

THE



SYSTEM

Microbiology

Sheet

Slide

Handout

Number: **Parasitology-1**

Subject: **Protozoa and helminthes**

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Price:

This lecture will be about the parasites that affect the gastrointestinal tract.

Amoeba : usually a free living, widely spread in nature ,common fresh water organism, widely studied in class rooms and laboratories. Under this name we have 6 types that live in the GI , out of these 6 only one that is pathogenic known as **entamoeba histolytica**. The other non-pathogenic are entamoeba gingivalis, entamoeba coli, dientamoeba fragilis, endolimax Nana, idomeboeba butchlii.

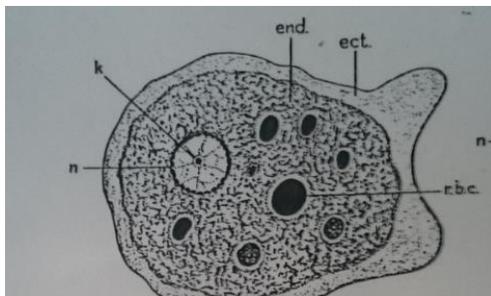
Gingivalis usually present in the mouth rather than the GI itself, associated with gum diseases, 95% of gum diseased patients have *gingivalis*, whether it is the causative or not, no one knows why. *Coli* is a **commensal non-pathogenic**, part of the normal flora of the GI in 30% of people, might be mistaken as a causative for a GI disease, so its morphology is really important to differentiate it from the causative parasite and making the wrong diagnosis.

At first we will begin with **Entamoeba histolytica**.

Transmission:

Route of transmission : directly fecal oral route.

Morphology



Trophozoite:

The pathological stage of the parasite, that moves, divides and **cause** the disease.

Size: 20-30 μ m in diameter .

Pseudopodia is very well marked in histolytica for motility.

Cytoplasm : the ring like, outer layer well demarcated, named ectoplasm (ect) which is the mobile part, the inner aspect is known as the endoplasm(end), it is more granular.

The vacuoles may contain bacteria or RBCs, if **RBCs** were present then it's definitely **histolytica** , but if it was bacterium or anything else, then it might be another type probably **coli** .

Trophozoite **can't transmit** the disease, but it can **cause** the disease , because it's unstable it will die the moment it comes out with the feces, the infection is transmitted through a **cyst** from human to another without the need of a vector. so the amebae itself goes through morphologic changes , becomes smaller, the appearance of some structures in the cytoplasm known as chromatoid bodies will occur, and becomes covered with a tough cover helping to survive outside the human GI for 2 weeks.

Chromatoid bodies: they are DNA and RNA that occur during the development of a cyst.

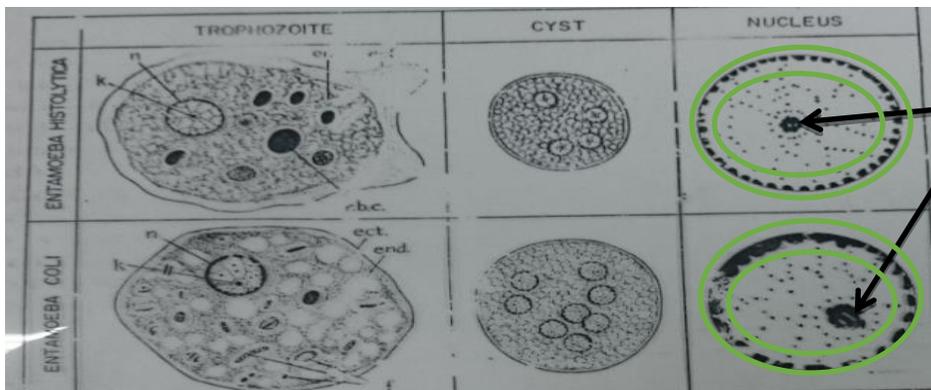
When the cyst becomes a mature one, chromatoid bodies disappear and the nucleus would have divided **to 4 nuclei**.

