# Protozoa

Parasites of medical importance come under the kingdom called protista and animalia . The microscopic single-celled eukaroytes(having true nuclear membrane) known as protozoa. In contrast, helminthes are macroscopic, multicellular worms possessing well differentiated tissues and complex organs belonging to the kingdom animalia.

Four major groups (Subphylum)of protozoa are recognized:-

- **Flagellates**(or Mastigophora) :moved by flagellum.
- **Amoebae**(or Sarcodina) moved by pseudopodium.
- **Sporozoans**(or Sporozoa, Apicomplexa) have no locomotion organelle
- **ciliatess** (or Ciliophora) moved by cilia .

## Amoebae (Sarcodina )

-Amoeboid shape (irregular shape)

-Moved by pseudopodium which considers a temporary projection of cytoplasm.These help not only in locomotion but also in in ingestion of food.

-Reproduction by binary fission.

-There are trophozoite and cyst stages in their life cycle.

Pathogenic Intestinal Amoeba.Ex: *Entamoeba histolytica*

Non pathogenic Intestinal Amoeba.Ex: *Entamoeba dispar*

*Entamoeba coli*

*Entamoeba hartmanni*

*Endolimax nana*

*Iodamoeba bütschlii*

***Entamoeba histolytica***

A single-celled protozoan parasite, the causative agent of intestinal amebiasis(old name is Amebic Dysentery).. This parasite is endemic (Belonging or restricted to a particular locality or region) in most tropical and subtropical areas of the world, where it causes millions of cases of dysentery each year. Infected persons display a wide range of disease severity, that range from asymptomatic, discomfort, diarrhea, dysentery, liver abscess and amoebic encephalitis, reflecting the contributions of the:-

- patient's immune.
- nutritional status
- the infective dose
- pathogenic potential of the infecting organism.

**Habitat**: caecum and sigmoido rectal region of man.

**Definitive hosts**: Humans

**Infective stage**: Quadrinucleate cyst

**Mode of infection:-**

- ❖ Eating raw vegetables (salad)

- ❖ Drinking water.
- ❖ Flies and food handlers (cyst passer).
- ❖ Faeco-oral(Autoinfection).

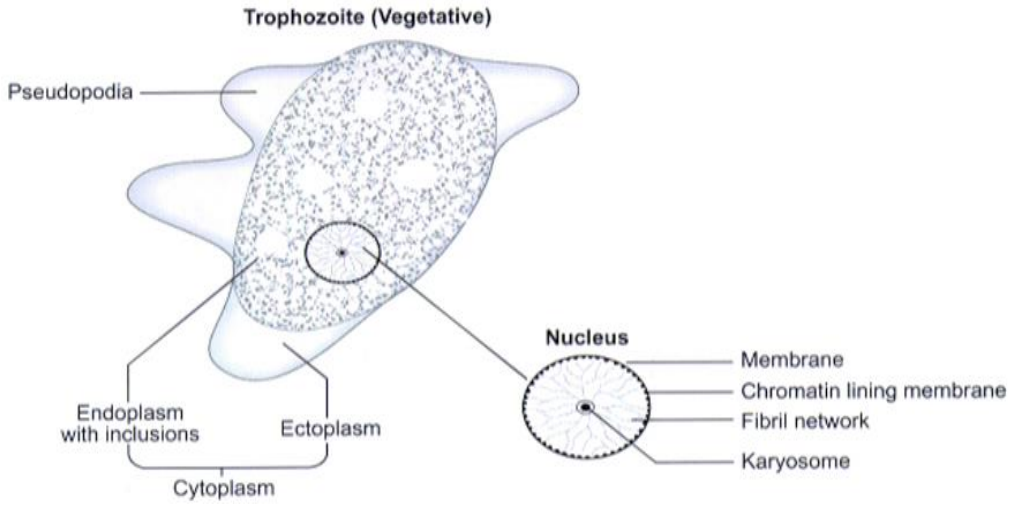
## Morphology of Trophozoite (vegetative form):

- Active, feeding stage,are 15-30 micrometers in diameter .
- Motility is rapid, progressive and directional, through pseudopods
- Cytoplasm is clearly differentiated into:

  Ectoplasm: is clear with well developed pseudopodia.

  Endoplasm: dense & fine granular enclosing,few ingested bacteria or debris in vacuoles , white blood cell ,red blood cell seen in side cytoplasm.

  Nucleus: is spherical and characterized by evenly arranged chromatin on the nuclear membrane and the presence of a small, compact, centrally located karyosome.



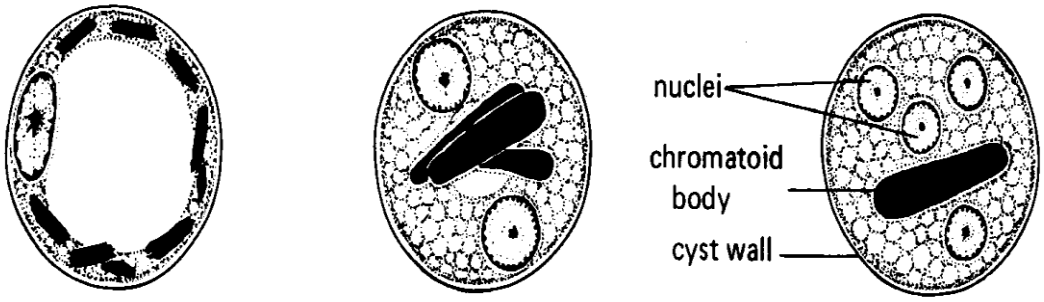

## Morphology of cyst:-

Precyst stage:-

- 10-60X15-30 m average(15-20 m)
- Round or oval with a blunt pseudopodia
- Smaller than the trophozoite but larger than cyst
- Absent cyst wall.
- Single nucleus present.

