CLASSIFICATION OF MEDICAL PARASITOLOGY

Parasites of medical importance come under the kingdom called protista and animalia. Protista includes the microscopic single-celled eukaroytes known as protozoa. In contrast, helminthes are macroscopic, multicellular worms possessing well-differentiated tissues and complex organs belonging to the kingdom animalia . Medical Parasitology is generally classified into:

• **Medical Protozoology** - Deals with the study of medically important protozoa.

• **Medical Helminthology** - Deals with the study of helminthes (worms) that affect man.

• **Medical Entomology** - Deals with the study of arthropods which cause or transmit disease to man.

MEDICAL PROTOZOLOGY

Protozoa (singular, protozoan), from the Greek 'protos' and 'zoon' meaning "first animal", are members of eukaryotic protists. They may be distinguished from other eukaryotic protists **by** their ability to move at some stage of their life cycle and by their lack of cell wall.

➢ CLASSIFICATION OF PROTOZOA

*Protozoa of medical importance are classified based on their morphology and locomotive system as described below:

1- **Class Rhizopoda (sarcodina) –** move by pseudopodia include all Amoebae ex. *Entamoeba histolytica* .
2- **Class Mastigophora (Flagellata)-** move by flagella include all the flagellates ex. *Trypanosoma* spp .
3- **Class Ciliphora (Ciliata)** – move by cilia ex. *Balantidium coli* .
4- **Class Sporozoa (Coccidian)** – form spores in one stage of life cycle and no movement organ so need carrier ex. *Plasmodium* species.

*Protozoan pathogens can also be grouped according to the location in the body where they most frequently cause disease :

Type and location	Species	Disease
1-Intestinal tract	*Entamoeba histolytica*	Ambiasis
	Giardia lamblia	Giardiasis
	Cryptosporidium parvum	Cryptosporidiosis
	Balantidium coli	Balantidiasis
	Isospora belli	Isosporiosis
2-Urogenital tract	*Trichomonas vaginalis*	Trichomoniasis
3-Blood andtissue	*Plasmodium* species	Malaria
	Toxoplasma gondii	Toxoplasmosis
	Trypanasoma species	Trypanosomiasis
	Leishmania species	Leishmaniasis

- **Diagnosis of parasites :**

Is essential for identified and diagnosis of parasites stages , this involves three distinct problems :

1- To detect the presence of eggs , larva , cysts on some other form of parasite in feces , blood , sputum , urine or tissues to distinguish these stages from each to other and from human artifacts.
2- Establishment of identified parasite as a causative agent of given case.

1- Class Rhizopoda (sarcodina):

Amoebas primitive unicellular microorganisms with a relatively simple life cycle which can be divided into two stages:

- **Trophozoite** – actively motile, feeding stage and reproduction form.
- **Cyst** – dormant non motile , infective stage , resistant form.

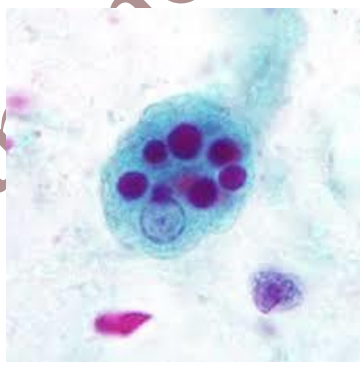
Their reproduction is through binary fission, e.g. splitting of the trophozoite or through the development of numerous trophozoites within the mature multinucleated cyst. Motility is accomplished by extension of pseudopodia (“false foot”).

The amoebae :

- ***Entamoeba histolytica*** *:*

Most of amoebae are free living and a few are parasitic on man and animal ex. *Entamoeba histolytica* inhibit the large intestine of man which cause intestinal and extra intestinal amoebiosis , localized in cecum and large intestine causing :

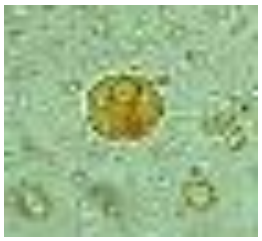
1- bloody diarrhea
2- dyspentery



There are two stages of life cycle:

Morphology (Trophozoite):

1- Its size (12-30um).
2- Large finger-like pseudopodia
3- The endoplasm is granular and may contain RBCs.
4- It has one nucleus, contain small central karyosome and fine chromatin granules arranged regularly beneath nuclear membrane.



