Lecture 3 Protozoa

General Features

Single-celled eukaryotic microorganisms belonging to kingdom protista are
classified as Protozoa (Greek Protos: first; zoon: animal).

*** The single protozoal cell performs all functions.**

***Most of the protozoa are completely nonpathogenic but few may cause major**
diseases such as malaria, leishmaniasis, and sleeping sickness.

***Protozoa like Cryptosporidium parvum and Toxoplasma gondii are being recognized as opportunistic pathogens in patients affected with human immunodeficiency virus (HIV) and in those undergoing immunosuppressive therapy.**

***Protozoa exhibit wide range of size (1–150 µm), shape, and structure; yet all possess essential common features.**

Classification of Protozoa

Protozoan parasites of medical importance have been classified into kingdom Protista, subkingdom Protozoa which is further divided into the following four
phyla:

I. Sarcomastigophora
2. Apicomplexa
3. Microspora
4. Ciliophora

Ameba

The word ameba is derived from the Greek word "amibe" meaning change.

Amebae are structurally simple protozoans which have no fixed shape.

They are classified under Phylum:

Sarcomastigophora, Subphylum: Sarcodina, Superclass: Rhizopoda and

Order: Amebida. The cytoplasm of ameba is bounded by a membrane and can be differentiated into an outer ectoplasm and inner endoplasm.

Pseudopodia: are formed by the ameba by thrusting out ectoplasm, followed by endoplasm.

These are employed for locomotion and engulfment of food by phagocytosis.

● Reproduction occurs by fission and budding. Cyst is formed in unfavorable conditions and is usually the infective form for vertebrate host (e.g. Entamoeba histolytica).

● Amebae are classified as either free-living or intestinal amebae.

Entamoeba Histolytica

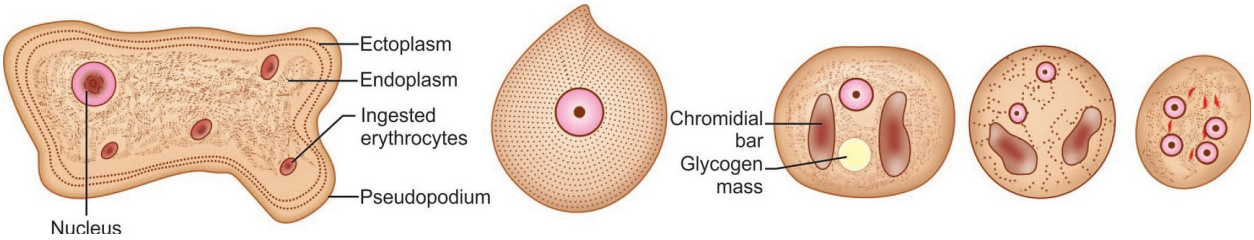
History and Distribution E. histolytica was discovered by Losch in 1875, who demonstrated the parasite

in the dysenteric feces of a patient in St. Petersburg in Russia.

*** In 1890, William Osler reported the case of a young man with dysentery, who later died of liver abscess.**

*** Councilman and Lafleur in 1891 established the pathogenesis of intestinal and hepatic amoebiasis and introduced the terms 'amoebic**

dysentery' and 'amoebic liver abscess'. E. histolytica is worldwide in prevalence, being much more common in the tropics than elsewhere. Mode of infection: Contaminated food and water Infected form: quadric nucleate cyst



Entamoeba histolytica. A. Trophozoite; B. Precystic stage;C.Uninucleate cyst; D. Binucleate cyst; E. Mature quadrinucleate cyst

