ENTAMOEBA HISTOLYTICA

Asst.prof. Dr.Hemdad Hawez Mawlood Course name and
Grade -3- fall semester Week number

Parasitology

Theoretical lec-3&4

Taxonomy

Kingdom	Animalia	
Subkingdom	Protozoa	
Phylum	Sarcomastigophora	
Subphylum	Sarcodina	Entamoeba
Subphylum	Mastigophora	Giardia
Phylum	Apicomplexa	malaria
Phylum	Ciliophora	Balantidium
Phylum	Microspora	microsporidium

Protozoa

..“eukaryote”..has genetic material encased in a nuclear membrane (unlike bacteria and viruses)

..classified traditionally by morphology (eg. organelles of locomotion), life cycle and mechanisms of reproduction etc.

Mastigophora: movement with flagella - e.g. Trichomonas, Giardia

Sarcodina: pseudopodia, e.g. Entamoeba histolytica

Apicomplexa: apical complex, no locomotor apparatus; sexual reproduction, e.g. cryptosporidium, malaria, toxoplasma

Ciliophora: movement with cilia, e.g. Balantidium.

INTESTINAL PROTOZOA

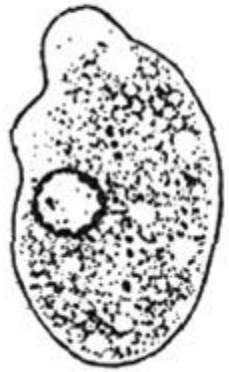
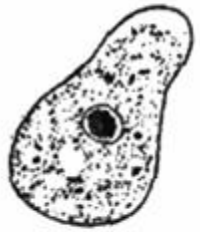
Pathogenic

Entamoeba histolytica
Balantidium coli
Giardia lamblia
Dientamoeba fragilis
Cryptosporidium parvum
Enterocytozoon bieneusi
Septata intestinalis
Cyclospora cayetanensis
Isospora belli

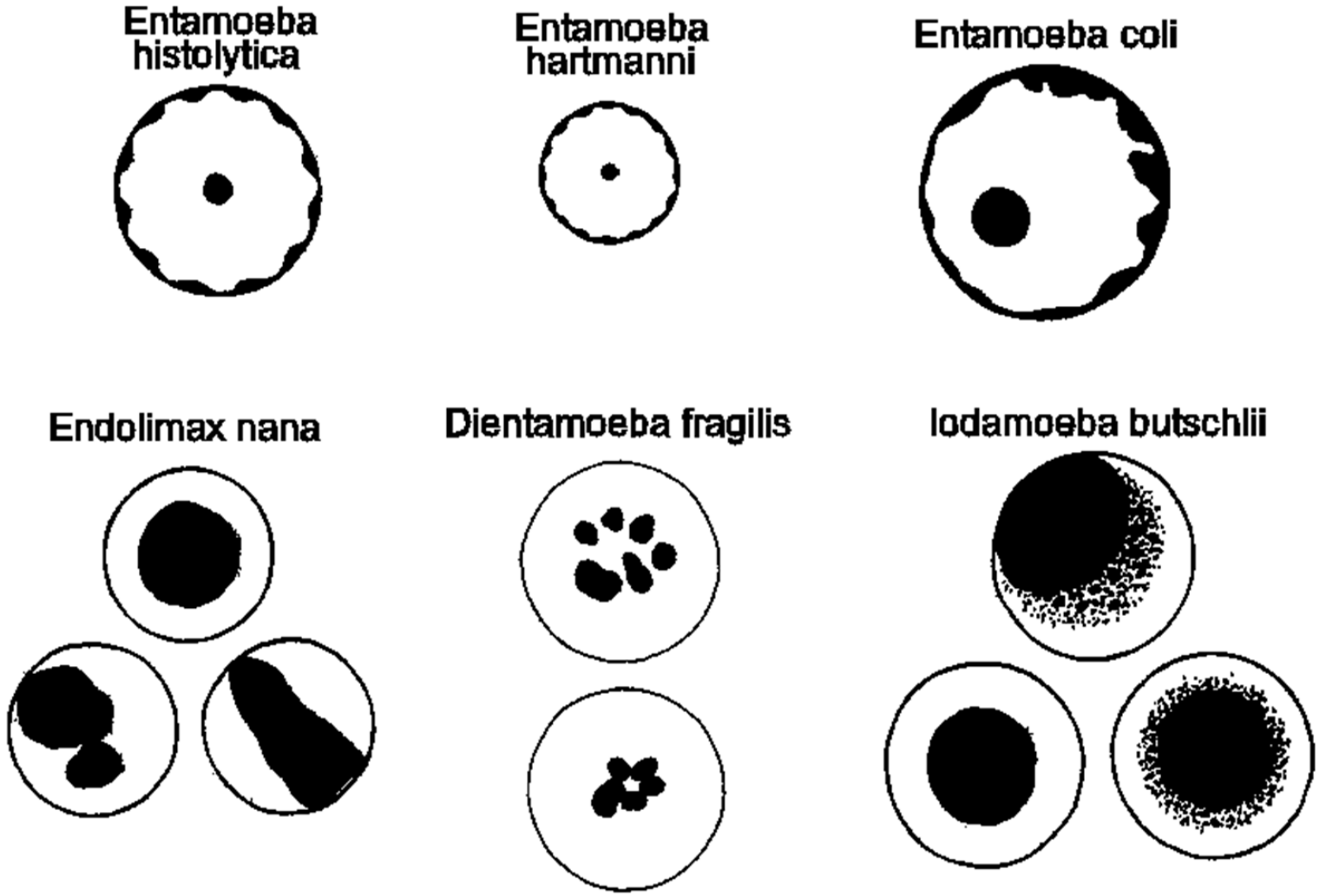
Commensal

Entamoeba hartmani
Entamoeba dispar
Entamoeba coli
Endolimax nana
Iodamoeba bütschlii
Chilomastix mesnili
Trichomonas hominis
Blastocystis hominis

Intestinal Amoebae

	Entamoeba histolytica	*Entamoeba hartmanni*	*Entamoeba coli*	*Endolimax nana*	*Iodamoeba butschlii*	*Dientamoeba fragilis*
trophozoite						
cyst						

Nuclear Morphology



Intestinal Protozoa

Entamoeba histolytica

Disease: Amebic dysentery and liver abscess

Etiology(causes of disease): *E. histolytica* is the major cause of amebic dysentery.

Habitat: A.Intestinal(It inhabit colon ,caecum)

B.Extra intestinal(liver, lung, brain, skin, etc.)

Infective Stage: Mature Cyst

Method of Transmission: Fecal-oral route

Geographic distribution and Epidemiology

1.*Entamoeba histolytica* has a cosmopolitan distribution, and Infection is associated with poor hygiene.

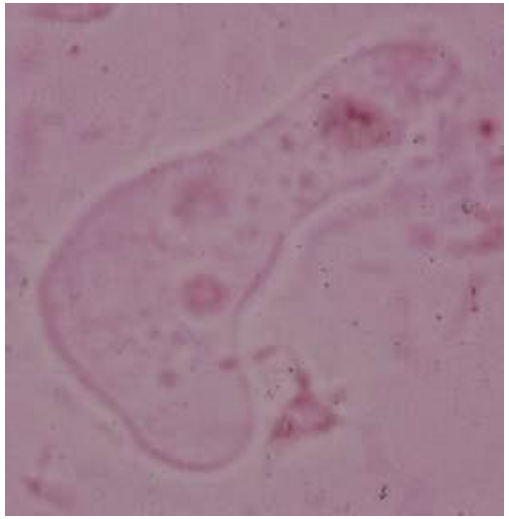
2.with an incidence rate ranged between 0.5-50% of the population world wide harbors it,

3.with the higher rates of infection being in underdeveloped countries.(Nepal,Bangladesh,Cambodia)

4.In USA 1 to 3% of the population are infected.

