

APPENDIX 2 *Acanthamoeba* biology

The Challenges:

1. ***Acanthamoeba* are found mainly in water and soil and their numbers are set to increase and expand geographically with climate change.**

Around a third of domestic taps, showers, lakes and recreation water facilities are contaminated with *Acanthamoeba*.¹ Increased numbers are associated with increased water temperatures, pollution and flooding and are likely to increase with climate change.²

2. **Trophozoites transform into resilient cysts that support survival in the environment and in the eye (Figure 2).**

This biological resilience enhances *Acanthamoeba*'s success in initiating and sustaining infection in *Acanthamoeba* keratitis (AK). Even when the active infection is resolved, cysts can lay dormant in the eye and reactivate at a later time (even up to 31 months after AK has resolved).³

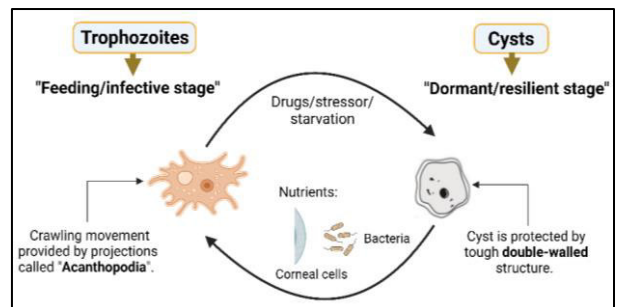


Figure 2. *Acanthamoeba* life cycle

3. ***Acanthamoeba* hosts microorganisms that exacerbate the infection in the cornea.**

Acanthamoeba not only transports these microbes to the eye, but it also enhances their ability to evade the eye's defences and makes them more resistant to antimicrobials. The associated microbes may also cause more severe AK.⁴

4. ***Acanthamoeba* are not classified consistently between laboratories/researchers hampering linking types to outcomes.**

There are different naming systems which can be based on several genes in the DNA structure or the shape and size of *Acanthamoeba*. As genetics influences the ability to cause infection, increase severity, and evade treatment, inconsistent naming is not supporting advances in clinical treatment.⁵

Recommendations:

A global biobank would facilitate better understanding of the biology of *Acanthamoeba* and their microbial cargos and develop strategies to overcome its unique survival and disease mechanisms.

1. Without a clear connection between patient outcome, drug susceptibility in the lab and appropriately named species/genotypes of the *Acanthamoeba* causing the infection, it is hard to determine if the varying outcomes between patients is due to the types of amoebae or other factors, such as the microbes they are carrying.
2. Advanced techniques such as genomics (analyzing DNA), proteomics (studying proteins), metabolomics (examining cell metabolism) and assessing the microbes carried by *Acanthamoeba* should be used to clarify the relationship between disease outcomes and treatments.

1.Carnt NA,et al. doi:10.1371/journal.pone.0229681.2.Rayamajhee B, et al. doi:10.1016/j.scitotenv.2023.165862. 3.Yang YF. doi:10.1136/bjo.85.3.277 4.Iovieno A et al. doi:10.1016/j.optha.2009.08.033; 5.Rayamajhee B, et al. doi:10.1016/S2666-5247(21)00093-8