



MICROBIOLOGY

DONE BY : Ferdous
Rababah

Lecture 4: Amebiasis and Giardiasis

Parasites : is an organism that lives on or in a host organism and gets its food from or at the expense of its host.

main classes of parasites:

- Protozoa : unicellular parasite
- metazoa : multicellular parasite , have some organs and can be seen by naked eye

Protozoa :are unicellular parasites, usually motile, multiply by asexual cycle and can induce GIT infections

The main protozoal human pathogen

Entamoeba histolytica/Giardia lamblia/Blantidium coli/Leishmania/Malaria/Toxoplasmosis

Trichomonas vaginalis

بهاي المحاضرة رح نحكي عن Giardia lamblia و Entamoeba histolytica

Amebas

أبسط أنواع ال protozoa

Amebas, are the most primitive of the protozoa

They multiply by simple binary fission (asexual cycle)

Move by means of cytoplasmic organelles called pseudopodia

بس ما عندها flagella

Several genera of amebas, including Entamoeba, Endolimax, and Iodamoeba, are obligate parasites of the human alimentary tract and are passed as cysts from host to host by the fecal–oral route

**قلنا اغلب ال microorganism اللي بتعمل GIT infection بتكون بتتنقل by the fecal–oral route

**طبعا كونه ال Entamoeba هي اللي فيهم بتعمل disease فهي اللي رح نحكي فيها اليوم *-*

Only *Entamoeba histolytica*, regularly produces disease; it has been recently subdivided into two morphologically identical but genetically distinct species:

1-an invasive pathogen that retains the species appellation "**histolytica**"

2-a commensal organism, now designated **E. dispar**

يعني لو اتطلع عليهم تحت ال microscope رح اشوفهم زي بعض بس لو عملت genetics study وشفنت ال DNA رح نلاقي اختلاف بينهم عكس انا بتهمني ال histolytica

Entamoeba histolytica

E. histolytica possesses both **trophozoite** and **cyst** forms

The trophozoites are:

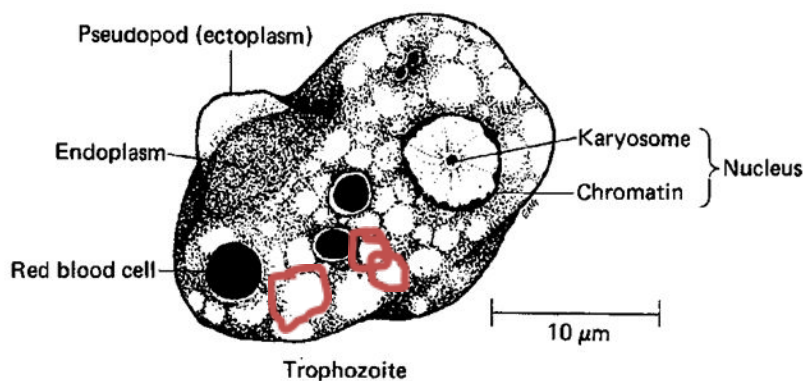
1-Microaerophilic (يعني بتحتاج كمية قليلة من الاكسجين وبتحتاج شوية CO₂)

2-Habitat in the lumen or wall of **the colon**

3-Feed on bacteria and tissue cells and **RBCs**

4-Multiply rapidly in the anaerobic environment of the gut

5-Morphology: their size (12 to 20 μm in diameter), directional motility, granular, vacuolated endoplasm and sharply demarcated, clear ectoplasm with finger-like pseudopods



شكلها irregular, وفيه الها pseudopods للحركة و endoplasm و vacuoles بالصورة محوطين بأحمر و nucleus عبارة عن :

(karyosome and chromatin) ولاحظوا كما ان انها 10 μm وطبعا هاي الصورة ل trophozoite مبتلعة RBC اللي باللون الاسود الغامق

The cyst form:

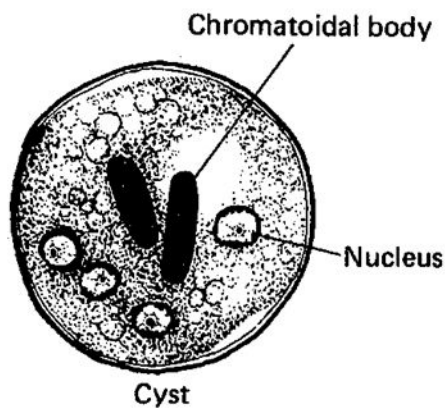
Trophozoites usually encyst before leaving the gut

Trophozoites بتضل تمشي بال intestine لحد مات قرب من اخر ال colon وبتطلع للبيئة الخارجية بتتحول ل cyst لانه هذا الشكل عنده القدرة يتحمل درجات الحرارة العالية, الرطوبة ,

Initially, a cyst contains a **single nucleus**, a **glycogen vacuole**, and one or more large, cigar-shaped ribosomal clusters known as **chromatoid bodies**

With maturation, the cyst becomes **quadrinucleate**, and the cytoplasmic inclusions are absorbed

شكلها regular round shape لاحظ ال chromatoid bodies شكلها زي السيجارة , وهي شكل ال mature cyst عرفت من وجود اربع nucleus وبرضو العضيات مختفية



Mature cysts can survive environmental temperatures up to **55°C, **chlorine concentrations normally found in municipal water supplies**, and **normal levels of gastric acid**

البلدية بالاردن بتلجأ لتعقيم المي بال chlorine وللأسف لو وصلتها ال cyst ما رح تموت فيها *-*, برضو كمان ما بتموت بال gastric acid يعني عندها القدرة تعيش بالمعدة

Life Cycle:

1-cyst are eaten ,from contaminated foods or drinks

2-then pass through stomach (remember that it can survive in normal levels of gastric acid)

3- cyst convert into trophozoite form in small intestine

4- when it reaches to large intestine it will convert again into cyst

5- released in feces ,and again it contaminate a foods or drinks and a cycle goes on .

التغيرات التي بتصير على ال cyst طول ال life cycle بالترتيب :

1-Mature cyst(4 nucleus , cromotoidal bodies)
2-every nuclei make a septum around it self
The process called **septation**
3- then it will divide into 4 cells
4- each cell will convert into trophozoite then it will release
5-then they will mature

NOTES

* each cyst will convert into 4 trophozoites

*the **transmission** form of *Entamoeba histolytica* is **CYST**, whereas the **invasive** form is **TROPHOZOITES**

Amebiasis may be :

1-Asymptomatic

2-Acute infection produce **intermittent diarrhea** with abdominal pain

خاصة اذا كانت high dose وأول مرة بتدخل الجسم

3-Chronic infection

Amebiasis can induce infection in

1-Intestine (most common)95%

2-Extra intestinal may spread to the **liver**, where an **abscess** is produced 5%

Epidemiology

E. histolytica* infection rates are higher in **warm climates, particularly in areas where the level of **sanitation is low**

*Although stool surveys indicate that 1 to 5% of the population harbors *Entamoeba*, the vast majority of these are now known to be colonized with the nonpathogenic *E. dispar*

بالبدائية حكو انه نسبة اللي انصابوا بال *Entamoeba histolytica* انها 1- 5% لكن بعدين اكتشفنا انه هاي النسبة أعلى من النسبة الحقيقية لأنه فيه *E. dispar* هيه تحت المجهر وال culture الها نفس خصائص *Entamoeba histolytica* ولكنها ما بتعمل أي مرض بجسمنا وأغلب اللي لقيناها بالدراسة كانوا *E. dispar* لهيك النسبة أعلى من الحقيقية

Symptomatic amebiasis is usually sporadic, the result of direct person-to-person fecal–oral spread under conditions of poor personal hygiene

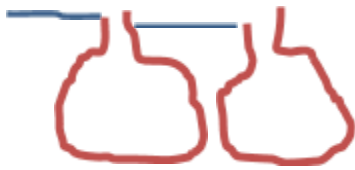
*Food- and water-borne spread occur, occasionally in epidemic form

