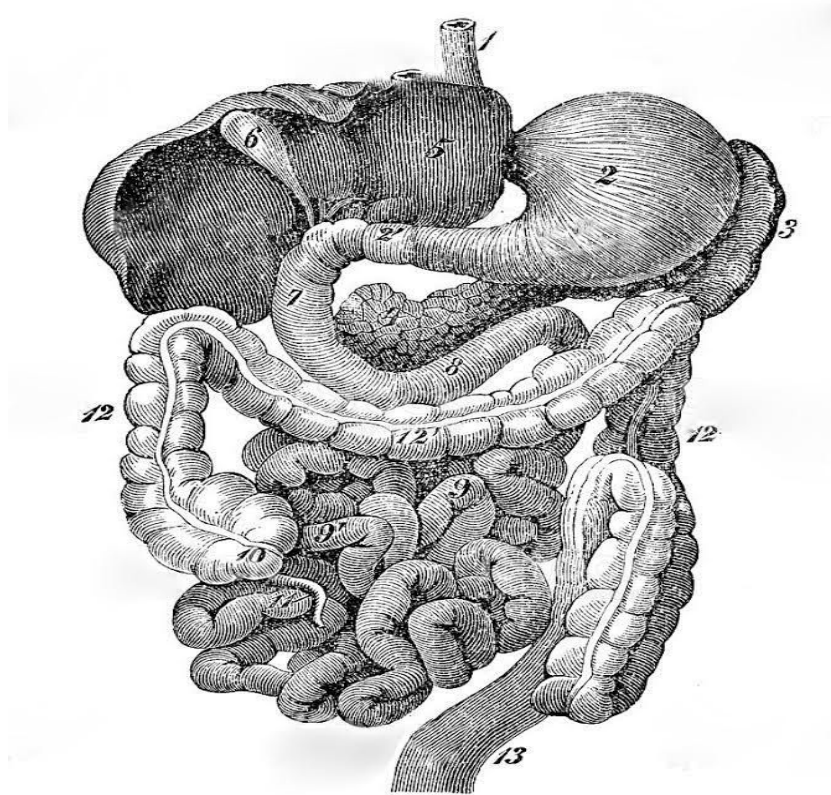


# Microbiology

435's Teamwork  
GastroIntestinal & Nutrition Block



- Kindly check our [Editing File](#) before studying the document.
- Please contact the team leaders for any suggestion, question or correction.
- Pay attention to the statements highlighted in **red**.
- Extra explanations are added for your understanding in **grey**.
- **Footnotes color code:** General | **Females** | **Males**.
- **color code:** **Female's notes** | **Male's notes**.

Revised by  
خولة العماري & هشام الغفيلي



# Intestinal protozoa

**Resources:** Foundation Block is enough to give prior knowledge for this block,...

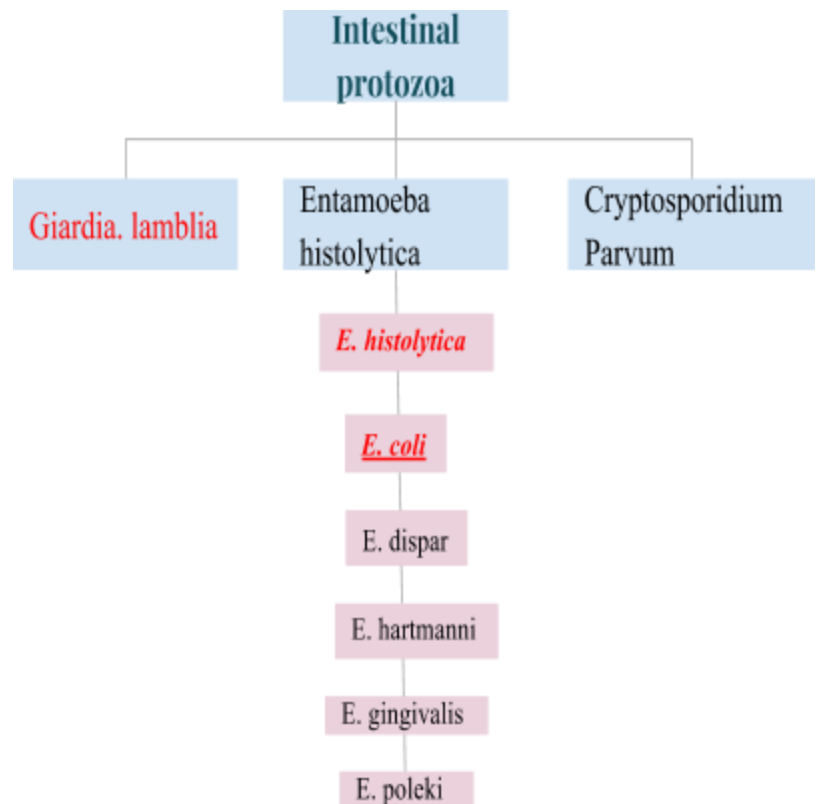
## Learning Objectives:

