

L 1:- Parasitology

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- **Parasitology:** is the science dealing with the study of parasites & pathogenic effects.
- **Parasite:** an organism that live in or on another organisms (host) and obtains its food from host.
- **Host:** an organism which harbors parasite.
- The parasites of medical importance fall into kingdom:
- **Protista and animalia.**
- The parasites are classified as four phyla into
- phylum: **protozoa**
- phylum: **platyhelminthus (cestoda)**
- phylum: **nematoda**
- phylum: **trematoda**
- **Protozoa** is single organism microscopic (belong to Protista). In contrast, **Helminthes** are multicellular organism or worm, macroscopic (belong to animalia). It possessing well differentiated tissues & organ system. The length of worm vary from less than millimeter to more than meter.

• **Classes of Protozoa:**

- Type of locomotion of organelle have been used to divide these into four major classes:
- **Rhizopods (amoebae):** organelle of locomotion are pseudopodia and the mode of reproduce by binary fission. Such as *E. histolytica*
- **Ciliophora:** organelle of locomotion are cilia and the mode of reproduce by binary fission. Such as *Blantidium coli*
- **Mastigophora or flagellated :** organelle of locomotion are flagella and the mode of reproduce by binary fission.
- **Sporozoa or Apicomplexa :** is non motile and reproduce by sporogony\schizogony. Such as **Plasmodium species)**

Characteristic of Parasites

- Eukaryotes.
- Absorb or ingest organic chemicals.
- May be motile via pseudopods, cilia, or flagella.
- Parasitic flatworms and round worms are called helminths.

DIFFERENT KINDS OF PARASITES

- **1• Ectoparasite**– a parasitic organism that lives on the outer surface of its host, e.g. lice, ticks, mites etc.
- **2• Endoparasites** – parasites that live inside the body of their host, e.g. *Entamoeba histolytica*.
- **3• Obligate Parasite**-This parasite is completely dependent on the host during a segment or all of its life cycle, e.g. *Plasmodium*
- **4• Facultative parasite**– an organism that exhibits both parasitic and non-parasitic modes of living and hence does not absolutely depend on the parasitic way of life, but is capable of adapting to it if placed on a host. Facultative parasite as a commensal, but may become parasitic. E.g. *Naegleria*.
- **5• Accidental parasite**– when a parasite attacks an unnatural host . E.g. *Hymenolepis* .
- the opportunistic parasite that particularly those that take advantage of certain situations.

DIFFERENT KINDS OF HOSTS

- **1• Definitive host**– a host that harbors a parasite in the adult stage or where the parasite undergoes a sexual method of reproduction.
- **2• Intermediate host**- harbors the larval stages of the parasite or an asexual cycle of development takes place. In some cases, larval development is completed in two different intermediate hosts, referred to as first and second intermediate hosts.
- **3. Reservoir host**– a host that makes the parasite available for the transmission to another host and is usually not affected by the infection.
- **4. Natural host**– a host that is naturally infected with certain species of parasite.
- **5• Accidental host**– a host that is under normal circumstances not infected with the parasite.

The host that stores the parasite (usually animals) is Reservoir host



- **The types of relationships between parasites and host**
- **Phoresis:** the parasite transport through the host with mechanism. *E. histolytica*
- **Commensalism:** this relation positive for parasite while neutralized for host.
- **Mutualism:** positive for parasite and host.
- **Parasitism:** positive for parasite and negative for host.

The infected phases of parasites:

1. ovum.
2. larva.
3. cyst.
4. adult phase (worm).

- **General Concepts of Protozoa:**
- **Generally unicellular**
- **Eukaryotic organisms**
- **Smallest could only be seen with an EM.**
- **completing all necessary life activities independently**
- **Motile with**
- **A-Pseudopodium – Amoeba, Entamoeba histolytica.**
- **Flagellum –, Giardia lamblia**
- **Cilia - Balantidium coli.**



• **General Concepts of Protozoa:**

• **Reproduction**

- **Binary fission, the most common form of reproduction among medical protozoa, is asexual;**
- **Multiple asexual division occurs in some forms;**
- **Sexual reproduction: takes place within the definitive host and usually results in the formation of a zygote;**
- **Both sexual and asexual reproduction occur in the Apicomplexa.**
- **Life cycle consist of two stages :-**
 - **Trophozoite: Actively growing and reproducing stage**
 - **Cyst: enclosed in a cyst coat resistant to an unfavourable environment-
medical importance of infection**
 - **The epidemiological term of Pandemic that refers to the disease that spreading through the human population across a large region continent or worldwide**
 - **The epidemiological term of Prevalence that refers to The number of infected individuals at given time in given area mean**



Source of the infection

- **Patient** : persons who have parasites in their body and show clinical symptoms
- **Carrier** : persons who have parasites in their body, not show symptoms
- **Reservoir host** : animals that harbor the same species of parasites as man, the parasites in animals sometimes can be transmitted into human

Routes of transmission

modes or portals of entry the host:

ingestion, inoculation, inhalation, congenital, venereal, and other.

portals of exit from host:

respiratory tract, gastrointestinal tract, genital tract, biting insect, and allergy.

