Parasitology is the study of parasites, their hosts and the relationship between them.

Parasite: A living organism that acquires of its basic nutritional requirements through its intimate contact with another living organism.

- Parasites may be simple unicellular protozoa (micro parasites) or complex multicellular metazoan (macro parasites).

Host: A host is the organism which harbors the parasite and provies nourishment and shelter to them.

- A host will suffer some degree of damage ranging from slight discomfort to death.

Vector: A living carrier (e.g. an arthropod) that transports a pathogenic and organism from an infected to a non infected host.

Example is the female *Anopheles* mosquito that transmits malaria.

Life Cycle: For survival and reproduction reasons many parasites evolve through a number of morphologic stages and several environments or different hosts. The sequence of morphological and environmental stages is referred to as the life cycle.

Carrier: A host that harbors a parasite but exhibits no clinical signs or symptoms.

Entamoeba histolytica

✓It is an anaerobic parasite protozoan

✓It is worldwide in distribution. It is more common in the tropics and subtropics than in the temperate zone.

✓In India, it is spread over all parts of the country.

Habitat:

Entamoeba histolytica is a parasitic amoeba. It is normally an inhabitant of the mucosa and submucosa of the large intestine, frequently invading the appendix and occasionally into the lower parts of small intestine.

Morphology:

The life cycle of *Entamoeba histolytica* is covered in three morphological forms-

❖Trophozoite

❖Pre Cystic stage and

❖Cysts

Trophozoite is the growing and feeding stage of amoeba. It is large, usually 20-30 μm in diameter when active, while 12 to 15 μm in diameter when confined to the gut lumen. It feeds on red blood cells, tissues and leukocytes.

❖The cytoplasm is divisible into two portions- thick outer layer of clear, ectoplasm enclosing more fluid granular endoplasm.

❖The endoplasm contains food vacuole. In the active feeding form, the red blood cells, leukocytes and tissue debris are found within the food vacuoles.

❖It shows slow gliding movement resulting from long finger like pseudopodial extensions of ectoplasm.

Pre-cystic stage:

✓It is smaller in size, varying from 10-20μm in diameter. It is round or slightly ovoid with a blunt pseudopodium projecting from the periphery.

✓The endoplasm does not contain food vacuole.

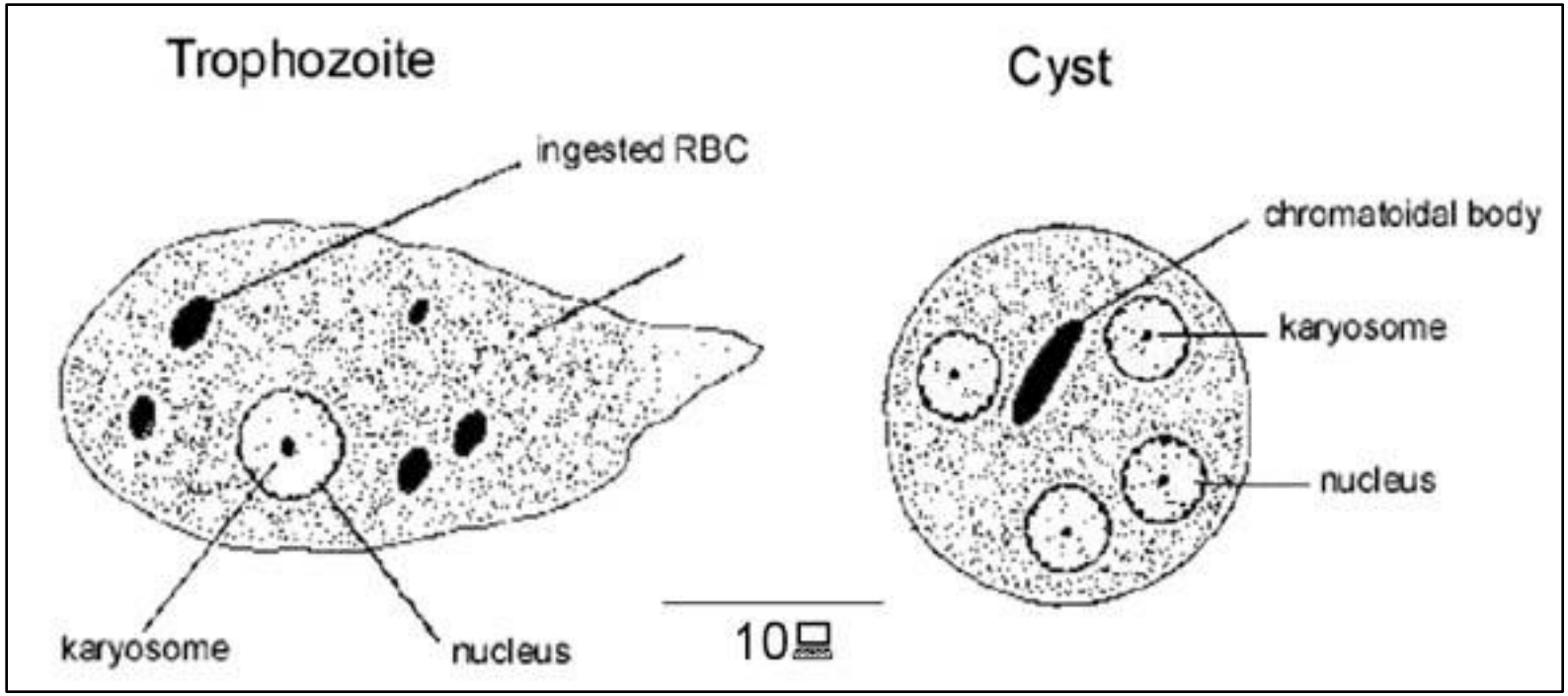
Cyst:

✓A cyst is spherical, 10-15 μm in diameter. It is surrounded by a highly refractile membrane called cyst wall.

✓The cyst begins as a uninucleate body but soon divides by binary fission and develops into bi-nucleate and quadrinucleate bodies.

✓During the process of division, the nuclei undergoes gradual reduction in size.

✓As the cyst matures from uninucleate to quadrinucleate stage, both the glycogen mass and chromatoid disappear.


Trophozoite
ingested RBC
karyosome
nucleus
10
Cyst
chromatoidal body
karyosome
nucleus

Life Cycle:

✓*Entamoeba histolytica* passes its life cycle only in one host, the man.

✓The uninucleate trophozoite of *E. histolytica*, occasionally inhibits the lower portions of the small intestine, but it is common in colon and rectum of the humans.

✓Within the hosts gut, the trophozoits multiply asexually by binary fission.

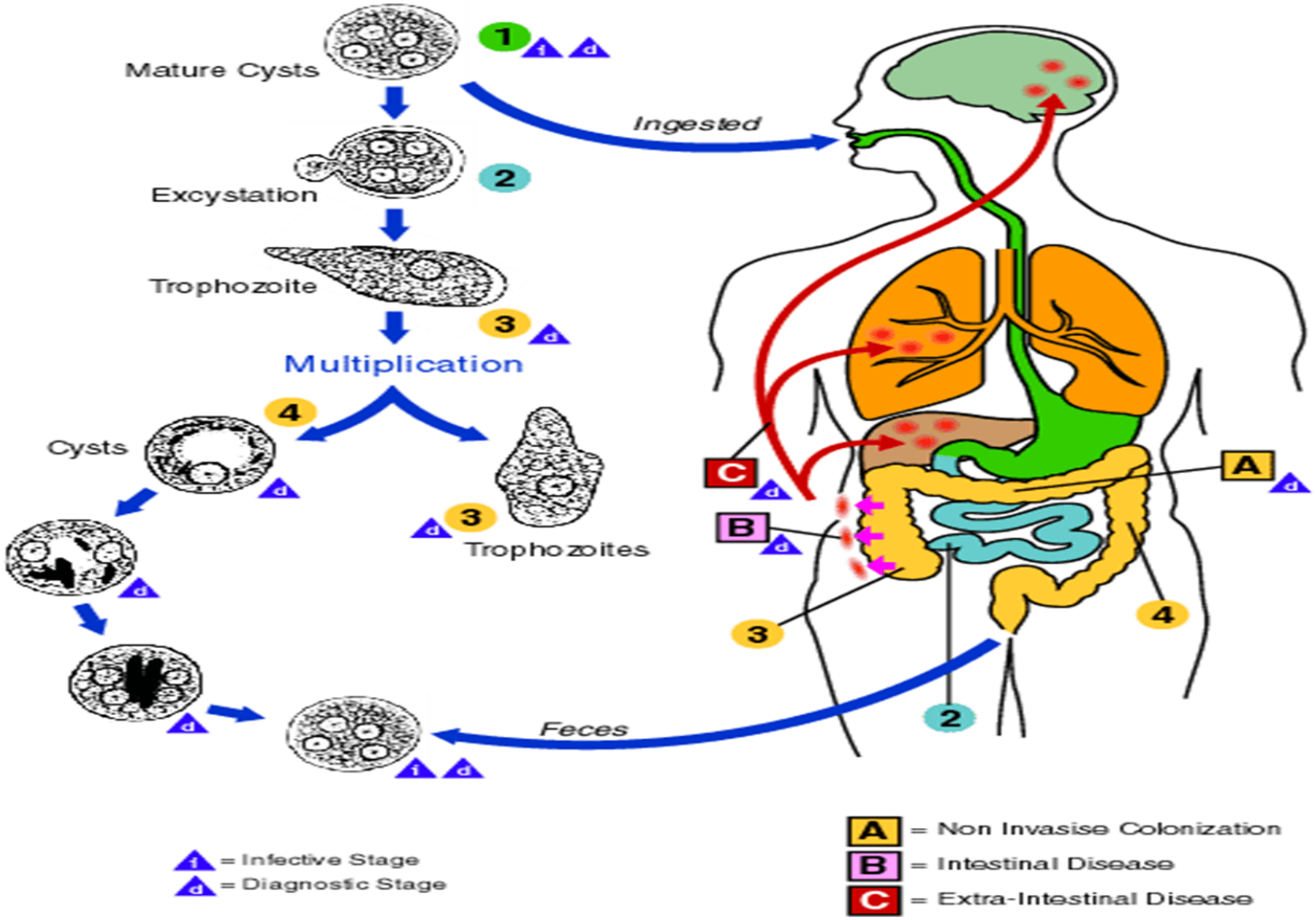
✓Trophozoites being actively motile invade the tissues and ultimately lodge in the submucous layer of the large bowel. Here they grow and multiply by binary fission.