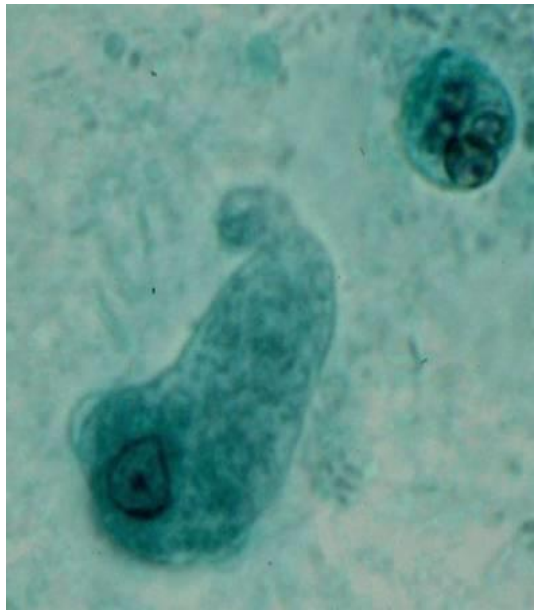
5.Humans are the principal host, although Dogs, Cats and Rodents may be infected.

Morphology

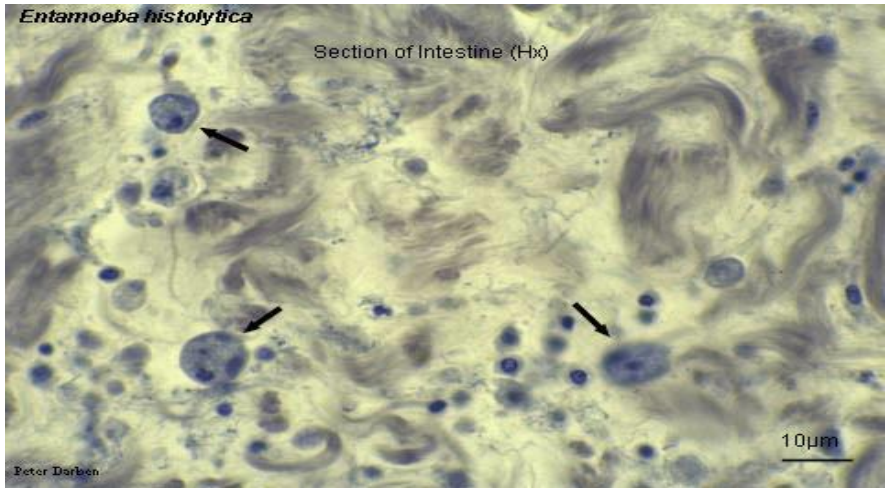


Haematoxylin stained trophozoite

- Trophozoite: This form has an amoeboid appearance, found in diarrheal stool and biopsies, and is usually 15-30 micrometers in diameter, although more invasive strains tend to be larger.
- The organism has a single nucleus with a distinctive small central karyosome. The fine granular endoplasm may contain ingested erythrocytes. The nuclear chromatin is evenly distributed along the periphery of the nucleus.



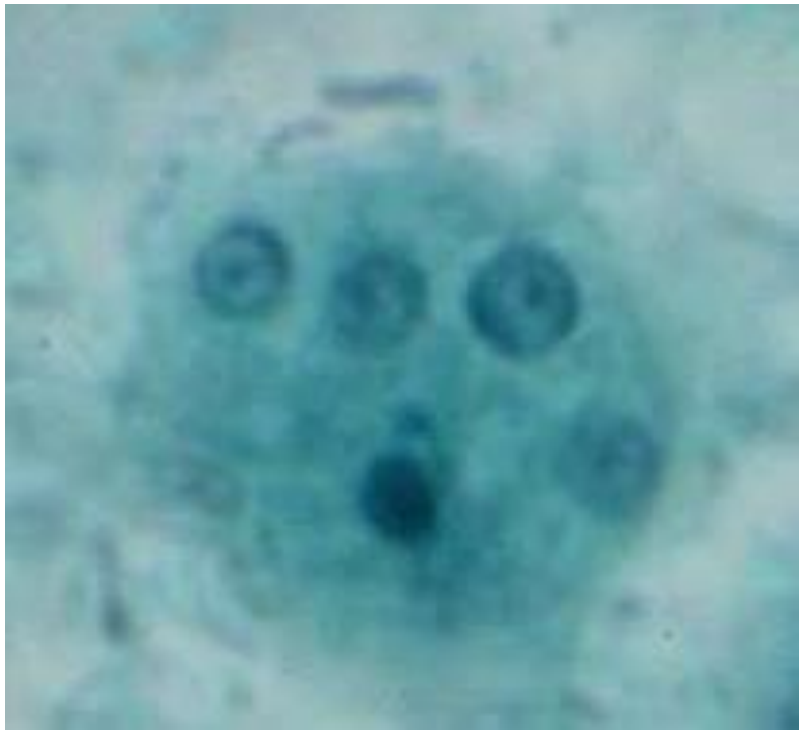
Trichrome stained trophozoite.



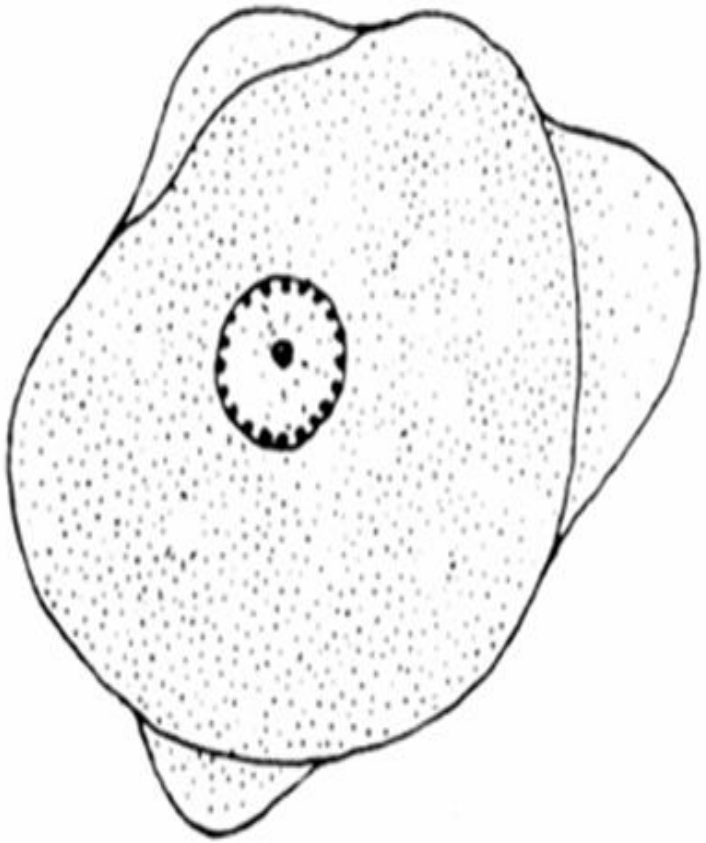
Entamoeba histolytica trophozoites in section of intestine(biopsy).

Encystation(Cyst Form)

- Trophozoite rounds up and secret cyst wall
- aggregation of ribosomes (= chromatoid bodies or chromatoid bar)
- 2 rounds of nuclear division (1→4 nuclei)



- Cyst become survive weeks to months and are spherical, with a retractile wall; the cytoplasm contains dark staining chromatoidal bodies
- and 1 to 4 nuclei with a central karyosome and evenly distributed peripheral chromatin.
- Cytoplasm with a single nucleus, rarely up to four; often with ingested red blood cells, sometimes with leukocytes, or bacteria.
- with ribosomes arranged in helices which aggregate to form characteristically shaped elongate bars with rounded ends (=chromatoid bodies).which is rich in glycogen

