



Parasitic and Fungal Meningitis

By

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BRAIN EATER



Pathogenic free-living amoebae

Naegleria fowleri

Acanthamoeba species

Pathogenic free-living amoebae are

1- *Naegleria fowleri*

Causative parasite of

Primary amoebic meningo-encephalitis.

2- *Acanthamoeba* species

Causative parasite of

1- Granulomatous amoebic encephalitis

2- keratitis

3- Chronic granulomatous infection of the skin.

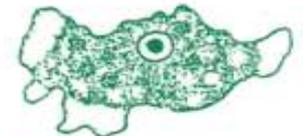
Geographical distribution:

- **Cosmopolitan.**
- **These amoebae are readily found free-living in dust, soil and warm stagnant fresh water (thermophilic) in lakes, ponds, streams and swimming pools. They are facultative parasites.**

Naegleria fowleri

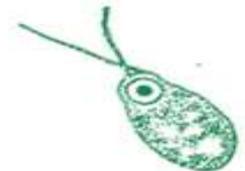
Morphology:

- **Trophozoite:** 15–30 μm , has a single nucleus and blunt pseudopodia with rapid movement.



Trophozoite

- **Flagellate form:** Pear shaped with two flagella at the anterior end (**occurs only in water**)



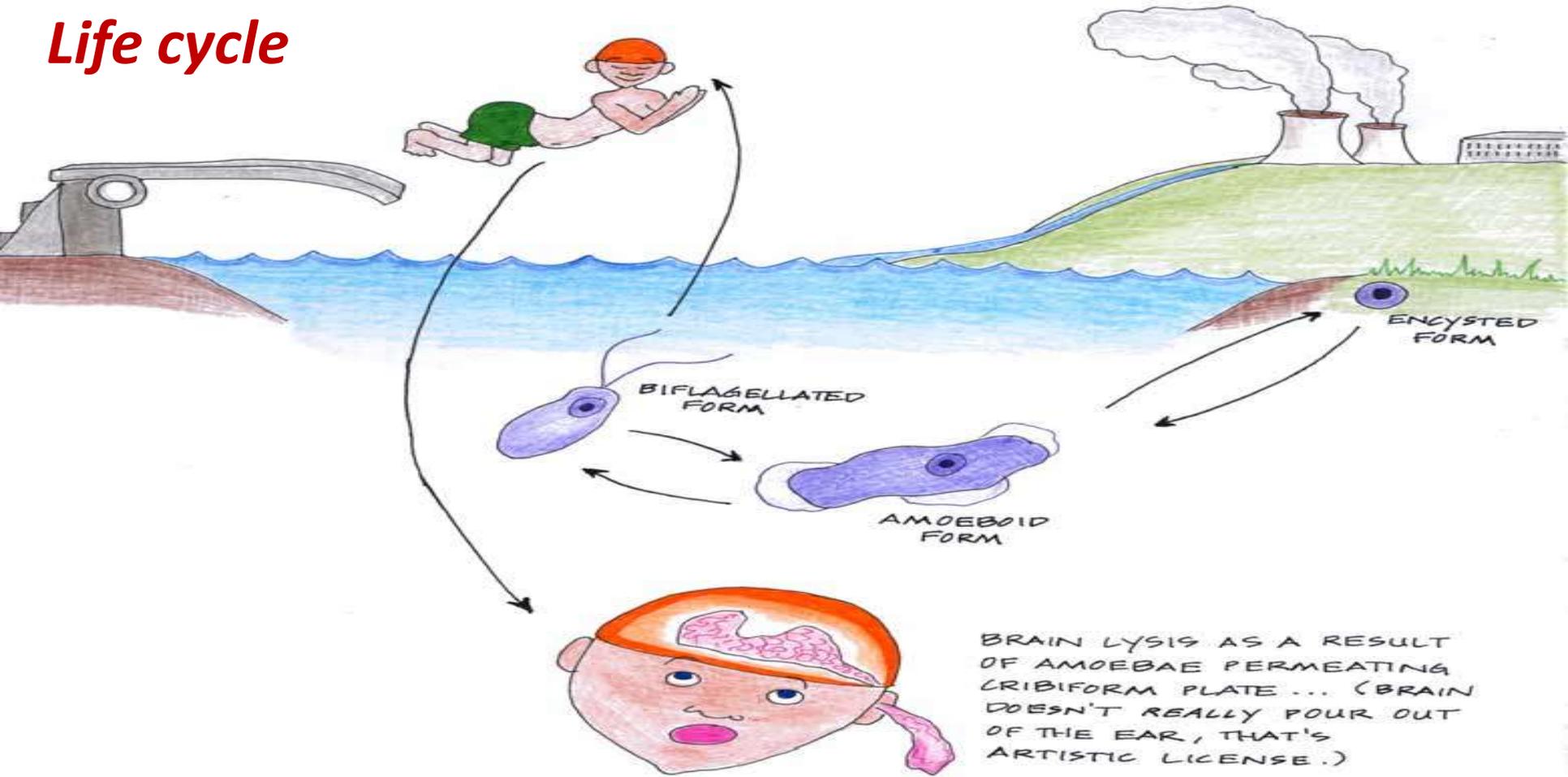
Flagellate form
in water

- **Cyst:** 10 μm , smooth, round with pores on its wall, has a single nucleus (**not present in tissue**).