✓Trophozoites are responsible for producing lesions in amoebiasis. Invasion of blood vessels leads to secondary extra intestinal lesions.

✓A certain number of trophozoites come from tissues into lumen of bowel and are first transformed into pre-cyst forms.

✓Pre-cysts secret a cyst wall and become a uninucleate cyst. Eventually, mature quadrinucleate cysts form. These are the infective forms.

✓Both mature and immature cysts may be passed in faeces. Immature cysts can mature in external environments and become infective.


Mature Cysts
1
i
d
Ingested
Excystation
2
Trophozoite
3
d
Multiplication
4
Cysts
d
3
d
Trophozoites
d
Feces
i
d
C
d
B
d
A
d
3
4
2
i = Infective Stage
d = Diagnostic Stage
A = Non Invasise Colonization
B = Intestinal Disease
C = Extra-Intestinal Disease

Pathogenecity:

✓*Entamoeba histolytica* as the name suggests (histo-lytica : tissue destroying) causes intestinal (amoebic dysentry) and extra-intestinal amoebiasis.

✓During growth, *E. histolytica* secrets a proteolytic ferment of the nature of histolysin, that brings about destruction and necrosis of tissues.

✓This helps the parasite in obtaining nourishment.

✓Trophozoites divide and produce extensive local necrosis in the large intestine. Invasion into the deeper mucosa with extension into the peritoneal cavity may occur. This can lead to secondary involvement of other organs, primarily the liver but also the lungs, brain, and heart.

✓Extraintestinal amebiasis is associated with trophozoites. Amoebas multiply rapidly in an anaerobic environment, because the trophozites are killed by ambient oxygen concentration.

Laboratory diagnosis

Intestinal amoebiasis:

1. Examination of stool:

If a fresh stool specimen cannot be examined immediately, it should be preserved with fixative such as polyvinyl alcohol or kept at 4°c.

a) Macroscopic Examination:

In case of amoebic dysentery, the stool is offensive dark brown semi-fluid, acidic in reaction and mixed with blood and mucus.

b) Microscopic Examination:

Stool is picked up with matchstick or platinum loop and emulsified in a drop of normal saline on a clean glass slide.

A cover slip is placed over it and examined under microscope.

2. **Blood Examination:** It shows moderate leukocytes.
3. **Serological Test:** Its take time to produce antibody, therefore it is negative in early cases. Serological test include-

- ❖ Indirect hemagglutination (IHA)
- ❖ Indirect fluorescent antibody (IFA)

Asymptomatic Group (Cyst Carrier)

a) **Stool Examination:** Stools are natural (formed). The cysts are observed with stool concentration method. Stools are negative microscopically, but when cultured it shows presence of parasite.

b) **Blood Examination:** There is no characteristic change in blood picture.