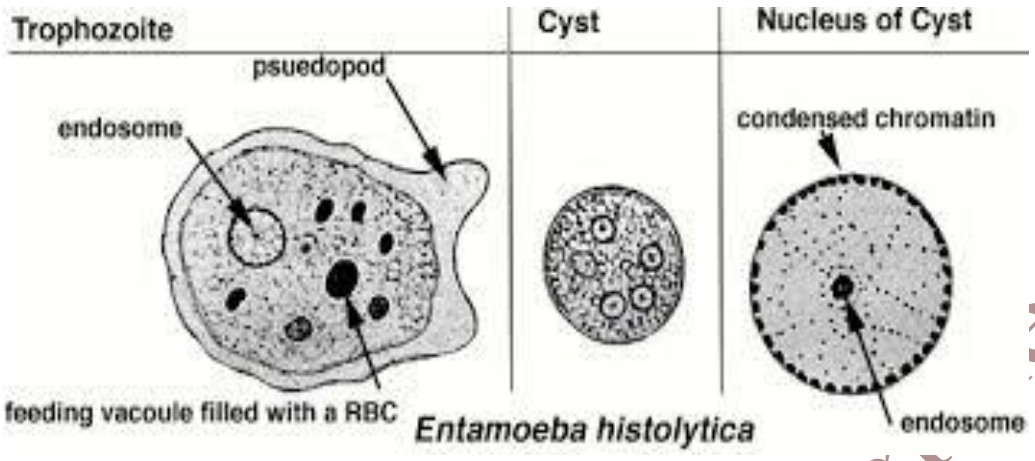
Morphology (mature Cyst):

Small (10-20um), spherical in shape, containing 1-4 nuclei is usually found in feces. Each nucleus contain similar nuclear morphology like the trophozoite

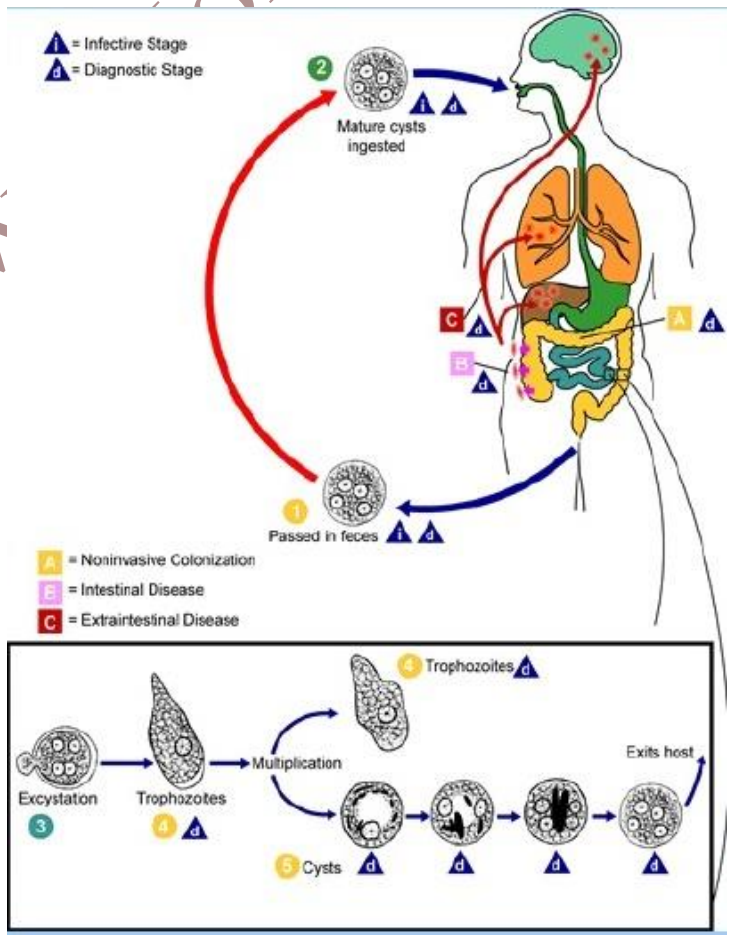
Life cycle of *E.histolytica*

Infection by *E. histolytica* occurs by ingestion of mature cysts in fecal contaminated food, water, or hands. Encystation occurs in small intestine and trophozoites are released which migrate to the large intestine. The trophozoites multiply by binary fission and produce cysts, which are passed in the faces.

