

Protozoa

It consists of single cell containing nucleus and cytoplasm performs all the necessary functions of life. Thousand species of protozoa have been described; most of them are free-living.

In general there are four main groups of protozoa depend on their locomotion using

1- **Amoeba** :- use pseudopodia (singular : pseudopodium) to creep or crawl over solid substrates as well as for feeding

2- **Flagellates**:- use elongate flagella (singular : flagellum) is hair –like extensions of the cell membrane which is by it`s undulating play a role in movement the cells through the liquid environments

3- **Ciliates**:- use numerous small cilia (singular :cilium) is hair –like extensions of the cell membrane similar in construction to flagella but shorter and present in much larger numbers which undulate in waves allowing cells to swim in fluid.

4- **Sporozoa** :- (spore –formers) are originally recognized not on the basis of their locomotion but because they all formed non-motile spore as transmission stages

Human amoebas

Free-living protozoan groups that inhabit soils and natural waters are extremely diverse, not only in their structure but also in the manner in which they feed, reproduce, and move. The amoeboid group includes hundreds of different organisms, ranging in size from about 2.5 to more than 200 μm . Amoebas are considered the most primitive animals and are classified in the **kingdom – Protista**

Subkingdom – Protozoa

Phylum- Sarcomastigophora.

Subphylum - Sarcodina :- The general characters of amoebic species:

- 1. Move by pseudopodia.**
- 2. Asexual reproduction by binary fission.**
- 3. Usually parasitic intestinal tract.**
- 4. Anaerobic eukaryotes lack mitochondria**

Unicellular \ Single celled

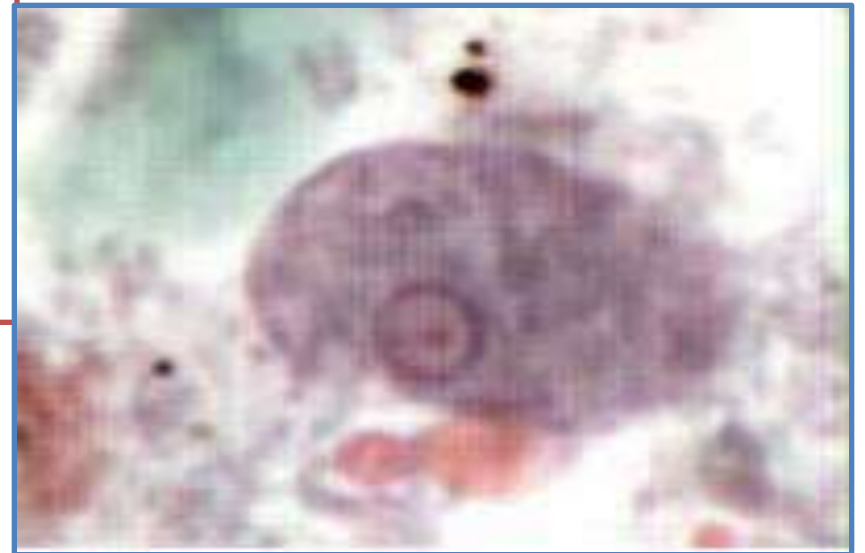
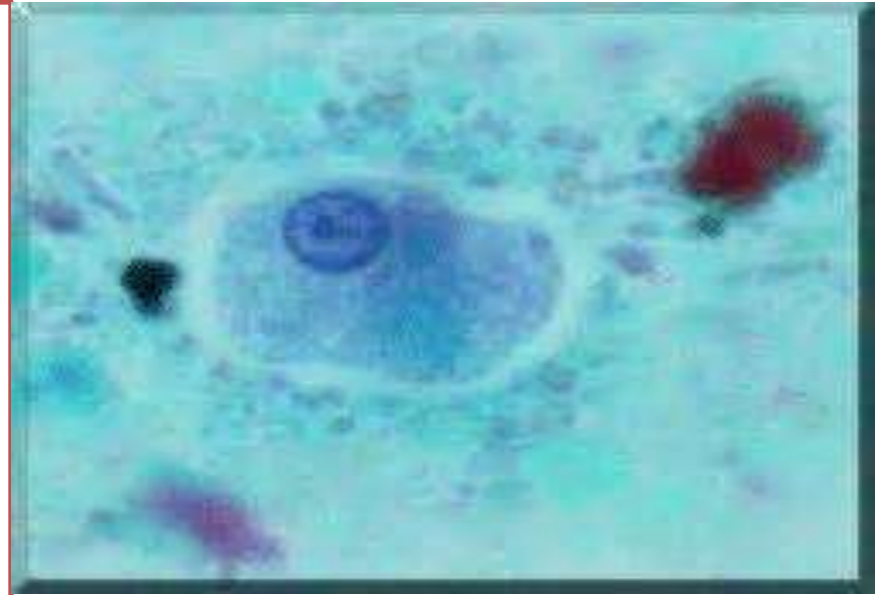