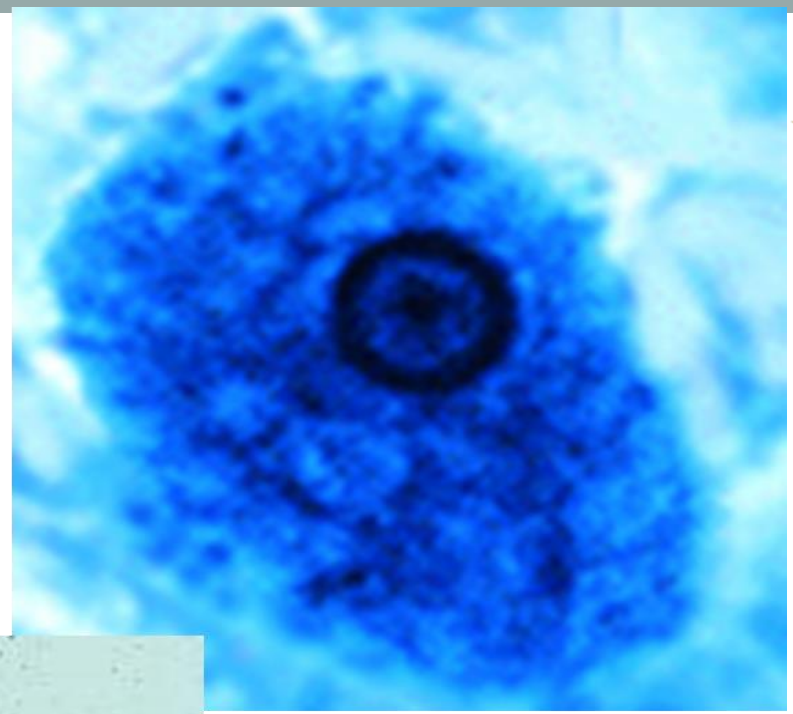


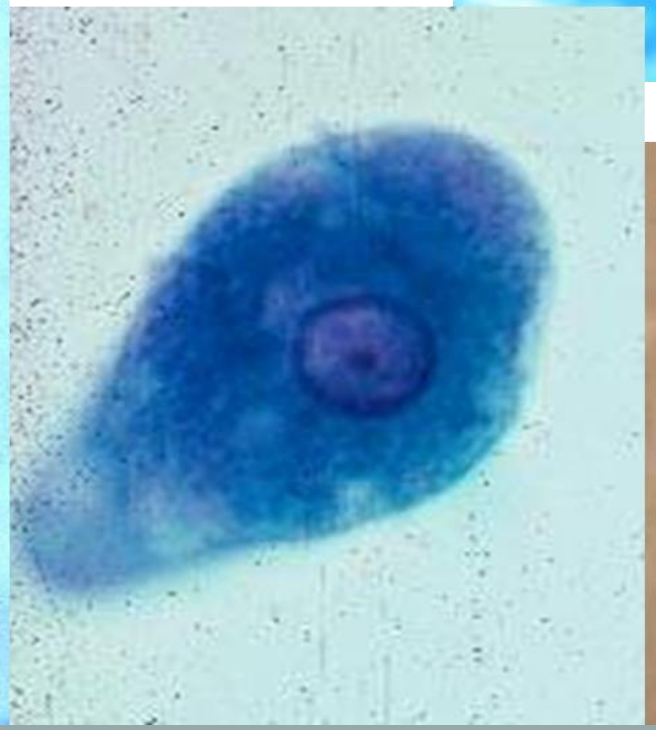
trophozoite

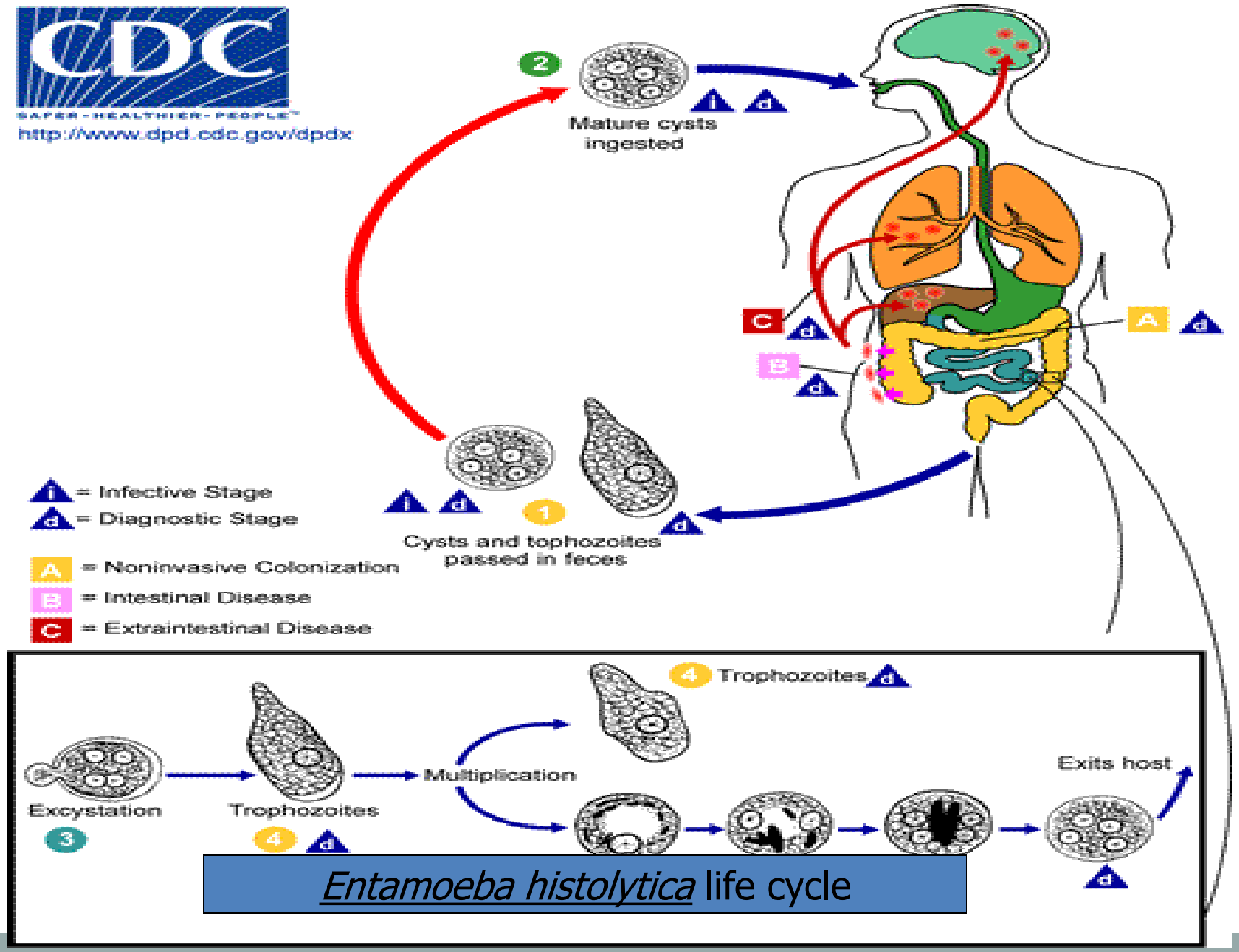
immature cyst

mature cyst

Entamoeba histolytica







Cysts predominate in formed stool

Is highly resistant to environmental conditions

Is killed by boiling, not killed by chlorination of water supplies.

Life cycle of *E. histolytica*

- Cysts and trophozoites are passed in feces and cysts are typically found in formed stool, whereas Trophozoites are typically found in diarrheal stool.

- Infection by *Entamoeba histolytica* occurs by ingestion of mature cysts in fecally contaminated food, water, or hands.(4 F)

- Excystation occurs in the small intestine and trophozoites are released, which migrate to the large intestine.

- The trophozoites multiply by binary fission and produce cysts.
- Both stages are passed in the feces.

