Parasitology-A

Chapter No. 7-12

Taxonomy and Classification

Definitions

Taxonomy

Classifying organisms on the basis of evolutionary history is called taxonomy.

Carolous Linnaeus is the father of taxonomy.

Binomial nomenclature

This system is used to name all the living things.In the binomial (two name) system, the first word designates the genus of organism and is captalized. The second name designates the species name and is not italicized.

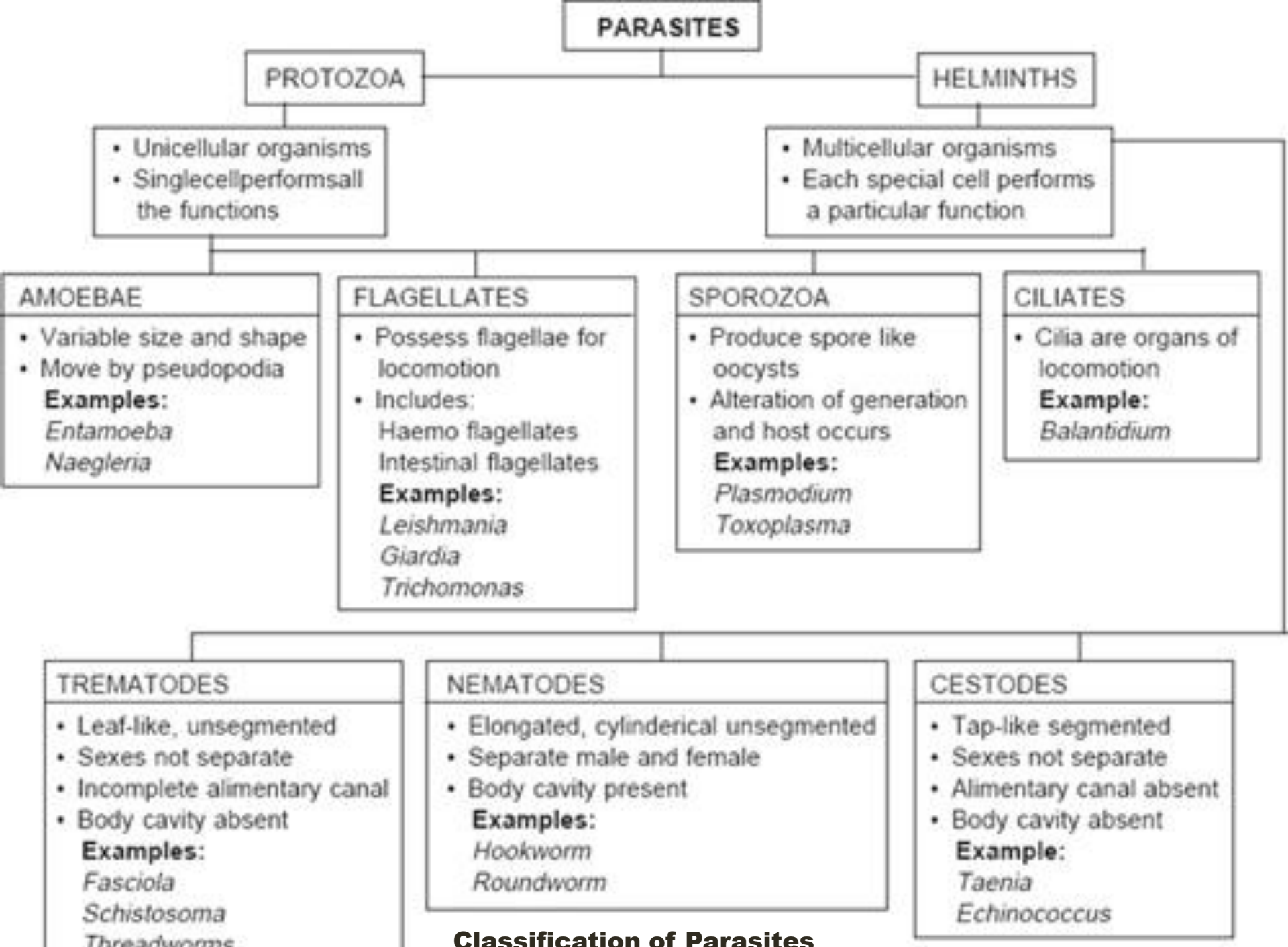
Example

Entamoeba histolytica

Five Kingdom System of Classification

The five kingdom system are

- Monera (prokaryote,unicellular)
- Protista (eukaryote,unicellular)
- Fungi (eukaryote ,uni-or multicellular)
- Plantae (eukaryote, multicelular)
- Animalia (eukaryote,multicellular)



Classification of Parasites

Laboratory Diagnosis

Most of the parasitic diseases cannot be conclusively diagnosed only on the basis of clinical features and physical examination . These require the support of the support of the laboratory to firmly establish the diagnosis.

