



TEAM443
MICROBIOLOGY

Intestinal protozoa

Dr. Mona & Ibrahim



Objectives

NO objectives were found

Any future corrections will be in the editing file, so
please check it frequently

Color Index:
Main text
Important
Doctor Notes
Males slide
Females slide
Extra



Introduction to intestinal parasites

Classifications of Parasites

Class	Protozoa	Helminths
Features	<ul style="list-style-type: none"> ○ Unicellular ○ Single cell for all functions <p>No sexual stage, replicate by binary fission</p>	<ul style="list-style-type: none"> ○ Multicellular ○ Specialized cells <p>-They are like human, have systems: Respiratory, Reproductive..</p> <p>-As long as there is reproductive system so there will be sexual stage in their life cycle</p>
Types	<ol style="list-style-type: none"> Amoebae: move by pseudopodia Flagellates: move by flagella Ciliates: move by cilia Apicomplexa (Sporozoa) tissue parasites 	<ol style="list-style-type: none"> Roundworms (Nematodes): <ul style="list-style-type: none"> - Elongated, cylindrical, unsegmented Flat worms <ul style="list-style-type: none"> - Trematodes: leaf-like, unsegmented - Cestodes: tape-like, segmented <p>○ Mnemonic: trematodes = tree = leaf like Cestodes = cm = tape</p>



Giardia. lamblia

Giardia. lamblia

- Giardia lamblia is flagellated **protozoan parasite capable of** causing sporadic (one case in one area) or epidemic (many cases in one area) diarrheal illness. Especially in children but it's self-limiting, unless in immunocompromised.
- **Giardiasis is an important cause of** waterborne and foodborne disease, daycare center outbreaks, and illness in international travelers. So, this disease comes from hand to food or water contaminated with fecal product.
- Giardiasis is especially common in areas with poor sanitary conditions and limited water-treatment facilities, Water is a major source of giardiasis transmission.

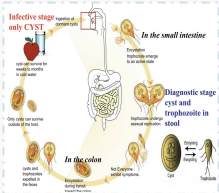
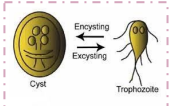
★ Giardia have two forms (Stage)

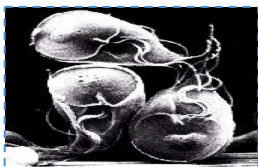
Cysts (inside shell)	Trophozoites
<p>★ Infectious & diagnostic stage</p> <ul style="list-style-type: none"> - Resists gastric acidity (this is why it's the infectious stage) - Survives the environment - Multinucleated - infections have an incubation of a week or more before symptoms of acute giardiasis may develop - even though it's the infectious stage. but, it does NOT cause the disease at all, the disease start from the Trophozoites stage 	<ul style="list-style-type: none"> - Replicative & diagnostic stage (NOT infectious because if it can't survive from the gastric acidity without the shell) - Can't resist gastric acidity - Can't Survive the environment - Pear-shaped - 2 nuclei & adhesive disc - Multi-flagellated (8) - it's the pathogenic organism



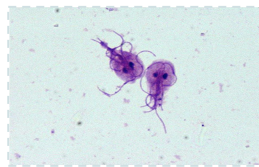
Giardia. lamblia

Giardia. lamblia

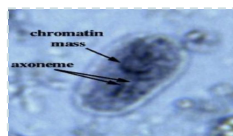
<p>Life cycle</p> 	<ul style="list-style-type: none"> ○ Giardiasis is transmitted via the fecal-oral route by ingestion of Cyst (the infective stage). These cyst resist acidity of stomach (the shell protect hir) & pass to the duodenum where excystation (shell ال تشلج) take place to become trophozoites → trophozoites can multiply by binary fission and responsible for causing the disease → after one week incubation period symptoms started as diarrhea, vomiting, excessive gas & loss of appetite especially in children ○ Some of the cysts can pass into stool -to infect other people-, other trophozoites then move towards the colon and some transform back into cysts (encystation). These cysts can stay infectious in the environment for more than 3 months ○ In short: Cyst ingestion → Excystation in duodenum (Cyst becomes Trophozoite) → Trophozoite replicate & causes local disease in duodenum → Encystation in colon (Trophozoite becomes Cyst) → Excretion in the stool as cyst or trophozoite. 
<p>Localization</p>	<p>Trophozoites are localize & attached to the mucosal surface of the ★duodenum, but trophozoite does not invade the mucosal epithelium. -infect the cilia of the duodenum only-</p>
<p>Clinical manifestations</p>	<ul style="list-style-type: none"> ○ It is mainly an asymptomatic infection that occurs in both children and adults. ○ Asymptomatic cyst & trophozoites shedding can last six months or more. ○ If symptoms occur, they include diarrhea, malaise, abdominal cramps, flatulence, weight loss & vomiting.
<p>Complication</p>	<ul style="list-style-type: none"> ○ In a small number of patients persistent infection is associated with development of malabsorption and weight loss ○ Chronic giardiasis may affect growth and development in children.
<p>Diagnosis</p>	<ul style="list-style-type: none"> ○ Stool examination: <ul style="list-style-type: none"> - Antigen detection assays: a number of immunoassays using antibodies against cysts or trophozoites antigens have been developed for stool analysis. - Microscopy for cysts & trophozoites. ○ Examination of duodenal contents for trophozoites. ★ Note that: infective stage: Cyst only but Diagnostic stage: both Cyst & Trophozoite in stool
<p>Treatment</p>	<ul style="list-style-type: none"> ○ Chemotherapy ★ Drug of choice is Metronidazole