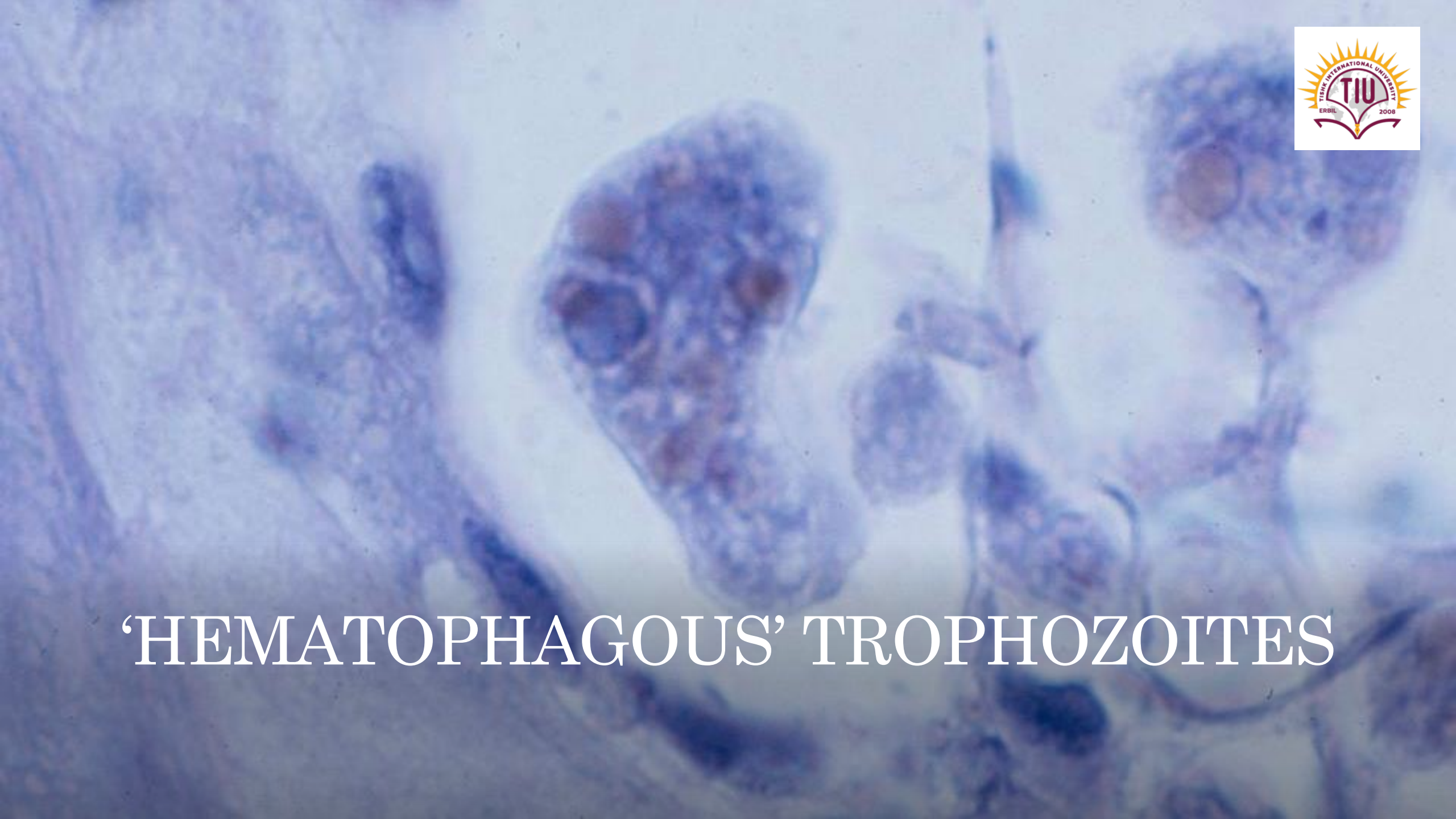
- Because of the protection conferred by their walls, the cysts can survive days to weeks and months in the external environment and are responsible for transmission of the Amoebiasis .
- The cysts are killed only by Boiling and are not killed in chlorinated water.

- Trophozoites passed in the stool are rapidly destroyed once are outside the body, and if ingested would not survive exposure to the gastric secretion .

- In many cases, the trophozoites remain limited to the intestinal lumen (noninvasive infection) of individuals who are asymptomatic carriers, passing cysts in their stool.
- In some patients the trophozoites invade the intestinal mucosa (intestinal disease), or, through the bloodstream, extra intestinal sites such as the liver, brain, and lungs (extra intestinal disease), and causing Pathological manifestation.

- It has been established that the invasive and noninvasive forms represent two separate species, *E. histolytica* &*E. dispar*.

- These two species are morphologically indistinguishable unless *E. histolytica* is observed with Ingested red bloodcells(erythrophagocystosis).



‘HEMATOPHAGOUS’ TROPHOZOITES

Strains of *Entamoeba histolytica*

Non-invasive

- ameba colony on intestinal mucosa
- asymptomatic cyst passer
- non-dysenteric diarrhea, abdominal cramps.

Invasive

- necrosis of mucosa → ulcers, dysentery
- ulcer enlargement → severe dysentery, colitis, peritonitis
- metastasis → extra intestinal amoebiasis

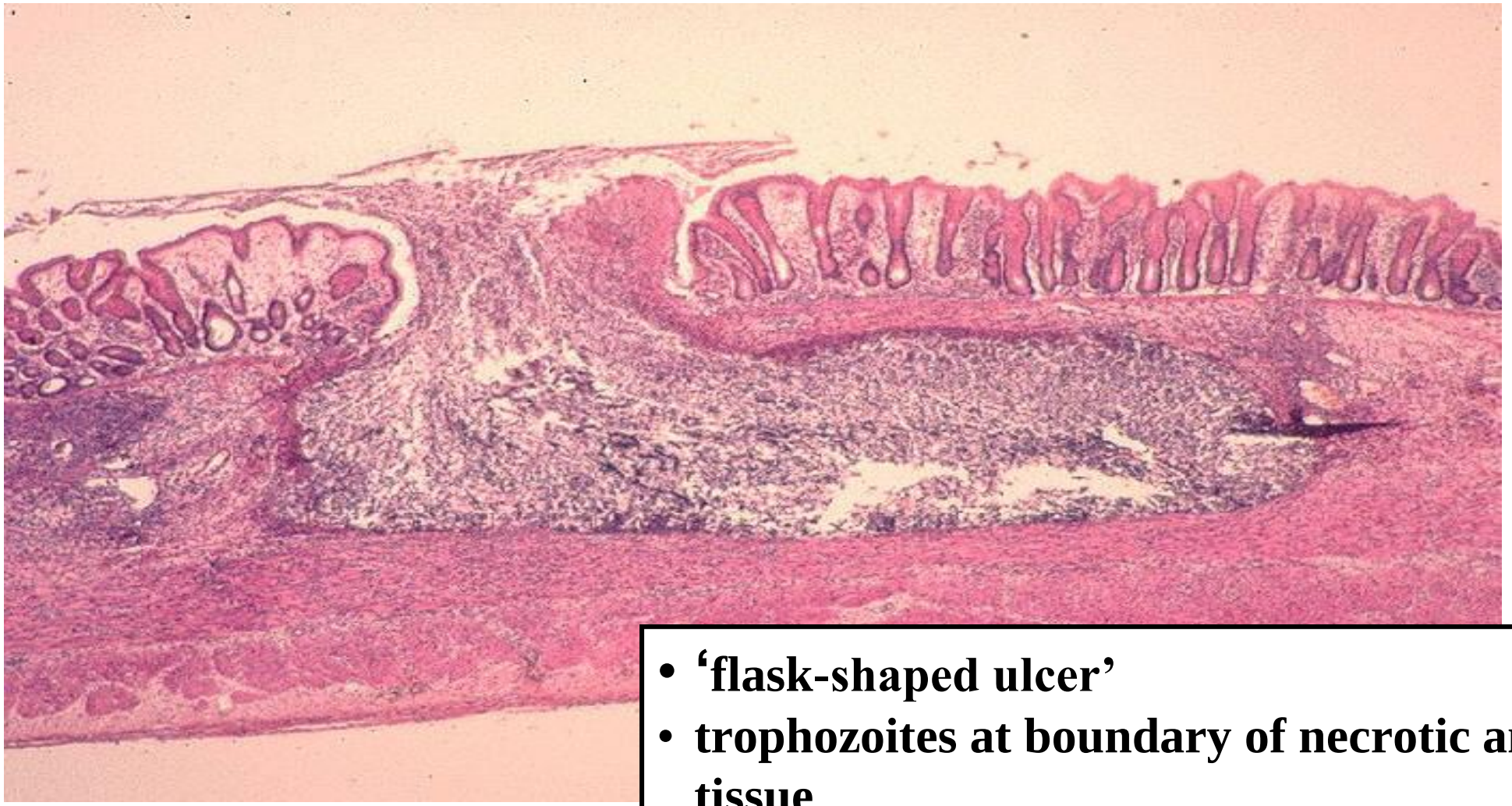
Pathology

Intestinal ulcers (**flask-shaped**) are due to enzymatic degradation of tissue.