Laboratory diagnostic methods

- Direct demonstration of adult parasites
- Microscopic examination of body fluids and tissues
- Culture
- Xenodiagnosis
- Animal inoculation
- Histopathology

- Immunodiagnosis
- Serology
- Skin reactions
- Radiological and scanning techniques
- Molecular tecniques

Xenodiagnosis

This method employs an intermediate host or vector within which the parasite multiplies to detect low level of parasitism.

Example: *Trypanosoma cruzi*

Other Flagellated Protozoa

Family Retortamonadidae

Two species in family Retortamonadidae are commonly found in humans.

- *Chilomastix mesnili*
- *Retortamonas intestinalis*

Although they are apparently harmless commensals they are worthy of note because they easily can be mistaken for highly pathogenic species

Giardia

More than 40 spices of Giardia have been described but only five are now considered valid

- *G.duodenalis (intestinalis= lamblia)*
- *G.muris* – from mammals
- *G.ardeae* - from birds
- *G.psittaci* – from birds
- *G.agilis* – from amphibians

G.duodenalis was first discovered in1681 by **Antony van Leeuwenhoek** who found in his own stool.

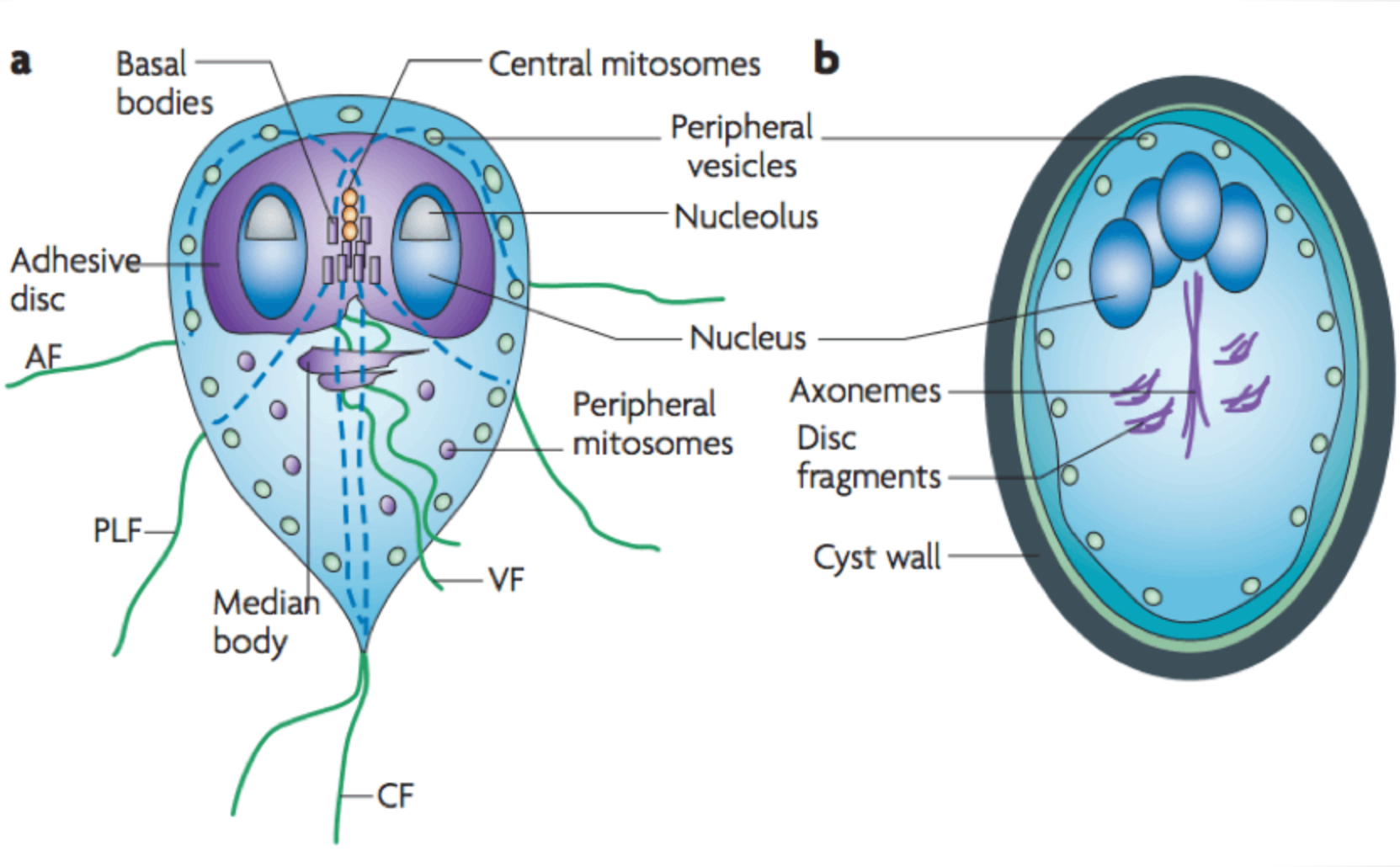


Diagram of *Giardia duodenalis*

Family Trichomonadidae

Trichomonas contain only three species

- *Trichomonas tenax*
- *T.vaginalis*
- *T.gallinae*

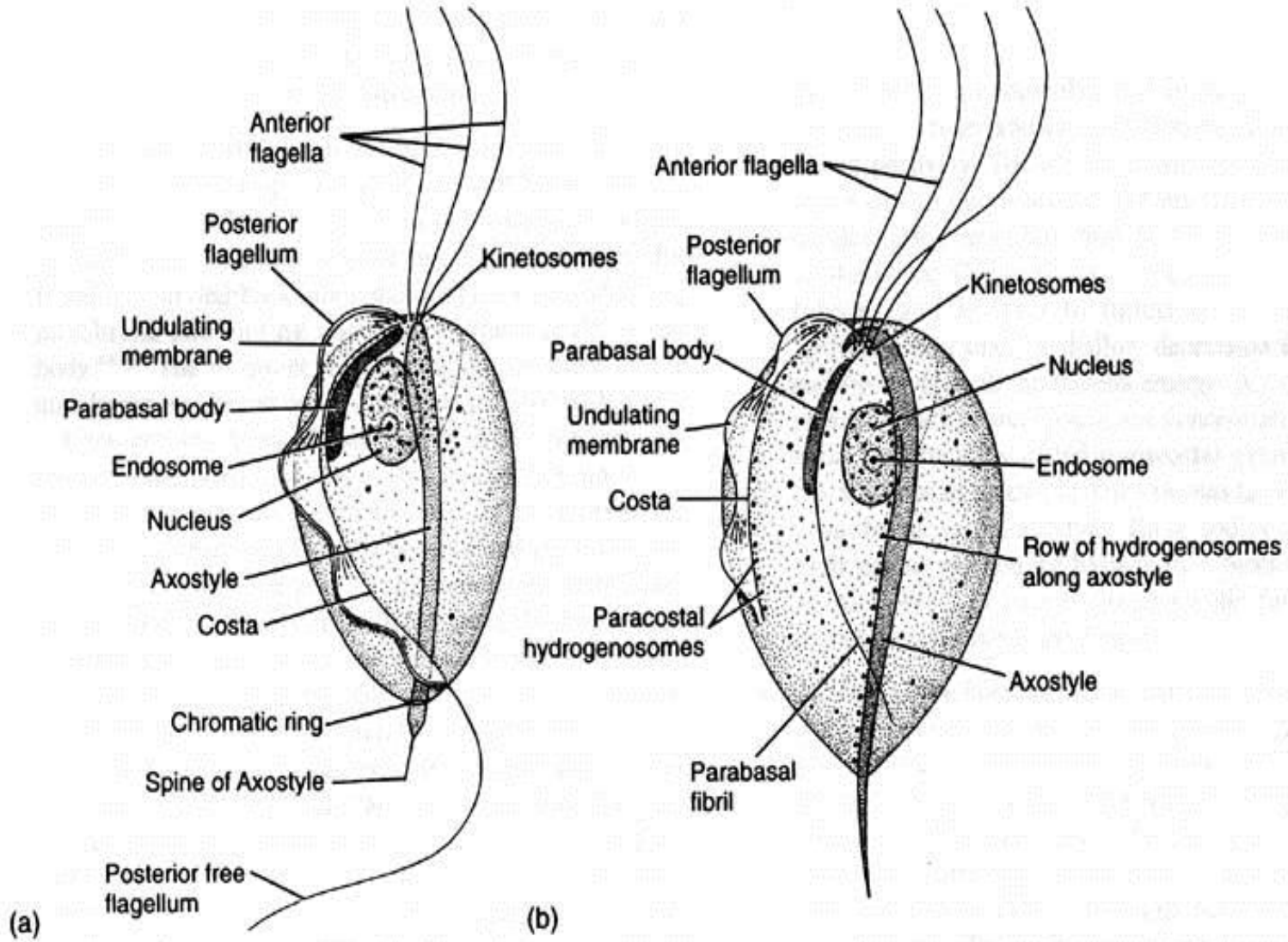


Figure 6.12

Morphology of trichomonads: (*a*) *Tritrichomonas foetus;* (*b*) *Trichomonas vaginalis.* The hydrogenosomes are not always in a definite row.

Source: Drawn by William Ober from D. H. Wenrich and M. A. Emmerson, "Studies on the morphology of *Tritrichomonas foetus* (Riedmüller) from American cows" in *J. of Morphol.* 55:195, 1933.