- **Congenital transmission** : from mother to infant , e.g., toxoplasmosis
- **Contact transmission** : direct contact or indirect contact with patients or infected animals, e.g., *Trichomonas vaginalis*

Routes of transmission

- **Food transmission** : the infectious stage of parasites contaminated food / the meat of the intermediate hosts containing infectious stage of parasites , e.g., Clonorchiasis
- **Water transmission** : drink or contact the water contaminated the infectious stage of parasites, e.g., schistosome, *Entamoeba histolytica*
- **Soil transmission** : soil contaminated by feces containing the certain stage of parasites which can develop into infective stage, e.g., *Ascaris lumbricoides* .

Prevention measures of parasitic diseases

- **Controlling the source of the infection: treatment of the patients, carriers and reservoir hosts**
- **Blocking the routes of transmission: managing feces and water resource, controlling or eliminating vectors and intermediate hosts**
- **Protecting the susceptible hosts: paying attention to health education/ personal hygiene, changing bad working/ eating habit, *etc.***

- **1. Class: Rhizopods (amoebae):**

- *Entamoeba histolytica* & *Entamoeba coli*

- **Morphology**

- *E. histolytica* & *E. coli* living in intestinal. The live cycle consists of two stage: **trophozoite & cyst**. The morphology of cyst & troph. of *E. Histolytica* & *E. coli* as shown in following table.

a protozoa, that infects predominantly humans and other mammals such as dogs and cats can become infected (the environmental survival form of the organism) with their feces. The active (trophozoite) stage exists only in the host and in fresh feces; cysts survive outside the host in water and soils and on foods, especially under moist conditions on the latter. When swallowed they cause infections by excysting (to the troph. stage) in the digestive tract.

- **excysting (cyst To trophozoite stage)**

- **encysting (trophozoite To cyst stage)**

Table showing the comparison between trophozoite of *E. histolytica* & *E. coli*

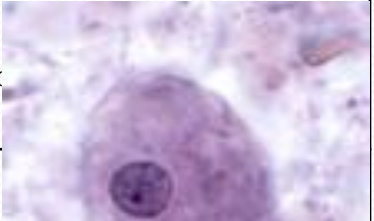
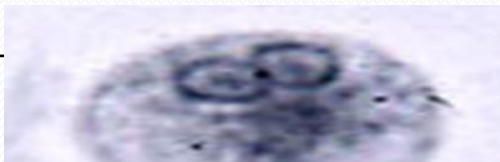

characteristic	Troph. of <i>E. histolytica</i> <i>pathogenic stage</i>	Troph. of <i>E. coli</i>
Size	8-65µm	12-55µm
No. of nuclei	One	one
Karyosome	Small & central	Large irregular shape, eccentric
Peripheral chromatin	Fine& evenly distributed	Coarse & unevenly distributed
Cytoplasm	Finely granular	Coarse& often vacuolated
Cytoplasmic inclusion	Ingested RBC in food vacuoles	Bacteria, other debris
Motility	Progressive, finger like pseudopodia	Non Progressive, blunt pseudopodia
Figure		

Table showing the comparison between cyst of *E. histolytica* & *E. coli*

characteristic	cyst of <i>E. histolytica</i>	cyst of <i>E. coli</i>
Size	8-22µm	8-35µm
shape	Spherical to round	Spherical to round
No. of nuclei	One to four	One to eight
Karyosome	Small & central	Large irregular shape, eccentric
Peripheral chromatin	Fine & evenly distributed	Coarse
Cytoplasm	Finely granular	granular
Cytoplasmic inclusion	Chromatoid bars, rounded ends, diffuse glycogen mass	Chromatoid bars, rounded with pointed ends, diffuse glycogen mass
Figure		