Cyst

Life cycle



Life cycle

-
- Infection with *Naegleria fowleri* trophozoites or flagellate forms occurs during swimming, diving or bathing in warm fresh water or rarely inhalation of cysts with dust. Cysts and flagellate forms are transformed into trophozoites in the nose. They enter the nose → nasal mucosa → olfactory nerve → penetrate cribriform plate → to reach the cranial cavity → to the brain.

Habitat

Host

- **Definitive host**
- **Intermediate host**
- **Reservoir host**

Diagnostic stage

Infective stage

Mode of infection

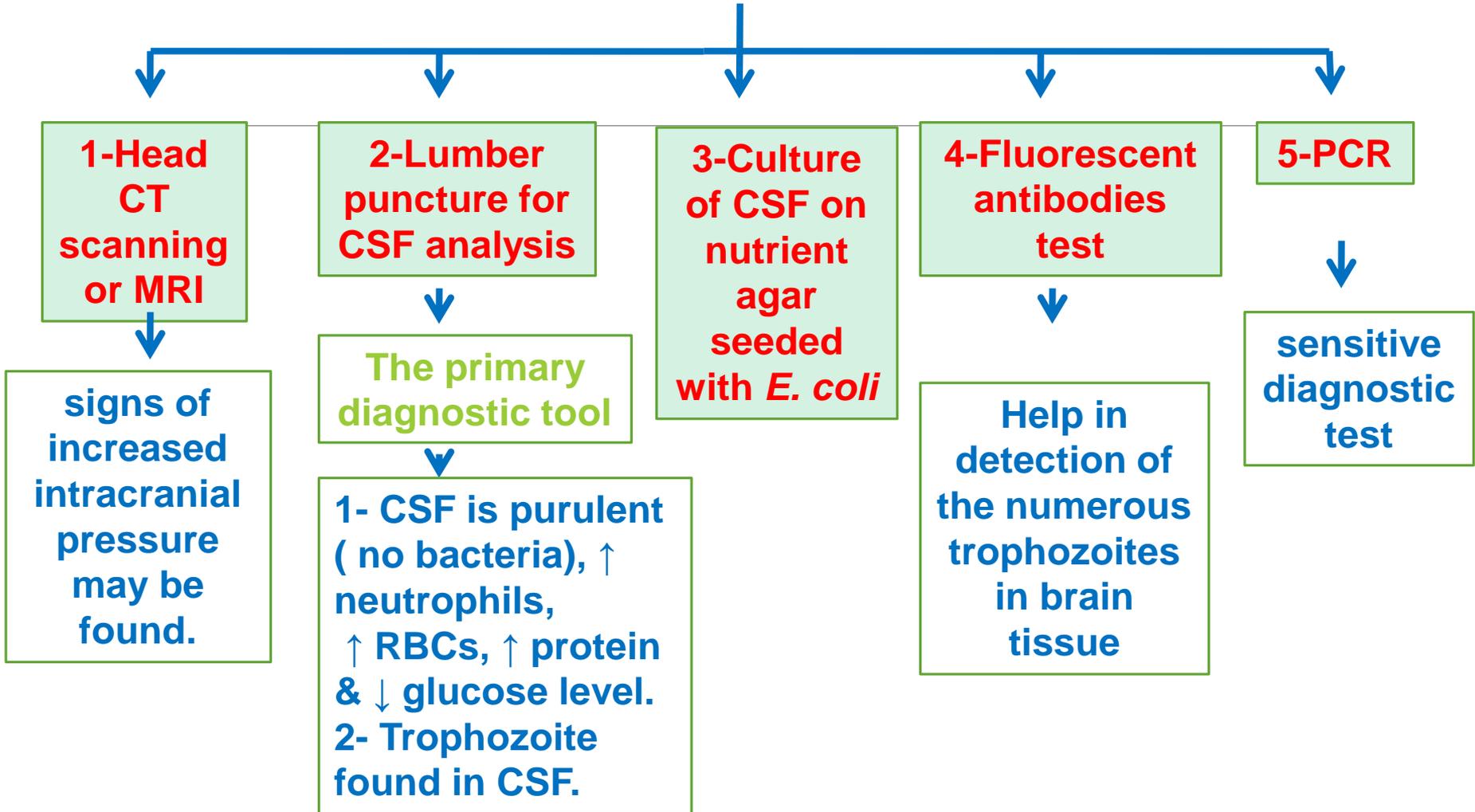
Life cycle

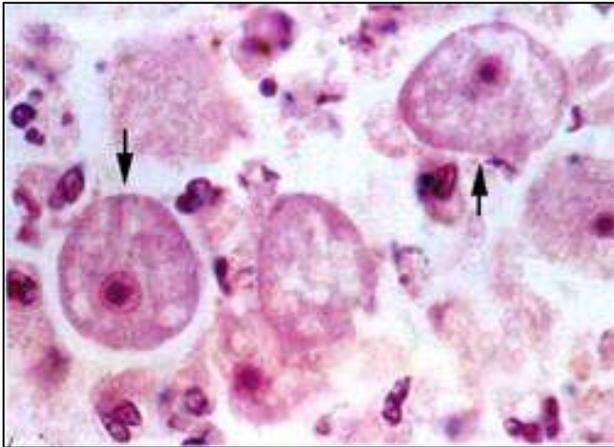
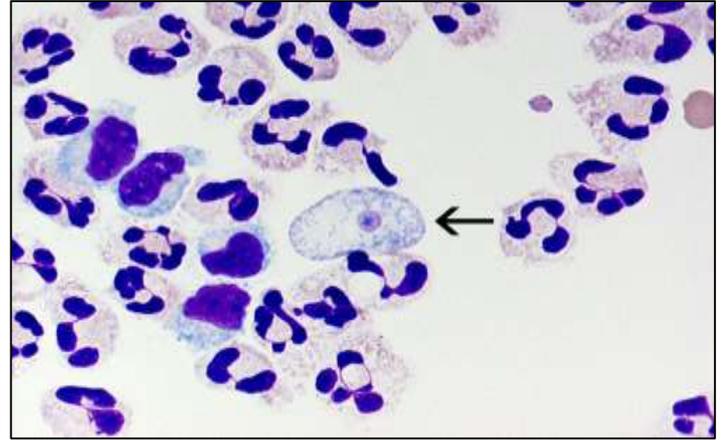
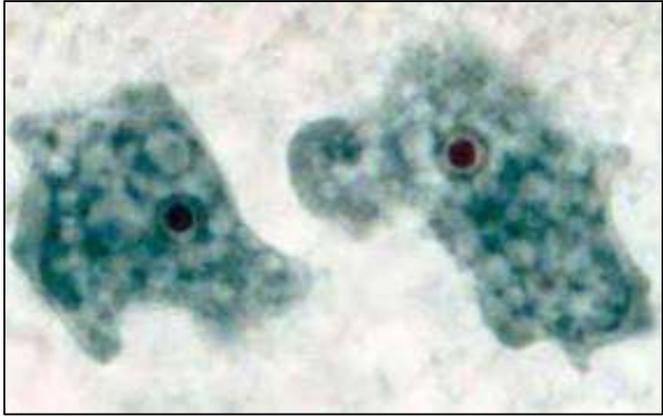
- **Habitat:** Brain
- **Definitive host:** Man
- **Intermediate host:** **No intermediate host**
- **Reservoir host:** **No reservoir host**
- **Diagnostic stage:** Trophozoite
- **Infective stage:** Trophozoite or flagellate form (in contaminated water), or the cyst (in dust)
- **Invasive stage:** Trophozoite.
