Meningoencephalitis (Amoeba)

Microorganisms that enters into the bloodstream cause **encephalitis,** by entering into the brain causing inflammation of the brain. Because the brain and the spinal cord (and the meninges) are so closely connected, infections of one of these structures may also involve the other. But two microorganisms cause a distinct disease called **meningoencephalitis**, and they are both amoebas. **Naegleria fowleri** and **Acanthamoeba** are accidental parasites that invade the body only under unusual circumstances.

Naegleria fowleri

- **Naegleria fowleri** is also known as "**brain-eating amoeba**"
- There are three morphological stages in the life cycle of *Naegleria* — a trophozoite, a flagellate, and a cyst. The trophozoite is the feeding, dividing, and presumably infective stage for humans which is a small, flask-shaped amoeba that moves by means of a single, broad pseudopod**.**
- It forms a rounded, thick-walled, uninucleate cyst that is resistant to temperature extremes and mild chlorination.
- Most cases of Naegleria infection reported worldwide occur in people who have been swimming in warm, natural bodies of freshwater like lakes and river
- Infection can begin when amoebas are forced into human nasal passages as a result of swimming, diving, or other aquatic activities.
- Once the amoeba is inoculated into the favorable habitat of the nasal mucosa, it burrows in, multiplies, and subsequently migrates into the brain and surrounding structures.
- The result is **primary amoebic meningoencephalitis (PAM)**, a rapid, massive destruction of brain and spinal tissue that causes hemorrhage and coma and invariably ends in death within a week or so.
- *Naegleria fowleri* trophozoites have been shown to destroy nerve cells, as well as other cell types, by trogocytosis (i.e. piecemeal ingestion) using a 'food-cup' structure on their surface

Naegleria fowleri Symptoms

- This organism is very common—children often carry the amoeba as harmless biota, especially during the summer months, and the series of events leading to disease is exceedingly rare.
- PAM is characterized by severe frontal headache, fever, nausea and vomiting, stiff neck, and occasional seizures.
- The acute hemorrhagic necrotizing meningoencephalitis that follows the invasion of the CNS generally results in death 7–10 days postinfection

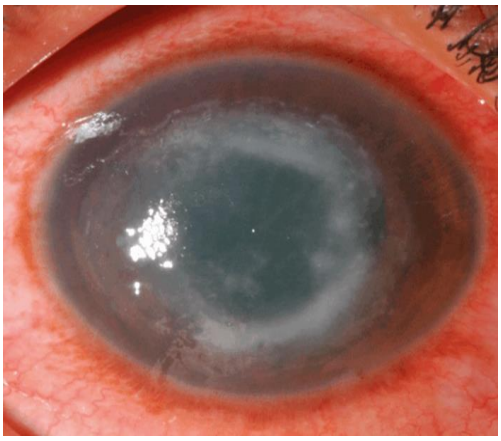
Naegleria fowleri Treatment

- Unfortunately, Naegleria meningoencephalitis advances so rapidly that treatment usually proves futile. Studies have indicated that early therapy with **amphotericin B, sulfadiazine**, or **tetracycline** in some combination can be of some benefit.
- Because of the wide distribution of the amoeba and its hardiness, no general means of control exists. Public swimming pools and baths must be adequately chlorinated and checked periodically for the amoeba.
- The infection does not occur from swallowing water contaminated with *Naegleria*.

Acanthamoeba

- This protozoan has a large, amoeboid trophozoite with spiny pseudopods and a double-walled cyst.

- It differs from Naegleria in its portal of entry; it invades broken skin, the conjunctiva, and occasionally the lungs and urogenital epithelia.
- Although it causes a meningoencephalitis somewhat similar to that of Naegleria, the course of infection is lengthier.
- The disease is called **granulomatous amoebic meningoencephalitis (GAM)** and **amebic keratitis (AK)** which is a painful sight-threatening disease of the eyes
- At special risk for infection are people with traumatic eye injuries, contact lens wearers, and AIDS patients exposed to contaminated water.



- The pathogenesis of infection is the adhesion of the microbe to the surface of the host tissues. ***Acanthamoebae*** express a major virulence protein, the **mannose-binding protein (MBP)**, which mediates the adhesion of amoebae to the surface of the cornea.
- The MBP is a transmembrane protein having cell surface receptor.
- Cutaneous and CNS infections with this organism are occasional complications in AIDS.

Disease Table Meningoencephalitis

	Primary Amoebic Meningoencephalitis	Granulomatous Amoebic Meningoencephalitis
Causative Organism(s)	*Naegleria fowleri*	*Acanthamoeba*
Most Common Modes of Transmission	Vehicle (exposure while swimming in water)	Direct contact
Virulence Factors	Invasiveness	Invasiveness
Culture/Diagnosis	Examination of CSF; brain imaging, biopsy	Examination of CSF; brain imaging, biopsy
Prevention	Avoid warm fresh water	–
Treatment	Amphotericin B; mostly ineffective	Surgical excision of granulomas; ketoconazole may help

References

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