Pathology:

كمختصر يتمسك ال Amebas بال epithelial cells بتبلش تعمل lyses فيها وبتعمل small ulcer وبتفتح لحالها فتحه صغيرة . وبتقوت من خلالها وبتضل تحفر بشكل عامودي لحي توصل ل ال submucosa بس توصلها بتبلش تحفر من الاطراف فبتعمل شكل زي الدورق هي واضح بالصورة تحت (مش رسمتي الصورة *-*) , طبعاً بتصير عندي منطقة necrotic ومنطقة normal

Trophozoites *** بتكون موجودة أكثر اشي بين المنطقة ال normal وال necrotic

اسمعو ا يعرف الرسمة بتشبهش الحقيقه بس بدي أوضح فكرة انه بتصير عندي منطقة necrotic ومنطقة normal



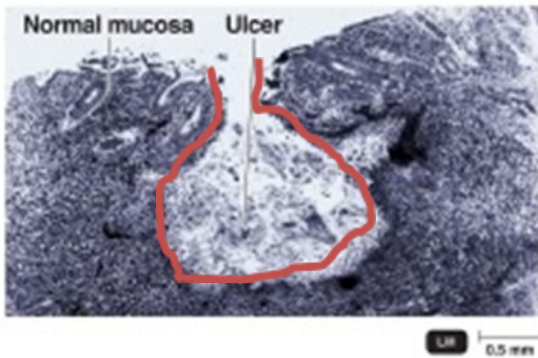
وبيناتهم (بين الخط الازرق والاحمر) هذا أكثر مكان بتكون فيه ال Trophozoites

1- Amebas contact and lyse colonic epithelial cells, producing small mucosal ulcerations

2- There is little inflammatory response other than edema and hyperemia, and the mucosa between ulcers appears normal.

*Trophozoites are present in large numbers at the junction **between necrotic and viable tissue** necrotic

3-Once the lesion penetrates below the superficial epithelium, it spreads laterally in the submucosa, producing a flask-like lesion with a narrow mucosal neck and a large submucosal body



**It eventually compromises the blood supply of the overlying mucosa, resulting in sloughing and a large necrotic ulcer necrotic ulcer ممكن تضغط على ال الشرايين اللي تحتها فهذا بسبب توسع ال

**Extensive ulceration leads to secondary bacterial infection, formation of granulation tissue, and fibrotic thickening of the colon

**The major sites of involvement, in order, are the cecum, ascending colon, rectum, sigmoid, appendix, and terminal ileum

احفظوهم بالترتيب ☺

**Amebas may also enter the portal circulation and be carried to the liver or, more rarely, to the lung, brain, or spleen. In these organs, liquefaction necrosis leads to the formation of abscess cavities

فيه عندي شروط لحتى توصل الاميبيا للكبد أو الدماغ انه لازم تكون كمية كبيرة من ال Amebas وتكون capable انها توصل the portal circulation وبرضو تكون مناعة الشخص كثير قليلة

الاعراض اللي بتظهر على المريض

1- كونه فيه عندي large necrotic ulcer فبتوقع أو لا انه يكون فيه bleeding بال stool و برضو severe abdominal pain

2- كونه فيه inflammation and irritation of colon فلهك ممكن يعمل diarrhea

Immunity:

*Although E. histolytica elicits both humoral and cellular immune responses in humans, it is still not clear to what degree these responses are capable of modulating initial infection or preventing reinfection

المناعة اللي بتتكون بتكون slow and variable يعني ممكن شخص تصير عنده مناعة من ال infection الثاني بينما شخص اخر ممكن من العاشر فبختلف من شخص لشخص

*Patients with invasive disease are known to produce high levels of circulating antibodies

*The susceptibility to invasive amebiasis of malnourished populations, pregnant women, steroid-treated individuals, indicates that cell-mediated immunity may be directly involved in the control of tissue invasion