Amoeba



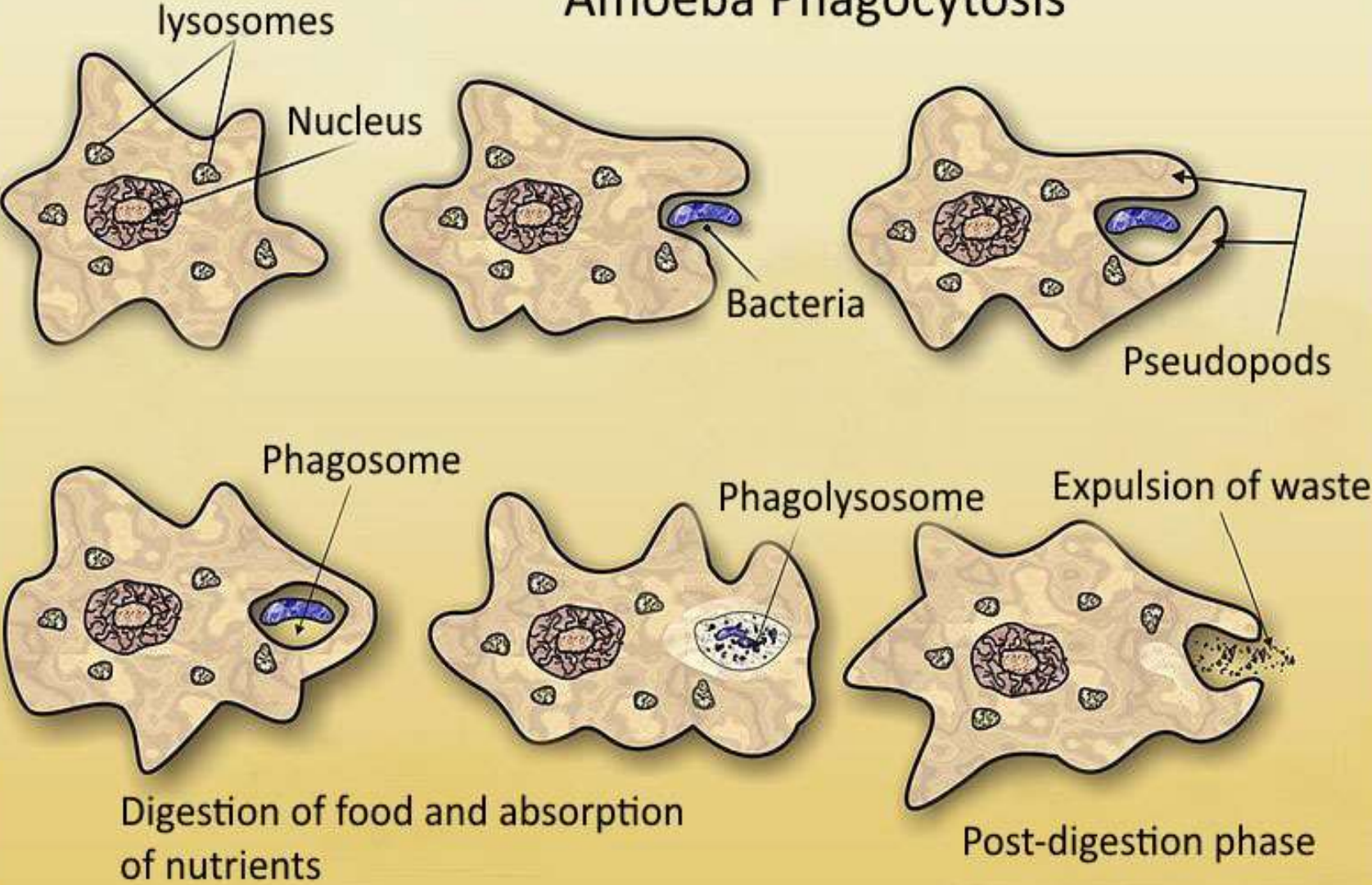
Microscopic

All amoeboid organisms have thin cell membranes, a semirigid layer of ectoplasm, a granular, jellylike endoplasm, and circular to an oval nucleus. Amoebas are identified by their ability to form temporary cytoplasmic extensions called pseudopodia or false feet, by means of which they move about



- ❖ Some species live on aquatic plants and some in moist ground; others are parasitic in animals and humans.
- ❖ Amoeba contains food vacuoles, food is taken in and material excreted at any point on the cell surface.
- ❖ **During feeding**, extensions of cytoplasm flow around food particles, surrounding them and forming a vacuole into which enzymes are secreted to digest the particles.
- ❖ Contractile vacuoles involved in osmoregulation pumps excess water out of the cell.
- ❖ Reproduction is asexual (binary fission).

Amoeba Phagocytosis



Three groups of amoebas are concerned with human health . These groups are:-

1- **Pathogenic amoebae** :- Live in the alimentary canal and able to invade tissue, such as *Entamoeba histolytica*