- **Mode of infection:** 1) Swimming in contaminated water (trophozoite or flagellate form)
2) Rarely inhalation of the cysts in dust

Clinical aspect

- **Disease: Primary amoebic meningo-encephalitis (PAME)**
- **Pathogenesis:** penetrate dura matter, lyse and ingest brain tissue causing haemorrhage and necrosis and a typical picture of meningitis
 - Acute, rapidly fatal within one week
 - Affects children and young adults.
 - **Early manifestations:** altered smell and taste, fever (39-40°C), severe frontal headache, nausea and vomiting.
 - **Later:** mental confusion, stiffness of the neck and convulsions followed by coma.

Laboratory Diagnosis





Trophozoites of *Naegleria fowleri*

Treatment

1- Medical:

**Amphotericin B intrathecally in severe cases
+Miconazole (IV injection) + Rifampicin (orally).**

**2- Surgical: Hydrocephalus may necessitate
shunting.**

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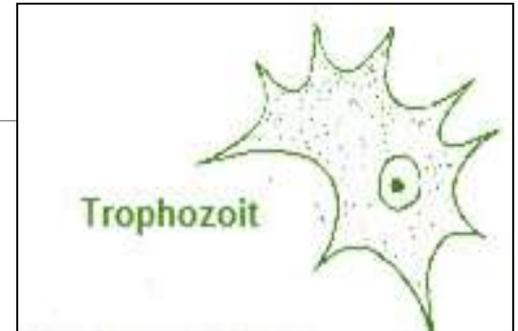
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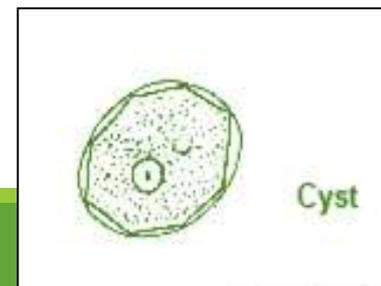
Acanthamoeba