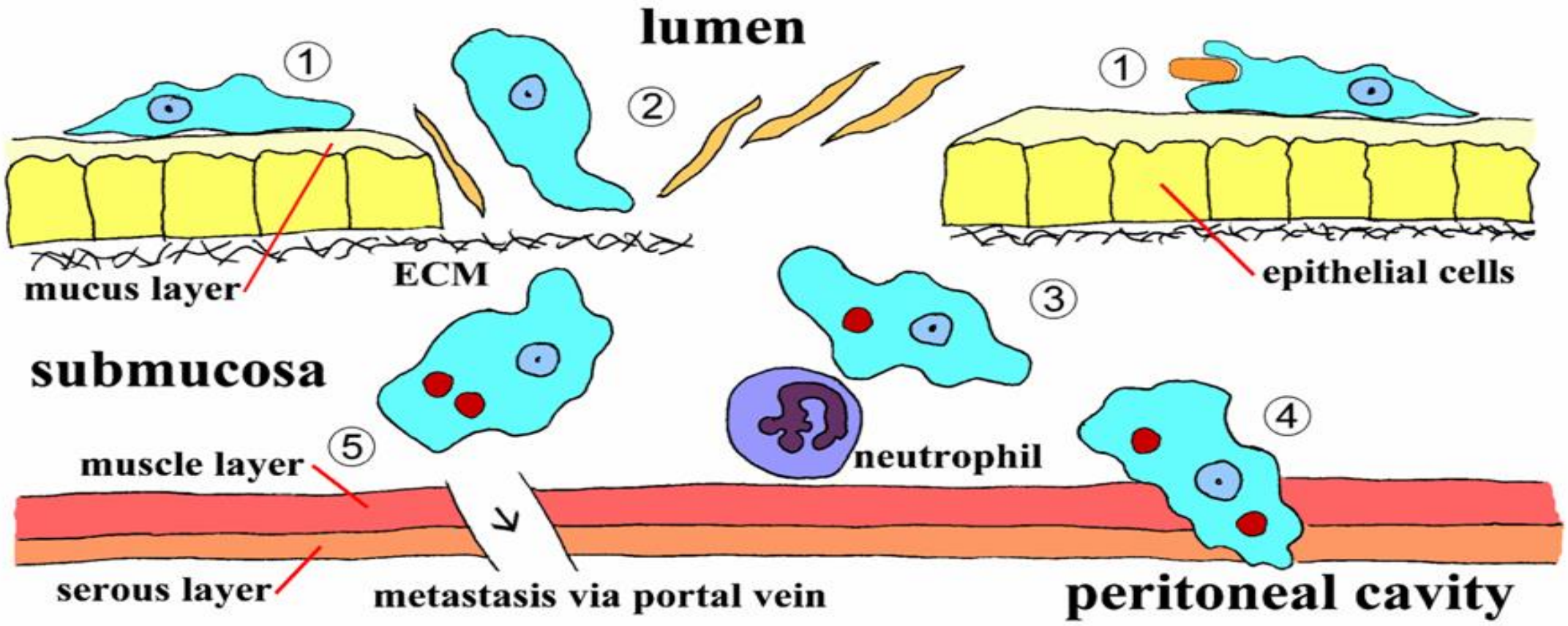
The infection may result in appendicitis, perforation(hole), stricture granuloma(pseudo-polyps), liver abscess, sometimes brain, lung and spleen abscesses can also occur.

Pathogen time

Most infections are cleared naturally in **6-12 months** with mild or no symptoms OR can cause a serious invasive disease.