**By the end of this lecture, you should know the...**

1. Know morphology of cysts and trophozoites of Giardia lamblia parasites
2. Describe life cycle of Giardia parasites
3. Describe Giardia trophozoites in tissue sections
4. Discuss the clinical picture of Giardia parasites (Typical and Atypical).
5. How to diagnose Giardia in the labs
6. Know the chemotherapy against Giardia parasites.
7. Summarize general features of Intestinal Entamoebae.
8. Know the six types of Entamoebae.
9. Compare between E. histolytica and E. dispar.
10. Describe Life cycle of E. histolytica
11. Discuss Pathology of E. histolytica (intestinal and extra-intestinal).
12. Diagnosis and treatment of Amoebae
13. Life cycle of Cryptosporidium and diagnosis

## Lecture Outline:

PROTOZOA
<p><b>Unicellular</b> Single cell for all functions</p>
<p>1:Amoebae: move by pseudopodia. الأقدام الكاذبة</p> <p>2:Flagellates: move by flagella.</p> <p>3:Ciliates: move by cilia</p> <p>4:Apicomplexa (Sporozoa) tissue parasites ثابتة لا تتحرك إلا بحركة الأشياء داخل الجسم</p>



# Giardia Lamblia

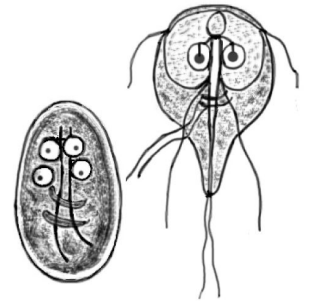
**Giardia Lamblia:** It is a **protozoan parasite** capable of causing **sporadic** or **epidemic diarrheal** illness.

## Giardiasis<sup>1</sup>:

- Remember here we do (NOT) have eggs we have cysts and trophozoite
- Water is a major source of giardiasis transmission

## Giardia Lamblia Life Cycle:

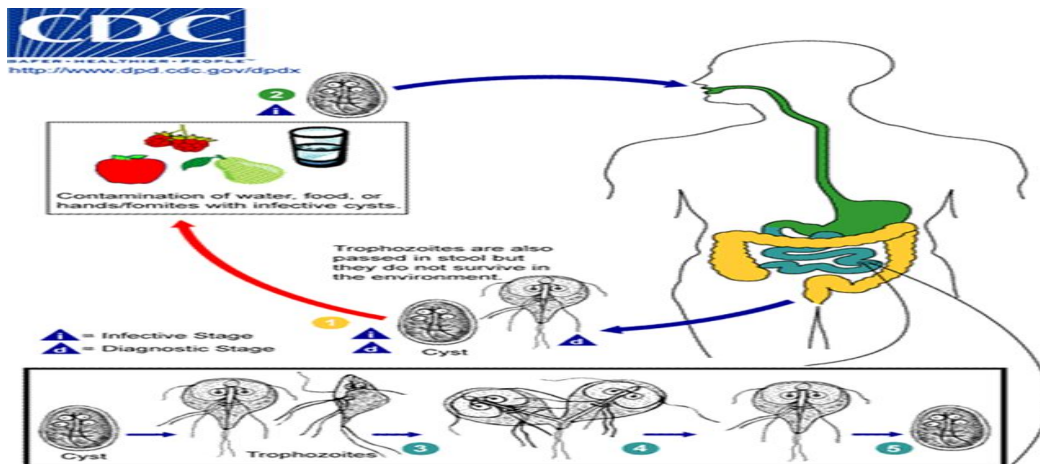
Infective stage	Diagnostic stage	Replicative (vegetative) stage
Cyst	Cyst & Trophozoite	Trophozoite