2- **Non-pathogenic Amoebas** lives in the alimentary canal and unable to invade tissue.

a. *Entamoeba coli*.

b. *Endolimax nana*.

c. *Entamoeba gingivalis*

3- **Pathogenic free-living** :- Amoebas live freely in water and can infect human brain while swimming in contaminated water such as *Naegleria fowleri*.

Entamoeba histolytica

Is a protozoan parasite responsible for a disease called amoebiasis (intestinal amebic dysentery and extra-intestinal diseases). It occurs usually in the large intestine (cecum and colon). Inside human bodies *Entamoeba histolytica* lives and multiplies as a trophozoite. In order to infect other humans they encyst and exit the body.

Predominantly infecting humans and also infected many other animals

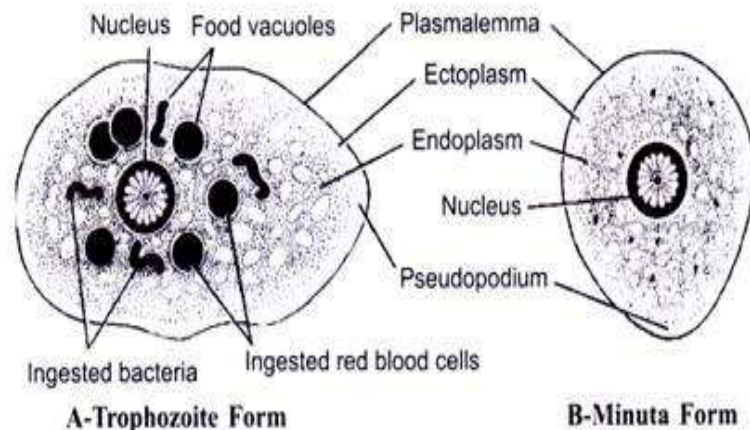


Fig. 9.1 A & B *E. histolytica*

Mode of infection (mode of transmission) :

1. Directly by ingestion of mature cyst through contaminated food or water or by contact of person to person(fecal-oral)
2. Indirectly by contact with dirty hands or objects.
3. Venereal transmission among homosexual males(oral-anal)