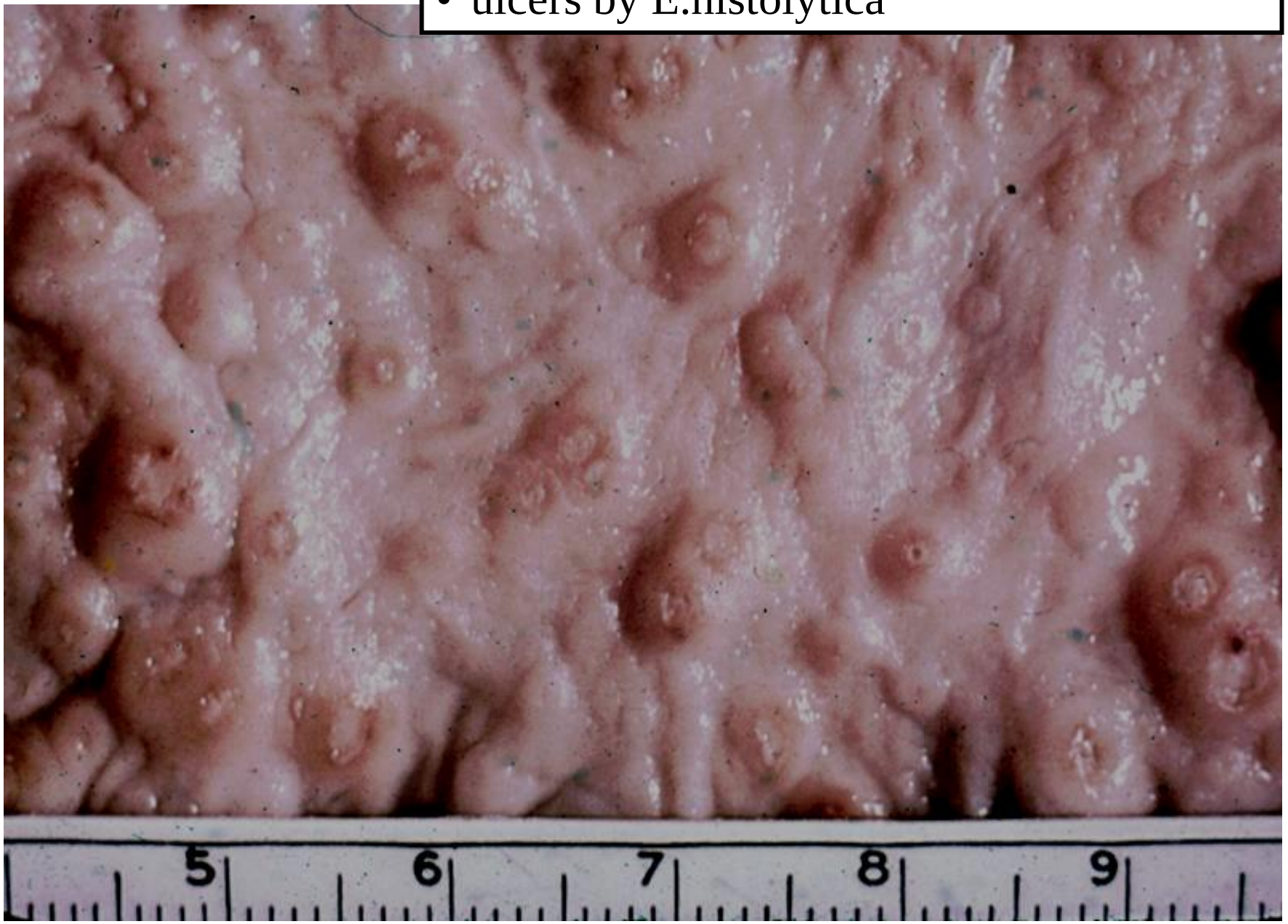


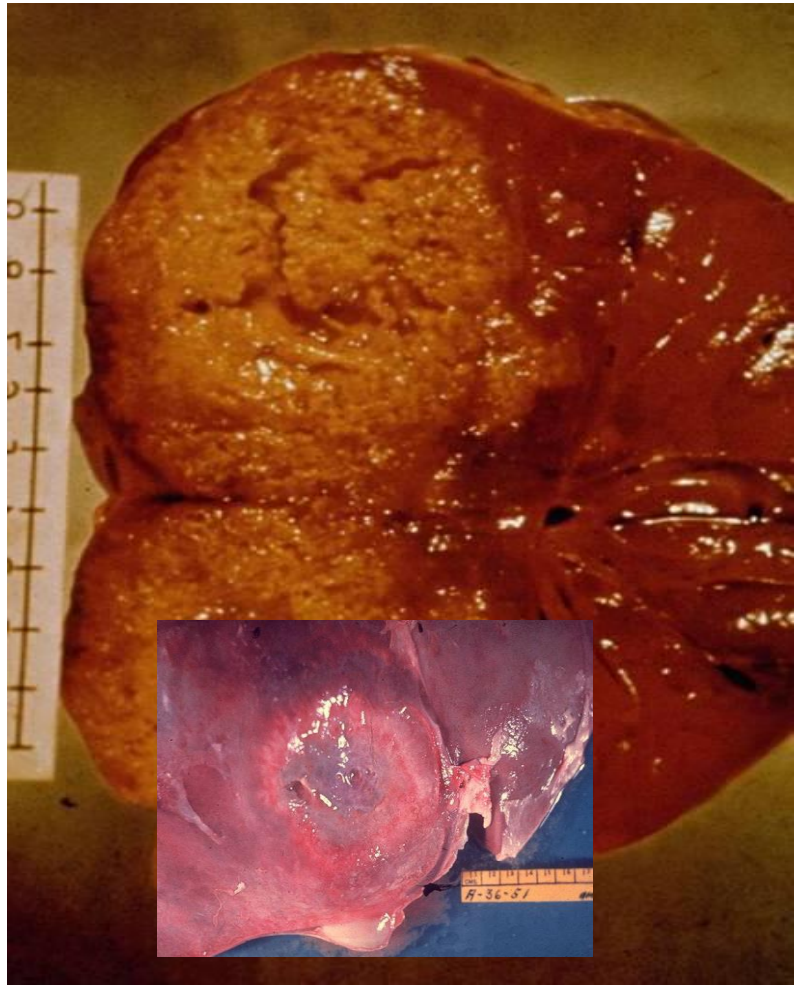
- ‘flask-shaped ulcer’
- trophozoites at boundary of necrotic and healthy tissue
- trophozoites ingesting host cells
- dysentery (blood and mucus in feces)



1.Attachment
2. Penetration of mucus layer
3. Contact-dependent killing of epithelial cells
4.Breakdown of tissues (extracellular matrix)
5. Contact-dependent killing of neutrophils, leukocytes, etc.

- ulcers by E.histolytica





Extraintestinal Amebiasis

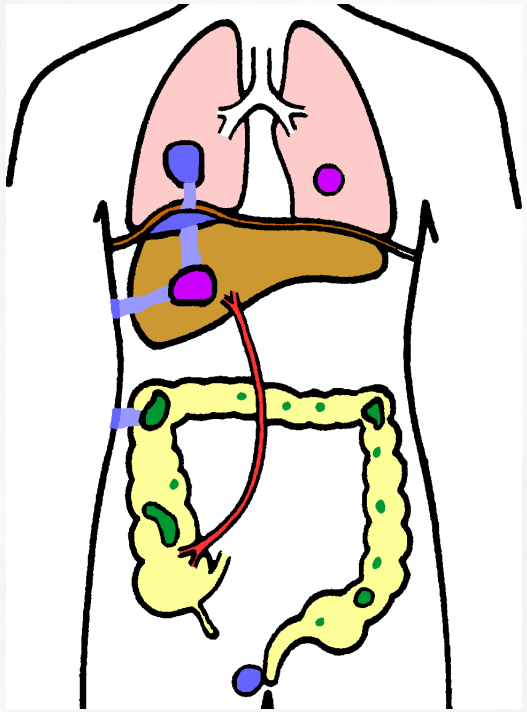
Occur due to:-

- Metastasis via blood stream
- Primarily liver (portal vein)
  - other sites less frequent

Amebic Liver Abscess

- Chocolate-colored ‘pus’ And Necrotic
- Lesions expand and coalesce
- Further metastasis, direct extension or fistula
- LFT are Applicable

A fistula is an abnormal connection or passageway that connects two organs or vessels that do not usually connect. They can develop anywhere between an intestine and the skin, between the vagina and the rectum, and other places.



- Pulmonary Amebiasis

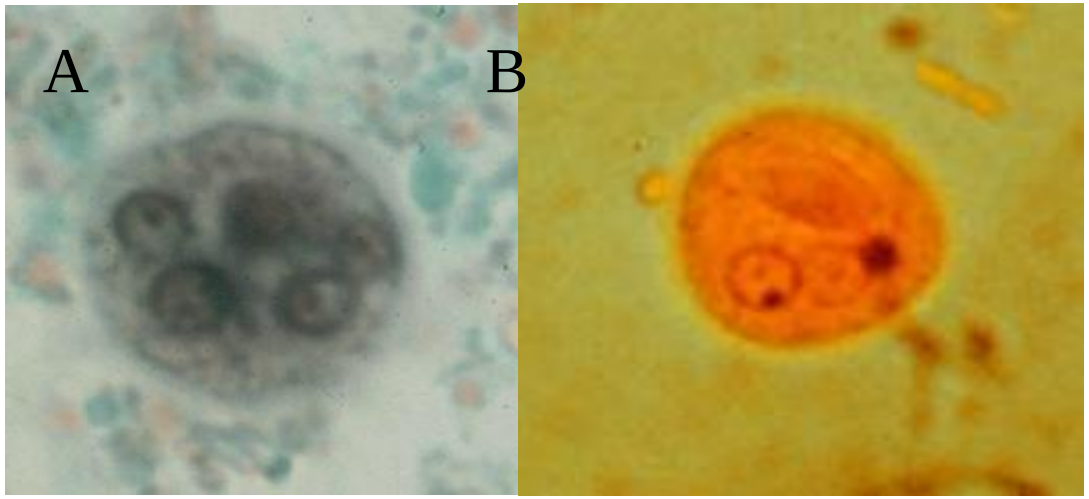
- Rarely primary
- Start it from rupture of liver abscess
- Fever, cough, dyspnea, and pain.
- PFT applicable

- **Cutaneous Amebiasis**
- Intestinal or hepatic fistula
  - Perianal ulcers
  - Urogenital tract

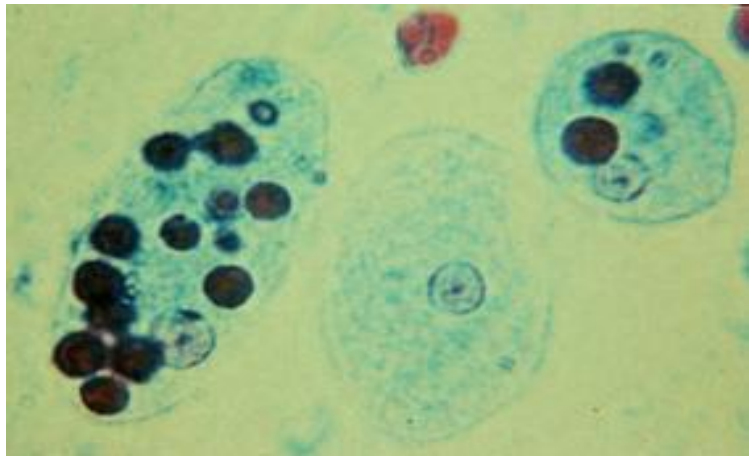
Symptoms

- **Acute**: Frequent dysentery with necrotic mucosa and abdominal pain.
- **Chronic**:
  - Recurrent episodes of dysentery with blood and mucus in the feces.
  - There are intervening(dominant) gastrointestinal disturbances and constipation.
  - Cysts are found in the stool.
  - The organism may invade the liver, lung and brain where it produces abscesses that result in liver dysfunction, Pneumonitis, and encephalitis.

Diagnosis



Cysts of Entamoeba histolytica in stool, stained with trichrome (A), permanent preparation and iodine (B),also we have wet mount preparation. (most common)



Trophozoites of Entamoeba histolytica. Trichrome stain. Two diagnostic characteristics are seen here: two of the trophozoites have ingested erythrocytes, and the nuclei have typically a small, centrally located karyosome, as well as thin, uniform peripheral chromatin.

Intestinal

- stool examination
  - cysts and/or trophozoites
- sigmoidoscopy
  - lesions, aspirate, biopsy
- antigen detection
  - histolytica/dispar

Extraintestinal (hepatic)

- symptoms
  - history of dysentery
  - RUQ pain
  - enlarged liver
- serology (current or past?)
- imaging (CT, MRI, ultrasound)
- abscess aspiration
  - only select cases
  - reddish brown liquid
  - trophozoites at abscess wall

Molecular methods: PCR,and other DNA techniques .