Intestinal Amoebae

Entamoeba Histolytica

- Entamoeba histolytica is an established pathogen with a wide spectrum of clinical features in human being.

- **History**

First described by Losch in 1875 in the stool of a Russian suffering from dysentry.

Taxonomy

It belongs to the genus Entamoeba ,family Entamoebidae,order Amoebida,Class lobosea, superclass Rhizopoda,subphylum sarcodina and phylum sarcomastigophora.

Disease Produced

The infection with *E.histolytica* is known as **amoebiasis.**

Epidemiology and Geographical Distribution

Theses amoebae are transmitted by oral-fecal route.

Morphology

These are trophozite , precyst and cyst.

- **Trophozite**

This stage is also known as growing stage , feeding stage or acive vegetative stage.

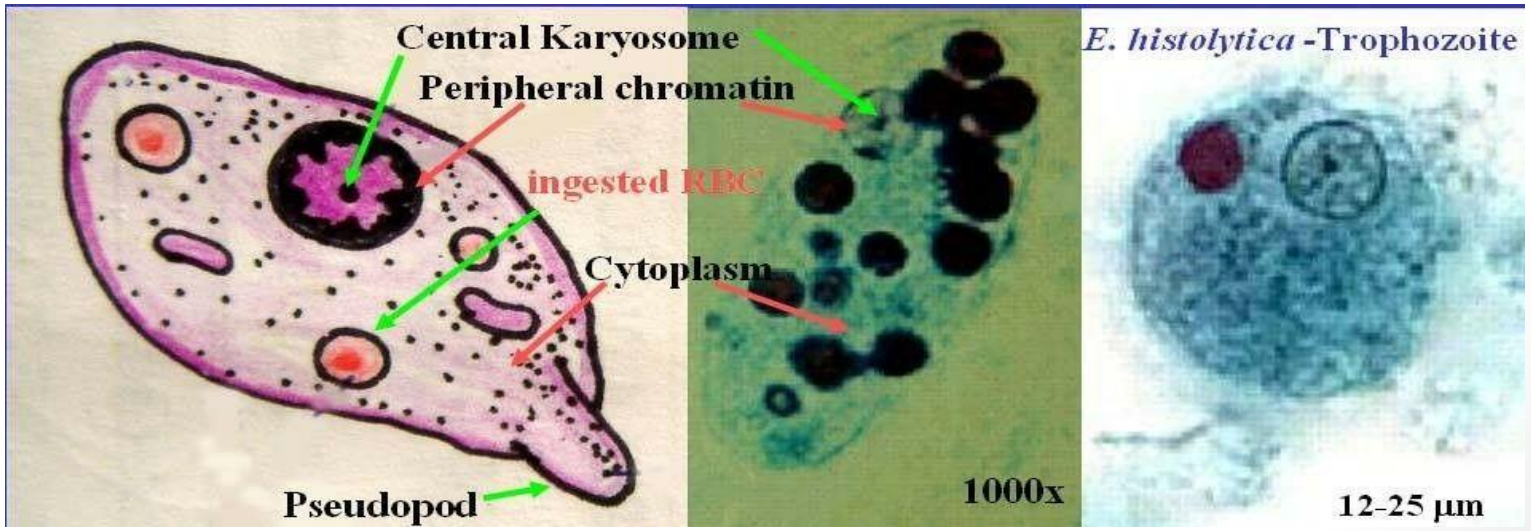
Size: vary in size from 10-60micrometer but majority are 15-30 micrometer

Shape: donot have a fixed shape because of constantly changing position.

Cytoplasm: This is divisible in two portions

- Transslucent ectoplasm
- Granular endoplasm

Nucleus: One nucleus, shherical in shape and placed eccentrically



❖ **Pre-cyst**

It is colourless , round or oval smaller than trophozite but larger than cyst.

❖ **Cyst**

The cyst containing 1-4 nuclei may be passed in the faeces.

Reproduction

Various modes ofreproduction seen in this organism are excystation , encystation and multiplication.

Source of Infection and mode of Transmission

The main source of infection is the cyst passing chronic patient or asymptomatic carrier.