## Cyst stage:-

- Spherical ,10-20 m average (15 m).
- The cystic stage of *E. histolytica* is either mature or immature , the maturity of cyst depend on the number of nuclei found in the cyst.The immature cyst includes uni and bi –nucleated cyst while the mature cyst is quadrinucleated cyst
- Glycogen mass and chromatoid bodies are present in immature cysts –disappear in mature ones.




A. Uninucleate B. Binucleate C. Quadrinucleate

## Reproduction

Various modes of reproduction seen in these organism include **Excystation, Encystation and Multiplication.**

**Excystation i**s the process of transformation of cyst in to trophozoite and occurs only in small intestine of the susceptible host. During excystation a quadrinucleate cyst gives rise to eight amoeba, each one of which is capable of developing into a trophozoite.

**Encystation** is the process transformation of trophozoite into cyst, which occurs in the lumen of an infect individual.

**Multiplication** is occurs only in the trophozoite stage,it occurs by simple binary fission first of the nucleus and then of cytoplasm.

**Intestinal Disease**

Patients with intestinal disease may exhibit a number of symptoms including profuse diarrhea with blood and mucus, fever ,dehydration, weight loss& abdominal pain. Amebic ulcers may develop in the large colon and can also be found in the rectal area. Trophozoites produce histolytic enzyme that produce necrosis of mucosa leading to the formation of flask-shaped ulcer with a small opening on the mucosal surface and a larger area below the surface.

## Hepatic Disease(Extraintestinal manifestations)

Trophozoites are transported from the intestine to the liver and liver disease is characterized with abdominal pain, fever, hepatomegaly and tenderness. If the abscess ruptures, there is spreading to the brain, pericardium and other sites. If left untouched the abscess will grow normally until it reaches a surface where it can discharge, e.g. the skin, the peritoneum, the pleural cavity or the pericardium. The stretching of the liver is presumably the main source of the pain.

**Laboratory Diagnosis (Intestinal amoebiasis):-**

1- stool examination: Trophozoites are found in diarrhoeic stool. Cysts are found in formed stool.

- Wet preparation

- Iodine stained

Permanent stain with iron haematoxylin or trichrome.

2- Concentration techniques for cysts.

3-Immunodiagnosis (ELISA, IFAT and latex agglutination).

4- Molecular analysis by PCR

5 -Sigmoidoscopy: - to visualize the ulcer, scrap, aspirate or take biopsy to see the trophozoites.

**Diagnosis (Extraintestinal amoebiasis)**

Clinical :according to the organ affected.

Laboratory:

Diagnosed by the use of scanning procedures for liver and other organs.

Specific serologic tests, together with microscopic examination of the abscess material, can confirm the diagnosis.

**Treatment:-**

- **Metronidazole, Tinidazole** Very effective in killing amoebas in the wall of the intestine, in blood and in liver abscesses.
- **Diluxanide furoate** kills trophozoites and cysts in the lumen of the intestine.

# *Entamoeba coli*

- Non pathogenic amoeba that very closely resembles *Entamoeba histolytica*
- has a worldwide distribution
- Feeds on bacteria and any other cells available to it
- does not invade tissues
- common inhabitant of the lumen of the cecum and colon of man and other animals
- Has the typical Entamoeba nucleus

**Morphology of Trophozoite:-**

- Usually 15-25 μm in diameter (range 10-50 μm) ,perhaps a little larger than the trophozoite of *Entamoeba histolytica*
- Cytoplasm:

More vacuolated or granular endoplasm with bacteria and debris but no RBCs

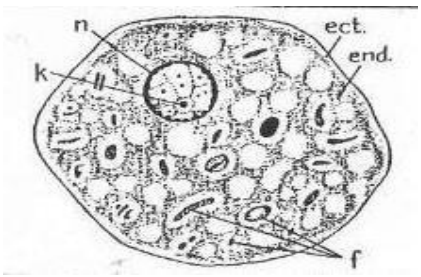
Pseudopodia: broad short pseudopodia and little locomotion

- function more to ingest food
– sluggish, non-directional motility

1. Nucleus

1 nucleus

–Thicker, irregular, coarsely granular peripheral chromatin with a large eccentric karyosome




## Morphology of cyst:-

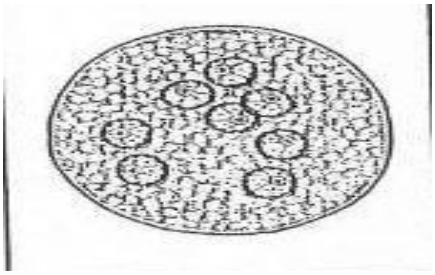
-size: 10-35 µm

-Nucleus

- Usually spherical
- mature cyst: 8 nuclei
- Immature cyst: 2 or more nuclei
- Karyosome is large, may/may not be compact and/or eccentric

-Cytoplasm: coarsely granular

-chromatoidal bodies: Splinter-shaped or broom-shaped with rough, pointed end.



## Laboratory diagnosis:-

Routine microscopic examination of stool is sufficient for diagnosis.