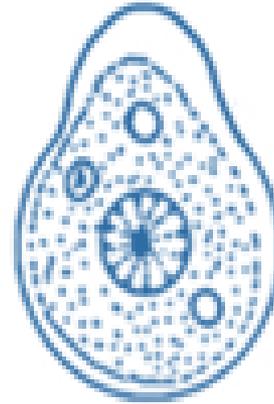


# Introduction to Protozoa

**Professor Dina Moustafa Abou Rayia**

**Medical Microbiology and Immunology Department**

- **Definition:** Protozoa are unicellular organisms capable of performing all life functions.



- **Morphology:**

❖ **Plasma membrane.**

❖ **Ectoplasm:** hyaline, non-granular outer layer and responsible for locomotion, feeding, excretion and protection

❖ **Endoplasm:** granular, responsible for metabolism. It contains food vacuoles, food reserves and contractile vacuoles

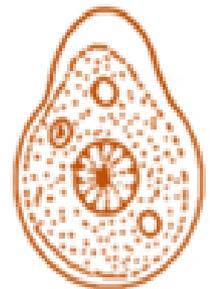
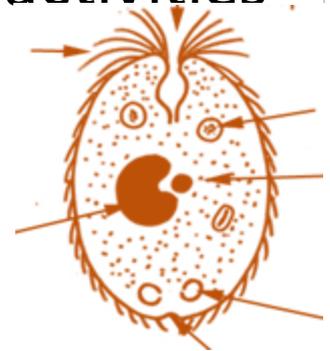
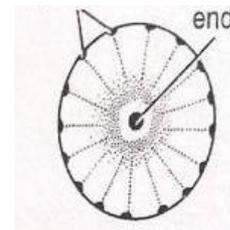
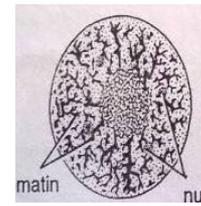
# General characters:

## ❖ Nucleus:

- One or more,, located in the endoplasm.
- Responsible for reproduction and regulates activities of the cell.

## • Consists of:

- Nuclear membrane.
- Nucleoplasm.
- Chromatin network.
- Karyosome (endosome or nucleolus)



# Biology:

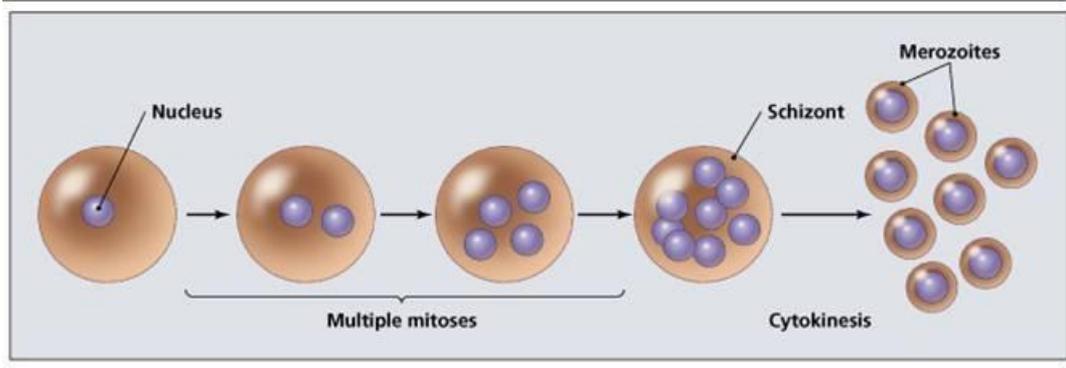
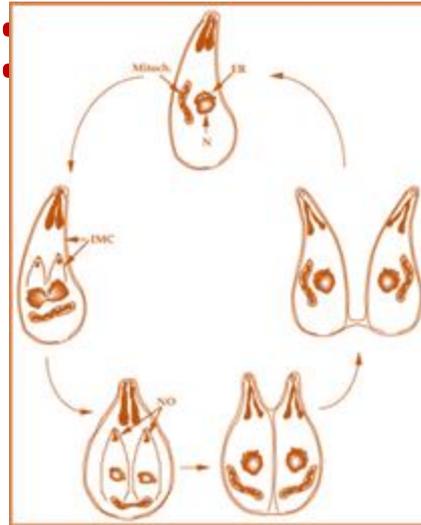
- **Locomotion:** by pseudopodia, flagella or cilia.
- **Nutrition:** by absorption of liquid food from the surface (saprozoic) or ingestion of solid particles (holozoic) through the cytostome or by pseudopodia.
- **Excretion:** by diffusion, contractile vacuoles or cytophyge.
- **Secretion:** enzymes, toxins, and materials for cyst walls.
- **Encystation:** formation of cysts, to resist unfavourable conditions and facilitate transfer