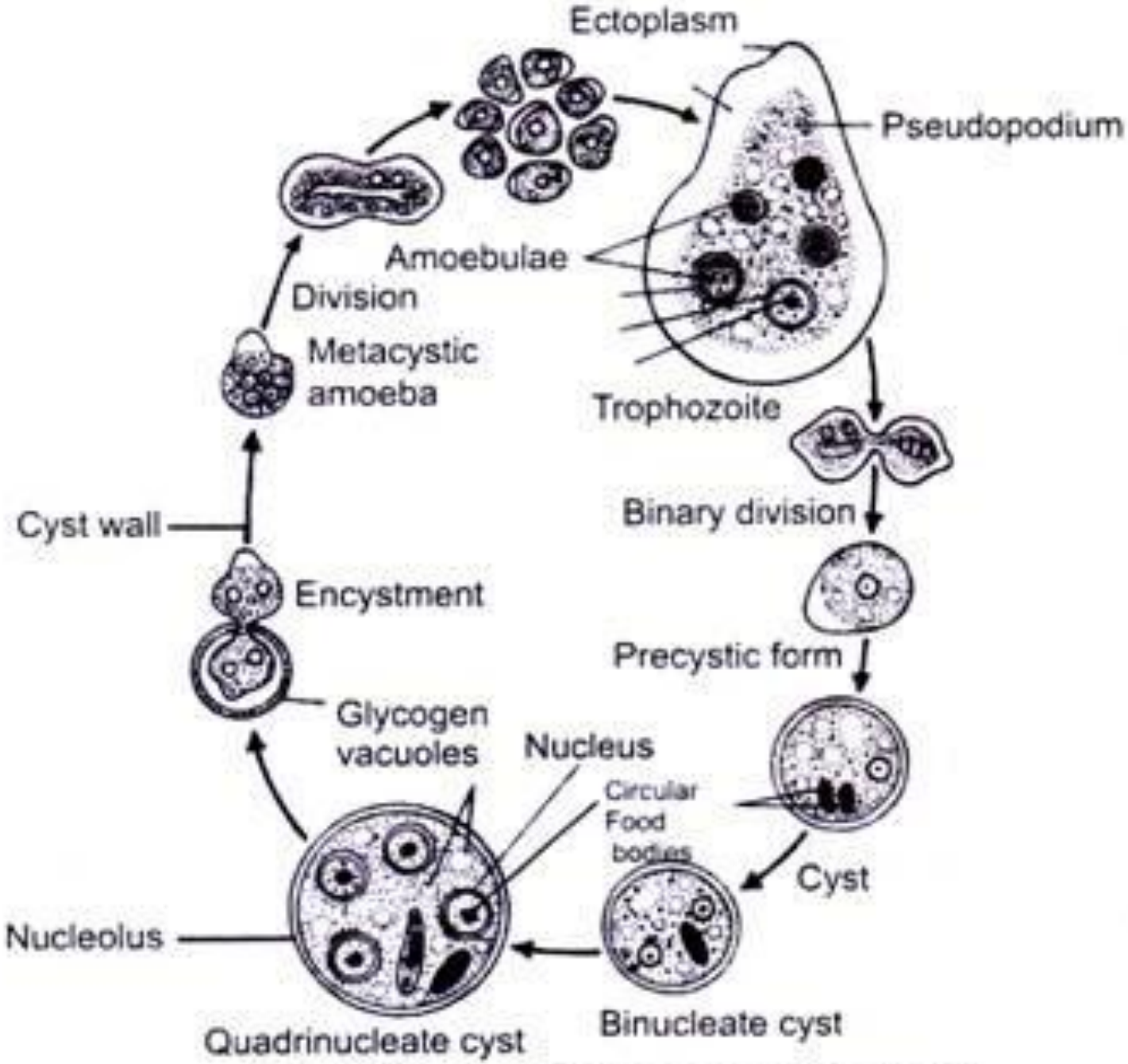


Fig. 9.2 Life Cycle of *E. histolytica*

Pathology

It can live in the lumen of the colon without tissue invasion and by feeding on bacteria and other bowel contents.

Clinical Features

TABLE 79-1 Classification of Amebiasis

WHO Clinical Classification of Amebiasis Infection (Modified)	Pathophysiologic Mechanisms
Asymptomatic infection	Colonization without tissue invasion
Symptomatic infection	Invasive infection
Intestinal amebiasis	
A. Amebic dysentery	Fulminant ulcerative intentional disease
B. Nondysentery gastroenteritis	Ulcerative intestinal disease
C. Ameboma	Proliferative intestinal disease
D. Complicated intestinal amebiasis	Perforation, hemorrhage, fistula
E. Post-amebic colitis	Mechanism unknown
Extraintestinal amebiasis	
A. Nonspecific hepatomegaly	Intestinal infection with no demonstrable invasion
B. Acute nonspecific infection	Amebas in liver but without abscess
C. Amebic abscess	Focal structural lesion
D. Amebic abscess, complicated	Direct extension to pleura, lung, peritoneum, or pericardium
E. Amebiasis cutis	Direct extension to skin
F. Visceral amebiasis	Metastatic infection of lung, spleen, or brain

Tratment of amoebiasis

Antimicrobial therapy	Amoebic liver abscess	Intestinal amoebiasis
Metronidazole	750–800mg three times daily for 10 days	750–800mg three times daily for 5–10 days
Tinidazole	2 g daily for 5 days	2 g daily for 3 days
Paromomycin	–	25–35mg/kg per day, divided into three doses, for 7 days
Diloxanide furoate	–	500mg three times a day for 10 days

Prevention

- Control of amebiasis can be achieved by exercising proper sanitation and avoiding fecal-oral transmission.
- Regular examination of food handlers and thorough investigation of diarrheal episodes may help identify the source of infection
- No prophylactic drug or vaccine is currently available for amebiasis.
- Immunization has been shown to be protective to amebic trophozoite challenge in animals.