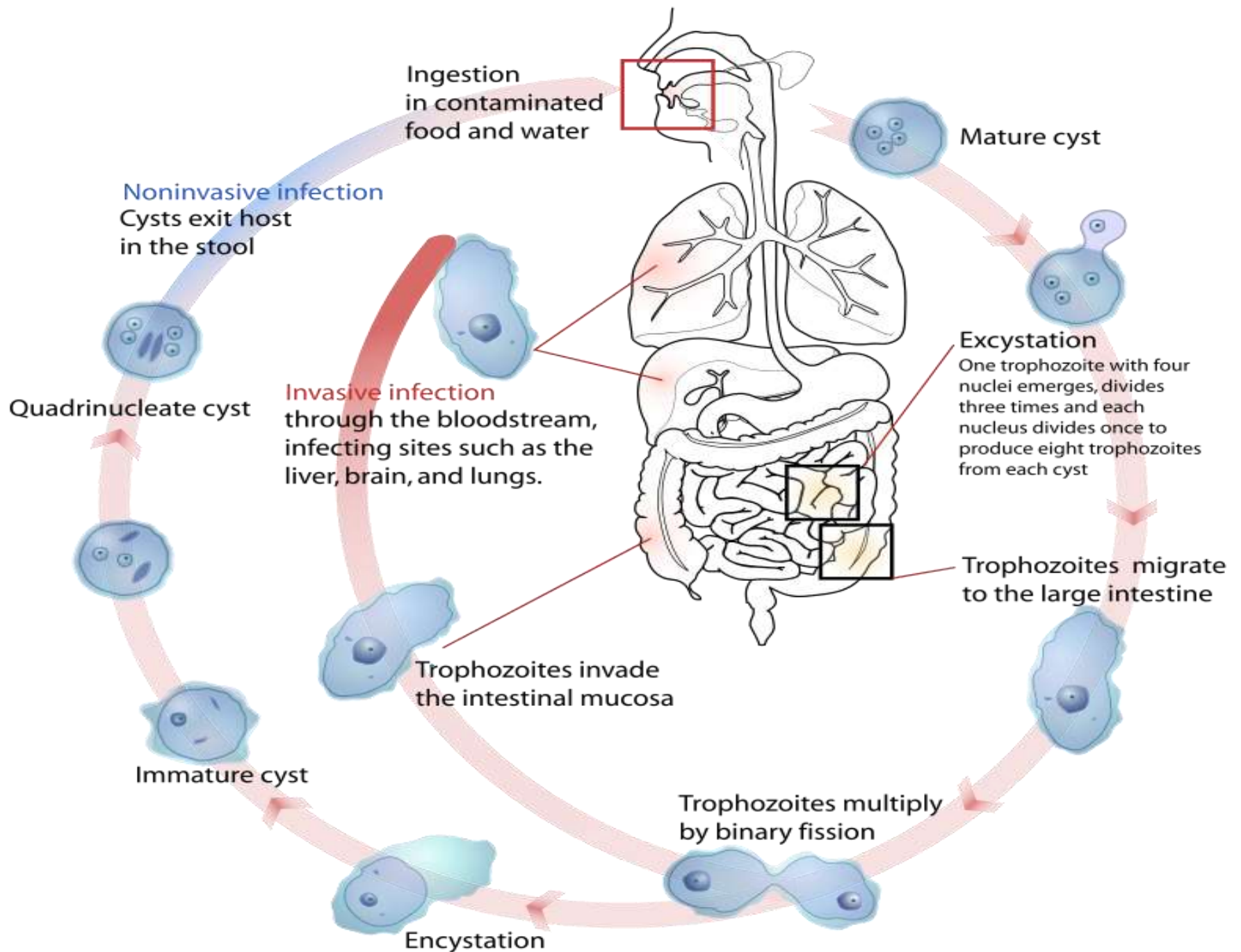
The word *histolytic* means "tissue destroyer" as it has proteolytic enzymes which are normally used to digest bacteria in food vacuoles but which can cause lysis of the epithelial cells by inducing cellular necrosis (causes internal inflammation).

