

Parasitology Lectures

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the Lecturer: Prof.Dr Hadi Rasool Hassan

Parasitology : The science which studying the relationship between different two kinds of organism .The smallest is a parasite all most **invertebrate** and the host which a bigger all **most vertebrate** .

This science consist of three branches:

1:Medical protozoology which studying the unicellular parasite Ex. *Entamoeba histolytica* . *Giardia lamblia*

2:Medical Helmentology which studying the parasitic flat and round worms Ex. *Fasciola hepatica* , *Ascaris lumbricoidis*.

3.Medical Entomology which studying the medical Erythropodes Ex. **Mosquito**, Ticks .

The relationship between organism

1:Symbiosis: (living together) the relationship between two individuals depend one to other and **it can't live without the other**, Ex. Termied and Hyper flagellate.

2: Commensalism :(eating at the same table) the relationship between two individuals the first take or obtains the food or habitat or both from the another **without causes any damage in it** Ex. *Entamoeba coli* in human.

3: Parasitism: (eating at the table of others) the relationship between two individual the first (parasite)obtain the food or habitat or both. from the another (host) and **must be causes damage in it** , Ex. *Entamoeba histolytica* in human.

The parasites can be divided into two groups:

1: Ectoparasite consist of the parasitic groups which infested on host skin or external parts of the host body Ex. mosquito, pediculous, ticks **which causes infestation**

2: Endoparasite consist of the parasitic groups infected internal parts of the body Ex. *Giardia lamblia*, *Plasmodium* spp., *Leishmania* spp. **which causes infection.**

Types of parasitism:

1: Facultative parasite: the parasite which can living in his life cycle as a parasitic or as free living Ex. *Strongyloides stracularis*, *Crysoma buziana*.

2: Obligatory parasite: this group must be living as a parasitic in all his life cycle or part of it and we can divided it to:

A. Temporary obligatory parasite this parasites are visit the host between time to time and obtains food or take Blood meal of it Ex. Mosquito.

B: Sporadic obligatory parasite this parasite living in part of his life cycle as a parasitic on the external parts of the body host and in second part of his life cycle free living Ex. Ticks, mites.

C: Permanent obligatory parasite : this parasitic group must be living all his life cycle as a parasitic on or in the hosts, Ex. Pediculous, *Entamoeba histolytica*. *Plasmodium* spp.

Zoonosis diseases consist of the veterinary diseases which transport between vertebrate animals only .Ex. Theileria.

Zoonotic diseases consist of common diseases which infected human and animals Ex. Hydated cyst.

Types of hosts

1: (final, definitive, primay) the host infected with adult stage or sexual phase of parasite which produce eggs or larvae Ex. human infected with *Ascaris*, *Ancylostoma*.

2: Intermediate or secondary host : the host infected with larval stage or asexual phase of parasite and must be important or essential to complete the life cycle of parasite, Ex. Herbivorous animals infected with hydated cyst.

3: Accidental host : the host ordinary infected with larval stage of parasite but it is not essential to complete it's life cycle, Ex. Human infected with Hydated cyst.

4: Reserver host: the host infected with larval stage but without symptoms and it important as a source of infection Ex. dogs infected with Leishmania .

5: Vector host: the invertbrate host which transport the infected stage of parasite from the host to another and it can be divided to biological vector like mosquito or mechanical vector house fly .

The routes of transmission, of parasites into the human body include:

1. Ingestion
2. Skin penetration
3. Mucus membrane penetration
4. Sexual transmission
5. Congenital transmission
6. Blood transfusion
7. Organ transplantation

1 – Protozoa : Unicellular parasite contains one or more nuclei in troph & four or more cystic stage motile by means of locomotion or non motile, production by binary fission or chizo gony can produced by sexual process.

The protozoa classified to four classes depend on **locomotion organulla**.

A – Sarcodyna (Amoeba) is related to two stages : Trophozoit & cyst through it`s life cycle.