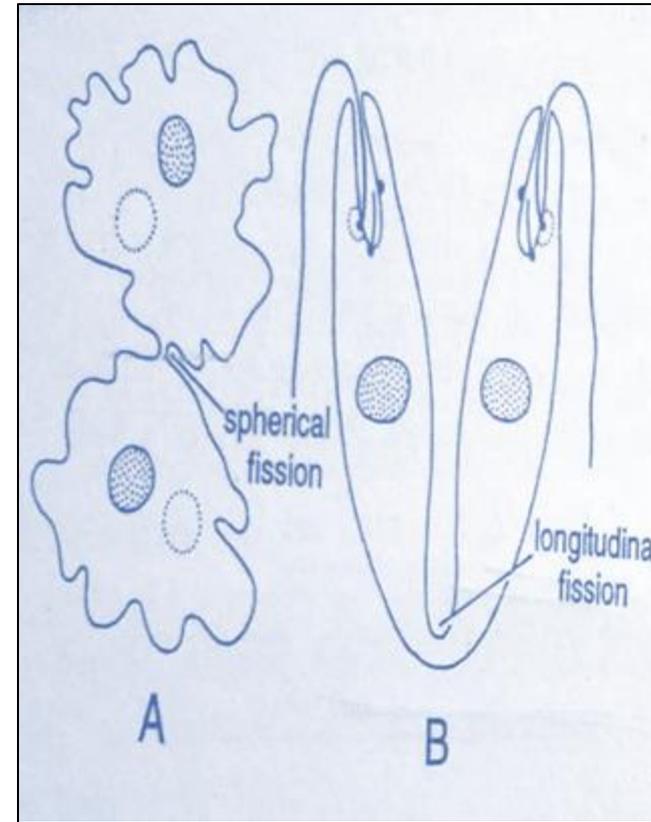
# Reproduction:

❖ Asexual:

Endodyogony



**Multiple fission (schizogony)**



**Simple binary fission**

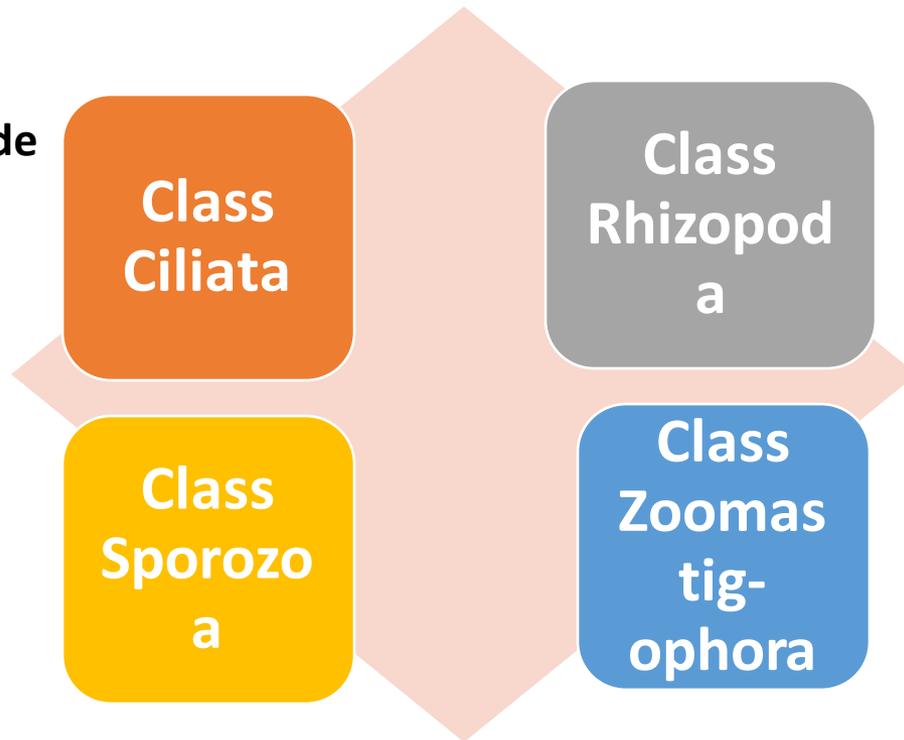
# Reproduction:

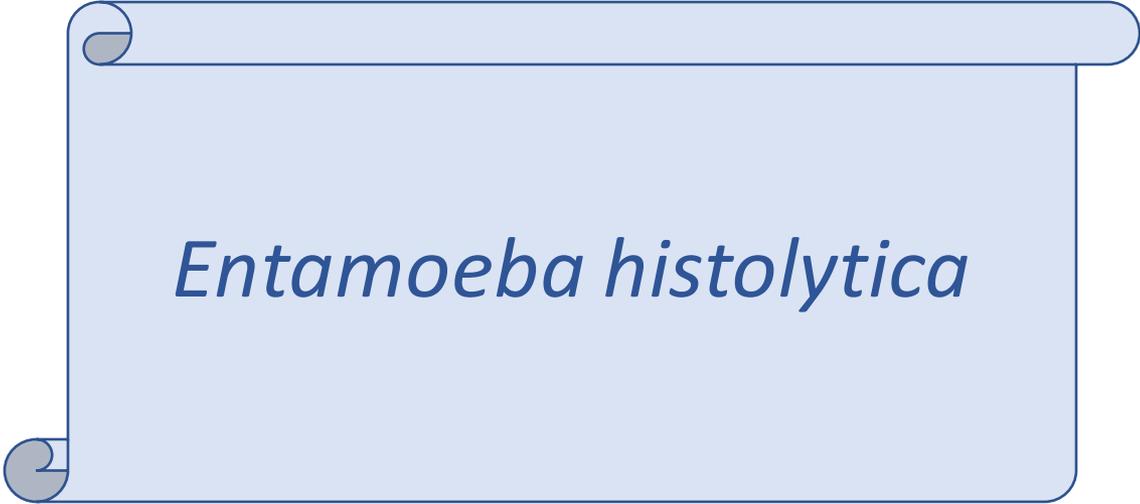
## ❖ Sexual:

- - **Conjugation:** temporary union of two organisms for exchange of nuclear material as in *Balantidium coli*.
- - **Syngamy:** permanent union of gametes for formation of a zygote.