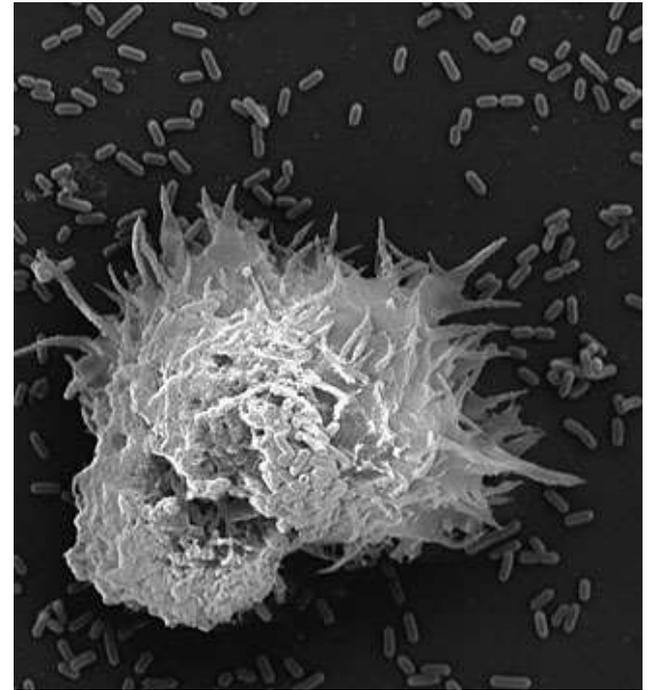
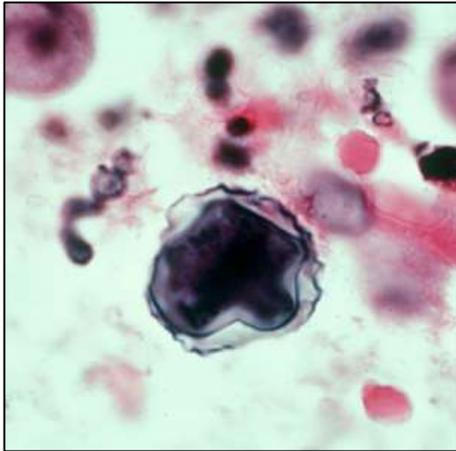


Morphology:

- **Trophozoite:** 10–40 μm , has a single nucleus and spiky pseudopodia with sluggish movement.

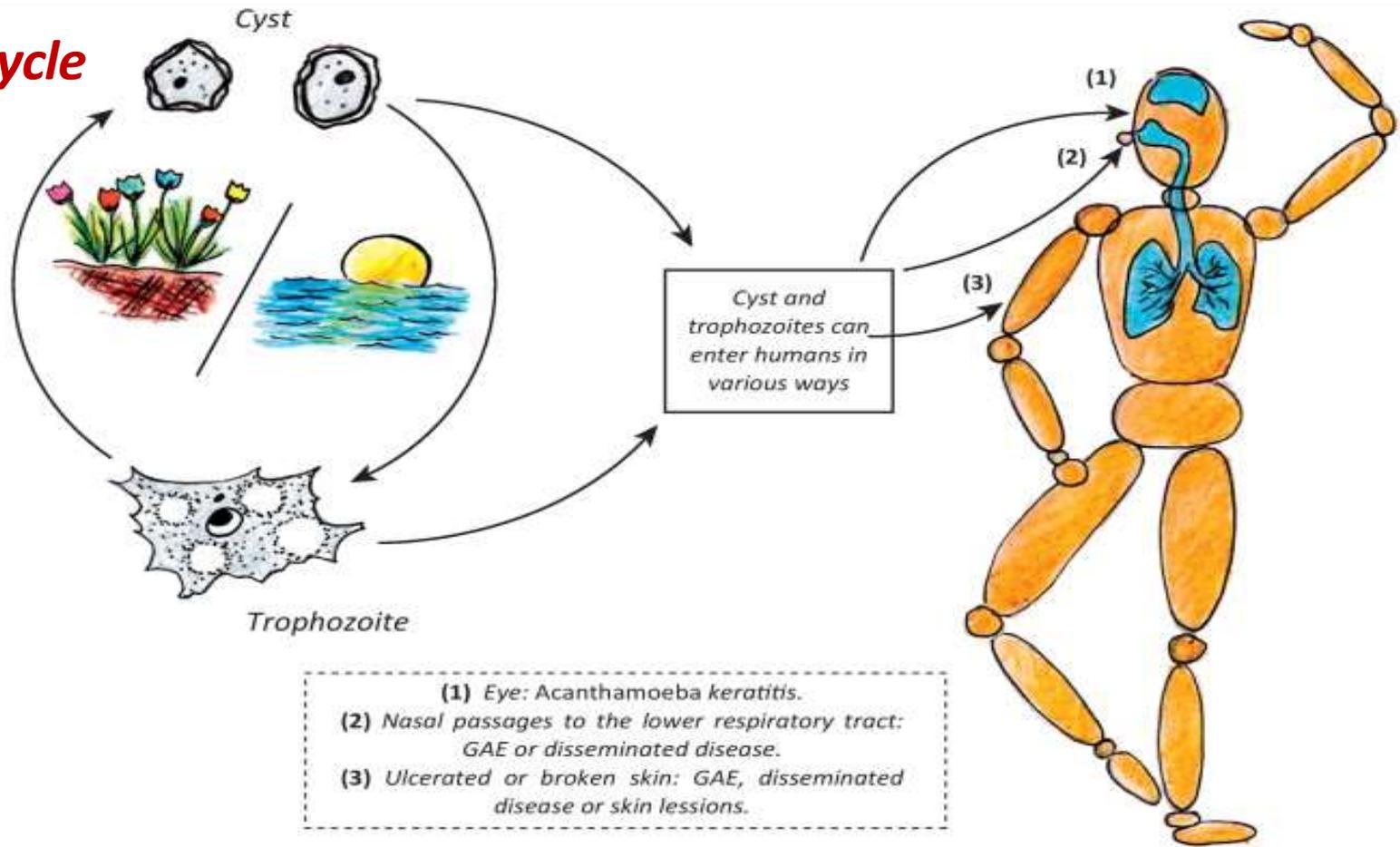
- **Cyst:** 15 μm , smooth, double-walled (polygonal inner layer and wrinkled outer layer), has a single nucleus