Life cycle :

It starts in the large intestine>>The cyst is passed to the outside world with the feces>>Ingesting the cyst>> goes to the stomach, cysts are resistant to the acids there>>Goes to the small intestine, reaches end of duodenum where it disintegrates and releases the 4 nuclei >> the 4 nuclei divide to become 8 nuclei >> each nucleus produced will form a small amoeba known Ameoboola(small amoeba)>>>> (so now I have 8 Ameoboolae)>>the Ameoboola goes to the large intestine and grow to become a trophozoite (the pathologic form).

The difference between *histolytica* and *coli* :

	<i>Histolytica</i>	<i>coli</i>
Nucleolus location	Very center	Extended to the sides
Chromatin (notice the black spots on the periphery of the nucleus)	Equally distributed around nucleus	Unequally distributed around nucleus
Number of nuclei in a cyst	4	8 or 6
Size of the cyst	Smaller	Larger
Shape of chromtoid bodies	Sausage shape or cigarette shape, thick	Splint shape, thin and pointed
Movement	More active and more movement due to larger pseudopods	Less movement and blunt pseudopods , considered sluggish
Vacuole continents	RBCs in vacuoles	No RBCs, maybe bacteria



Notice the location of the nucleolus

the distribution of chromatin at the periphery (between the 2 circles, if I got you confused just forget about the picture)

Sorry for the pictures but those are all what the doctor got

Previously thought that 10% of the human population was infected by *histolytica*, but then after studying them at the molecular level, it turned out that 90% of these 10% is due to another type which is *E. dispar* that looks exactly the same as *histolytica* morphologically speaking, which means that *histolytica* only infect 1% of the population. The difference is that *histolytica* has pathogenicity factors like EHL (*EH lectin* that allows amoeba to adhere to the mucosa of the GI tract, they also have on the surface (*amoeba poles*) that produce holes in the cells of the

epithelium of the large intestine, and finally produce **proteases** that digest cells). So *histolytica* that causes diseases while *dispar* is **not pathogenic at all**.

Diseases caused by *histolytica*:

-amebic dysentery:

Main symptoms :

we can notice **bloody diarrhea, mucous, pus** and feces is found very smelly. The amount of fecal matter is not large like watery diarrhea, but it is very **frequent** (goes to the toilet produces only a small amount, then after 10 min he needs to go to the toilet again) , there is also **fever and abdominal pain**.

The main cause :

Due to action of **invasion** of the mucosa by the parasite.

Morphology of the disease:

The invasion is not uniform, so the area of inflammation is scattered, however the whole colon is infected (**colitis**). Perforation of the wall can happen and may lead to **peritonitis**, that has a chance to end up with death (considered as the **2nd cause** of death after malaria, reach up to 100,000 deaths due to amebic diseases).

Occasionally we might get granulation around the area of inflammation, a swelling or a mass in the wall of the intestine that is named **Ameboma**. It is important to differentiate it from tumors.

To say you noticed a mass in the intestine you think of a tumor or an ameboma, so you check it histologically to know what it is exactly.