The troph can live inside the host and multiplies with in it.

In the external environment the trophozoit will **transform in to cyst**.

The mode of locomotion occurs due to a presence of **pseudo podia** .

The mode of reproductive is by binary fission .The main parasite with clinically important as following :

1-Entamoeba hystolytia 2- Entamoeba coli 3-Entamoeba gingivalis 4- Endolimax nana 5- Dientamoeba frgalis 6-6- lodamoeba butchlii 7- Neagleria fowleri 8-Acanthamoeba Spp.

1-Entamoeba histolytica .

Epidemiology .

E. histolytica has a worldwide distribution. Although it is found in cold areas, the incidence is highest in **tropical and subtropical regions that have poor sanitation and contaminated water** .

the main source of **water and food contamination** .
the symptomatic carrier who passes cysts. .

. The epidemic form is a result of direct person-to-person faecal-oral spread under conditions of poor personal hygiene. .

Morphology: .

Trophozoite: Ameboid, 15-30 μm , Sometime Larger; reach to -60 μm in diameter

Single Nucleus With A Distinctive **Small centrally located Karyosome** . .

Fine Granular Endoplasm **May Contain Erythrocytes** . .

More Invasive Strains Are Larger. .

The Nuclear Chromatin Is Evenly Distributed Along The Periphery Of The Nucleus. .

Cysts range in size from 10-20 μm . The immature cyst has glycogen mass and chromatoidal bars.

matures cyst, the glycogen completely disappears; may also have four nucleus . .

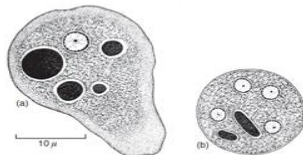


Figure 2.1 *Entamoeba histolytica* trophozoite (a) and cyst (b). It can be difficult or impossible to distinguish the chromatoidal bodies in the cysts using light microscopy and their nuclear structure may be lost after prolonged . .

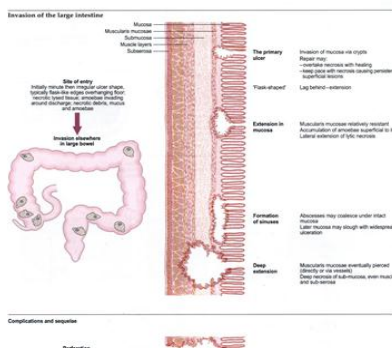
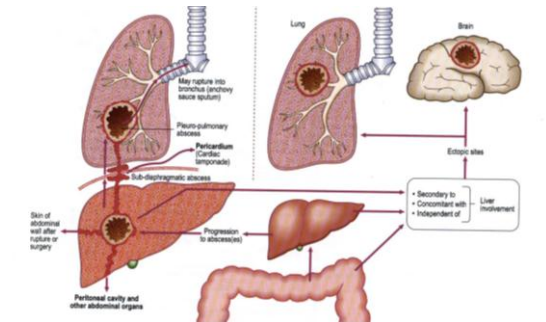
Clinical symptom's **Diarrhoea, flatulence, and cramping are complaints of symptomatic patients.** .

More severe disease is characterized by the passing of **of numerous bloody stools** .
in a day.

Systemic signs of infection (**fever, leukocytosis, rigors**) are present in patients .
with extra intestinal amebiasis.

The liver is primarily involved, because trophozoites in the blood are removed .
from the blood by the portal veins.

The right lobe is most commonly involved, thus pain over the liver with hepatomegaly



Life cycle

Intestinal infections occur through the ingestion of a **mature quadrinucleate infective cyst**, contaminated food or drink and also by hand to mouth contact.

It is then passed unaltered through the stomach, as the cyst wall is resistant to gastric juice.

In terminal ileum (with alkaline pH), **excystation takes place**.

Trophozoites being actively motile invade the tissues and ultimately lodge in the sub mucous 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.