# Protozoa classification

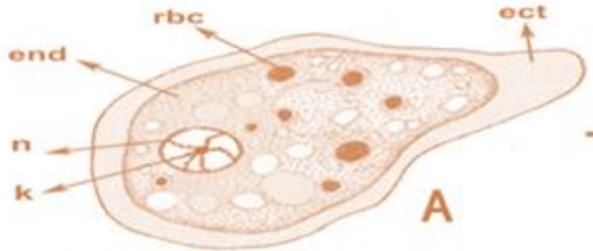
According to the mode of locomotion



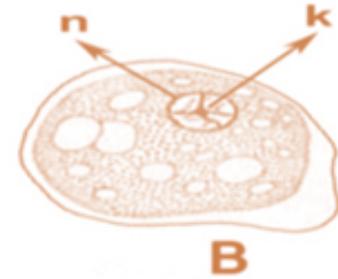


*Entamoeba histolytica*

# *Entamoeba histolytica*



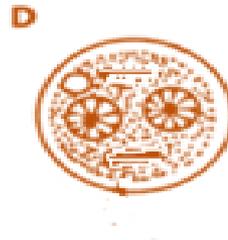
**Trophozoite**



**Pre-cyst**



**Uninucleated  
cyst**

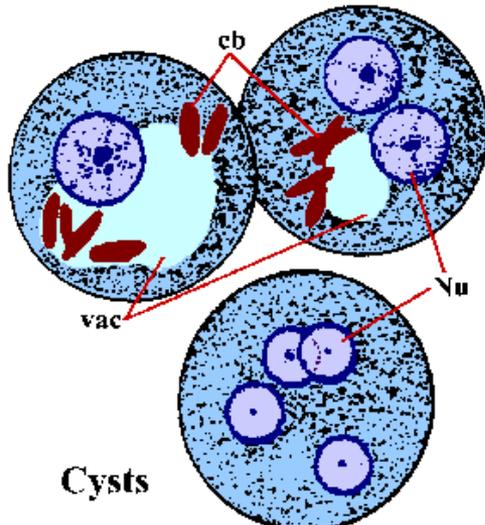
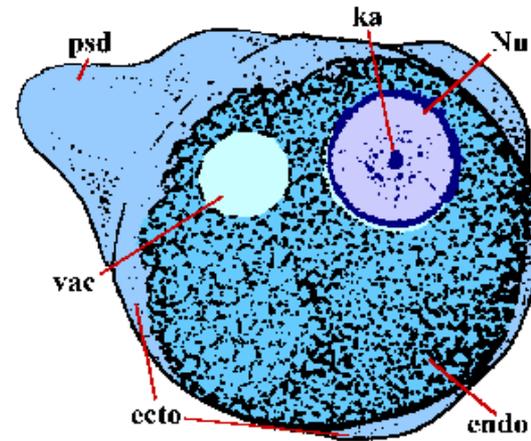