Stages of *Acanthamoeba*

Life cycle



TRENDS in Parasitology

Habitat

Host

- **Definitive host**
- **Intermediate host**
- **Reservoir host**

Diagnostic stage

Infective stage

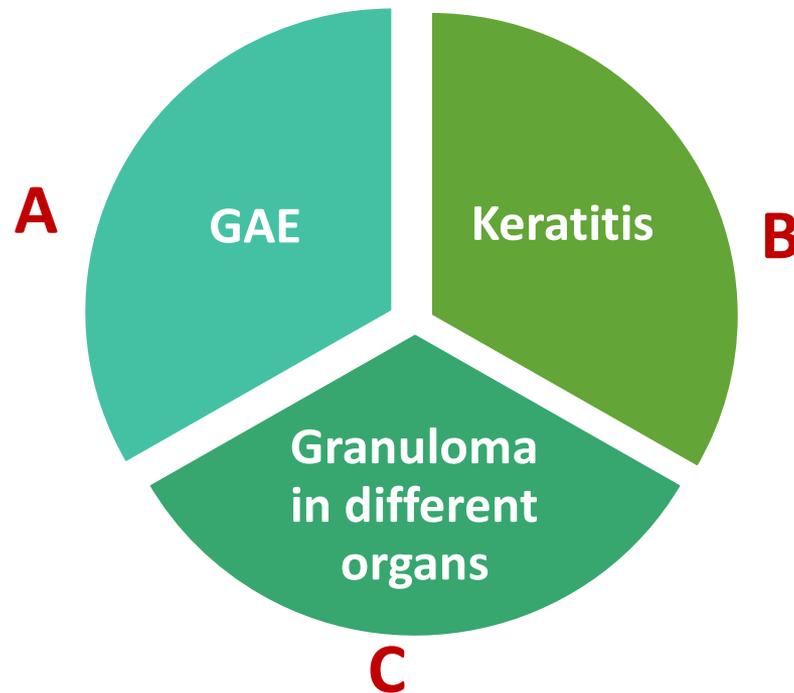
Mode of infection

Life cycle

- **Habitat:** Brain and other organs

- **Definitive host:** Man
- **Intermediate host:** **No intermediate host**
- **Reservoir host:** **No reservoir host**
- **Diagnostic stage:** Trophozoite and cyst
- **Infective stage:** Trophozoite and cyst
- **Mode of infection:** 1- Swimming in infected water or inhalation of dust-----
through the nose----blood -----CNS
- 2- The organism enters through skin lesion-----blood-----granuloma
- 3- Through the eye: contaminated contact lenses, minor trauma or contaminated water