And **mature quadrinucleate cysts form. These are the infective forms.**

The outcome of infection may result in a **carrier state**, intestinal amoebiasis, or extraintestinal amoebiasis.

Laboratory diagnosis

In intestinal amoebiasis: Examination of a fresh dysenteric faecal specimen or rectal scraping for trophozoite stage.

(Motile amoebae containing red blood cells are diagnostic of amoebic dysentery).

• Examination of formed or semifformed faeces for cyst stage.
(Cysts indicate infection with either a pathogenic *E.histolytica* or non-pathogenic *E.dispar*.)

2- Entamoeba coli Nonpathogenic amoebas live in human intestine commensal parasite

:Morphology

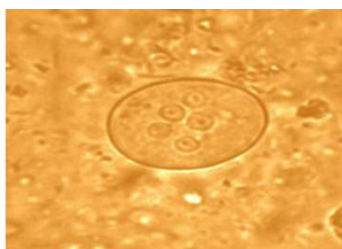
Trophozoite: Ameboid, 20-40 μm Larger than *E. histolytica*

Single Nucleus With a distinctive Small A centrally located Karyosome

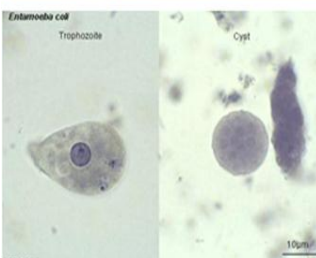
It feeding on debris and not Contain Erythrocyte

Cysts range in size from 10-20 μm . The immature cyst has glycogen mass and chromatoidal bars

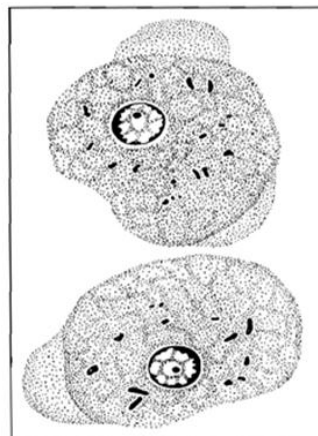
matures cyst, the glycogen completely disappears; may also have four nucleus



Entamoeba coli cyst



Entamoeba coli cyst and trophozoite, haematoxylin stained. Used with permission



Entamoeba gingivalis

Entamoeba gingivalis was the first parasitic amoeba of humans to be described. It was recovered from the soft tartar between the teeth. It has also been recovered from the tonsillar crypts and can multiply in bronchial mucus, **morphologically** it is very similar to *E. histolytica*, it is important to make the correct identification from a sputum specimen, that is, *E. gingivalis*, which is considered to be a nonpathogen, rather than *E. histolytica* from a possible pulmonary abscess. The trophozoite measures approximately 5 to 15 μm , and the cytoplasm most often contains ingested

Endolimax nana is a lumen habitat in the large intestine, primarily at the cecal level, where it feeds on bacteria. The life cycle is similar to *E. histolytica*. Motility is typically **sluggish (slug-like)** with blunt hyaline pseudopodia, Projects shortly. Human infection results from ingestion of viable cysts in contaminated water or food. Maybe confused with *E. hartmanni* and *E. histolytica* in diagnosis. No treatment is indicated for this nonpathogenic infection. Prevention can be achieved through personal cleanliness and community sanitation

Iodamoeba buetschlii: - the natural habitat is the lumen of the large intestine, the principal site probably being the caecum. The trophozoite feeds on enteric bacteria; it is a natural parasite of man and lower primates. It is generally regarded as a nonpathogenic

lumen parasite. No treatment is ordinarily indicated. Prevention is based on good personal hygiene and sanitation in the community.

PATHOGENIC FREE-LIVING AMOEBAE

Among the numerous free-living amoebae of soil and water habitats, certain species of *Naegleria*, *Acanthamoeba* and *Balamuthia* are facultative parasites of man. Most human infections of these amoebae are acquired by exposure to contaminated water while swimming. Inhalation of cysts from dust may account for some infections.

