confirmation."

Welch agreed with Zell. "Most non-specialist physicians who have been out of training for a long time don't know much more about giardiasis than your average outdoor educator. To them it's straightforward: diarrhea after a camping trip means giardiasis. The treatment is easy, so they just give it. However, most cases of diarrhea go away after several days anyway, so the patient would get better no matter what treatment." Welch concluded, "In this case, however, when the patient gets better after taking anti-Giardia medication everyone assumes the 'disease' has been 'treated.' It is a self-fulfilling prophecy."

Myth busted: If you get sick after a backpacking trip, it's because you have giardiasis

3. Disregard Biased Parties

One water filter advertisement warns, "No water sources should be considered safe to drink without treatment." Water treatment companies are biased and have an interest in selling their products. They only benefit from spreading unfounded rumor. As Welch wrote, "There is ample evidence that the risk of acquiring disease from North American backcountry waters is nil, and that the real way in which disease is spread on treks is within the group from poor hygiene. Sometimes this entire thing seems like a conspiracy by the manufacturers of those silly filters."

Meanwhile, state, federal, and private agencies fear the L word: liability. In *The Backpacker's Handbook* Townsend reported, "To cover themselves, land managers generally advise people that all water needs treating." Trail clubs has followed suit, warning that all backcountry water will make you sick. From the Appalachian Trail Conservancy: "Water in the backcountry... may look, smell and taste good, but can still be contaminated by microorganisms, including Giardia lamblia and others...." From the Green Mountain Club: "Even if the water looks clean, it can carry bacteria, viruses, and protozoa. Giardia is one of the best-known risks from drinking untreated or poorly treated water, but it's far from the only one." From the Colorado Trail Foundation: "No water source along the Colorado Trail should be considered safe to drink...." The Pacific Crest Trail Association offered the darkest prediction: "Be warned, a drink of untreated contaminated water could land you in a hospital intensive care unit with a potentially lethal infection." Most troubling is that these trail clubs rarely warn hikers of the consequences of poor hygiene.

In James Wilkerson's *Medicine for Mountaineering*, Fred Darvill Jr., MD, agreed with Townsend. "Frantic alarms about the perils of giardiasis have aroused exaggerated concern about this infestation. Governmental agencies, particularly the U.S. Park Service and Forest Service, have filtered hundreds of gallons of water, found one or two organisms (far less than enough to be infective), and erected garish signs proclaiming the water 'hazardous.'"

Like Townsend and Darvill, Welch loathes the baseless warnings, especially trailhead postings. In a 1997 issue of *Adirondac* he wrote, "Upon passing any of the busy entrances to the [Adirondack] High Peaks on a summer day, one could easily get the idea he or she was coming into an area whose water quality approximates that of Bangladesh."

On and on the warnings go, yet what evidence are they based on? Though I have been looking since 2006, the year I started studying backcountry water quality, I have been unable to find a reputable study that supports the supposition that backcountry water is unsafe for consumption. To the contrary. All evidence supports what objective and well-informed medical professionals have known for decades. That is, the water's just fine.

In *The Backcountry Classroom*, authors cited Welch, and I'll give him the final word here. "In the United States, the vast majority of cases of giardiasis are caused by hand-to-mouth spread.... No studies have shown that consumption of backcountry water in North America is an important cause of this disease."

Myth busted: Biased parties report the facts about Giardia

4. The Real Culprits

Roland Mueser, author of *Long Distance Hiking*, completed a 1989 study that became the core of his book. He hiked the Appalachian Trail, and during his pilgrimage he asked thru-hikers a smattering of questions, from how many miles they hiked each day to if they smoked. Two unrelated questions he asked pertain to this article. He asked thru-hikers if they treated their water and, if so, how often. He also asked if they experienced gastrointestinal illnesses during their hikes. Mueser interviewed 136 of the 208 backpackers who successfully traversed the Appalachian Trail that year. His contact rate of 65 percent is impressive. Of those 136 thru-hikers, some boiled their water, some used a chemical treatment, some used a filter, and some

didn't treat their water at all. No matter their treatment choice (including no treatment), approximately one-quarter experienced gastrointestinal illnesses. Mueser's data follows.

How often they treated their water	Percent who became ill
Always	21%
Usually	28%
Sometimes	29%
Never	20%

How can this be? As Mueser correctly deduced, "It seems probable that some systematic explanation for gastrointestinal illness [lies] beyond the simple water-purification process...." The thru-hikers didn't get sick from the water. They suffered from food-borne illnesses due to not properly washing their utensils and dishes, and they became infected with protozoan and bacterium by not washing their hands. This is how backpackers continue to get sick today.

Addressing hikers who suffer from food-borne illnesses, it would be best to ditch the multiple pots, pans, mugs, and utensils and adopt the "one pot system." When I taught outdoor education, my students each carried one pot, one lid, and one spoon into the field. That's it, and they weren't allowed to share them. Students chose meals that required boiling water. By boiling water in their pots each day and then eating out of them rather than out of anything else, they ensured their pots were perpetually disinfected. To ensure you and your campmates don't become victims of a food-borne illness, adhere to the ten golden rules of the backcountry kitchen.