Clinical aspect

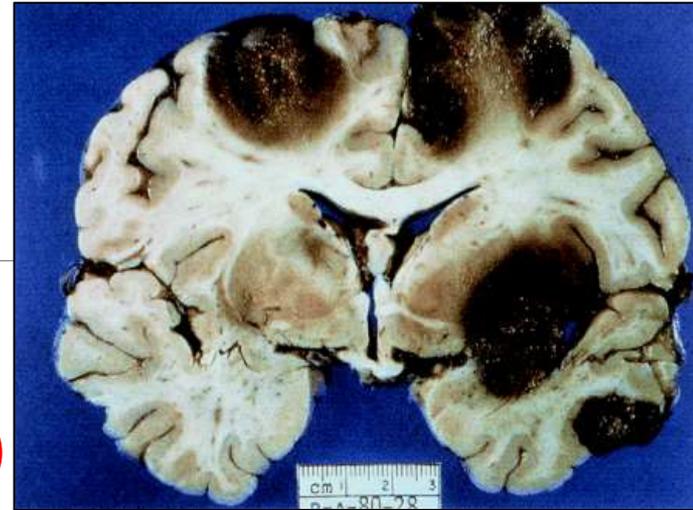


Clinical aspect

- Diseases

1. Granulomatous amoebic encephalitis (GAE)

- Chronic, with gradual onset.
- Affects debilitated or immune-suppressed persons (**opportunistic**).
- GAE resembles space-occupying lesions & is manifested by vomiting, headache, diplopia, altered mental state, convulsions & stiffness of the neck
- It is fulminant in severely immune-suppressed patients → acute encephalitis



Clinical aspect

2. Corneal ulcers and keratitis in healthy persons

(may lead to blindness)

3. Chronic granuloma of the skin, lung, liver,.....in immunocompromised persons



Diagnosis

A) **Clinical:** clinical picture and history of swimming in hot fresh water.

B) **Laboratory:**

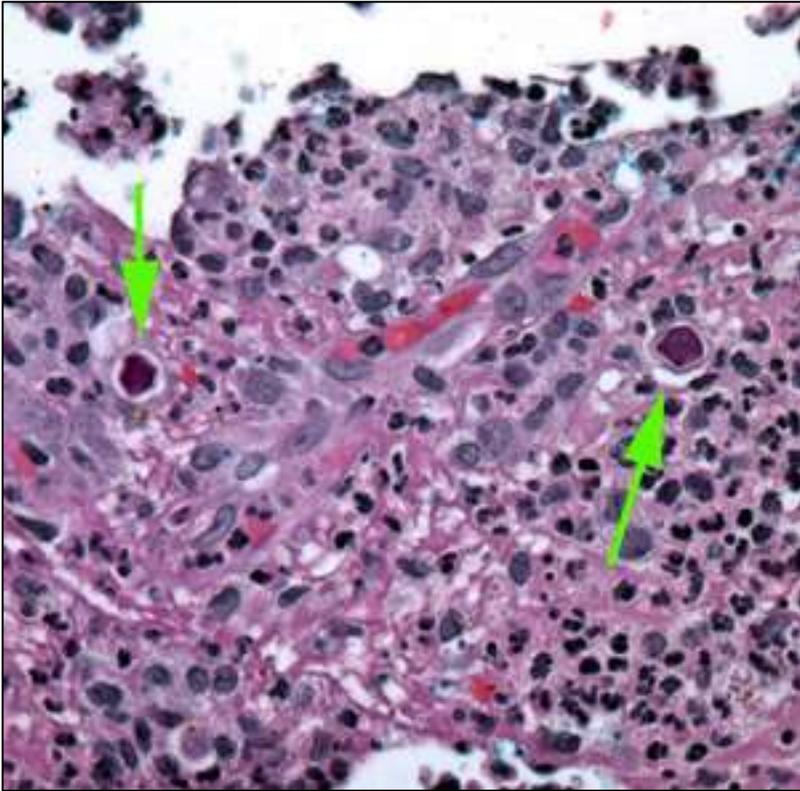
1) CSF examination: **very rare** to detect trophozoites. ????????

2) Corneal scraping and biopsy from granulomatous lesions detect trophozoites or cysts

3) Culture on non-nutrient agar seeded with *E.coli*

C) **Other investigations:** CT and MRI of the brain.

D) PCR



Treatment

1. Amphotericin-B + sulphadiazine
2. For keratitis: - Topical application of a combined regimen of propamidine, miconazole & neomycine.
 - Surgical: Keratoplasty may be required.



