**National Aeronautics and Space Administration**
**Goddard Space Flight Center Health Units**

# Monthly Medical Moment: June 2025

## Waterborne Illnesses: Staying Safe While Making a Splash this Summer

Recreational waters include those that are used for swimming, boating, watersports, and other recreational activities. You can be exposed to recreational water-based illnesses if you have contact with, swallow, or breathe in mists of contaminated waters; you can also develop illness by having contact with or inhaling evaporated chemicals used in the water. Water can become contaminated when water washes off of swimmers' bodies, or even when water runs off of recreational swimming areas where there might be human or animal feces.

***These diseases are preventable!***

### Diarrhea From Parasites:

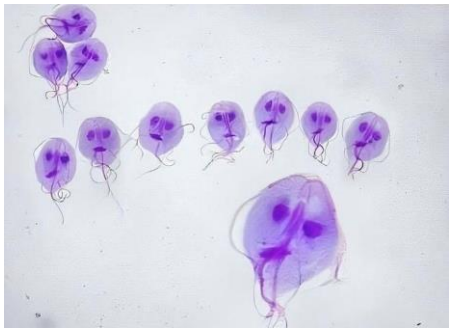
*Cryposporidium*[1]

- Symptoms: 2-10 days after infection, can last 1-2 weeks; most commonly watery diarrhea; immunocompromised individuals could have life-threatening malabsorption
- Treatment: most people with healthy immune systems will recover with adequate hydration and without treatment, though additional care may be needed for those who are immunocompromised

If infected with a parasite, do not swim for two weeks until after diarrhea has ended. These organisms are more resistant to chlorination than others![3]

*Giardia*[2]

- *Giardia* can survive for weeks-months outside of the body such as in soil
- Symptoms: 1-2 weeks after infection, can last 2-6 weeks, some occasionally have symptoms that can last for years; may have diarrhea 2-5 times per day, fatigue, gas, malodorous greasy feces, cramping, nausea, dehydration
- Children are more likely to get sick than adults
- Treatment: symptomatic individuals may need antiparasitic medication; certain individuals without symptoms may also need treatment and should consult with a healthcare provider



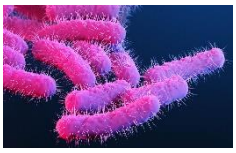
### Diarrhea From Bacteria:

*Shiga Toxin-Producing E. coli (STEC)*[4,5]

- *Escherichia coli (E.coli)* is a bacterium that normally lives in the intestines, but certain strains can produce illness-causing toxins. One strain, Shiga toxin-producing *E. coli*, has been associated with people swimming in feces-contaminated water
- Symptoms: 1-10 days after exposure; some do not become ill, but some can develop bloody diarrhea, vomiting, fevers, cramps. A severe condition called infection-associated hemolytic uremic syndrome may develop, which is a condition of blood cell breakdown ("hemolytic anemia"), low platelet count ("thrombocytopenia"), and kidney damage/failure
- Individuals at increased risk of infection include children younger than 5, adults 65 and older, immunocompromised individuals, and international travelers

- Treatment: most people recover with supporting treatment like staying hydrated, but anyone with bloody diarrhea should seek medical care – depending on the type of organism and extent of infection, antibiotics can increase or decrease risk of complications
- AVOID anti-diarrheal medications like loperamide (Imodium) or diphenoxylate with atropine (Lomotil) because they may make symptoms worse by preventing toxins from leaving the bowels

### *Shigella*[6]



- There are different species of *Shigella* – these bacteria cause around 450,000 infections in the US annually, and antibiotic-resistant infections result in $93 million in direct medical costs
- Symptoms: 1-2 days after infection, can last 7 days; people might experience bloody, prolonged diarrhea, fever, stomach pain, and sensation of needing to pass stool even when the bowels are empty. Some types of *Shigella* can also cause hemolytic uremic syndrome (see "*Shiga Toxin-Producing E. coli"*)
- People at higher risk include children under age 5, travelers to areas with poor sanitation, and sexual activity involving stool exposure
- Treatment: mild cases may need only fluids and rest, though prescribed medication may be needed for more severe cases – consult with a healthcare provider because *Shigella* species may be resistant to and not treated by certain antibiotics, and certain treatments may increase or decrease the risk of complications
- AVOID anti-diarrheal medications like loperamide (Imodium) or diphenoxylate with atropine (Lomotil) because they may make symptoms worse by preventing toxins from leaving the bowels