Treatment:

- Asymptomatic

iodoquinol or paromomycin **In endemic areas?**

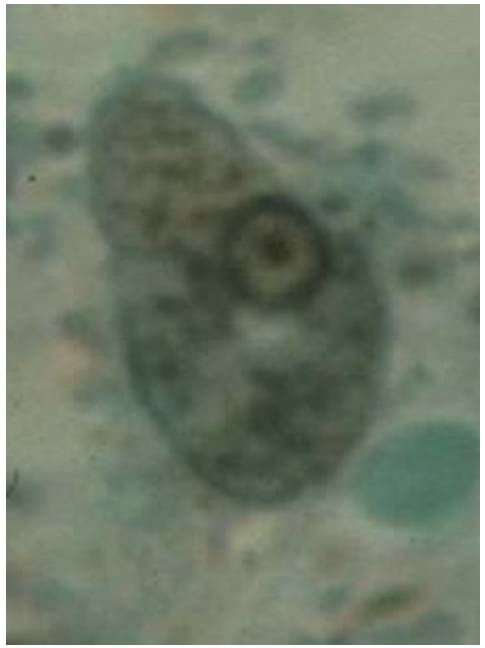
- Symptomatic metronidazole or tinidazole followed by liver abscess.
- Have to be distinguishable from other non-pathogenic intestinal protozoa (e.g., *Entamoeba coli*, *Entamoeba hartmanni*, *Endolimax nana*, *Iodamoeba buetschlii*, etc.).

Control

- avoid fecal-oral transmission
- Application of hygienic methods

Other Amoebae

1.Entamoeba hartmanni



- < 10 μm = *E. hartmanni*
- > 10 μm = *E. histolytica*

Cysts

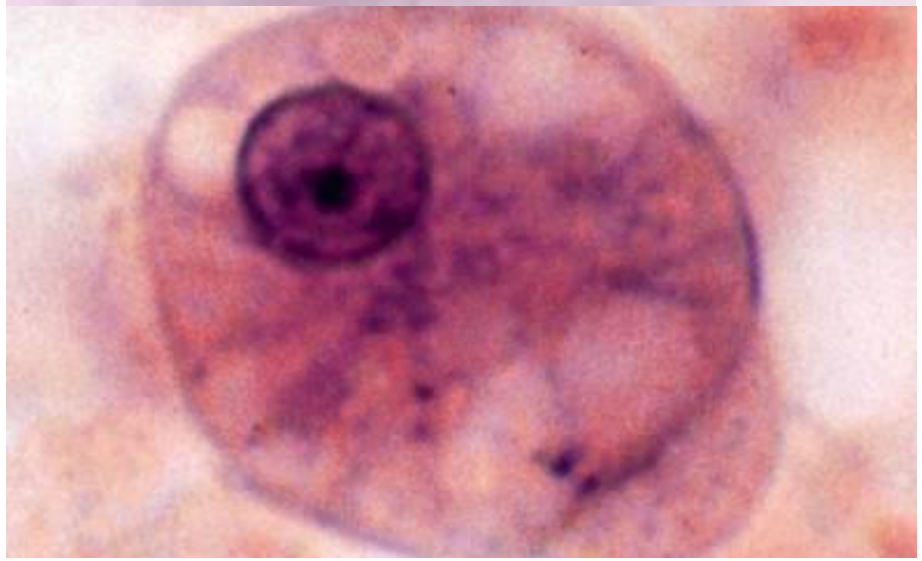
- 6-8 mm
- 4 nuclei (mature)
- Blunt chromatoid bodies

Trophozoites

- 8-10 mm

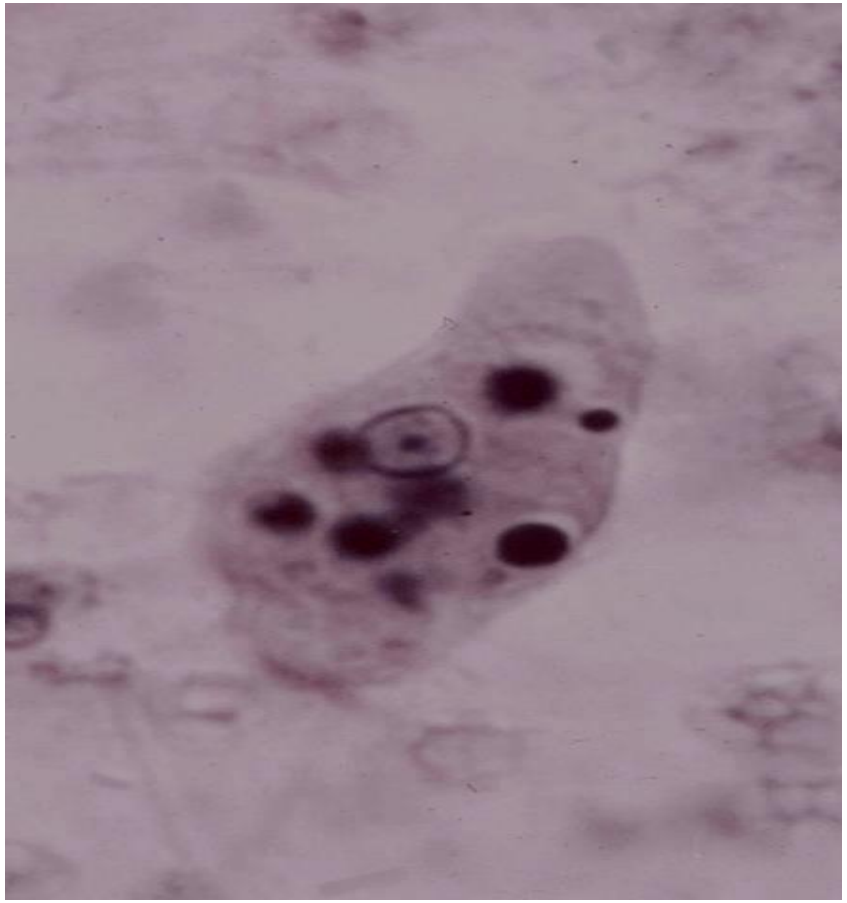
Nuclear structure

- peripheral chromatin
- small karyosome



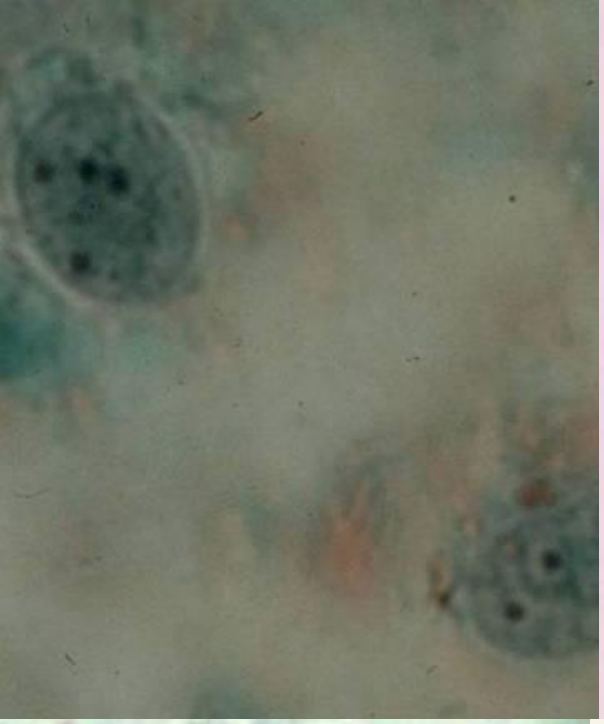
2.Entamoeba coli

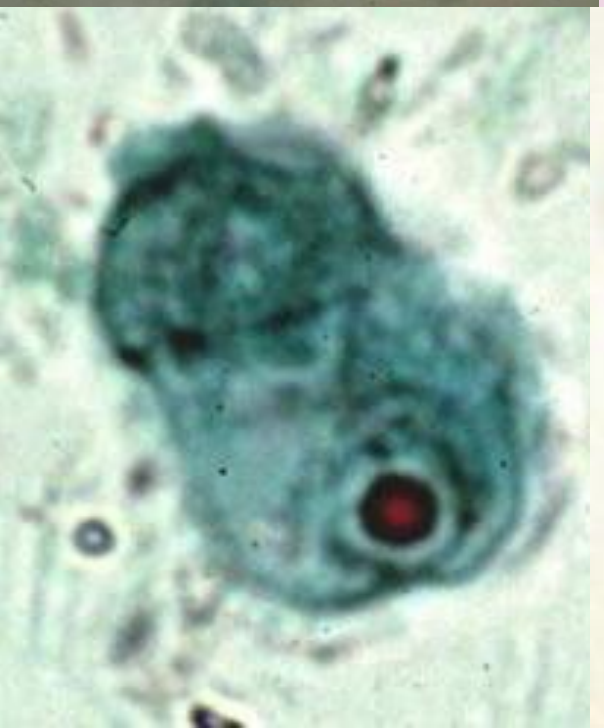
- **Cysts**
  - 15-25 mm
  - 8 nuclei (mature)
  - pointed chromatoid bodies (less prominent)
- **Trophozoites**
  - 20-25 mm may be larger
  - broad blunt pseudopodia
- Nuclear structure
  - irregular peripheral chromatin?
  - eccentric karyosome?