Fungal meningitis

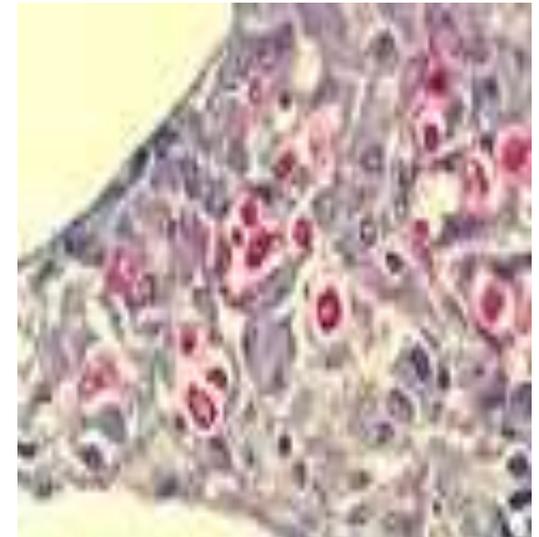
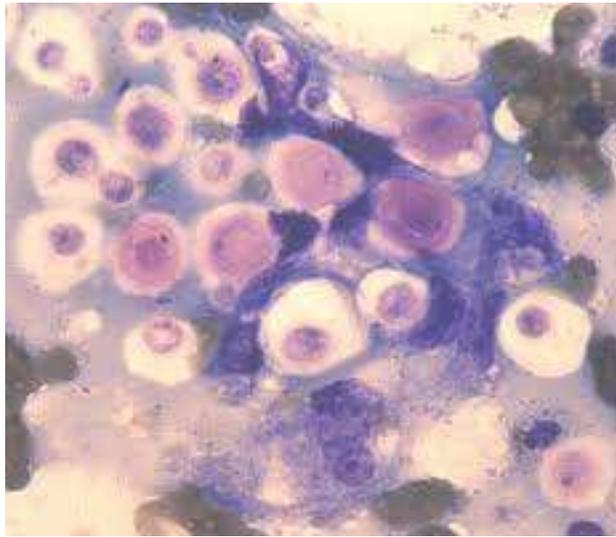
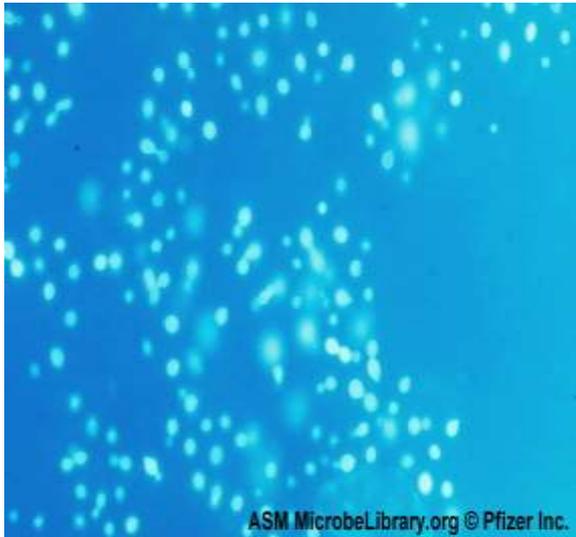
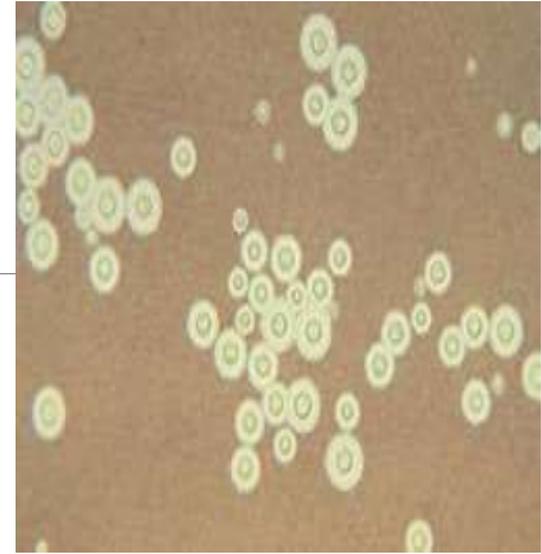
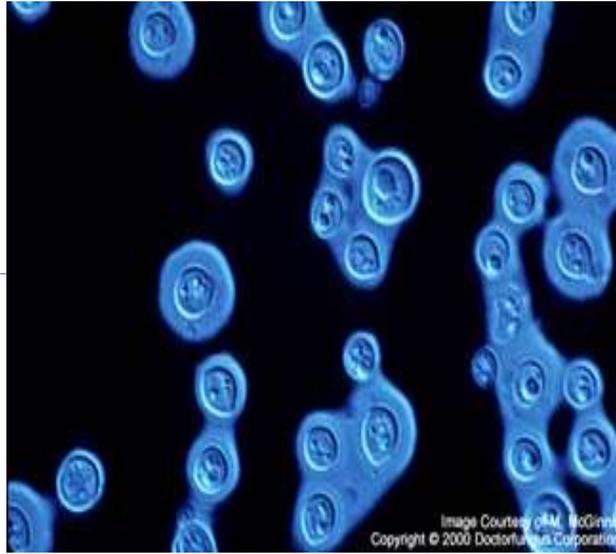
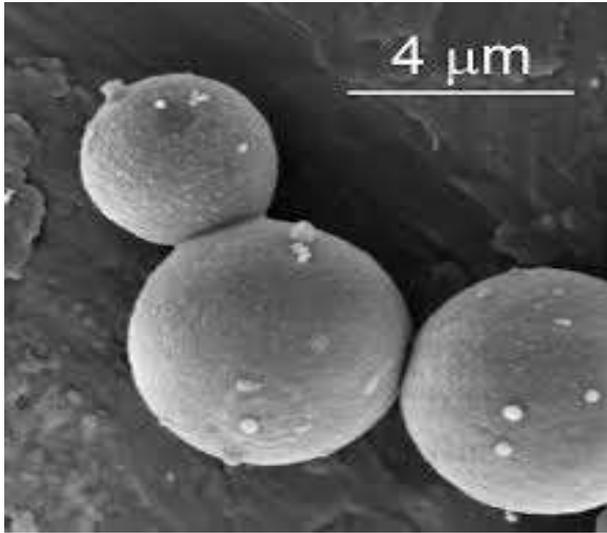
CRYPTOCOCCOSIS

