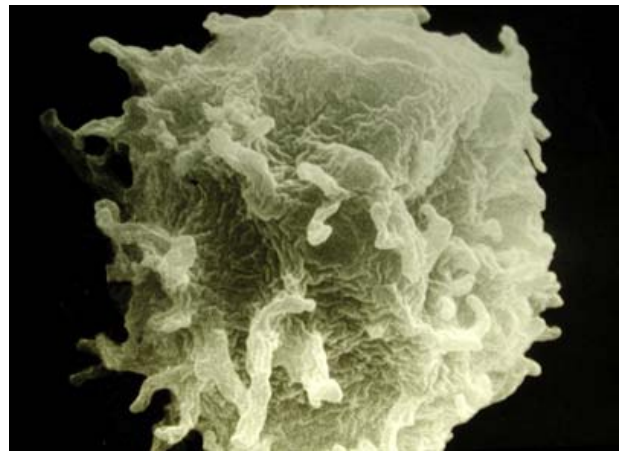


Acanthamoeba

Danger in the Water



by Jay Hardy, CLS, SM (NRCM)

Jay Hardy is the founder and president of Hardy Diagnostics. He began his career in microbiology as a Medical Technologist in Santa Barbara, California.

In 1980, he began manufacturing culture media for the local hospitals. Today, Hardy Diagnostics is the third largest media manufacturer in the U.S.

To ensure rapid and reliable turn around time, Hardy Diagnostics maintains six distribution centers, and produces over 3,000 products used in clinical and industrial microbiology laboratories throughout the world.

www.HardyDiagnostics.com

A *canthamoeba* is one of the most common types of protozoa in soil and is often found in fresh water. Most species supply their metabolic needs by eating bacteria, fungi and other protozoa.

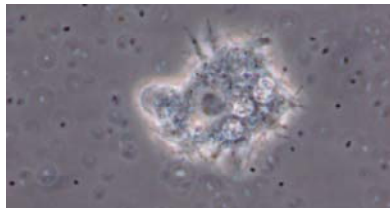


Figure 1: The Acanthamoeba trophozoite is seen here at 1,000X phase contrast. The organelles and acanthopodia can be seen. It has no flagellar form, which is characteristic of Naegleria.

Acanthamoeba is a microscopic, free-living ameba. This ameba has been isolated from water (including natural and treated water in pools or hot tubs), soil, air (in association with cooling towers, heating, ventilation and air conditioner systems), sewage systems, and drinking water systems (shower heads, taps).

Most people will be exposed to *Acanthamoeba* during their lifetime and will not get sick. In fact, 50 to 100% of the population will have antibodies to *Acanthamoeba* in their blood, and the organism can be isolated from the pharynx of many healthy individuals.

However, *Acanthamoeba* is capable of causing several devastating infections in humans; and has only been known to cause disease since the 1970s.

Amebic Keratitis

One of the diseases caused by *Acanthamoeba* is called amebic keratitis, which is an infection of the eye.



Figure 2: Invasion of the cornea is seen with amebic keratitis.

Over 1,300 cases have been described in the literature. The organism can live between the contact lens and the cornea and will eventually invade the cornea producing a milky white ulcer.

Approximately 85% of all amebic keratitis cases occur in people who wear contact lenses. The infection is very painful and can lead to blindness.

Since the ameba can be found in chlorinated swimming pools and domestic tap water; people who wear lenses while swimming or use tap water to rinse their lenses have an increased risk of infection. The cysts are resistant to the chlorine used to treat drinking water and swimming pools.

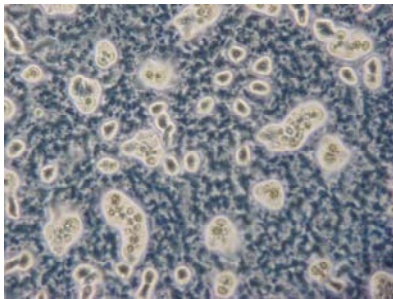


Figure 3: Both the cyst and trophozoite stages of *Acanthamoeba castellanii* can be seen here at 400X.

The incubation period is a few days. Keratitis typically begins with a foreign-body sensation followed by pain, tearing, photophobia, blepharospasm (twitching of the eyelid), and blurred vision.

The prevalence of this infection has risen in the past twenty years worldwide, mainly because more people are wearing contact lenses.

When people rinse their contact lens cases in tap water, they become contaminated with the amebae that feed on bacteria. They are then transferred onto the lenses and can live between the contact lens and the eye. This is particularly worrisome because most commercial contact lens solutions do not kill the amebae.