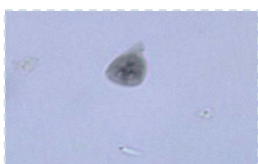
Giardia trophozoites (electron microscopy)



Giardia trophozoites (Trichrome stain)



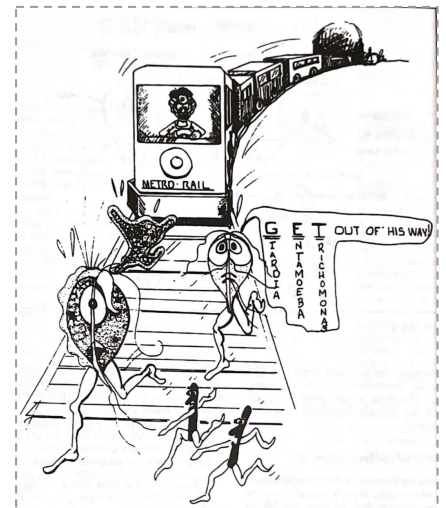
Giardia Cyst (Light Microscopy)



Giardia trophozoites (Light Microscopy)



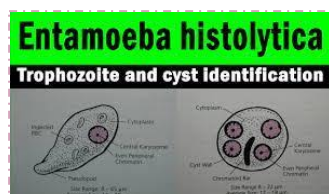
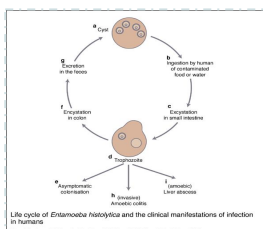
Giardia trophozoites in tissue section



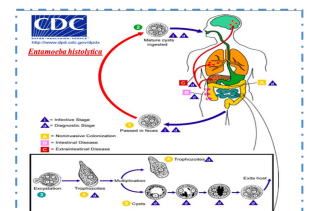


Entamoeba Histolytica

Entamoeba Histolytica	
Overview	<ul style="list-style-type: none"> ○ Amebiasis occurs worldwide; the prevalence is increased in developing (tropical) countries because of poor socioeconomic conditions and sanitation levels. ○ 500 million people are infected. ○ 100,000 deaths per year. ○ It is a waterborne infection, there is pathogenic and non-pathogenic strains, but we can't distinguish between them by microscopic examination, e.g. E.Histolytica & E.dispar
Species	<p>There are 6 species of Entamoeba:</p> <ul style="list-style-type: none"> - E.Histolytica amoebae are (pathogenic & invasive). - E.dispar is non-pathogenic, non-invasive form. - E.coli - E.gingivalis - E.hartmanni - E.polecki
Forms	<p>Cysts</p> <ul style="list-style-type: none"> - Infective and diagnostic stage - Resists the stomach acidity. - Resists the harsh conditions of the environment.
	<p>Trophozoites</p> <ul style="list-style-type: none"> - Vegetative and diagnostic stage - Causes invasive disease. - Fragile structure. - Can not survive in the environment so must encyst to survive but it's responsible to cause the disease
Life Cycle	<p>The cysts pass through the stomach & resist gastric acidity → to the small intestine, where they excyst to form trophozoites → The trophozoites can invade & penetrate the mucous barrier of the colon → causing tissue destruction colitis and increased intestinal secretion and can thereby ultimately lead to bloody diarrhea with mucus.* (so, it's more dangerous than Giardia)</p> <p>⊙ Excystation occurs in the lower region of the small intestine with production of trophozoites which enter the large intestine and may:</p> <ol style="list-style-type: none"> 1. invade the tissue and cause complication as flask shaped ulcer, intestinal perforation of large intestine. 2. live in the lumen of large intestine without invasion, and become carrier passing cysts in the stool (encystation). 3. extra-intestinal invasion to the liver (mainly) and brain or lung.
Mode of infection	<ul style="list-style-type: none"> ○ Fecal-oral route: water and food. ○ Flies can act as a vector of transmission. ○ Not a zoonosis (can not be transmitted from animal to human) ○ The infective dose can be as little as 1 cyst (highly virulent organism). ○ The incubation period can be from few days to few weeks depending on the infective dose. ○ If the TROPHOZOITE is ingested it disintegrates in the stomach without producing infection. ○ Only the Cysts can survive in the outside environment for weeks at appropriate temperature and humidity after excreted from stool of infected patients or carrier.



