

Primary Amoebic Meningoencephalitis

Primary Amoebic Meningoencephalitis (PAM) is a very rare, but often fatal disease characterized by inflammation of the brain. PAM is caused by *Naegleria fowleri* (*N. fowleri*), a free-living single-celled organism called an amoeba. *N. fowleri* is commonly known as the brain-eating amoeba. Since the disease was first identified in 1965, 151 cases have been identified in the United States, and 126 of those cases (83%) have occurred in children and adolescents.

Most human victims of PAM are exposed to *N. fowleri* while swimming in warm surface waters such as ponds, lakes, streams and rivers. In very rare instances, *N. fowleri* infections can occur when humans are exposed to improperly maintained swimming pools and heated, contaminated tap water. The risk of acquiring PAM increases as water temperatures rise.

Transmission to humans occurs when the organism gains access to brain tissues through the nasal passages. The organism can enter the nasal passages when water that contains the organism is forced up the nose by activities such as diving, jumping into water, underwater swimming and use of nasal irrigation devices. PAM is not transmitted from person to person or by swallowing contaminated water.

PAM can affect people who are healthy prior to infection, and infection with *N. fowleri* has mainly occurred in young people. Treatment has been successful in very few cases if administered immediately. In cases where the disease is not successfully treated, death occurs within three to ten days due to brain swelling caused by the destruction of brain tissue.

Symptoms of the disease generally appear three to seven days after exposure to *N. fowleri*. Early symptoms may include severe headaches, vomiting, nausea and fever. Later symptoms include neck stiffness, confusion, loss of balance and seizures.

N. fowleri is common in warm surface waters. Swimmers who swim only in cool, unpolluted, moving waters or properly maintained pools should be at little risk for acquiring PAM. Although PAM is rare, people should take steps to protect themselves by:

- avoiding swimming in stagnant (unmoving) water;
- avoiding swimming in water with a temperature above about 80° F (If the water does not feel cool when you first enter, it is likely warmer than 80° F);
- avoiding underwater swimming, except in properly maintained swimming pools;
- holding your nose or using nose plugs when diving or jumping into water, except in properly maintained pools; and
- for nasal irrigations, using only store-bought distilled or sterile water, or boiling and cooling tap water before use.

The Centers for Disease Control and Prevention (CDC) website has very good information on PAM and *N. fowleri* (<https://go.usa.gov/xubke>), and was used to prepare this Fact Sheet.

