ACANTHAMOEBA

General description
Acanthamoeba spp. are free-living amoebae (10–50 mm in diameter) common in aquatic environments and one of the prominent protozoa in soil. The genus contains some 20 species, of which A. castellanii, A. polyphaga and A. culbertsoni are known to be human pathogens. However, the taxonomy of the genus may change substantially when evolving molecular biological knowledge is taken into consideration. Acanthamoeba has a feeding, replicative trophozoite, which, under unfavourable conditions, such as an anaerobic environment, will develop into a dormant cyst that can withstand extremes of temperature (-20 to 56 °C), disinfection and desiccation.

Human health effects
Acanthamoeba culbertsoni causes granulomatous amoebic encephalitis (GAE), whereas A. castellanii and A. polyphaga are associated with acanthamoebic keratitis and acanthamoebic uveitis. GAE is a multifocal, haemorrhagic and necrotizing encephalitis that is generally seen only in debilitated or immunodecient persons. It is a rare but usually fatal disease. Early symptoms include drowsiness, personality changes, intense headaches, stiff neck, nausea, vomiting, sporadic low fevers, focal neurological changes, hemiparesis and seizures. This is followed by an altered mental status, diplopia, parasthesia, lethargy, cerebellar ataxia and coma. Death follows within a week to a year after the appearance of the first symptoms, usually as a result of bronchopneumonia. Associated disorders of GAE include skin ulcers, liver disease, pneumonitis, renal failure and pharyngitis. Acanthamoebic keratitis is a painful infection of the cornea and can occur in healthy individuals, especially among contact lens wearers. It is a rare disease that may lead to impaired vision, permanent blindness and loss of the eye. The prevalence of antibodies to Acanthamoeba and the detection of the organism in the upper airways of healthy persons suggest that infection may be common with few apparent symptoms in the vast majority of cases.

Source and occurrence
The wide distribution of Acanthamoeba in the natural environment makes soil, airborne dust and water all potential sources. Acanthamoeba can be found in many types of aquatic environments, including surface water, tap water, swimming pools and contact lens solutions. Depending on the species, Acanthamoeba can grow over a wide temperature range in water, with the optimum temperature for pathogenic species being 30 °C. Trophozoites can exist and replicate in water while feeding on bacteria, yeasts and other organisms. Infections occur in most temperate and tropical regions of the world.

Routes of exposure
Acanthamoebic keratitis has been associated with soft contact lenses being washed with contaminated home-made saline solutions or contamination of the contact lens containers. Although the source of the contaminating organisms has not been established, tap water is one possibility. Warnings have been issued by a number of health agencies that only sterile water should be used to prepare wash solutions for contact lenses. The mode of transmission of GAE has not been established, but water is not considered to be a source of infection. The more likely routes of transmission are via the blood from other sites of colonization, such as skin lesions or lungs.

Significance in drinking-water
Cases of acanthamoebic keratitis have been associated with drinking-water due to use of tap water in preparing solutions for washing contact lenses. Cleaning of contact lenses is not considered to be a normal use for tap water, and a higher-quality water may be required. Compared with Cryptosporidium and Giardia, Acanthamoeba is relatively large and is amenable to removal from raw water by filtration. Reducing the presence of biofilm organisms is likely to reduce food sources and growth of the organism in distribution systems, but the organism is highly resistant to disinfection. However, as normal uses of drinking-water lack significance as a source of infection, setting a health-based target for Acanthamoeba spp. is not warranted.

Selected bibliography