Stained	Entamoeba coli	Entamoeba histolytica	Disinfectants	Entamoeba histolytica	Entamoeba dispar	Entamoeba histolytica
Optimum pH	7.5-8.5	6.5-7.5	Disinfectants	Disinfectants	Disinfectants	Disinfectants
Water characteristics	Thick	Thin	Thick	Very delicate	Delicate	Delicate
Morphology	Thick	Thin	Thick	Very delicate	Delicate	Delicate
Characteristics membrane	Coarse	None	Smooth granular	None	Fine granules	None
Karyosome	Coarse, granular	Large	Large	Central granules	Small central	Small central
Flagellum	May be observed	None	None	None	None	None
Pathogenicity	Non-pathogenic	Pathogenic	Pathogenic	Pathogenic	Pathogenic	Pathogenic



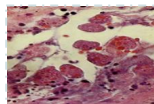
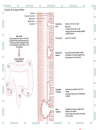
* We can see bloody & mucus diarrhea either in Shigella (bacteria) OR here in Entamoeba (parasite). Also, they have the same clinical picture but we can distinguish between them from the lab examination



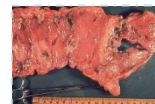
Entamoeba Histolytica

Entamoeba Histolytica

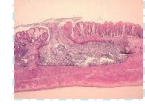
Infection Outcomes	Symptomatic	intestinal (Amoebic dysentery), extraintestinal
	Asymptomatic	carrier
Clinical manifestations	<p>The majority of entamoeba infections are asymptomatic, but some have symptoms which range from:</p> <ol style="list-style-type: none"> 1. Mild diarrhea to severe amebic dysentery (it mean: diarrhea with visible blood and mucus in stools) producing abdominal pain, bloody diarrhea, and bloody/mucous stools. 2. fulminant amebic colitis. (Fulminant colitis with bowel necrosis leading to perforation, and peritonitis has been observed in approximately 0.5 % of cases) 3. Weight loss occurs in about half of patients, fever. 	
Intestinal amoebiasis (acute amoebic dysentery)	<ul style="list-style-type: none"> ○ Trophozoite has the ability to hydrolyze host tissues with their active enzymes -to make the invasion process easier- present on the surface membrane of the trophozoite, also trophozoite has the ability to ingest blood cells. ○ The presenting symptom is diarrhea which is accompanied by blood, mucus, and sometimes tenesmus ★ 	
Extra-Intestinal amoebiasis	<p>- The complication is mentioned previously</p> <p>A 30-year-old male experienced diarrhea for two weeks with fever of 39° C, nausea, vomiting, malaise & right upper abdominal pain. Physical examination revealed hepatomegaly 6cm below the right costal margin. CT scan showed a single hypodense mass in the right lobe of 7.8 x 5.2cm, round, with well defined borders. Serology was positive for Entamoeba histolytica at 1/512. Amebic liver abscess was diagnosed. Amebic liver abscess was diagnosed</p>	
Complications	<p>Lesions are found mainly in the colon and they may heal or cause serious complications:</p> <ol style="list-style-type: none"> 1. Perforation of the colon → flask shaped ulcer (characteristic) in large intestine, this may lead to peritonitis that can lead to death. 2. Severe intestinal hemorrhage or rarely perforation may occur in cecum, appendix or colon. 3. Ameboma: Granulomatous mass obstructing the bowel (mass around the amoeba which looks like tumor) 4. Blood invasion; Amoebic liver abscess (mass), lung, brain. (as an extra-intestinal amoebiasis complication) 5. Direct extension 	
Diagnosis Dr: by CT-scan	<p>➔ Intestinal:</p> <ul style="list-style-type: none"> ○ Stool Examination (Microscopy): <ol style="list-style-type: none"> 1. presence of ingested RBCs in the trophozoites is characterized feature of amebiasis 2. Wet mount (cysts and trophozoites) 3. Concentration methods (only cysts) ○ Antigen detection (Serology):(Mainly for invasive infections): IHA, ELISA ○ Molecular testing: detection of parasitic DNA or RNA in feces via probes, can also be used to diagnose amoebic infection & to differentiate between the different strains. ○ Colonoscopy with biopsy and histological examination. <p>➔ Extra-intestinal:</p> <ul style="list-style-type: none"> ○ Serology: IHA, ELISA. ○ Surgical aspirate (needle aspiration not done as a diagnostic procedure due to risk of extension): to look for Trophozoite ○ Radiological examination. ○ Sigmoidoscopy and/or colonoscopy and taking biopsy: Trophozoite. 	
Treatment	<ul style="list-style-type: none"> ○ Intestinal: <ol style="list-style-type: none"> 1. Asymptomatic (cysts only): diloxanide furoate (Furamide). 2. Symptomatic (cysts and trophozoites): Metronidazole (same as giardia) ○ Extra-intestinal: Metronidazole. 	



