

Facts About *Naegleria fowleri* and Primary Amebic Meningoencephalitis

***Naegleria fowleri* is found around the world, often in warm or hot freshwater (lakes, rivers, and hot springs).**

***Naegleria fowleri* infections are rare and devastating. From 2005 to 2014, 35 infections were reported in the U.S. All but two were fatal.**

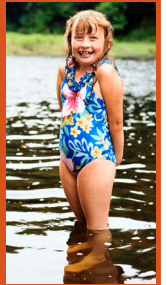
- *Naegleria fowleri* is a warm water-loving amoeba found around the world, often in warm or hot freshwater (lakes, rivers, and hot springs).
- *Naegleria fowleri* amoeba can travel up the nose and into the brain. This causes the disease primary amebic meningoencephalitis (PAM), which destroys brain tissue and causes brain swelling and death.
- Of 133 people known to be infected in the U.S. since 1962, only three people survived.

Symptoms

Symptoms can be mild at first, but they worsen quickly.

- Usually start about 5 days after infection (but can range from 1–9 days)
- Can include headache, fever, nausea, or vomiting
- Later symptoms can include stiff neck, confusion, lack of attention to people and surroundings, loss of balance, seizures, and hallucinations
- After symptoms start, the disease causes death within about 5 days (but can range from 1–12 days)

You cannot be infected with *Naegleria fowleri* by drinking contaminated water, and the infection cannot spread from one person to another.



Spread

Infections are spread through the nose.

People are infected when water containing the amoeba enters the body through the nose. Recreational water-associated infection most often occurs when people go swimming or diving during the summer in warm freshwater places, like lakes and rivers. Sometimes infections occur after people put their head under water in hot springs.

Infection has also happened when people use contaminated drinking water to cleanse their nasal passages during religious practices, use a neti pot or other device to rinse their sinuses through the nose, or get the contaminated water up their nose during recreational play.

National Center for Emerging and Zoonotic Infectious Diseases
Division of Foodborne, Waterborne, and Environmental Diseases



People and Places

***Naegleria fowleri* infections are more common in young boys and after use of warm lakes, rivers, and hot springs.**

Young boys are most at risk for *Naegleria fowleri* infection. While the reasons are unclear, young boys might participate in more water activities like diving and playing in the sediment at the bottom of lakes and rivers.

In the U.S., most infections have come from freshwater lakes, rivers, and hot springs located in southern-tier states. Recently people have become infected in northern states following periods of very warm temperatures.

The ameba can be found in:

- Bodies of warm freshwater, like lakes and rivers
- Geothermal (naturally hot) water, like hot springs, and drinking water sources (from water going up the nose)
- Warm water discharge from industrial plants

Recreational water-associated infections occur most often in July, August, and September, when temperatures are high for prolonged periods of time, causing water temperatures to rise and water levels to decrease.

***Naegleria fowleri* is not found in salt water, like the ocean.**

Protect Yourself

Lower your risk when swimming and rinsing your sinuses.

We do not know how to lower natural *Naegleria fowleri* levels in lakes and rivers. People should assume that there is always a low level of risk of *Naegleria fowleri* infection whenever they enter warm freshwater lakes, rivers, and hot springs, especially in southern-tier states.

The only certain way to prevent an infection when swimming is to avoid water-related activities in warm freshwater.

If you choose to swim, limit the amount of water going up the nose, and avoid water where *Naegleria fowleri* might live.

- Hold your nose shut, use nose clips, or keep your head above water when taking part in water-related activities in bodies of warm freshwater, including activities in warm water discharged from industrial plants.
- Avoid putting your head under water in hot springs and other untreated geothermal waters.
- Avoid water-related activities in warm freshwater during periods of high water temperatures and low water levels.
- Avoid digging in, or stirring up, the sediment while taking part in water-related activities in shallow, warm freshwater areas.

Rinsing sinuses, including with neti pots

When making a solution for irrigating, flushing, or rinsing your sinuses (for example, when using a neti pot, sinus rinse bottle, or other irrigation device, or performing ritual nasal rinsing), use safe water to protect yourself.

Take **at least one** of these actions to lower your risk of becoming infected:



- **Boil:** Use water that has been previously boiled for 1 minute and left to cool.
 - » At elevations above 6,500 feet, boil for 3 minutes.
- **Filter:** Use a filter designed to remove some water-loving germs.
 - » The label may read “NSF 53” or “NSF 58.”
 - » Filter labels that read “absolute pore size of 1 micron or smaller” are also effective.
- **Buy:** Use water with a label specifying that it contains distilled or sterile water.
- **Disinfect:** Learn how to disinfect your water to ensure it is safe from *Naegleria fowleri*.
 - » Chlorine bleach **used at the right level and time** will work as a disinfectant against this germ.

Rinse the irrigation device after each use with safe water, and leave the device open to air dry completely.



www.cdc.gov/naegleria