In some patients the trophozoites invade the intestinal mucosa and cause intestinal disease or developed perforated ulcer and the trophozoites migrate through the blood stream to invade the extraintestinal organs such as the liver, brain, and lungs and it will cause amoebic infection in these organs.



Entamoeba histolytica



Epidemiology:

The incidence of Amoebasis is common & high in tropical & subtropical areas especially in areas of **lower socioeconomic status** due to :

(1)Poor sanitation (2) overcrowding & (3) malnutrition

It is estimated that up to 10% of the world's population may infected with *E.histolytica*.

Transmission of amoebiasis occurs through:

1.Mature cyst is the main source of the infection which passing with the feces of chronic patents or asymptomatic carrier.

2. Human being acquires the infection via contamination of food, drinks, vegetables or hands with infective cysts especially in restaurants.

3. Flies (House fly) play important roles in transmission of these cysts to the food of human.

**(fecal –oral transmission by contaminated food& water by infected cyst directly or indirectly)

Pathogenesis of *E.histolytica*:

The pathogenesis activity of *E.histolytica* depend on :

1- The resistant of the host
2- The number of the amoebas
3- Presence of pathogenic bacteria
4- Presence of physical & chemical injury of the mucosa

The lesions produced by *E.histolytica* are **primarily** in large intestine and **secondarily** extra intestinal especially the liver, brain or any organ of the body may be affected.

Clinical features of intestinal lesion:

1- The incubation period range from **2-4 weeks**.
2- The majority of infections with *E.histolytica* show no symptoms or show symptoms which varies from mild to intense and long lasting.

The typical symptoms include:

1- **Diarrhea**, the diarrhea frequently alternates with constipation or soft stools may contain mucous but no visible blood.
2- **Abdominal cramps.**
3- **Nausea**
4- **Anorexia**
5- **Dysentery:** which is usually starts slowly with abdominal cramps and associated with loose stool and diarrhea with blood, mucus and necrotic tissues.
6- Few patients especially children may show fever, vomiting, abdominal tenderness.

Extraintestinal Amoebiasis :

1- Amoebic liver abscesses.
2- Pulmonary amoebiasis.
3- Cutaneous amoebiasis .

Diagnosis of Amoebiasis:

1-General stool examination (GSE): patient should be examined microscopically:

a- The typical amoebic stool is contain **blood, mucous, WBC & Bacteria.**
b- Direct method with **saline** for motile trophozoite.
c- Stool specimens should be stained usually with **iodine** and microscopically examined for cysts of *E.histolytica*.

2-Culture of stool.

3-Sigmoidoscopy may reaveal the characteristic flask-shaped ulcers especially in severe cases.

4-Biopsy & fluid from large intestine aspirates also be examined microscopically for trophozoites.

5-Serolgy, is very important for the diagnosis of extra intestinal amoebiasis e.g: Indirect heamagglutination (IHA) & Polymerase Chain Reaction **(PCR test).**

6-Ultrasound, CT scan, MRI can be used to detect hepatic abscesses.

Treatment :

Amebicides classified into three parts :

1- Mixed : effective against luminal and systemic disease .
Metronidazole (f lagyl).

2- Luminal : effective only in the bowel lumen
   a- Paromomycin (humatin)
   b- Iodoquinol (diodoquin)
   c- Tetracycline
3- Systematic : effective in the intestine and liver
   a- Emetine
   b- Dehydroemetine
   c- Chloroquine

Prevention & control:

1- All human infections should be treated.
2- A symptomatic carriers should be treated especially those working in restaurants.
3- Effective environmental sanitation is necessary to prevent water, food, and vegetable contamination, e.g. Sewage disposal should be treated with chemical before used as fertilizer in gardens.
4- Chlorination & filtered water supply are important to kill the cyst of *E.histolytica*.
5- Insects should be controlled by insecticides.
6- Uncooked vegetables should be washed with running water.