Life Cycle

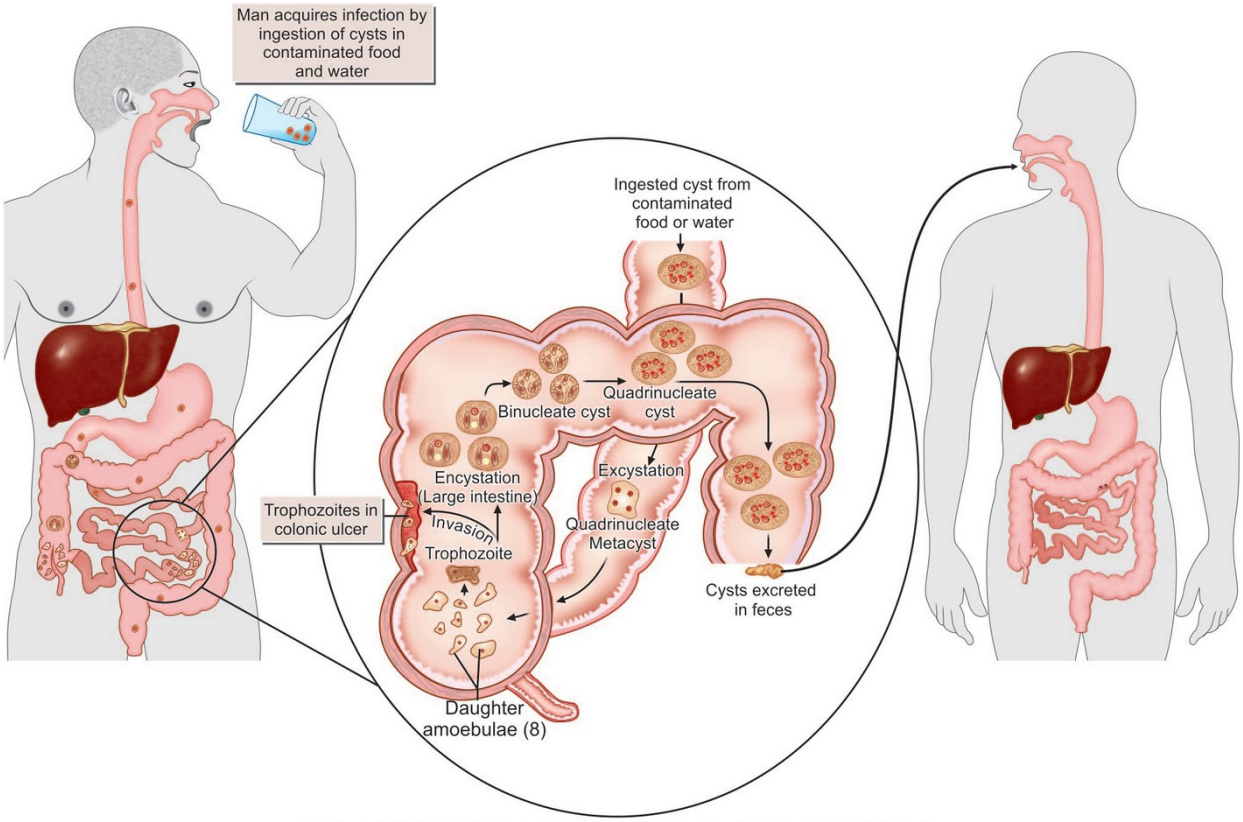
E. histolytica passes its life cycle only in 1 host-man Infective form: Mature quadrinucleate cyst passed in feces of convalscents and carriers. The cysts can remain viable under moist conditions for about 10 days. Mode of transmission: Man acquires infection by swallowing food and water contaminated with cysts. As the cyst wall is resistant to action of gastric juice, the cysts pass through the stomach undamaged and enter the small intestine.

Excystation: When the cyst reaches caecum or lower part of the ileum, due to the alkaline medium, the cyst wall is damaged by trypsin, leading to excystation.

The cytoplasm gets detached from the cyst wall and amoeboid movements appear causing a tear in the cyst wall, through which quadrinucleate amoeba is liberated. This stage is called the metacyst.

Metacystic trophozoites:

The nuclei in the metacyst immediately undergo division to form 8 nuclei, each of which gets surrounded by its own cytoplasm to become 8 small amoebulae or metacystic trophozoites.



LIFE CYCLE OF ENTAMOEBA HISTOLYTICA

Clinical Features of Intestinal Amoebiasis The incubation period is highly variable from 1–4 months. The typical manifestation of intestinal amoebiasis is amoebic dysentery. This may resemble bacillary dysentery, but can be differentiated on clinical and laboratory grounds.