3.E. gingivalis

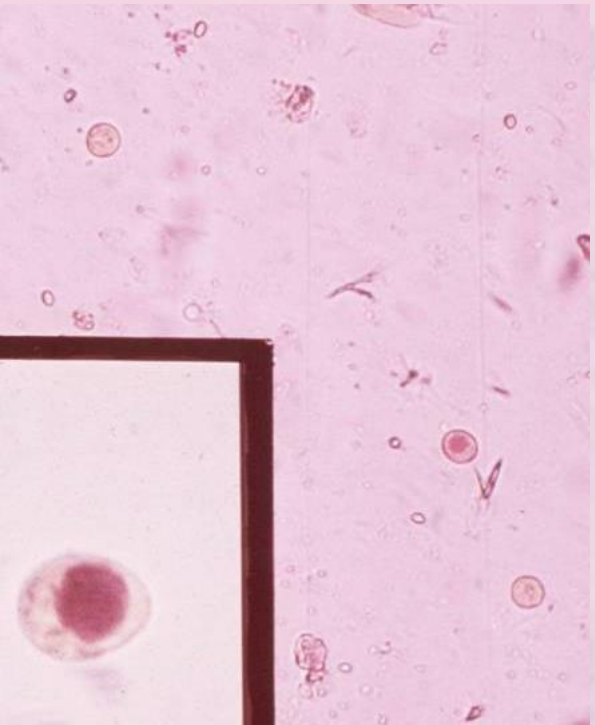
- oral cavity
- no cyst stage
- trophozoites nearly identical to *E. histolytica*
- periodontal disease?(around the tooth).

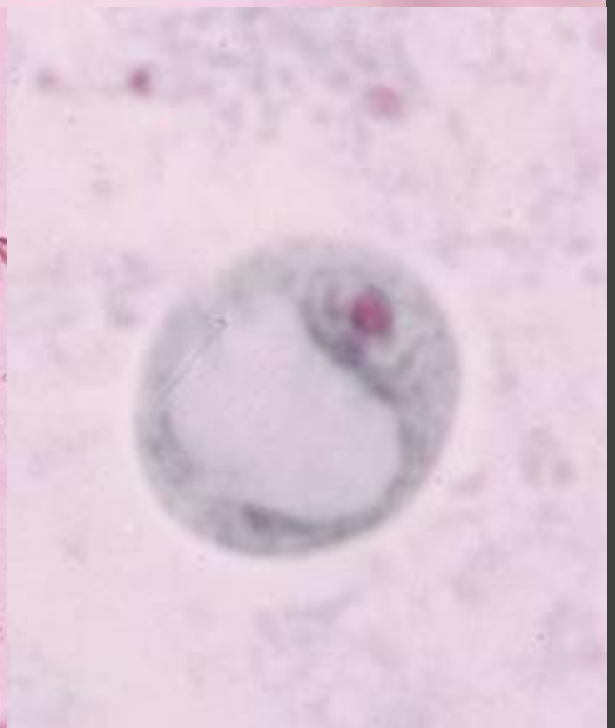





4.Endolimax nana

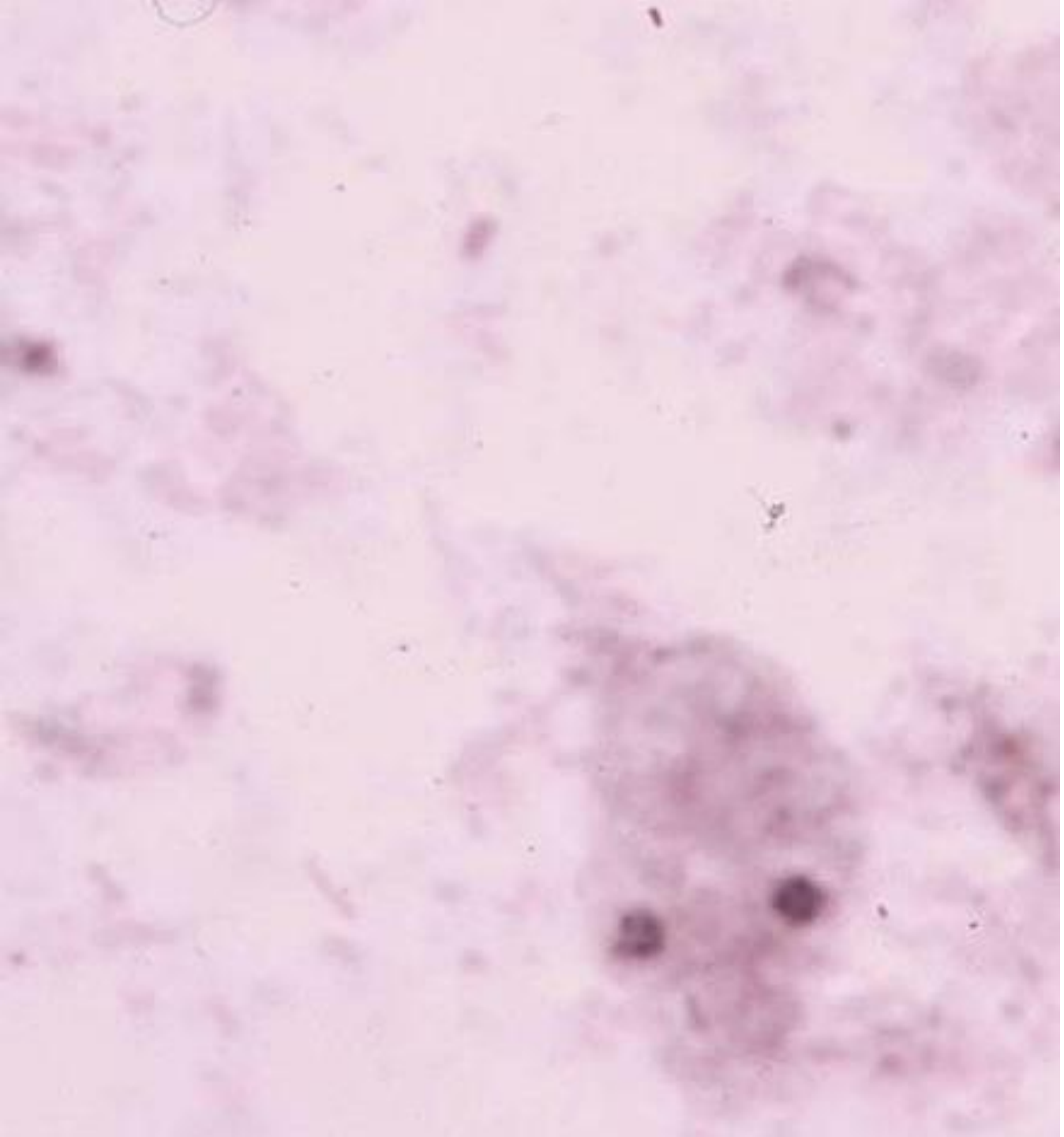
- **Cysts**
  - 6-8 mm
  - 4 nuclei
- **Trophozoites**
  - 8-10 mm
- Nuclear structure
  - no peripheral chromatin
  - large karyosome





5.Iodamoeba bütschlii

- **cysts**
  - 10-12 mm
  - 1 nucleus
  - glycogen vacuole
- **Trophozoites**
  - 12-15 mm
- nuclear structure
  - no peripheral chromatin
  - large karyosome



6.Dientamoeba fragilis

- No cyst stage
- **Trophozoites**
  - 9-12 mm
  - often binucleated
- Nuclear structure
  - no peripheral chromatin
  - fragmented karyosome