Pathogenic Free Living Amoebae

These are also called **opportunist amoebae.**

Habitat

These amoebae are commonly found in soil, fresh water, sewage and sludge, brackish water and seawater.

Naegleria

There is only oneNaegleria species, N.fowleria which is pathogentic to man.

Disease produced

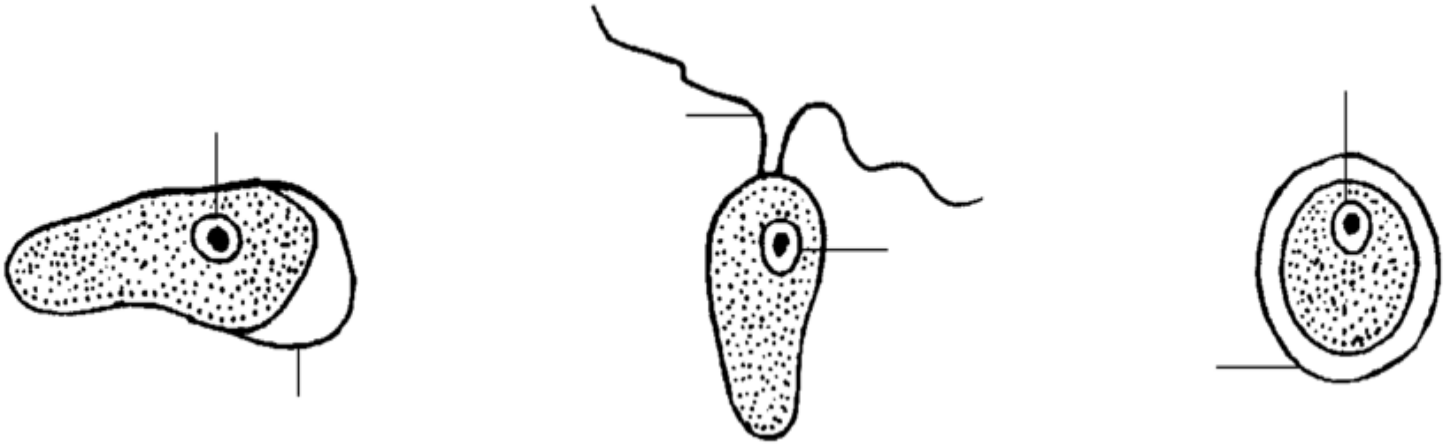
Naegleria amoeba cause an acute and fulminating primary amoebic meningoencephalitis(PAM).

Morphology

Naegleria occurs in trophozoite and cycst forms. The trophozoites exist in two forms-amoeboid or flagellate.

Infective Form

Trophozoites both amoeboid and flagellates are infective forms.