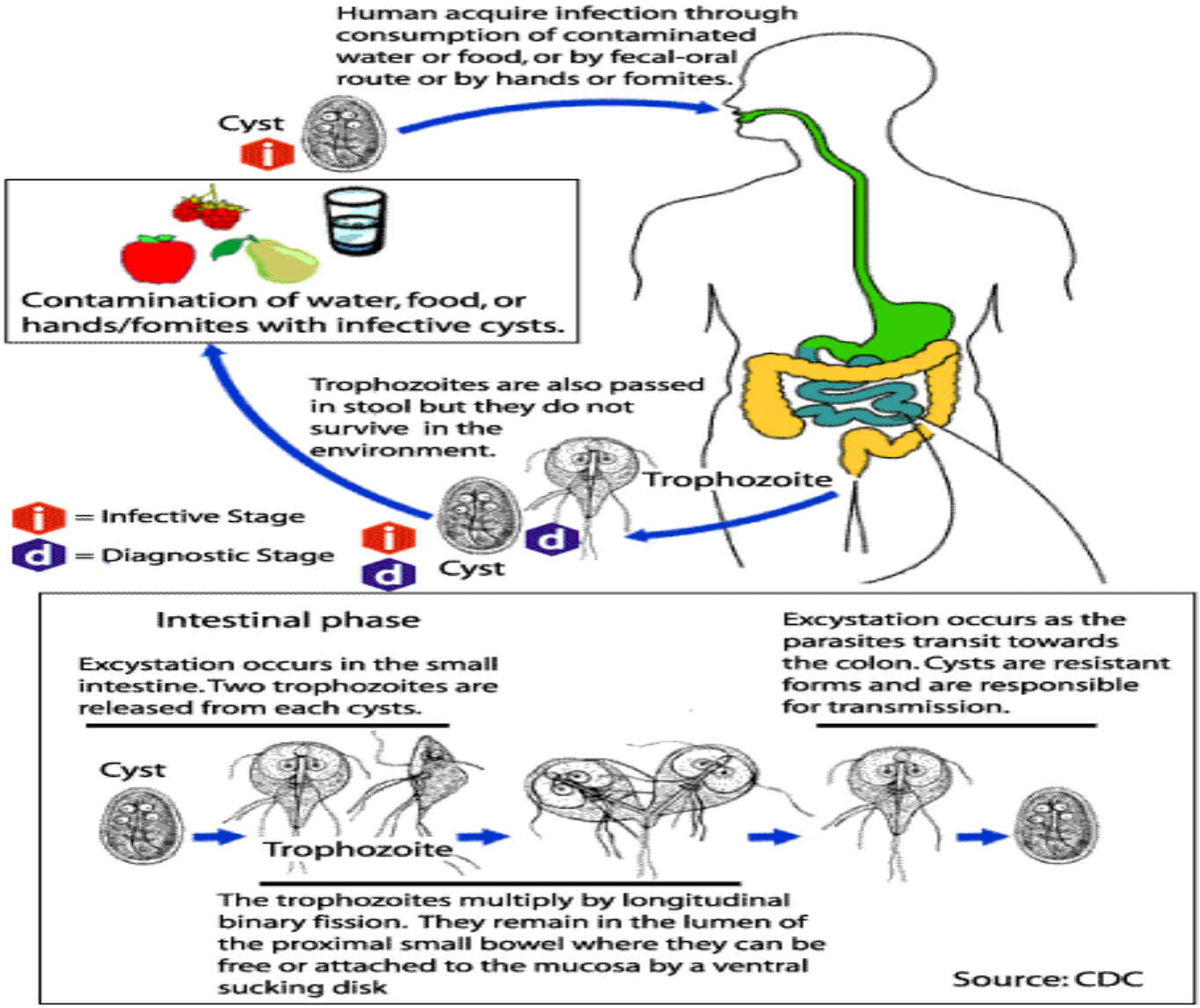
c) **Serological tests:** Asymptomatic carriers are sero- negative. But in some cases where tissue invasion without any symptom has existed for long time, the serological tests may show positive results.

Balantidium coli

The intestinal protozoan *Balantidium coli* are the only member of the ciliate group that is pathogenic for humans. Disease produced by B. coli is similar to amoebiasis, because the organisms elaborate proteolytic and cytotoxic substances that mediate tissue invasion and intestinal ulceration.

Life cycle

The life cycle of B. coli is simple, involving ingestion of infectious cysts, excystation, and invasion of trophozoites into the mucosal lining of the large intestine, caecum, and terminal ileum. The trophozoite is covered with rows of hair like cilia that aid in motility. Morphologically more complex than amoebae, B. coli has a funnel-like primitive mouth called a cytostome, a large (macro) nucleus and a small (micro) nucleus involved in reproduction.


Human acquire infection through consumption of contaminated water or food, or by fecal-oral route or by hands or fomites.
Cyst
Contamination of water, food, or hands/fomites with infective cysts.
Trophozoites are also passed in stool but they do not survive in the environment.
Trophozoite
= Infective Stage
= Diagnostic Stage
Cyst
Intestinal phase
Excystation occurs in the small intestine. Two trophozoites are released from each cysts.
Excystation occurs as the parasites transit towards the colon. Cysts are resistant forms and are responsible for transmission.
Cyst
Trophozoite
The trophozoites multiply by longitudinal binary fission. They remain in the lumen of the proximal small bowel where they can be free or attached to the mucosa by a ventral sucking disk
Source: CDC

Laboratory Diagnosis

✓Microscopic examination of faeces for trophozoite and cysts is performed.

✓The trophozoite is very large, varying in length from 50 to 200μm and in width from 40 to 70μm.

✓The surface is covered with cilia.