Clinical Manifestation

Individuals who harbor E. histolytica are usually clinically well. In most cases, particularly in the temperate zones, the organism is avirulent, living in the bowel as a normal commensal inhabitant

Diarrhea, flatulence, and cramping abdominal pain are the most frequent complaints of symptomatic patients

The diarrhea is :

1-Intermittent, alternating with episodes of normality or constipation over a period of months to years

2-Consists of one to four loose to watery

3-Foul-smelling passages that contain mucus and blood

Physical findings are limited to abdominal tenderness localized to the hepatic, ascending colonic, and cecal areas

*Approximately 5% of all patients with symptomatic amebiasis present with a liver abscess

*Life-threatening manifestations are: hemorrhage, perforation, appendicitis, and tumorlike growths, amebomas

*Severe forms of disease result in 10% fatality rate

Diagnosis:

*The microscopic diagnosis of intestinal amebiasis depends on the identification of the organism in stool or sigmoidoscopic aspirates

بنطلب عينة stool وبنحطها تحت المجهر وبنشوفها وبالأغلب بتكون cyst form لانه هي بتطلع مع ال stool

*If trophozoites or cysts are seen, they must be carefully differentiated from those of the commensal parasites, particularly E. hartmanni and E. coli

E. histolytica trophozoites can be differentiated from those of E. dispar only by the presence of ingested erythrocytes; the cysts appear identical.

إذا شفتنا trophozoites or cysts لازم نتأكد انها E. histolytica مش E. coli , E. hartmanni , (E. dispar) , إذا شفتها مبتلعه RBCs فهذا بأكدلي انها E. histolytica إذا ما كان فيه RBCs بدي اضطر أعمل genetic studies حتى اميز بينهم أو بطلب يعمل specific stool antigen tests أو عن طريق cultural and polymerase chain reaction techniques

**Recently, sensitive and specific stool antigen tests (e.g. Enzyme immunoassay) for E. histolytica have become commercially available; their value in the clinical diagnosis of amebiasis, when compared to microscopic examination, is now clear

**Although cultural and polymerase chain reaction techniques are somewhat more sensitive, they are not widely available in most clinical laboratories

*The diagnosis of extraintestinal amebiasis is more difficult. Serologic tests are therefore of paramount importance. Typically, results are negative in asymptomatic patients, suggesting that tissue invasion is required for antibody production

**Most patients with symptomatic intestinal disease and more than 90% with hepatic abscess have high levels of antibodies

*Indirect hemagglutination test and EIA are the most sensitive. Several rapid tests, including latex agglutination, agar diffusion, and counter immunoelectrophoresis, are available to smaller laboratories

يعني انا بس خذت عينة من ال stool وشفنت بعد ال diagnosis انها E. histolytica فهذا يثبتلي انه عنده اياها بال intestine لكن هل هي طلعت من ال intestine ووصلت ل liver فهذا يثبتته :

1- أما عن طريق ال imagination by using ultrasound بشوف عنده hepatic abscesses بس ما بقدر يثبتلي ايش سببه

2- Serologic tests بساعدني اعرف كيف ؟ كل ما كان ال levels of antibodies اعلى فهذا بدل انه عنده hepatic invasion

3- aspiration under radiology guidance يعني بحط المريض تحت ال radiation وبشوف وين فيه abscess وبسحبهم وبشوفهم تحت ال microscope اذا لقيت trophozoites or cysts بعملمهم antigen test وهيك بتأكد انه صار الهم hepatic invasion

Treatment is directed toward

1- Relief of symptoms

2- Blood and fluid replacement

3- Eradication of the organism

**The need to eliminate the parasite in asymptomatic carriers remains uncertain

بس الدكتور حكى انه بنصحنا نعطي المريض دواء حتى لو كان asymptomatic carriers عشان ما يصير عندي complication أو يعمل infection to other people