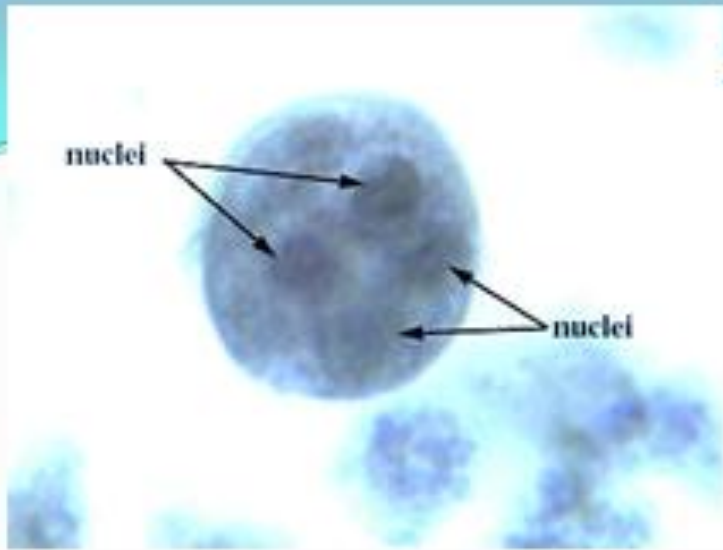
Amebiasis (or amoebiasis) or amebic dysentery is the name of the infection caused by *E. histolytica*. In addition to infection of the large intestine, the organism invasive infection, may invade other internal organ such as the lung, liver, skin and brain. The development of a disease and the chain of events leading to that disease is pathogenicity

Signs and symptoms amebic dysentery:

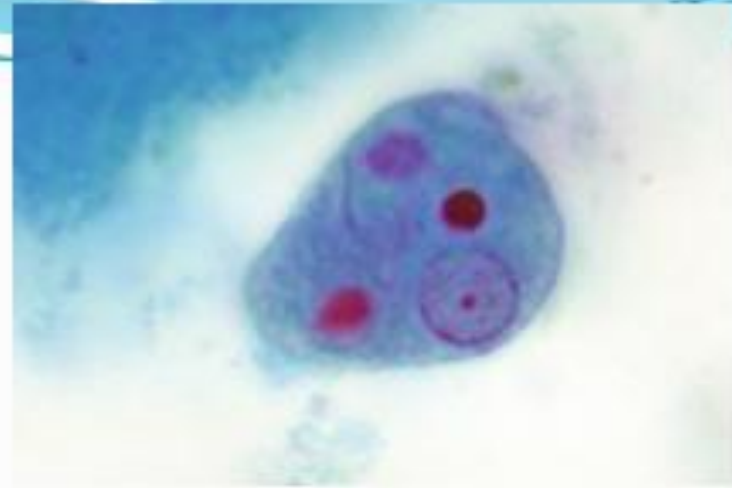
- In severe cases of intestinal amebiasis, the organism invades the lining of the intestine, producing sores (Flasks shape ulcer appears when the host infected with), **bloody diarrhea**, severe abdominal cramps, vomiting, chills, and fevers as high (40°C). In addition, a case of acute amebic dysentery may cause complications, including inflammation of the appendix, a tear in the intestinal wall (perforation), or a sudden, severe inflammation of the colon (fulminating colitis).

- ***Entamoeba coli***

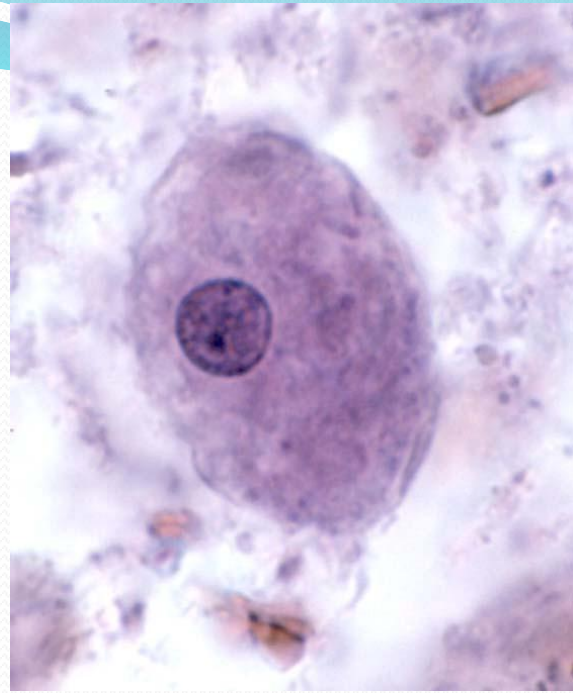
- is a non-pathogenic amoeba with worldwide distribution. Its life cycle is similar to that of *E. histolytica* but it does not have an invasive stage and does not ingest red blood cells.
- The relationship between the host and *E. coli* is Commensalism.
- the large intestine is the normal habitat of *E. coli*
- **Laboratory diagnosis of amebiasis is made by stool examination.**
- **The diagnostic stages are troph & cyst or both in diarrhea stool.**
- **The infective stage is cyst of *E. histolytica* & *E. coli***
- **The diagnostic stages are troph & cyst of *E. histolytica***