In May of 2007, a contact lens solution manufacturer recalled their product after the Centers for Disease Control found that 21 individuals had possibly received an *Acanthamoeba* infection after using the lens solution in the month prior to diagnosis.

Diagnosis and Culturing

Since *Acanthamoeba* feed readily on *E. coli* bacteria, it can be cultured by inoculating a plate of [Non-Nutrient Agar \(G225\)](#) that has been previously inoculated with a film of *E. coli*. If *Acanthamoeba* is present, “feeding tracks” will be seen at 100X when the plates are placed under the microscope and examined for up to ten days.



Figure 4: Tracks are seen as the amebae feed upon the film of *E. coli* on a petri plate. The amebae are seen at the end of each track (100X).

Disinfection

Although the amebae can be sensitive to the antiseptic chlorhexidine, the concentration found in some contact lens solutions is usually not high enough to be effective. Another possible disinfectant is polyhexamethylene biguanide (PHMB) but is not always effective. This has also been suggested as a treatment. Hydrogen peroxide is another commonly used disinfectant; however heat (at least 70°C) has been found to be the most effective means of killing the organism.

Treatment

The infection can be difficult to treat because the cyst is tough and resilient. Current treatment regimens usually include a topical (in this case, applied to the eye) cationic (made with positive ions) antiseptic drug such as polyhexamethylene biguanide

(PHMB, 0.02%), or chlorhexidine (0.02%) with or without a diamidine such as propamidine (0.1%), or hexamidine (0.1%). Therapy may last six months to a year, and is best done with a combination of drugs.

Risk Factors

The high risk factors are:

- Improper storage and handling of lenses (the longer the life of the lens, the greater the risk).
- Improper disinfection of lenses; such as using tap water or homemade solutions to clean the lenses.
- Not changing the lens case regularly.
- Swimming, using a hot tub, or showering while wearing lenses.
- Coming into contact with contaminated water.
- Having a history of trauma to the cornea.

Granulomatous Amebic Encephalitis

Acanthamoeba can also be a cause of encephalitis by entering cuts, wounds, or the nostrils and spreading to the nervous system.

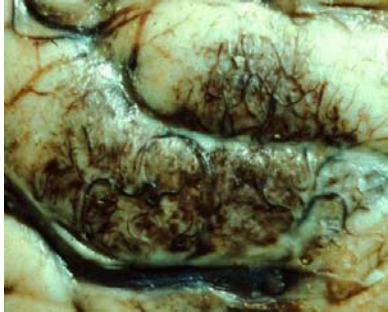


Figure 5: An *Acanthamoeba* abscess is seen here in brain tissue.

Although the organism is ubiquitous, there have only been 400 cases of *Acanthamoeba* encephalitis reported worldwide. Most cases occur in immunocompromised patients, and the survival rate is only two or three percent. Due to the infrequency of infection it is often misdiagnosed and improperly treated. The current treatments such as amphotericin-B, rifampicin, trimethoprim-sulfamethoxazole, ketokonazole, fluconazole, sulfadiazine, and albendazole are of only limited value.

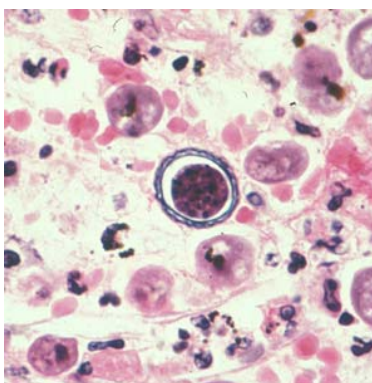


Figure 6: An *Acanthamoeba* cyst in brain tissue (H&E stain).

MRSA and *Acanthamoeba*

Oddly enough, due to the amebae's appetite for bacteria, Methicillin Resistant *Staphylococcus aureus* (MRSA) organisms have been found to be living inside the *Acanthamoeba* organism. Some strains have been found to contain MRSA in their cysts and have been an effective means of airborne dispersal of the drug resistant bacteria.

Summary

Acanthamoeba is a potentially dangerous pathogen that can be controlled effectively if precautions are taken.

Hardy Diagnostics offers a complete selection of products for the culturing and maintenance of free-living amebae including *Acanthamoeba* and *Naegleria*.

- [Non-Nutrient Agar, G225](#)
- [Pages Saline, R225](#)
- [Acanthamoeba Maintenance Broth, K225](#)
- [Naegleria Maintenance Broth, K325](#)

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