**Binucleated  
cyst**

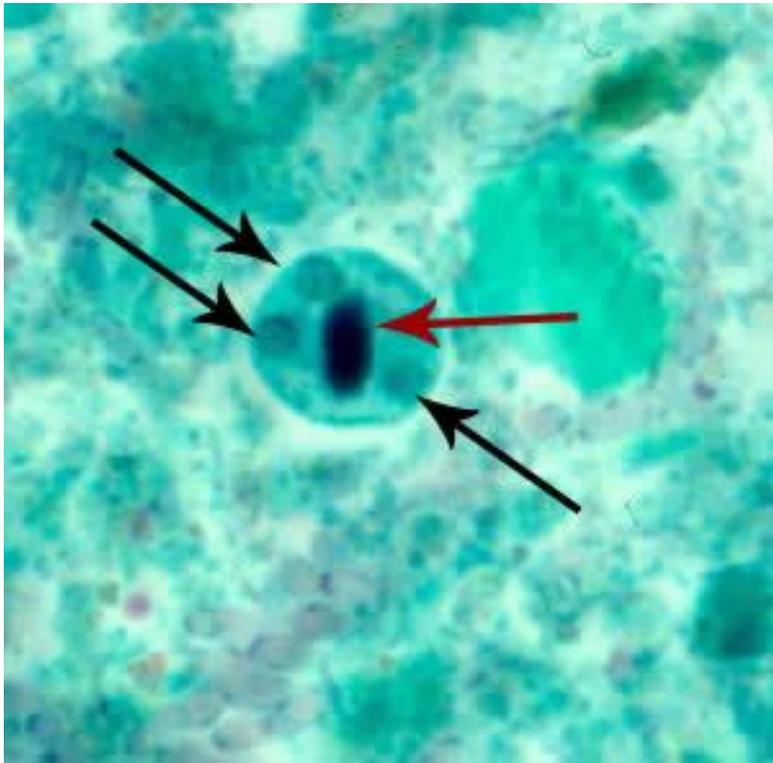


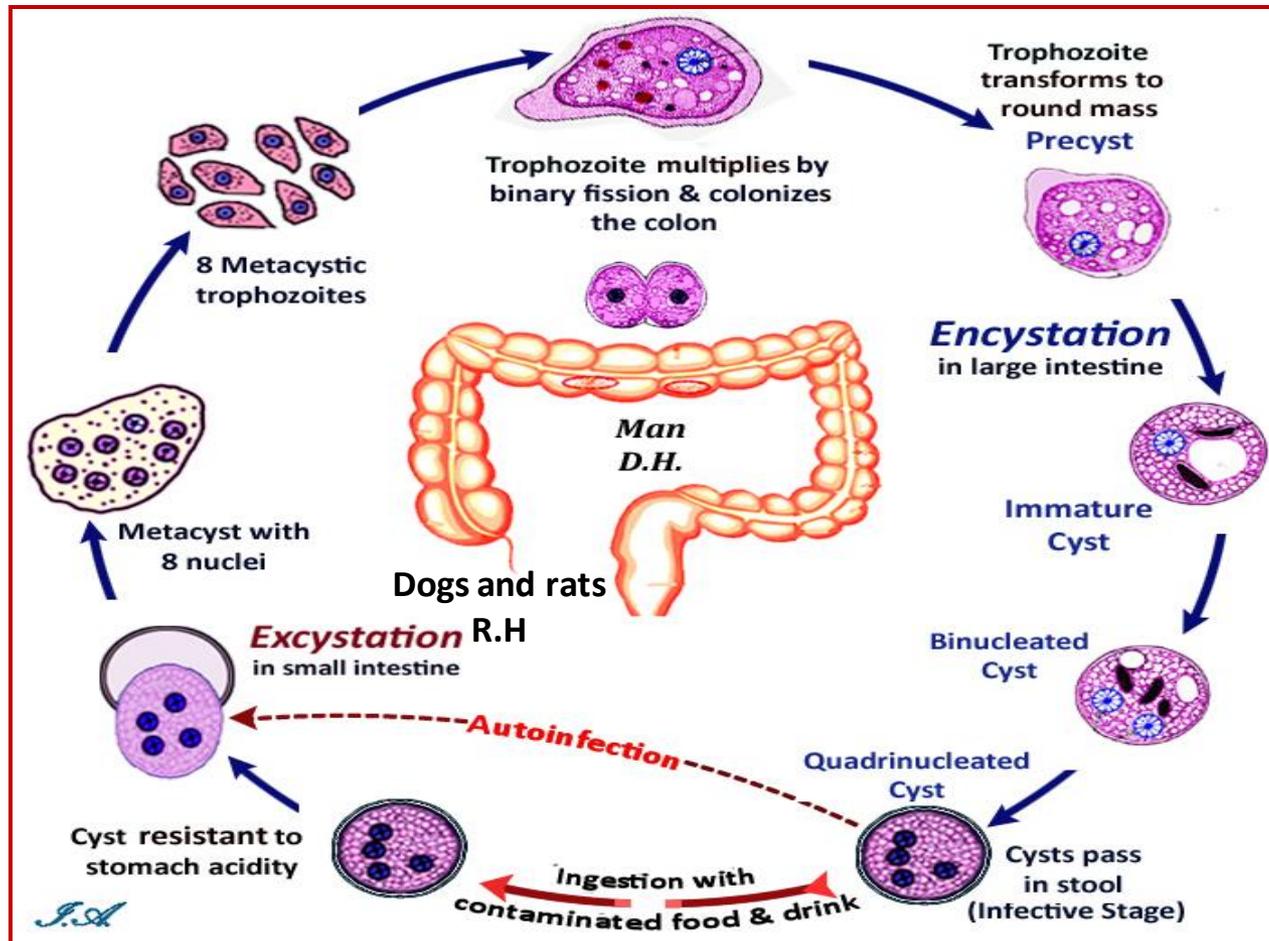
**Quadrinucleated  
mature cyst**

# Trophozoite



# cyst





- ❖ Habitat
- ❖ Hosts: D.H and R.H
- ❖ D.S
- ❖ I.S
- ❖ Mode of infection

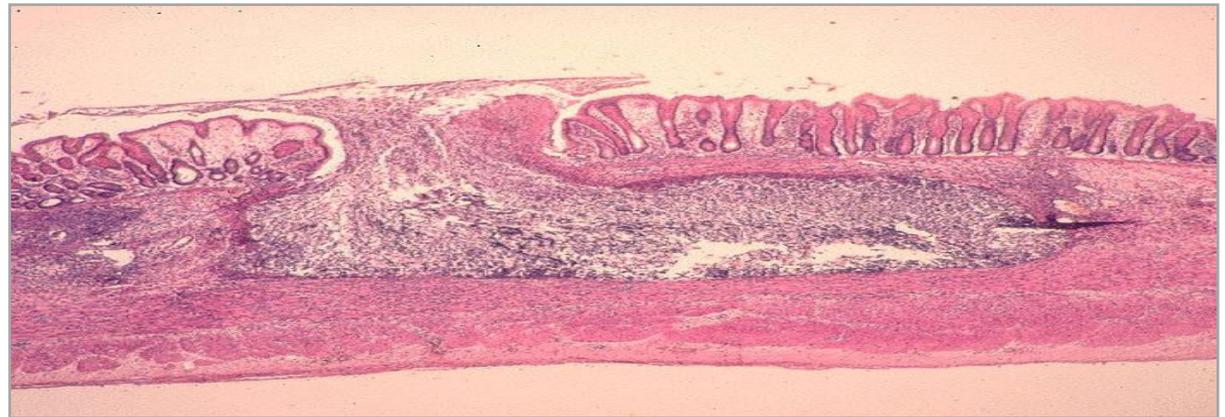
# Pathogenesis



**With heavy infection and lowering of host immunity**

The trophozoites of *E. histolytica* invade the mucosa and submucosa of the large intestine by secreting lytic enzymes → amoebic ulcers

The ulcer is flask-shaped with deeply undermined edges containing cytolysed cells, mucus and trophozoites.



The most common sites of amoebic ulcers are caecum, colonic flexures and sigmoidorectal regions due to decrease peristalsis & slow colonic flow at these sites that help invasion.

# Clinical pictures



## I) Intestinal amoebiasis

### 1-Asymptomatic infection

Most common and trophozoites remain in the intestinal lumen feeding on nutrients as a commensal without tissue invasion  
**(Asymptomatic patient known as a healthy carrier and cyst passers)**

### 2-Symptomatic infection

#### a) Acute amoebic dysentery

Presented with fever, abdominal pain, tenderness, tenesmus (difficult defecation) and frequent motions of loose stool containing **mucus, blood and trophozoites.**

#### b) Chronic infection

-Occurs if acute dysentery is not properly treated.  