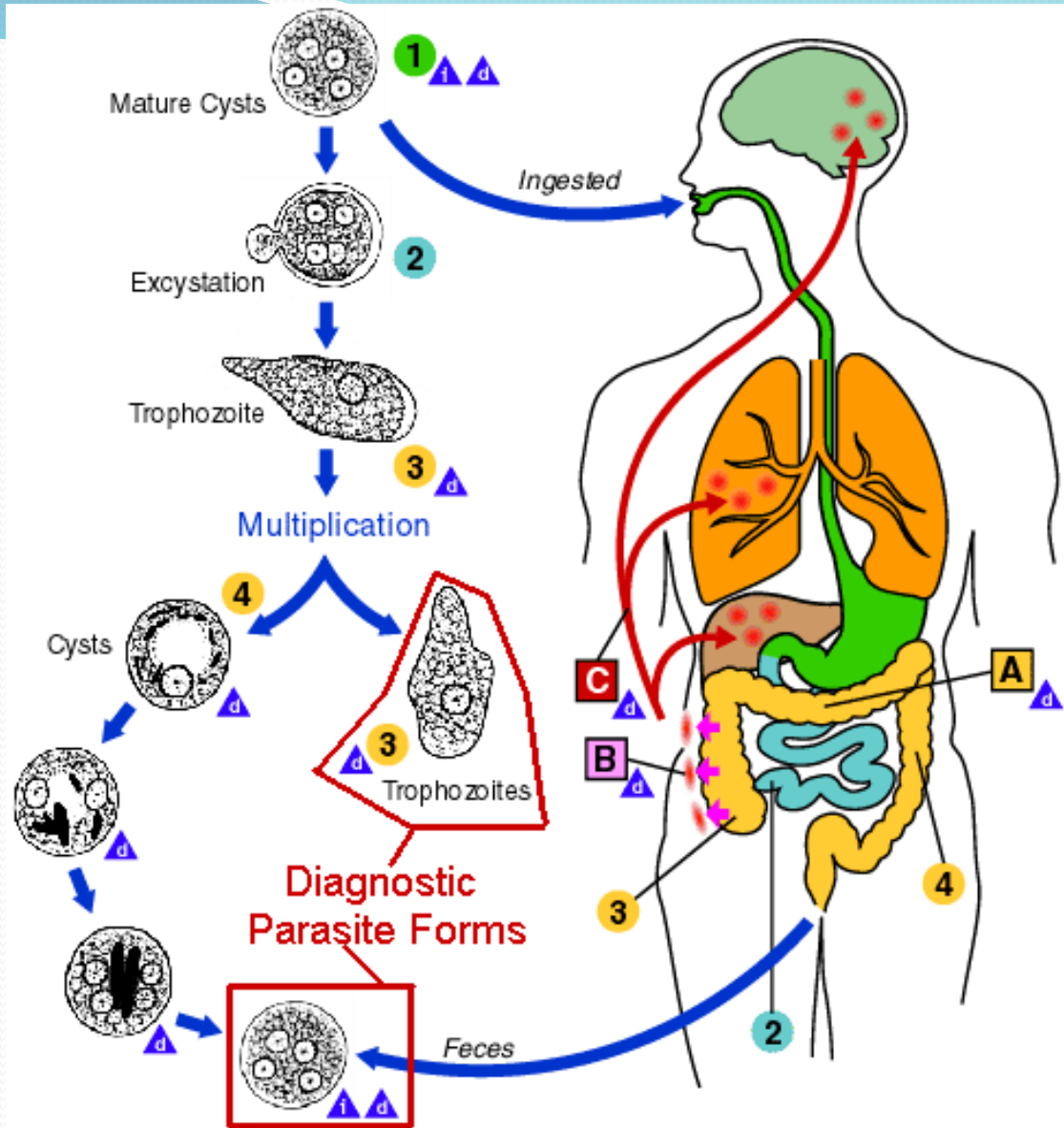
entamoeba histolytica cyst



entamoeba histolytica troph



E.coli cyst &trph



i = Infective Stage
 d = Diagnostic Stage

A = Non Invasive Colonization
 B = Intestinal Disease
 C = Extra-Intestinal Disease

Prevention and Control

- **control** of *E. histolytica* = hygiene, Avoid taken contaminated food and water
- Improvement of water supply and sewage and Good health education.
- **Treatment** of *E. histolytica* = Metronidazole
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