## Diarrhea from Viruses – *Norovirus*[3,7]

- Norovirus is a highly contagious virus that can cause vomiting and diarrhea for 24-48 hours. It is sometimes called the stomach flu, but is *not* related to the flu (caused by the influenza virus)
- Symptoms: 12-48 hours after exposure, can experience 24-48 hours of diarrhea, vomiting, nausea, stomach pain, fever, headaches, body aches, and dehydration
- Treatment: most people recover within 1-3 days by staying hydrated, but you can still spread norovirus for two or more weeks after feeling better. There is no specific medicine to treat norovirus – antibiotics will NOT work against norovirus

## Skin Rashes/Dermatitis[3,8,9]

- Chemical dermatitis – a rash that can develop from too much chlorine in the water
- Hot tub rash from *Pseudomonas* – *Pseudomonas* is a bacterium that is associated with infections from hot tubs, spas, and whirlpools; it can cause itchy, red, and bumpy rash, or pus-filled blisters around hair follicles. Mild rashes usually go away on their own in a few days


- *Mycobacteria* or "fish handler's disease" or "aquarium handler's disease" - *Mycobacteria* are a group of bacteria that includes tuberculosis, but there are non-tuberculous mycobacteria that can be found in coastal waters, pools, and tropical fish aquariums that cause skin infections (open sores, red lumps/rashes) which can spread to the joints or bones. Infection can occur by handling infected fish when you have a cut or open sore on the skin. Most infections heal on their own, though more serious infections may need antibiotics or surgery. Without treatment, infection can last for weeks to months. People with weakened immune systems are at increased risk



## Swimmer's Ear[10,11]

- Swimmer's ear is a type of infection of the outer ear/ear canal ("otitis externa"), often involving multiple bacteria like *Pseudomonas* and *Staphylococcus aureus*. It is different from middle ear infections, and occurs when water is trapped in the ear canal
- Symptoms: fast onset (within 48 hours), may include ear canal inflammation, pain, itching, fullness, hearing loss or jaw pain
- A lack of earwax (such as due to aggressive cleaning with Q-tips/cotton swabs) can *increase* your risk for swimmer's ear! Earwax limits bacterial growth and is a natural barrier to moisture
- Treatment: depending on the severity and whether the ear drum is intact, the treatment regimen can vary, and could include antibiotics, steroids, or anti-inflammatory medication. Symptoms may start improving within 2-3 days, but can take up to two weeks to fully recover

## Hot Tub *Legionella*[12,13]

- *Legionella* bacteria from contaminated hot tub mists can cause *Legionella* pneumonia ("Legionnaires' disease") and a milder, self-limited flu-like illness ("Pontiac fever"). Those at increased risk include people aged 50 or older, current/former smokers, people with chronic lung diseases, and immunocompromised people
- Symptoms and treatment:
    - Legionnaires' disease may be similar to other pneumonias and cause fever, cough, and shortness of breath – it can also cause gastrointestinal upset, low sodium, and liver damage. Because Legionnaires' disease can be severe and *Legionella* may be resistant to certain antibiotics, a healthcare provider should be consulted for specific, indication-based antibiotics
    - Pontiac fever can occur 4-60 hours after exposure, and can last for up to nine days and resolve without specific therapy. Symptoms may include fever, headache, nausea, vomiting, diarrhea, and muscle aches

## Pool Chemical-Related Irritation[14]

- Chlorine used in pools can combine with contaminants like urine, feces, sweat, dirt, skin cells, deodorant, and makeup to reduce the amount of chlorine available to kill germs, and to also create irritating chemicals called chloramines
- If you smell chlorine where you are swimming, it is probably from chloramines, which form in the water and can release into the air, which can be a problem if the area is not well-ventilated
- Chloramines can irritate the airways, eyes, and skin, resulting in nasal irritation, coughing, wheezing, asthma attacks, red/itchy eyes, and rashes

## Bonus Infection: *Vibrio* Infections[15,16]

- *Vibrio* bacteria can cause gastrointestinal, wound, bloodstream, and ear infections, and severe blistering skin lesions
- *Vibrio* exposure can occur through ocean/coastal waters, eating raw/undercooked shellfish, having contact with shellfish drippings, and receiving any cuts/wounds from items that were in contact with ocean/coastal waters, like catfish barbs, fishhooks, and crab pots
- Anyone can get sick from a *Vibrio* infection, but individuals at higher risk include those with liver disease, cancer, diabetes, HIV, thalassemia, immunosuppression, taking medicine to decrease stomach acid levels (as stomach acid helps destroy bacteria), or recent stomach surgery