Fungal meningitis (Cryptococcosis)

It is a fatal fungal disease caused by *Cryptococcus neoformans*.

❖ General characters of *C. neoformans*:

- 1- Yeast cells, oval in shape with a gelatinous capsule.
- 2- Found in soil contaminated with the excreta of birds specially pigeons' feces.
- 3- It is an opportunistic fungus affecting mainly immunosuppressed persons specially AIDS patients.



Risk groups

1- Diseases as AIDS, lymphoma, sarcoidosis, liver cirrhosis, lung & heart diseases.

2- Long term corticosteroids therapy.

3- Diabetes.

4- Pregnancy.

Mode of infection

Infection occurs by inhaling microscopic airborne spores of this fungus that may spread systematically

Clinical pictures

**Respiratory symptoms
(pneumonia like illness)**

**Fever, cough, chest
pain & dyspnea**

**Dissemination of the
infection mainly with AIDS**

**To CNS causing
meningoencephalitis**

- Headache, fever.
- Neck pain.
- Nausea and vomiting.
- Sensitivity to light
- Mental status range from confusion to coma.
- If left untreated, cryptococcal meningoencephalitis may lead to brain damage, hearing loss & hydrocephalus

Diagnosis

Specimens:

Sputum, CSF, blood

Microscopic Examination

CSF examination by using **India ink** showing the oval yeast surrounded by unstained capsule.

Blood or CSF culture on Sabouraud Dextrose Agar (SDA) show mucoid colonies which are urease positive

Detection of *Cryptococcosis* antigen in CSF by

Latex agglutination test & ELISA.

Rapid & sensitive methods for diagnosis

PCR

Dipstick test

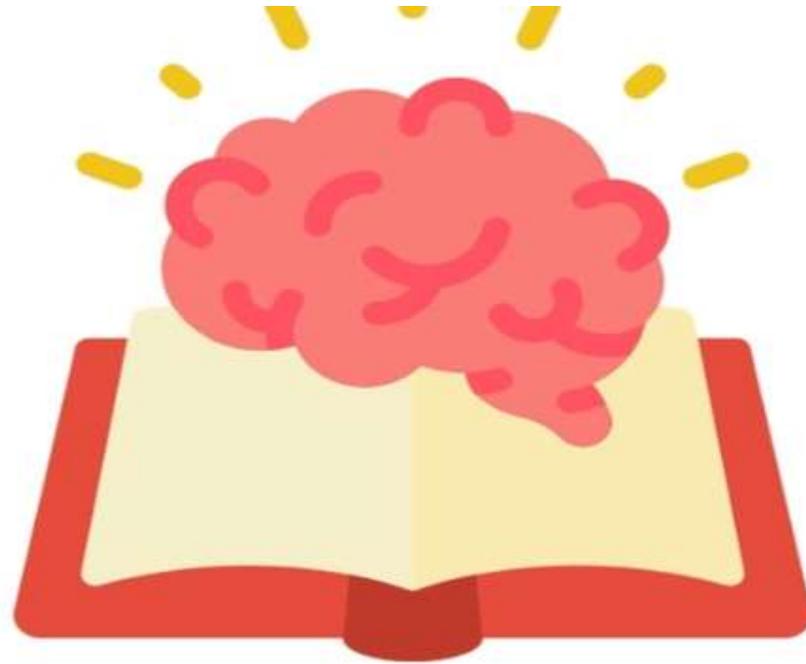
A new method for detecting *Cryptococcal* antigen in patient's serum

Rapid (takes 10 minutes), sensitive & inexpensive



Treatment

❖ **Combination of amphotericin B and flucytocine.**



Test Knowledge

❖ Differences between

Naegleria fowleri and *Acanthamoeba species*

❖ How to diagnose a case of *Cryptococcus neoformans* meningitis

Thank You

The image features the words "Thank You" in a large, 3D, pink, sans-serif font. The letters are arranged in a slightly staggered manner. Two monarch butterflies with orange and black wings are perched on the letters. The text is surrounded by green foliage and small white flowers, giving it a natural, garden-like appearance.