1- **The stools are large, foul-smelling, and brownish black, often with blood streaked mucus intermingled with feces. The RBCs in stools are clumped and reddish-brown in color.**

2- **Cellular exudate is scanty. Charcot-Leyden crystals are often present. E.histolytica trophozoites can be seen containing ingested erythrocytes.**

3- Intestinal amoebiasis does not always result in dysentery. there may be only diarrhea or abdominal symptoms popularly called 'uncomfortable belly' or 'growling abdomen.'
4- Chronic involvement of the caecum causes a condition simulating appendicitis. Laboratory Diagnosis Diagnosis of Intestinal Amoebiasis
5- Stool examination Intestinal amoebiasis has to be diff erentiated from bacillary dysentery. The stool should be collected into a wide mouth container and examined without delay. It should be inspected macroscopically as well as microscopically, Macroscopic Appearance: The stool is foul-smelling, copious, semi liquid, brownish black in color, and intermingled with blood and mucus. It does not adhere to the container.

Microscopic Apprearance:

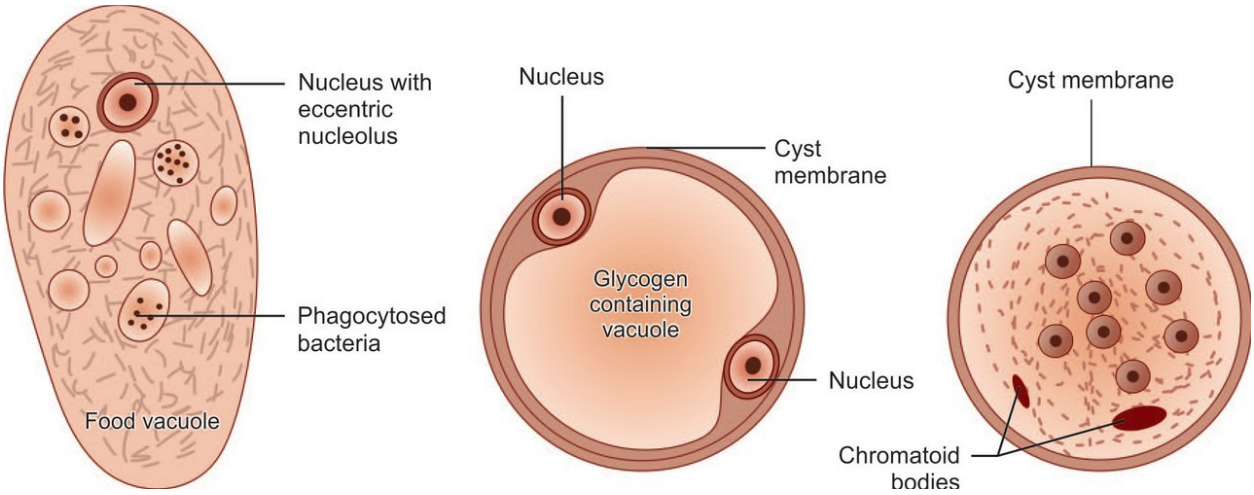
Saline pre parathion The cellular exudate is scanty and consists of only the nuclear masses (pyknotic bodies) of a few pus cells, epithelial cells, and macrophages.

The RBCs are in clumps and yellow or brown red in color. Charcot-Leyden crystals are often present. These are diamond-shaped, clearand retractile crystals.

1- Stool Culture
2- Molecular Diagnosis
NONPATHOGENIC INTESTINAL AMOEBA
Entamoeba Coli E. coli was fi rst described by Lewis (1870) and Cunnigham (1871) in Kolkata and its presence in healthy persons was mreported by Grassi (1878).

It is worldwide in distribution and a nonpathogenic commensal intestinal amoeba. It is larger than E. histolytica about 20–50 µm with sluggish motility and contains ingested bacteria but no red cells.
The nucleus is clearly visible in unstained fi lms and has a large eccentric karyosome and thick nuclear membrane lined with coarse granules of chromatin.
Cysts are large, 10–30 µm in size, with a prominent glycogen mass in the early stage.
The chromatoid bodies are splinterlike and irregular. The mature cyst has 8 nuclei.

- **The life cycle is the same as in E.histolytica except that it remains a luminal commensal without tissue invasion and is nonpathogenic.**



Schematic diagram of the morphological forms of Entamoeba coliA. Vegetativeform; B. Binucleate cyst; C. Eight-nucleate cyst.