Asymptomatic carrier can consider as source of infection for endemic disease specially in children's institutions.

Life cycle

Entamoeba histolytica does not require any intermediate host. Mature cysts are passed in the feces of an infected human. Another human can get infected by ingesting them in contaminated water, food or hands. If the cysts survive the acidic stomach, they transform into trophozoites in the small intestine. Trophozoites migrate to the large intestine (cecum and colon) where they live and multiply by binary fission.

Both cysts and trophozoites are sometimes present in the feces. Cysts are usually found in solid stool, whereas trophozoites are found in loose stool. Only cysts can survive longer period up to many weeks outside the host body. If trophozoites are ingested they can be killed by the gastric acid of the stomach

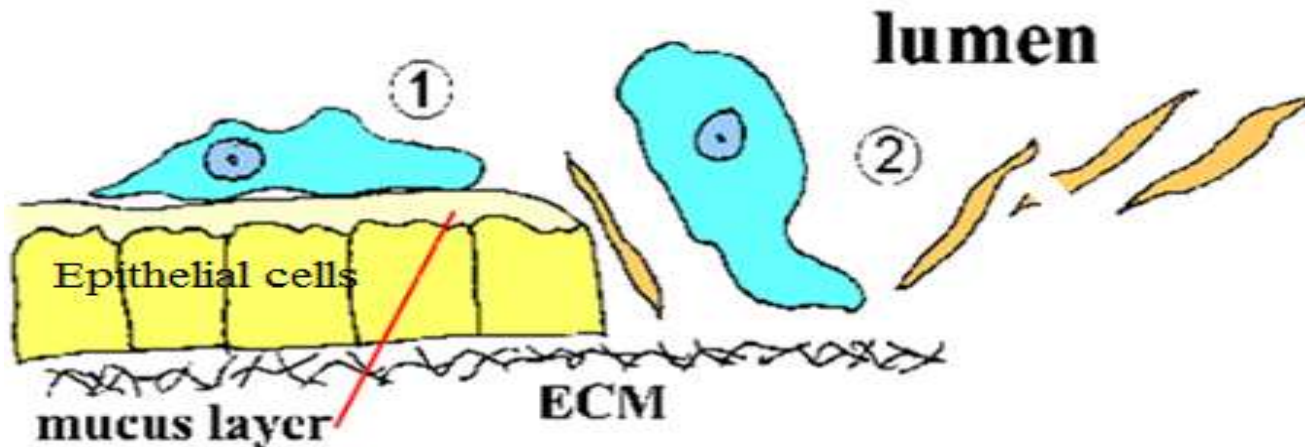


Pathogenesis:

1- Once the trophozoites are excysted they colonize in the large intestine, remaining on the surface of the mucus layer and feeding on bacteria and food particles.

2. Trophozoites move through the mucus layer where they come in contact with the epithelial cell layer and start the pathological process.

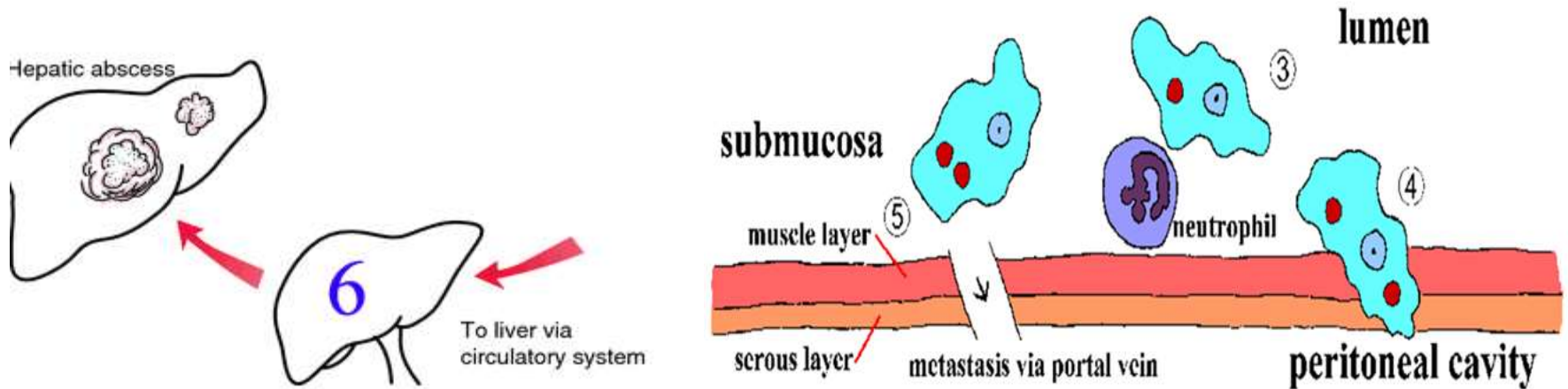
E. histolytica has proteolytic enzymes normally used to digest bacteria in food vacuoles but which can cause lysis of the epithelial cells by inducing cellular necrosis and apoptosis when the trophozoite comes in contact with them.



