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## Primary amoebic meningoencephalitis - deadly waters

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**Abstract.** *Naegleria fowleri* Carter, is a protozoan that causes Primary Amoebic Meningoencephalitis (PAM). *Naegleria fowleri* is also referred to as the “brain-eating amoeba”, due to the fact that it destroys the brain when in contact. PAM is an extremely rare, yet fatal disease. Fewer than 5 percent of people that have had PAM have survived. PAM is in the United States as well as in underdeveloped countries, most recently Pakistan. PAM is avoidable, as long as the contaminated water does not enter the nostrils.

**Keywords:** Protozoa, amoeba

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### Introduction

*Naegleria fowleri* Carter (Schizopyrenida: Vahlkampfiidae), is a protozoan that causes Primary Amoebic Meningoencephalitis (PAM). This microscopic amoeba is capable of entering the nose and traveling to the brain. There, it destroys brain tissue leading to death. Since this amoeba attacks the brain it has been referred to as the “brain-eating amoeba” (Yoder et al. 2010)

### Background

There have been 133 cases of PAM in the US since 1962 (Yoder et al. 2010). Of those 133 people, only three have survived. The cases have all been in the southern United States. This is primarily because of the climate being hot and moist. More than half of the cases in the United States have been in Florida and Texas. There was even a case in Mississippi where a four year old boy died from the amoeba after playing on a Slip N’ Slide while in Louisiana (Tolan 2013). Cases of PAM have been occurring sporadically in the United States since about 1962. A number of those cases are from people swimming in water for recreational purposes (Yoder et al. 2010).

### Epidemiology

Primary Amoebic Meningoencephalitis (inflammation of the membranes of the brain) is the infection of the brain by the free living protist known as *Naegleria fowleri*. A protist is any free living eukaryotic organism that is unicellular. This organism targets brain tissues and causes PAM. Symptoms include: headaches, stiff neck, hallucinations, and dizziness. PAM is almost always fatal. The amoeba attacks brain tissues, causing the brain to swell and rapidly leads to death (Yoder et al. 2010).

*Naegleria fowleri* typically lives in warm freshwater and feeds on bacteria in the water. Since it thrives in warmer waters, summer is when the amoeba is at its peak (Yoder 2010, Cabanes et al. 2001). Many people swim in the same contaminated water for recreational purposes, unknowingly putting themselves at risk of infection. Occasionally, the amoeba will make its way into a human host by way of the nose. The amoeba travels through the olfactory nerves (connected to sense of smell) of the nose and to the frontal lobe of the brain. There, it destroys the tissue of the brain (Yoder 2010, Cabanes et al. 2001).

Due to the fact that PAM progresses so rapidly, treatments are rarely useful. Physicians have used amphotericin B which is an antifungal medication. Other medicines have been tested using in vitro studies but have remained unproven (Yoder 2010, Cabanes et al. 2001).

The fatality rate of *Naegleria fowleri* is unfortunately 99 percent. In the United States, 35 infections have been reported in the last ten years. Of those 35 cases, 31 people were infected by contaminated recreational water, three people from nasal irrigation by contaminated tap water, and one person from playing on a Slip N' Slide. From the point of infection, it usually takes about 5 days for the infection to kill the person (Tolan 2013).

### **One Health**

The amoeba that causes PAM is in the water we use almost every day. It affects us all in more ways than one. More often than not, people that get this disease die. Families then have to take care of funeral costs. So, the economy is primarily affected by this infection. There are other countries that are at risk as well. Pakistan for example has had an increase in cases of PAM recently. Pakistan is an underdeveloped and poor country where clean water is scarce. Due to the low income of the country, it makes it easier for PAM to be contracted and kill the citizens. The society as a whole is affected at this point. The fact that the country cannot afford to keep the water source clean is killing some of the citizens, along with the society (Yoder et al. 2010).

### **Conclusion**

Although PAM caused by *N. fowleri* has a high fatality rate, it is usually avoidable. Precautions must be taken whenever a person is exposed to untreated fresh water through recreational activities. Early recognition of the symptoms might lead to prompt treatment which might give a person a stronger chance of recovery and survival (Cabanes et al. 2001)

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