The drug of choice for eradication is metronidazole. It is effective against all forms of amebiasis, but should be combined with a second agent, such as paromomycin, and

chloroquine, to improve cure rates in intestinal disease and diminish the chance of recrudescence in hepatic amebiasis

Prevention

Because the disease is transmitted by the fecal–oral route, efforts should be directed toward sanitary disposal of human feces and improvement in personal hygienic practices

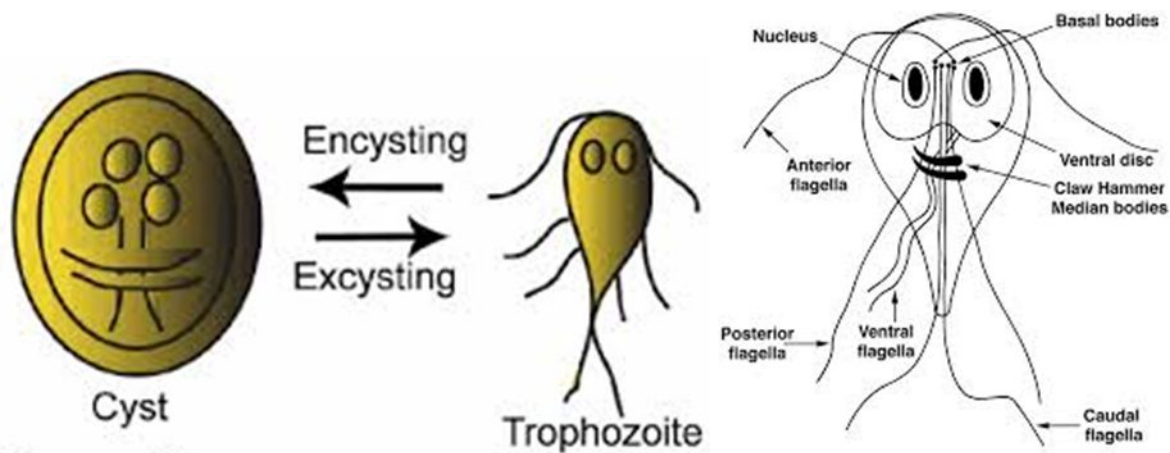
هناك نوعين من *Entamoeba histolytica* والتي هي *Giardia* وأشهر نوع منها هو :

Giardia lamblia

Giardia possesses both a trophozoite and a cyst form. It is a sting-ray–shaped trophozoite. When viewed from the top, the organism’s two nuclei and central parabasal bodies give it the appearance of a face with two eyes and a crooked mouth.

Four pairs of flagella—anterior, lateral, ventral, and posterior—reinforce this image by suggesting the presence of hair and chin whiskers.

صح عندها trophozoite and a cyst form لكن الشكل والخصائص تختلف تماما ال trophozoite يكون شكلها زي الكمثرى وعندها two nuclei يعطوها شكل زي العينين ويرضو 2 parabasal bodies بعملو شكل فم وعندها Four pairs of flagella فبصير شكلها زي الطائفة الورقية او الوجه الباسم أو البومة بينما شكل ال cyst يشبه ال *E. histolytica* عندها 4 nuclei والتي يميزها عنها انه فيه 2 parabasal bodies



These distinctive parasites reside in the duodenum and jejunum, هناك كان بالقولون where they thrive in the alkaline environment and absorb nutrients from the intestinal tract. They move about the unstirred mucous layer at the base of the microvilli with a peculiar tumbling or “falling leaf” motility.

Cystic forms develop in colon - the infective form of the parasite, may survive in cold water for more than 2 months and are resistant to concentrations of chlorine generally used in municipal water systems. They are transmitted from host to host by the fecal-oral route

Giardiasis

Giardiasis, an intestinal infection acquired from untreated water sources, is most often symptomatic. When disease occurs, it is in the form of a diarrhea lasting up to 4 weeks with foul-smelling, greasy stools. Abdominal pain, nausea, and vomiting are also present.