1. Institute the one pot system
2. Cook food thoroughly
3. Choose meals that require boiling water
4. Don't eat leftovers
5. Dispose of spoiled food
6. Wash all utensils, pots, bowls, and mugs often
7. Let all in #6 air-dry completely
8. Clean the threads of your water bottles

9. Choose foods with long shelf lives
10. Further educate yourself on food-borne illnesses

Addressing hikers who don't wash their hands well nor often, our hands are the most common vector for spreading disease. In a 2012 article by Welch, et al., "High Fecal Hand Contamination Among Wilderness Hikers," Welch and colleagues found that among the 72 hikers involved in this study, 31 percent "had hands colonized with fecal bacteria." To ensure you do not spread nor become a victim of sickness in the backcountry, employ the ten golden rules of hygiene.

1. If you're sick, let your campmates know
2. If you're sick, stay out of the kitchen
3. If you're very sick, tent alone
4. If you're wicked sick, go home
5. If you cough or sneeze, do so into your elbow
6. Do not reach into others' food bags
7. Do not share utensils, pots, bowls, water bottles, or mugs
8. Avoid outhouses
9. Keep your fingers out of your mouth
10. Use hand sanitizer after using the bathroom and before preparing food

To quote Rockwell, "The bad news: Giardia Lamblia is almost everywhere." Giardiasis infections have been traced to public swimming pools, day care centers, public restrooms, facilities that cater to intellectually disabled persons, unsafe sexual practices, municipal water sources, and food sources, among other sites and practices. No evidence traces giardiasis back to backcountry water.

Myth busted: Untreated water is the primary source of illness in the backcountry

5. Lab Rats Don't Lie

By this point perhaps you're daring, "Well, if the water's so safe, Schlimmer, then why don't you go out there and drink a hundred quarts of untreated water?" I'm way ahead of you. During June 2006, I read the studies shared within this article and haven't treated any backcountry water since. Here's the field data from June 2006 to August 2023.

Location	Quarts consumed
Adirondack Park, NY	660
Catskill Park, NY	150
Great Smoky Mtns. National Park, NC	105
San Isabel National Forest, CO	50
Pike National Forest, CO	50
Lake Tahoe Basin, CA/NV	30
Tonto National Forest, AZ	25
Chugach National Forest, AK	20
Coronado National Forest, AZ	20
Denali State Park, AK	20
White Mountain National Forest, NH	20
Paper company lands, ME	15
Arapaho National Forest, CO	10

That's 1,175 quarts of untreated water consumed. I've shown no signs of giardiasis. Incredibly, some say this is "luck" – that I miraculously chose scores of Giardia-free sources across nine states. If this is luck, it is the most remarkable case of luck in the history of mankind.

By my hundredth quart I was convinced of Giardia's absence. I then empowered the outdoor education students and trail crew members I led. Between May 2008 and September 2012, I let them decide whether to treat their water or not, but good hygiene was not optional. No one who drank untreated water contracted giardiasis or any other gastrointestinal illness. Here's the field data.

Date	Location	Participants	Quarts consumed (average)
May 2008	Adirondack Park, NY	7	105 (15)
Sept. 2008	Adirondack Park, NY	10	110 (11)
May 2009	Adirondack Park, NY	6	60 (10)
July 2009	Denali State Park, AK	12	220 (18)
Aug. 2009	Adirondack Park, NY	10	505 (51)
May 2010	Adirondack Park, NY	3	45 (15)
May 2010	Adirondack Park, NY	8	165 (21)
Oct. 2010	Adirondack Park, NY	7	110 (16)
May 2011	Adirondack Park, NY	8	90 (11)
July 2012	Great Smoky Mtns. NP, NC	5	90 (18)

After recording these 76 participants collectively consume 1,500 quarts and remain perfectly healthy, I moved toward the backpacking community at large and posted an announcement on two popular Internet hiking forums, asking people if they treated their water. There was great interest. One forum logged more than 1,600 views and 40 responses. The other forum doubled this. Combining their responses with my experience leading outdoor education students and trail crew members who didn't treat their water, I recorded the experiences of more than 200 participants who collectively consumed more than 10,000 quarts and remained perfectly healthy. If anyone maintains this is luck, it is an amazing stroke of luck, year-round, across the country, from mountain springs to lakes, sea level to timberline, in individuals ranging from children to senior citizens, who covered tens of thousands of miles of terrain. No one's that lucky.

Myth busted: If you drink untreated water, you'll get giardiasis

The final question is "Why?" Why are most backpackers, outdoor educators, and land managers not embracing an evidence-based view toward backcountry water and hygiene, and what's the best course to take moving forward? Addressing this question as a former outdoor educator, there are four answers.

First, presenting rumor as fact undermines education. Educators are supposed to know their stuff. So are veteran backpackers. Through this they serve as mentors. If they teach others that water needs to be treated, and then those others read articles that prove otherwise, a disservice has been committed and reputations rightfully become suspect.

Second, we can all be doing better things with classroom time. Instead of discussing water treatment in paranoid tones, outdoor educators, for example, can discuss effective communication. That's the most important skill leaders need but the number one skill up-and-coming leaders lack.

Third, we can be doing better things with field time. Instead of filtering water, we can examine local flora and fauna, complete a map check, pick a better campsite, wash our hands, or care for our feet, all the while enjoying clean, safe water.

Fourth, we must stay up-to-date. Outdoor education students used to be taught to suck venom from snakebites. Trail crew members used to be taught to build trails straight uphill. These practices are now seen as nonsense, which is what treating water is.

We have the power to finally terminate a false industry standard by being evidence-based practitioners. Since we already agree that hot meals are welcome and cotton and antagonistic insects make for bad times, let us discuss our commonalities over a quart of untreated water and a bottle of hand sanitizer without concern for giardiasis.

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