-With low grade fever, recurrent episodes of diarrhea alternates with constipation.  
- Only cysts are found in stool.

### 3-Complications

- Haemorrhage** due to erosion of large blood vessels.
- Intestinal perforation** → peritonitis.
- **Appendicitis.**
- Amoeboma (Amoebic granuloma)** around the ulcer → stricture of affected area.

## II) Extra-intestinal amoebiasis



Due to invasion of the blood vessels by the trophozoites in the intestinal ulcer → reach the blood → to spread to different organs as:

→ **Liver** →

- Amoebic liver abscess or diffuse amoebic hepatitis.
- Affect commonly **right lobe** either due to spread via portal vein or extension from perforating ulcer in right colonic flexure.
- CP:** include fever, hepatomegaly and pain in right hypochondrium.

→ **Lung** →

- Lung abscess → pneumonitis with chest pain, cough, fever.
- Amoebic lung abscess usually occur in the **lower part of the right lung** due to direct spread from the liver lesions, through the diaphragm or very rarely trophozoites may reach the lung via blood.



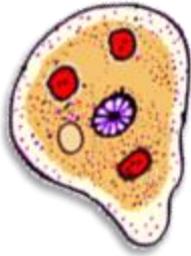
→ **Brain** → Brain abscess ⇔ encephalitis (fatal).

→ **Skin** →

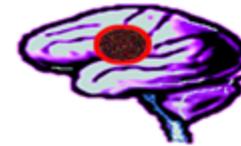
## Cutaneous amoebiasis (**Amoebiasis cutis**):

- when the invasive amoebae escape from the large gut and stick to adjacent skin, usually the perianal and perigenital area.