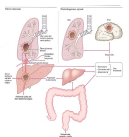
E.Histolytica in mucosa Numerous trophozoites can be seen with ingested erythrocytes



Intestinal perforation



Flask shaped ulcer in large intestine

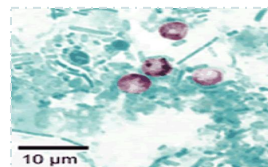
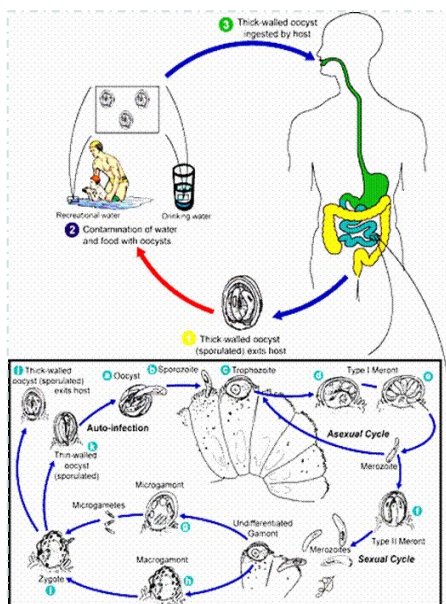




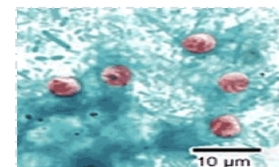
Cryptosporidium Parvum

Cryptosporidium Parvum

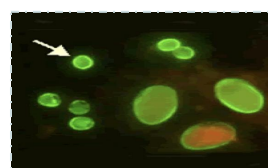
<p>Overview</p>	<p>An intracellular protozoan parasite that is associated with:</p> <ul style="list-style-type: none"> ○ Self-limited diarrhea in normal individual immunocompetent hosts. ○ Can cause Severe debilitating diarrhea with weight loss and malabsorption in ★immunocompromised patients (AIDS patients and those undergoing immunosuppressive therapy like cancer patient). In these patients infection may not be self-limiting, leading to dehydration, severe diarrhea & in severe cases, death. ○ So, it causes NO infection, but only in immunocompromised patients. “Opportunistic infection”
<p>Mode of transmission</p>	<ul style="list-style-type: none"> ○ Infection is caused by ingestion of sporulated oocysts (infective stage) ○ Spread from an infected person or animal by fecal-oral route. (unlike entamoeba histolytica) ○ From a contaminated environment, such as food or water source contamination.
<p>Diagnosis</p>	<ul style="list-style-type: none"> ○ Cryptosporidium species cannot be cultivated in vitro - ما نزرعه-. So when doctors do all the investigation and find them all negative, then find the oocyst on the stool, immediately know that it's cryptosporidium. So, diagnosis of cryptosporidiosis is generally based upon microscopy and Ag detection in stools. ○ From stool oocysts in: <ol style="list-style-type: none"> 1. Feces when using modified Acid-fast stain (Ziehl-Neelsen (ZN)) same as TB 2. Antigen detection by using ELISA, IF. ○ Duodenal aspirates, Bile secretions & biopsies from affected gastrointestinal tissue: <ol style="list-style-type: none"> 1. Polymerase Chain Reaction (PCR) 2. Enzyme immunoassays: (ELSA) & IF.
<p>Treatment & Prevention</p>	<ul style="list-style-type: none"> ○ Prevention: Hygiene is the most effective way to combat this difficult-to-prevent parasite. ○ Treatment <ul style="list-style-type: none"> - Self limited in immunocompetent patients - In AIDS patients: Paromomycin