## Bonus Infection: *Naegleria fowleri,* or the "brain-eating amoeba"[17,18]

- *Naegleria fowleri* is a free-living amoeba (a one-celled organism) that lives in warm freshwater lakes, rivers, and hot springs
- It can enter the nose while swimming and cause a rare brain infection called primary amebic meningoencephalitis (PAM) which is nearly always fatal and progresses rapidly. Most people with PAM die within 1-18 days, and can have symptoms including headache, fever, vomiting, stiff neck, confusion, seizures, and other neurologic abnormalities
- There have been five known survivors of PAM in North America, and treatment requires an intensive course and combination of medications
- The overall risk of PAM is very low – there were 37 cases total in the US from 2006-2015

The feeding structures of *N. fowleri* have a face-like appearance. D.T. John and T.B. Cole, Visuals Unlimited

## Bonus Illness: Algae Blooms[19]

- Algae and cyanobacteria can grow quickly ("bloom") and produce illness-causing toxins in fresh, salt, or brackish water especially if there are higher levels of nutrients (nitrogen, phosphorous) in the water
- Symptoms can vary by organism and toxin, and vary by exposure to blooms in fresh water (liver, kidney, neurological toxins; skin/eye effects, lung irritation from off-gassing of hydrogen sulfide and methane) or salt water (pulmonary and neurologic toxins, with gastrointestinal, cardiovascular, and other effects)
- There are no known antidotes to harmful algal bloom toxins – treatment is supportive

## Bonus Worm: *Baylisascaris procyonis* [20]

- Raccoons leaving feces in and around pools can leave behind eggs of a worm called *Baylisascaris procyonis* – swallowing a few eggs can result in no/few symptoms, though swallowing a large number of eggs can result in a severe disease that can invade the spinal cord, brain, and eyes

Adult raccoon roundworms removed from the small intestine of a raccoon; Clinical Microbiology Newsletter 2002; 24:1-7

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## Ways to Prevent Waterborne Illness[3,9,19,21,22]

### DON'Ts:

- Enter the water if you have diarrhea or upset stomach – one incident in the water can release enough organisms (millions!) that swallowing a mouthful can cause a 2–3-week illness
- Drink/swallow pool water, or water from creeks, streams, lakes, bays, oceans
- Change diapers at poolside
- Enter pools that are not properly maintained
- Enter waters that are cloudier than usual, discolored, or smell bad
- Swim in areas with closed/do-not-swim signs
- Swim in areas where pipes are draining into the water as they may pick up feces and other germs, especially after heavy rains
- Swim with an open cut or wound – if you do go into the water, use waterproof bandages to completely cover the wound

### DO's:

- Practice good hygiene – wash your hands with soap after using the toilet or changing diapers, even if you're going back in the water! If soap and water is not available, use alcohol-based hand sanitizer with at least 60% alcohol – wipe off sand beforehand!
- Seek medical care if you become ill after water recreation
- Take children to the bathroom often to prevent accidents
- Shower with warm water and soap before entering the water, and rinse off between pools
- Check and follow swimming, fishing, and shellfish advisories
- Notify a lifeguard of any feces in the pool
- Maintain your pools and hot tubs with proper filtration, chlorine, and pH levels
- Dry ears thoroughly after swimming
- Avoid exposing open wounds to salty or brackish waters – if exposed, wash the wound with soap and clean water
- Wash hands with soap and water after contact with fish, aquariums, swimming pools, and coastal waters; consider wearing gloves when handling fish
- Avoid submerging your head in warm untreated waters like hot springs
- Avoid digging in or stirring up sediment in shallow, warm freshwater areas
- Address pool contamination as soon and safely as possible - check out CDC guidance for responding to different pool contaminants and critters https://www.cdc.gov/healthy-swimming/response/index.html


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Please contact the Health Unit with any questions or concerns.
For emergencies, please call 9-1-1.


NASA Wallops Flight Facility Health Unit
34200 Fulton Street Building F-160
Wallops Island VA 23337
Phone: 757-824-1266 | Fax: 757-824-1497
Email: gsfc-wffhealthunit@mail.nasa.gov

NASA Goddard GSFC Health Unit
800 Greenbelt Rd Building 97 Mail Stop Code 250
Greenbelt MD 20771
Phone: 301-286-6666 | Fax: 301-614-6942
Email: gsfc-gbhealthunit@mail.nasa.gov