

FACT SHEET:

Acanthamoeba

Acanthamoeba and human infection

Acanthamoeba species are a group of free-living amoebae that are widely distributed in fresh and marine water bodies, soil and sewage. These organisms can also occur in tap water systems and household plumbing, bottled water, outdoor atmospheric dust, indoor dust in homes and hospitals, water in dental units, spas and swimming pools. *Acanthamoeba* species are a component of biofilms in drinking water systems. They feed on bacteria, but may also serve as hosts for pathogenic bacteria including *Legionella* and *Mycobacteria*.

Given the presence of *Acanthamoeba* in multiple environmental niches, it is likely that exposure to these microorganisms is very common; however, disease in humans is relatively rare. When illness does occur, it may be serious. Three types of infection are associated with *Acanthamoeba*:

- Acanthamoebic keratitis. Keratitis is an infection of the clear surface layer of the eye (the cornea) which can occur in healthy people. If not quickly diagnosed and treated, keratitis can cause scarring of the cornea, which may lead to partial or total loss of vision in the affected eye. Keratitis is most common among people who wear contact lenses, but may also occur after eye injuries or eye surgery. Keratitis can be caused by a number of different microorganisms. *Acanthamoeba* is not the most common cause.
- Granulomatous amoebic encephalitis (GAE). This is an infection of the brain and spinal cord which occurs in people with compromised immune systems. It is believed that the infection probably begins at another body site and then spreads through the bloodstream. GAE is often fatal.
- Disseminated infection. This is an infection that can affect many parts of the body, including the skin, sinuses, lungs and other organs. This illness is also usually confined to those with a compromised immune system.

Acanthamoeba cells have two different forms during their life cycle—an actively growing form (trophozoite), which is relatively sensitive to environmental conditions and disinfectants, and a dormant form (cyst) which is highly resistant to adverse environmental conditions. More than 25 species of *Acanthamoeba* have been identified and several have been associated with human infections. The optimum growth temperature for pathogenic *Acanthamoeba* species is around 30 °C.

Acanthamoeba infections are not subject to routine surveillance in Australia and no national estimate of disease rates is available. Some outbreaks of acanthamoebic keratitis have been reported to health agencies in Australia and other countries. Investigations showed these to be associated with particular formulations of contact lens care solution, which were subsequently withdrawn from the market. Tests conducted during these investigations indicated that the disinfectant in these products was less effective against *Acanthamoeba* than those in other formulations.

Acanthamoeba in water supplies

Drinking water is not routinely monitored for the presence of *Acanthamoeba* species, and there is limited information on the occurrence or concentrations of these amoeba in drinking water systems. Internationally, no standards or guideline values have been established for *Acanthamoeba* in drinking



water systems. Studies have shown that conventional water treatment using coagulation and filtration greatly reduces the levels of amoebae in water, but some trophozoites and cysts are able to pass through the filter beds. *Acanthamoeba* trophozoites are killed by chlorination but the cysts are able to survive disinfection processes and subsequently pass into the water distribution system where they may grow if conditions are favourable. Intrusion of soil contamination during pipe breaks and repairs may also be a source of *Acanthamoeba*. Good management practices such as maintaining disinfectant residuals, flushing and disinfection after repairs, and regular cleaning of sediment from pipes and storage tanks may reduce opportunities for regrowth of these organisms in the distribution system. Nevertheless, it is likely that *Acanthamoeba* are present intermittently in water supplies and in building plumbing.

Studies in England and Wales have shown a geographic variation in rates of acanthamoebic keratitis that are positively associated with both ambient temperatures and tap water hardness. However, it is not clear whether regional differences also exist in other factors which may affect infection risks (e.g. the types of contact lenses worn and the types of cleaning solution used).

Management of *Acanthamoeba* risks

The most important risk factor for *Acanthamoeba* keratitis (and contact lens-associated keratitis caused by other microorganisms) is exposure of contact lenses or lens storage cases to any non-sterile solution, including tap water.

Contamination of lenses may occur from using tap water to clean lenses or storage cases, or from showering, swimming in pools or natural waters, using a spa while wearing contact lenses, or using bottled water for lens hygiene.

Risk management advice from health agencies and medical organisations concerned with eye health emphasises that only sterile solutions are suitable for cleaning contact lenses and their storage containers, and contact with tap water, or any other type of unsterilised water, should be avoided. Adherence to other hygiene measures, such as frequent replacement of lens storage containers and treatment solutions, and good hand hygiene when changing contact lenses, is also important. The manufacturer's instructions for the frequency of changing disposable contact lenses should be followed. Among people who do not wear contact lenses, traumatic injury to the eye is the most common risk factor for acanthamoebic keratitis.

Where tap water is intended for eye washing under circumstances where injury to the eyes may have occurred (e.g. emergency eye wash stations at sites handling hazardous materials), the potential for exposure to *Acanthamoeba* should be considered in risk management programs.

In regard to GAE and disseminated infections caused by *Acanthamoeba*, there is currently insufficient knowledge about the relative importance of potential sources of infection for health agencies to offer advice on risk reduction.

More information is available from your State or Territory Health Department.

References

Stapleton N. and Carnt F. (2016) Strategies for the prevention of contact lens-related *Acanthamoeba* keratitis: a review. *Ophthalmic & Physiological Optics* 36: 77–92

World Health Organisation (2011) Guidelines for drinking-water quality - 4th Edition. Microbial Fact Sheets, *Acanthamoeba* p269.