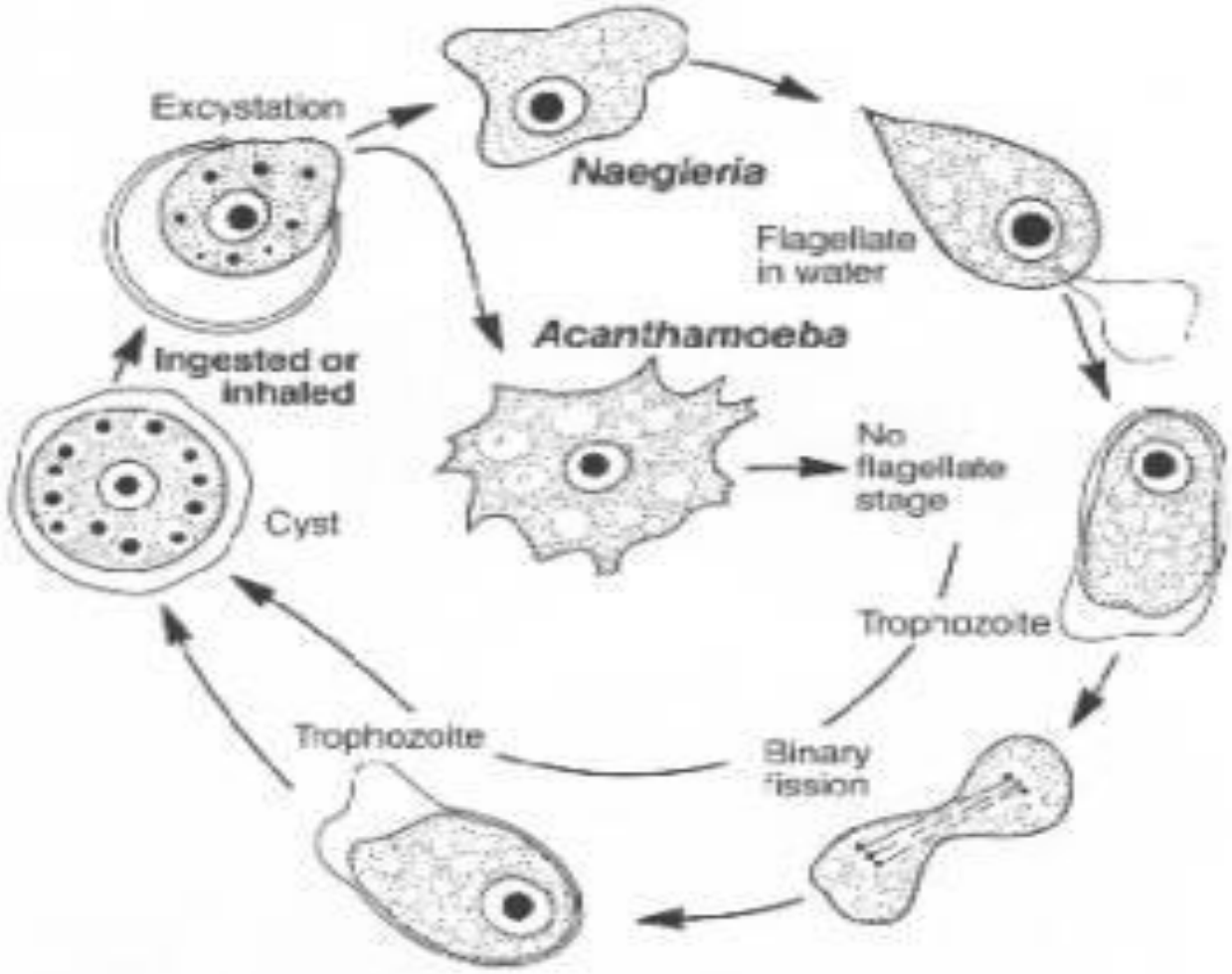
Source of infection

- In most cases during hot summer months in young person who swam during the previous week in lakes,ponds,streams or swimming pools containing the infective form.
- Inahalation of infected dust are also recorded.

Incubation Period

ranges between one to seven days.

Life Cycle of *Naegleria*



Clinical Features

The early symptoms are upper respiratory tract infection, low grade fever, mild headach.

Pathological Features

The pathological features of PAM involving the cerebrum and spinal cord.

Treatment

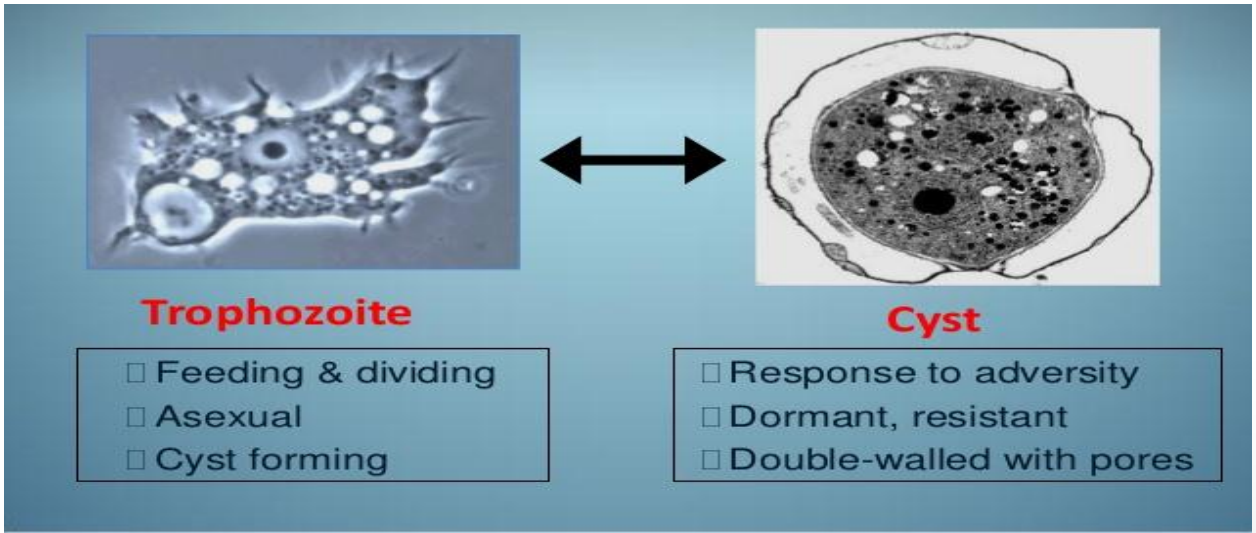
No satisfactory traetment for PAM.