Cryptosporidium oocyst in feces by stain modified acid-fast stain ZN



Cryptosporidium, safranin Ziehl-Neelsen



Crypto-Giardia FAT IF



Crypto-Giardia: Ag detection test in stools



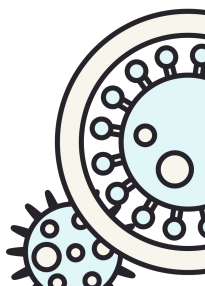
Summary

Parasite	Giardia. lamblia	Entamoeba Histolytica	Cryptosporidium Parvum
Transmission	Fecal-oral route (from contaminated food or water)	Fecal-oral route (from water & food)	Fecal-oral route (from infected person or animal)
Life cycle	<ul style="list-style-type: none"> ○ Infective stage: Cyst ○ Diagnostic stage: Cyst & Trophozoites ○ Replicative stage & pathogenic organism: Trophozoites ○ Excystation (transforming to Trophozoites) happened in duodenum ○ Trophozoites does NOT invade the mucosal) 	<ul style="list-style-type: none"> ○ Infective stage: Cyst ○ Diagnostic stage: Cyst & Trophozoites ○ Vegetative stage: Trophozoites ○ Excystation (transforming to Trophozoites) happened in lower region of the small intestine ○ Trophozoites invade & penetrate the mucous barrier of the colon 	Infective stage: sporulated oocysts
Clinical Picture	Watery diarrhea & loss of appetite especially in children	<ul style="list-style-type: none"> ○ Trophozoite has the ability to ingest blood cells. ○ Amebic dysentery (bloody & mucus diarrhea) ○ Intestinal: flask shaped ulcer in large intestine ○ Extraintestinal invasion: liver 	Severe debilitating diarrhea in immunocompromised (AIDS)
Treatment	★ Metronidazole		-



For Anki flashcards

Special thanks to Shaden alhazzani





MCQs

Q1 - duodenal aspirate is a good specimen for diagnosis of:

A- giardiasis B- teniasis C- amoebic dysentery D- cvsticercosis

Q2 - Liver abscess is known complication of:

A-Giardia Lamblia B- fasciola hepatica C- schistosoma mansoni D- Entamoeba histolytica

Q3 - The patient came to the ER and presented with bloody diarrhea with mucus. Which of the following can cause this clinical manifestation?

A- sporulated oocysts B- Giardia Lamblia C- Entamoeba histolytica D-Cryptosporidium Parvum

Q4 - What is the complication of chronic giardiasis in children?

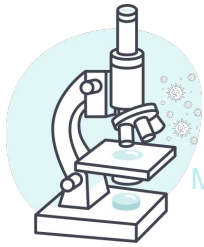
A- Stunted growth B- Hair loss C- Weight gain D- Asymptomatic

Q5 - What is the pathogenic specie of entamoeba?

A- Dispar B- Coli C- Hartmanni D- Histolytica

Q6 - What is the transmission of cryptosporidium?

A- Sexual contact B- Fecal-oral C- Oral-oral D- Animals



TEAM 443
MICROBIOLOGY

Team leaders

Aishah Boureggah Aroub Almahmoud Maryam Alghannam Nazmi M Alqutub

Team Members

Mohammd Alqutub

Raghad Almuslih

Khalid Alsobei

 Afnan Alahmari

Lama Alotabi

Wajd Almutairi

Sultan Albaqami

Zahra Alhazmi

Nourah Alarifi

Moath Alhudaif

Almas Almutari

Sarah Alajaji

Aban Basfar

Reema Almotairi

Alhawraa Alawami

Mohammed Alarfaj

Reema Algarni

Shahad Alzaid

Faris Alzahrani

Farah Abukhalaf

Danah Almuhausen

Abdulrahman Almusallam

Remaz Almahmoud

Areej Alquraini

Zeyad Alotaibi

Aleen Alkulyah

Layan Al-Ruwaili

Luay Alhudaithy

Rafan Alhazzani

Haya Alzeer

Nazmi A Alqutub

 Reuf Alahmari

Raseel Almutairi

Rahaf Alshowihi

Reena Alsadoni