Epidemiology

*Giardiasis has a cosmopolitan distribution; its prevalence is highest in areas with poor sanitation and among populations unable to maintain adequate personal hygiene, IgA deficiency and high attack rates in day-care centers. In developing countries, infection rates may reach 25 to 30%.

*Water-borne and, less frequently, food-borne transmission of *G. lamblia* has also been documented.

Pathogenesis

Disease manifestations appear related to intestinal malabsorption, particularly of fat & carbohydrates. Disaccharidase deficiency with lactose intolerance, altered levels of intestinal peptidases, and decreased vitamin B12 absorption have been demonstrated.

Mechanical blockade of the intestinal mucosa, damage to the brush border of the microvilli, organism-induced deconjugation of bile salts, altered intestinal motility, accelerated turnover of mucosal epithelium, and mucosal invasion have all been suggested.

Immunity

Susceptibility to Giardiasis has been related to several factors:

1- strain virulence, 2-inoculum size, 3- achlorhydria or hypochlorhydria, 4- immunologic abnormalities.

Animal studies have demonstrated that Giardia-specific, secretory IgA antibodies inhibit attachment of trophozoites to intestinal epithelium. Moreover, antitrophozoite IgM or IgG antibodies, plus complement, are known to be capable of killing Giardia trophozoites.

Clinical Manifestations

In endemic situations, over two thirds of infected patients are asymptomatic.

1-Symptoms begin 1 to 3 weeks after exposure; they typically include diarrhea, which is sudden in onset and explosive in character.

2-The stool is foul smelling, greasy in appearance, and floats on water. It is devoid of blood or mucus.

عشا ما عنده ulcer لهيك ما عنده .blood or mucus

3-Upper abdominal cramping is common. Large quantities of intestinal gas produce abdominal distention, sulfuric eructations, and abundant flatus.

4-Nausea, vomiting, and low-grade fever **may be** present.

**The acute illness generally resolves in 1 to 4 weeks; in children, however, it may persist for months, leading to significant malabsorption, weight loss, and malnutrition.

**Subacute or chronic phase characterized by intermittent bouts of mushy stools, flatulence, and “heartburn” and weight loss that persist for weeks or months.

بالاسابيع الاولى بتكون acute illness اما جهاز المناعة بتغلب عليها بس اذا لا بتضل موجودة بس حدة الاعراض بتقل

لقدام بصير يظهر عليها malabsorption symptoms

Diagnosis

*The diagnosis is made by finding the cyst in formed stool or the trophozoite in diarrheal stools, duodenal secretions, or jejunal biopsy specimens.

*In acutely symptomatic patients, the parasite can usually be demonstrated by examining one to **three stool specimens**, providing appropriate procedures are used.

*EIAs detect Giardia Ag (sensitive and specific) in stool.

Treatment

Four drugs are currently available : **quinacrine hydrochloride, metronidazole, furazolidone, and paromomycin.**

*****First line is metronidazole and Tinidazole**

Entamoeba و Giardia لى 7 أيام لل metronidazole بنعطيه ***Tinidazole in single-dose لكن بنعطيه 3 أيام لل histolytica

Quinacrine and metronidazole are somewhat more effective (70 to 95%). Tinidazole, an oral agent is safe and effective in single-dose treatment.

Because of the potential of giardiasis for person-to-person spread, it is important to examine and, if necessary, treat close physical contacts.

None of the aforementioned agents should be used in pregnant women because of their potential **teratogenicity**. **Paromomycin**, a non-absorbed but somewhat less effective agent, may be used in this circumstance.

Prevention:

*Avoid ingestion of untreated surface water, even in remote areas, because of the possibility of contamination by feces of infected animals.

*Adequate disinfection can be accomplished with halogen tablets yielding concentrations higher than that generally achieved in municipal water systems. The safety of the latter results from additional flocculation and filtration procedures

عشانو بنتقل بالمى لازم اتأكد انه مصدرى للمى نضيف ومعقم اما بالغليان او halogen, لازم برضو الحكومة نتأكد من نضافة المى اللى بتوصل للمواطنين

Thank you