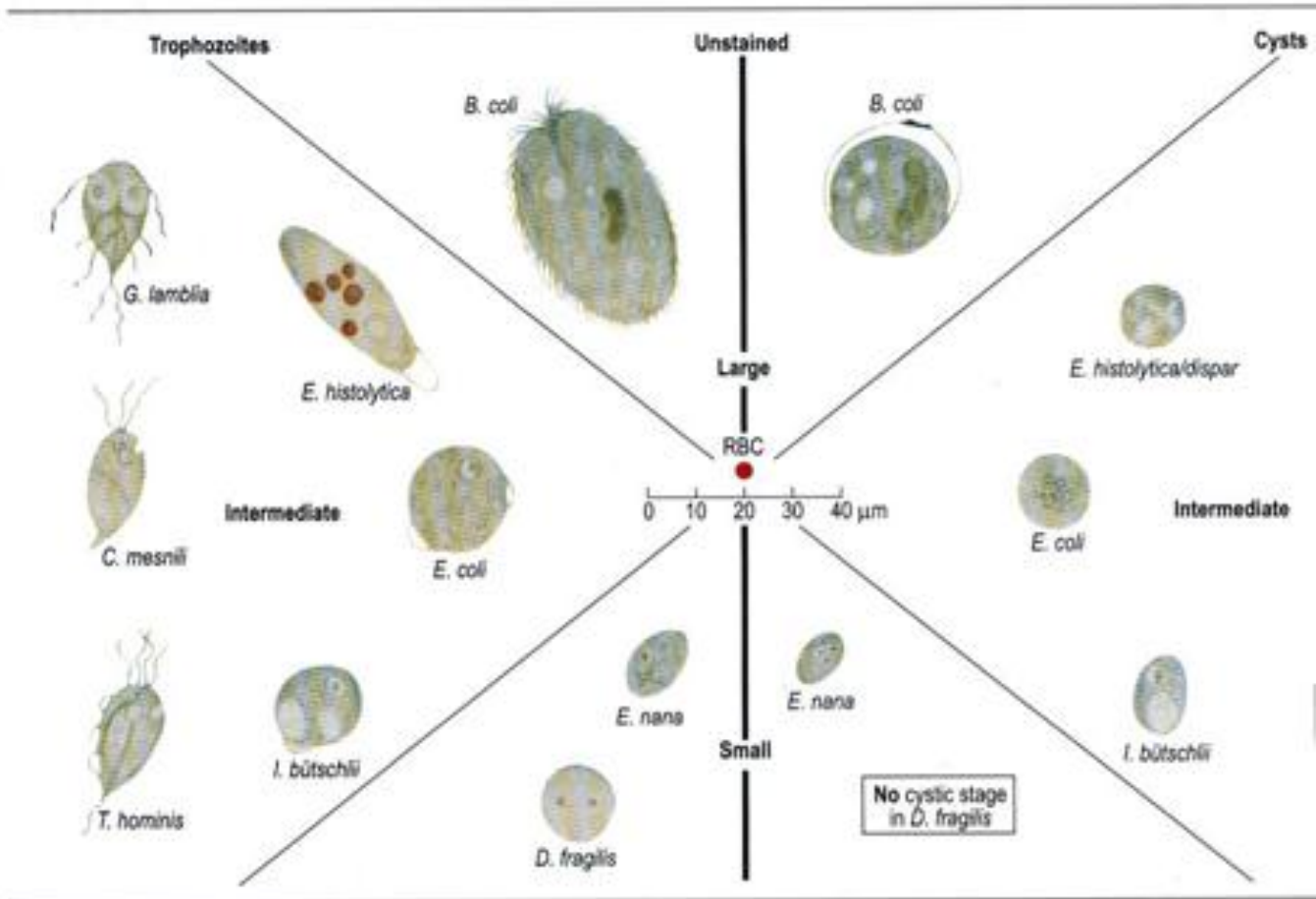
Naegleria fowleri- the trophozoites occur in two forms. Amoeboid forms with single pseudopodia and flagella forms with two flagella which usually appear a few hours after flooding water or in CSF.