# Pathogenesis of amoebiasis



Cerebral amoebiasis



Pleuropulmonary amoebiasis



Hepatic amoebiasis

Amoebic hepatitis

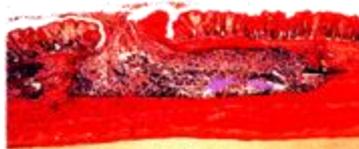
Amoebic liver abscess



Intestinal amoebiasis

Acute amoebic dysentery

Chronic intestinal amoebiasis



Flask-shaped ulcers



Coetaneous amoebiasis





# Laboratory diagnosis

## I) Intestinal amoebiasis

### a) Direct

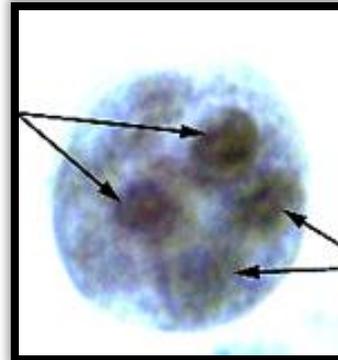
• **Macroscopic:** Offensive loose stool mixed with mucus and blood.

• **Microscopic:**

**1-Stool examination:** Reveals either trophozoites (in loose stool) or cysts (in formed stool) by direct smear, iodine stained & culture.

**2-Sigmoidoscopy:** To see the ulcer or the trophozoites in aspirate or biopsy of the ulcer.

**3-X-ray after barium enema:** to see the ulcer, deformities or stricture.



### b) Indirect

- **Copro-antigen detection in stool**

- **Serological tests:** CFT, IHAT, IFAT, ELISA and GDPT (gel-diffusion precipitin test).

**N.B.** These serological tests are positive only in invasive intestinal amoebiasis but negative in asymptomatic carriers.



## II) Extra- intestinal amoebiasis

According to the organ affected

a) Direct

### 1- X- ray:

In liver ⇒ space occupying lesion.

In lung ⇒ pleuritis with elevation of the diaphragm

### 2- Ultrasonography, CT scan & MIR:

For liver abscess.

### 3- Aspiration of abscess content:

For liver abscess to detect trophozoites.

b) Indirect

1- **Serological tests:** As intestinal amoebiasis. They are positive and can persist for years.

### 2- Molecular by PCR.

3- **Blood examination:** Leucocytosis.

4- **Liver function tests:** Increased in amoebic liver abscess.



# Treatment

**1) Asymptomatic intestinal carrier**

**Luminal amoebicides**

**Paromomycin or  
Diloxanide furoate**

**2) Intestinal amoebiasis**

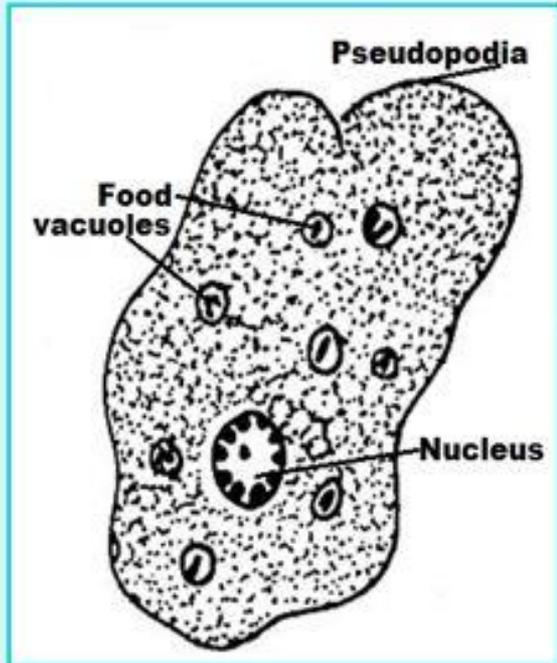
**Tissue & luminal amoebicides**

**Metronidazol  
(Flagyl) is the drug  
of choice +  
Paromomycin or  
Diloxanide furoate**

**3) Extra-intestinal amoebiasis**

**Tissue & luminal amoebicides**

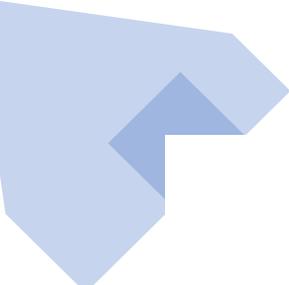
**Metronidazol  
(Flagyl) +  
Paromomycin or  
Diloxanide furoate**



***E. Coli* trophozoite**



***E. Coli* cyst**



Thank  
You

