

Pathogenic Free-Living Amoebae



Australian
Water
Quality
Centre

Analysis for:
Naegleria
Acanthamoeba

Limit of Reporting:
<1/L

Components:
N. fowleri
Acanthamoeba

Sampling Requirements:

- Sterile 600mL PET bottles, Sodium thiosulphate dosed
- Air gap essential
- Transport & store at room temperature
- Process within 24-48hrs of collection



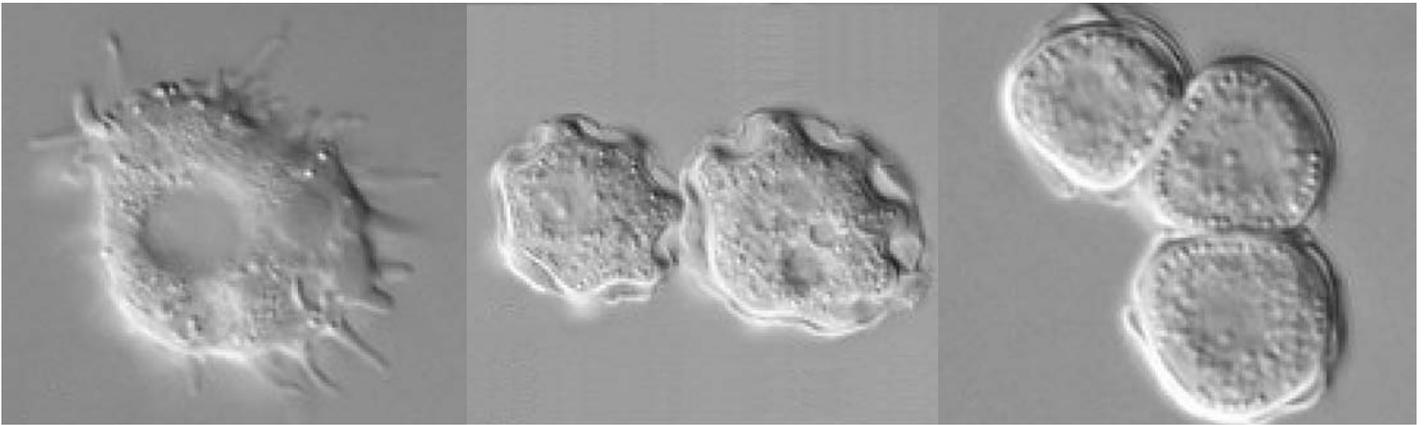
There are several groups of amoebae that are natural aquatic or soil organisms but are also opportunistic pathogens; that is, infection is coincidental to their normal life cycle.

Naegleria Fowleri

The waterborne disease primary amoebic meningoencephalitis (PAM, sometimes called amoebic meningitis) was discovered at the Adelaide Children's Hospital in the 1960s. While it is a rare disease, there have been more than 20 fatal cases in Australia. It has since been reported from about 15 other countries in Africa, Asia, Europe and North and South America.

PAM is caused by *Naegleria fowleri*, and follows intranasal infection during swimming in warm, contaminated freshwater. Most victims have been children and the disease is almost invariably fatal. Infections have been linked with warm waters such as above-ground pipelines, tropical lakes, geothermal water, heated swimming pools or discharges of industrial cooling water. Until infections were identified in the USA in 2002, Australia was the only country where *Naegleria fowleri* had been associated with public water supplies.

Temperatures favourable for *N. fowleri* growth (grows fastest at 42°C) occur in water piped above ground and in other man-made environments. *N. fowleri* exists in various forms including a dormant cyst which survives low temperature. These cysts have poor resistance to desiccation, so that this species rarely occurs in soil.



Control of Naegleria fowleri: Chlorine kills all life-cycle stages of Naegleria fowleri and is the most effective way to disinfect swimming pools. However, in rural water supplies chlorine does not always reach areas that the amoebae may colonise. Chloramination is more effective against N. fowleri. The South Australian Water Corporation now uses this process where amoebae have been detected.

Related Organisms: There are more than 40 named species of Naegleria. These occupy various thermal niches, ranging from warm thermal springs to cold polar lakes. Two species, Naegleria australiensis and Naegleria italica, can infect laboratory mice if inoculated in large numbers, but are not known to have caused human infections. All other species appear to be benign.

Acanthamoeba

Acanthamoeba is a group of amoebae unrelated to Naegleria, but also free-living. Several species are infectious, causing two diseases.

Granulomatous amoebic encephalitis (GAE) is a brain infection somewhat different from PAM. It typically occurs in immune-suppressed patients, usually secondary to infection elsewhere in the body (e.g. skin ulceration). Most cases are fatal after a protracted illness. There has been one Australian case caused by Acanthamoeba.

Amoebic Keratitis (AK) is a severe corneal (eye) infection, caused by several Acanthamoeba species, that appears

to be growing in frequency. It occurs in two different circumstances: some patients are people who work outdoors (e.g. gardens or building sites) and who may have a damaged cornea (e.g. a scratch). Other patients are people who wear contact lenses, but who handle their lenses unhygienically. Early cases of AK resulted in loss of the eye, or necessitated a corneal graft. AK can now be treated by drugs, provided it is diagnosed quickly.

Ecology of Acanthamoeba: Acanthamoeba occur in freshwater, soil and marine environments. The dormant stage (cyst) is highly resistant to desiccation in most species, making Acanthamoeba the most common protozoa in soil.

Acanthamoeba species are also suspected of playing a role in the dispersal of Legionella pneumophila, the bacterium responsible for Legionnaires' Disease. Legionella can grow symbiotically inside the amoebae, which may partly explain the ability of the bacteria to thrive in soil and to spread by air.

Other Amoebae

Free-living amoebae are extremely diverse and play an important part in natural biological processes including decomposition. In soil, they are believed to contribute to control of plant diseases caused by fungi and bacteria. They can also be useful indicators of environmental change, particularly of the effects of temperature.