Extraintestinal amoebiasis :Diagnosed by the use of scanning procedures for liver and other organs. Specific serologic tests, together with microscopic examination of the abscess material, can confirm the diagnosis.

Treatment Acute, fulminating amebiasis is treated with metronidazole followed by iodoquinol, and asymptomatic carriage can be eradicated with iodoquinol, diloxanide furoate, or paromomycin.

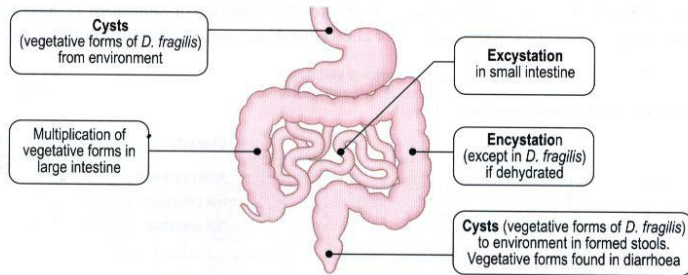
The cysticidal agents are commonly recommended for asymptomatic carriers who handle food for public use **Metronidazole, chloroquine, and diloxanide furoate can be used for the treatment** of extra intestinal amebase.

Luminal intestinal protozoa



Other intestinal amoebae

Life cycle



Morphology

Unstained

	Vegetative forms (trophozoites)						
	<i>Entamoeba coli</i>	<i>Endolimax nana</i>	<i>Iodamoeba bütschlii</i>	<i>Dientamoeba fragilis</i>	<i>Entamoeba histolytica</i>	<i>Entamoeba dispar</i>	<i>Entamoeba hartmanni</i>
Size	15–50 µm	8–10 µm	8–20 µm	5–12 µm	15–60 µm	15–60 µm	15–60 µm
Motility	Sluggish	Sluggish	Fairly active	Very active	Very active	Active	Active
Ectoplasm	Little	Little	Little	Abundant	Abundant	Abundant	Abundant
Pseudopodia	Blunt, mainly granular	Blunt, mainly granular	Blunt, clear	Leaf-like, clear	Finger-like, clear	Finger-like, clear	Finger-like, clear
Endoplasm	All have granular cytoplasm with food particles, bacteria, crystals, vegetable cells, often in vacuoles. No ingested RBCs				Ingested RBCs	No ingested RBCs	No ingested RBCs
Nucleus	Ring of refractive dots	Generally invisible	Generally invisible	Two, collection of dots	Generally invisible	Generally invisible	Generally invisible
	Precyst (round up, discharge food particles, bacteria, etc.)						
Glycogen	Often prominent vacuole	Rare	Conspicuous	None	Diffuse, soon disappears	Diffuse, soon disappears	Diffuse, soon disappears
Chromidial bars	Rarely seen	Rare	None	None	Large refractile bars	Large refractile bars	Large refractile bars
	Cysts						
Size	10–33 µm	5–14 µm	5–18 µm	None	10–20 µm	10–20 µm	8–10 µm
Shape	Spherical or oval	Oval	Irregular	None	Spherical	Spherical	Spherical
Wall	Thick	Thin	Thin	None	Thin	Thin	Thin
Glycogen	Diffuse central	None	Well-defined vacuoles	None	Sometimes persists	Sometimes persists	Sometimes persists
Chromidial bars	Not usual	None	None	None	Sometimes present	Sometimes present	Sometimes present
Nuclei numbers	1–8	4 (at one end)	1 only	None	1–4	1–4	1–4