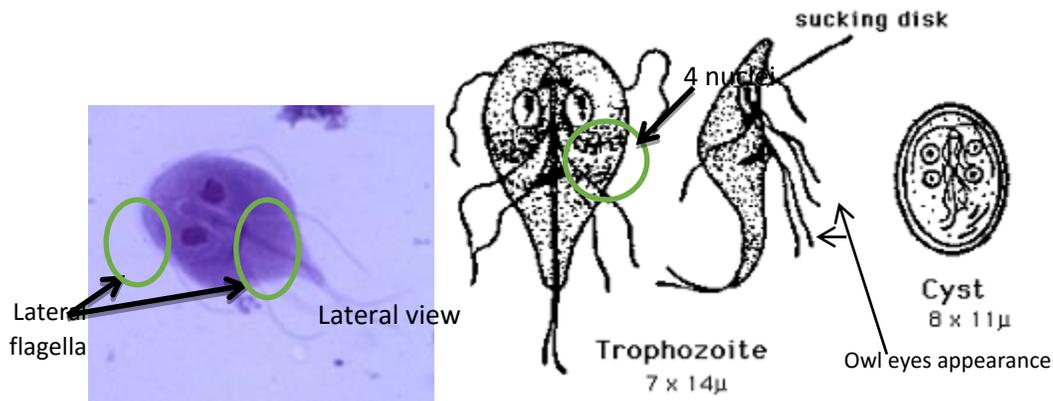
Blood invasion can occur because they go with the portal hepatic circulation ,end up in the liver and produce **amebic liver abscess**. Ameba can be considered a **luminal parasite** which can causes pathology there and at the same time a **tissue parasite** (infect tissues and viscera).

There is a type known as bacillary dysentery caused by *shigella*, so it is bacterial dysentery.

-Amebic liver abscess :

the patient becomes ill, develops fever and may have jaundice but not necessary, in some cases it can spread further and reach the lungs.

Morphology



- Pear- shaped.
- A flagellates because it presents 4 lateral flagella (4 pairs, 4 at each side projecting laterally).
- It has 2 nuclei with prominent nucleolus, that gives it an appearance like owl eyes (the second picture)
- The **dorsal** surface is **convex** but the **ventral** is **flat**.
- They have suckers; to stick to the wall of **the lumen of the small intestine** (since the lumen is actually where they live).

Cyst :

4 nuclei present, doesn't show any flagella on the outside.

Life cycle :

The organism that actually causes the disease in the small intestine (trophozoite) produces a cyst>> cyst passed in the feces>> the feces will contaminate most likely water (sometimes food).

transmission, so both types of reproduction (sexual and asexual) occur in the primary host which is human being.

Morphology

apical apparatus that allows it to get in the cell, which means it's infection is **intracellular** (opposite to other species that are usually extracellular)

Reproduction:

sexually and asexually.

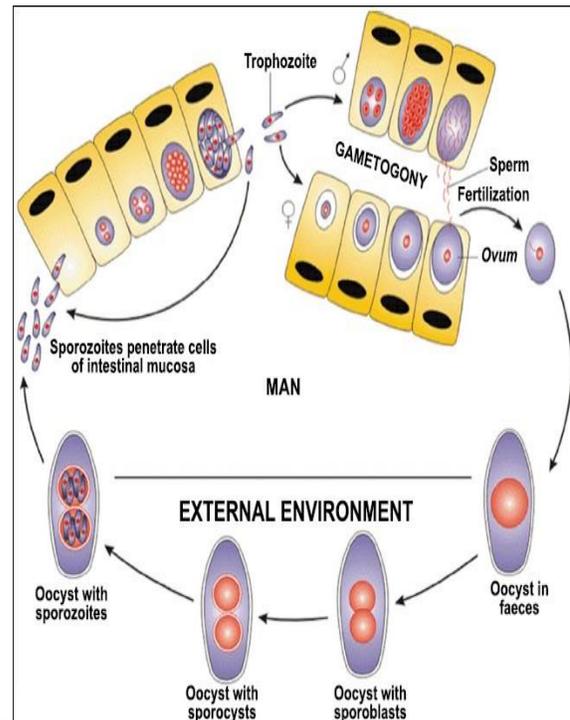
usually sexually happens in the primary host like malaria (human is the primary host and there is where the sexual reproduction occurs)

Life cycle:

they infect the small intestine, and the infection with these coccidia is by sporozoites, at the beginning we have an enlarged oocyst then divides into 2 sporocysts and each of them develops 4 sporozoites. (in total we will have 8 sporozoites) this happens in the external environment.