Acanthamoeba

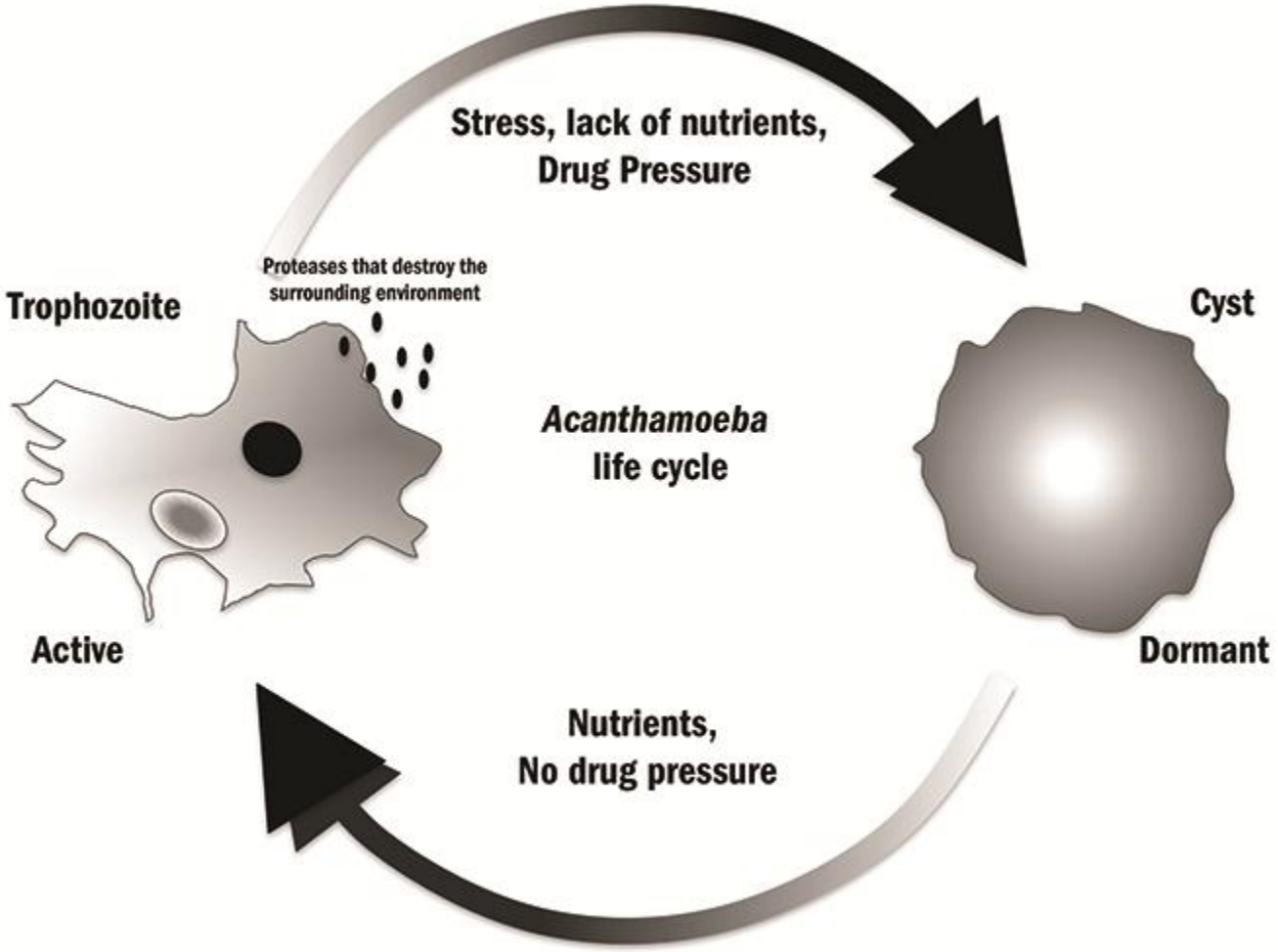
Several Acanthamoeba species are considered pathogenic to humans *A. culbertsoni.*

Morphology

Nucleus charcterized by a large, dense, centrally located nucleolus. It is not having flagellate stage and forming cysts in tissue.



Life Cycle of *Acanthamoeba*



Mode of infection

It can be acquired by inhalation, ingestion or through transmitted skin or eyes.

Incubation Period

ranges between several weeks to several months.

Clinical Features

GAE like that of PAM is indious with prolonged clinical course.

Treatment

Oral ketoconazole together with topical miconazole.