3- The proteolytic enzyme causes lysis of epithelial cell. The trophozoite engulf the dead cells, this leading to tissue distraction and produce ulcer (flask-shaped ulcer).

4- This tissue destruction can also involve blood vessels leading to bloody diarrhea, amebic dysentery.

5- Trophozoites enter the bloodstream where they transported typically to the liver via the portal system causes extraintestinal abscess especially in liver.



Clinical signs & symptoms

Symptomatic infection: the amoeba does not usually come in contact with the intestine itself due to the protective layer of mucus that lines the gut.

After Incubation period (2-4 weeks) the symptoms can range from mild diarrhea to severe dysentery with blood and mucus. Also there are other symptoms abdominal cramps, nausea and vomiting, loss of appetite, and weight loss, anemia. In severe cases may cause dehydration. This will be considered as **acute stage**.

Chronic: Recurrent episodes of dysentery with blood and mucus in the feces associated with anorexia and weight loss as prominent features. Mild anemia and a high rate of erythrocyte sedimentation RBCs (ESR) are the most common laboratory findings. In case of extraintestinal amebiasis The organism may invade the liver, lung and brain where it produces abscesses that result in liver dysfunction, pneumonitis, and encephalitis

flask-shaped ulcer

amebic liver
abscess

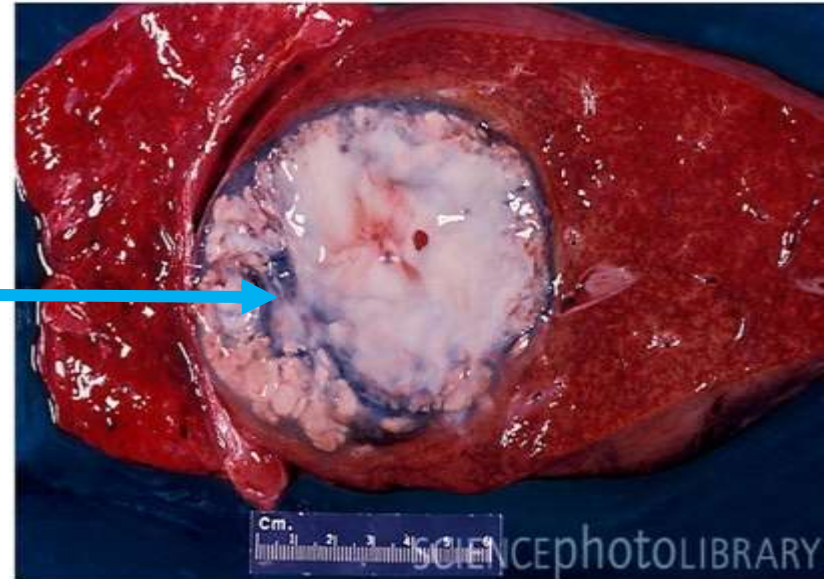


Figure 1. Invasion of submucosa by trophozoites. The lesion spreads out laterally, creating the flask-shaped amebic ulcer. (Histopathology, UFPA, Araújo R.).