By eating sporocysts, the sporozoites will come out and invade the lining epithelial cells, start dividing within the cell and give rise to merozoites, that get out of the cell and go infect other ones. This is considered an **asexual multiplication**. Occasionally some sporozoites develop gametocytes, fuse and give rise to a **zygote**, that develops into an **oocyst** that is passed into the feces>>> **sexual reproduction**.

So sexual and asexual multiplication occurred within the same host which is the human being.



Pathogenesis of isospora:

The disease is usually **watery diarrhea**, it is not really significant because it's self-limited. But in *immune compromised people*, people who did *transplant* they

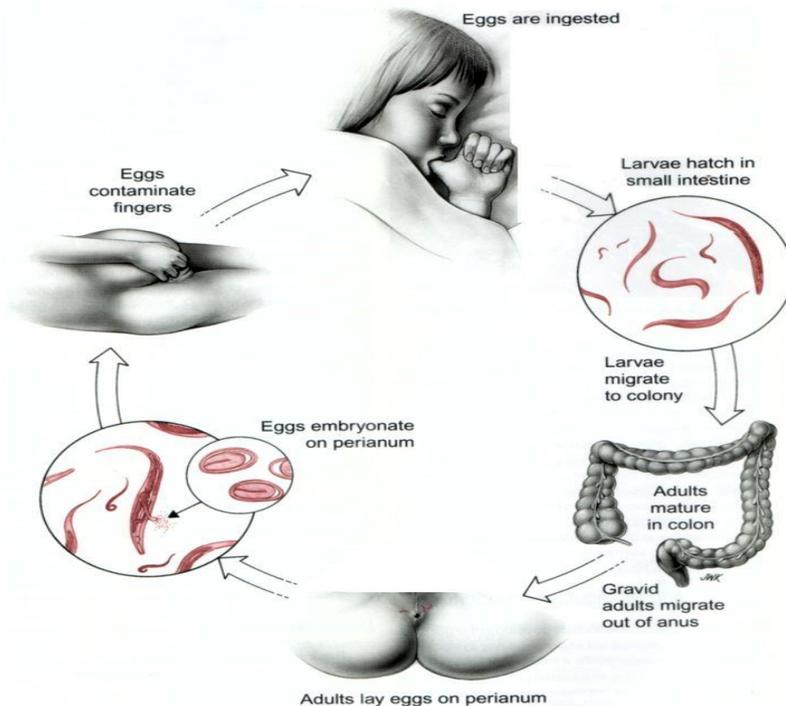
Symptoms :

It causes scratching, because of the movement of the worms around the anal skin and irritate the skin, it is mostly considered a **children's disease** . Has nothing to do with hygiene, because once a child at school gets this worm he can easily spread it. The worms can be noticed around the anus sometimes. Worms rarely present in the feces unless it is a heavy infection, otherwise it is normally found at the perianal skin. Nothing more than itching can occur, sometimes it can be very intense that is disturbs the child's sleep especially at night when changing clothes.

Transmission :

Scratching causes cutting of the eggs and become under their finger nails, so from their nails they can pass the eggs to others (mostly family members and friends at school) or again to themselves causing more worms in their body. It is not necessarily transmitted by feces, it can be by food ,shaking hands etc,, **there is no intermediate host.**

Enterobius vermicularis



Life cycle

Once the eggs are ingested they go to the small intestines, release the larvae (embryo) quickly become a mature worm and go to the large intestine, off to the anal skin.

Diagnosis:

By taking a sticky tape, the sticky surface of the tape and stick it on the perianal skin and take it off, by doing this the eggs on the skin become on the tape, put the tape on a glass slide and examine it.

Treatment:

One dose of mebendazole should be enough to kill all the worms, you should repeat the treatment with another dose 5-6 weeks later, because the first dose will kill the ones in the intestine but they still might have some under their nails causing re-infection, also giving a dose to the whole family would be better.

The sheet is over

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"you used to call me on my cellphone"