It has two forms: أليارديا لامبليا فيها سيست و تروفوزويت شو الفرق بيناتهم؟

السست هي نفسها التروفوزويت بس تقولها تعالي انتي لو طلعتي برا لحالك تموتي ماتعرفي تعيشي لا في الستوماك ولا في ظروف البيئة الصعبة فتعالي أنا ألك و أخبيك فيلبسها كوت و تسير سيست فيعني هي نفسها بس قاعدة جوات سيست

- **Cyst stage:** (the infectious stage)<sup>2</sup> → Excreted in stool because it resist the acidity يساعدها على البقاء حية خارج الجسم
- **Trophozoite stage:** pear shaped, binucleate, multi-flagellated parasite forms capable of division by binary



شكلها داخل الجسم ولا تستطيع النجاة به خارج الجسم. fission.

**-Important-** Cyst ingestion → eXocystation (in the small intestines) → release of trophozoites → trophozoites attaches to the mucosal surface of duodenum and jejunum (but not the mucosal epithelium)

*Note that after cyst ingestion, infections have an incubation period of a week or more before symptoms of acute giardiasis may develop.*

If I drank water or ate vegetables (not properly washed) contaminated with cyst, it will go to the stomach and for sure it's strong enough to resist the acidity and from there it goes to the duodenum and causes malnutrition, diarrhea, vomiting and abdominal discomfort for the baby, the baby then will have the Trophozoite and cysts in the stool why do you think he got trophozoite in the stool? he was infected with the cyst? yes true but the cyst was only for protection purposes once it's in the duodenum Excystation occurs (تشلج الحكيث تبعها) and then we have the trophozoite which does everything (So in duodenum we have the trophozoite not the cyst), and again if it wants to go to the large intestine it will think (لو نزلت لحالي) so again it uses cyst (encystation) that's why the baby got the Trophozoite and cysts in the stool

<sup>1</sup> Giardiasis is an infection in your small intestine. It's caused by a microscopic parasite called Giardia lamblia.

<sup>2</sup> Remember the cyst resist the environment that's why it's the (infective stage)

## Symptomatic Infections:

The parasite mostly asymptomatic or can produce a wide range of gastrointestinal symptoms especially in children.

**Typical picture:** IP 1-2 wks followed by **diarrhea, vomiting** & flatulence (غازات) for about 6 weeks,

**Atypical:** Severe **diarrhea, malabsorption** (especially in children) and **cholecystitis**.

## Diagnosis & Treatment:

Stool Examination	- Now we rely on antigen detection but still the <b>microscopy</b> is the golden standard
Duodenal Contents Examination	- In search of trophozoites
treatment	- Metronidazole _Chemotherapy

## *Entamoeba Histolytica*

### Intestinal Amoebae:

There are a number of intestinal commensal<sup>3</sup> amoebae. However, the only **pathogenic species** is **Entamoeba Histolytica (*E.histolytica*)**

**Entamoeba:** genus of Amoebozoa found as internal parasites or commensals of animals

There are 6 species of Entamoeba:

- *E. histolytica*
- *E. Coli*
- *E. dispar*
- *E. hartmanni*
- *E. gingivalis*
- *E. poleki*

<b><i>E.histolytica</i></b>	<i>E. dispar</i>
Amoebae that are pathogenic and invasive.	The nonpathogenic, noninvasive form
The 2 amoebae can't be <b>distinguish</b> by microscopic observation.	

### Entamoeba Histolytica:

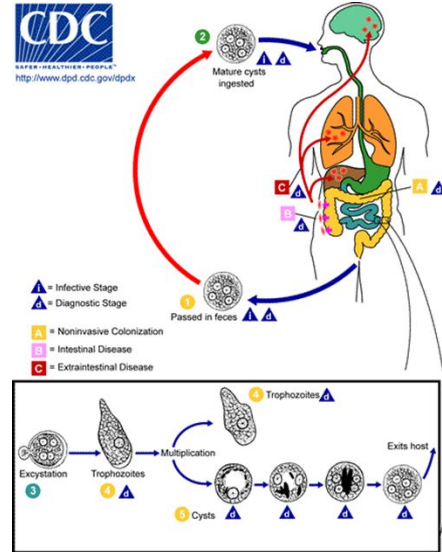
Infective stage	Diagnostic stage	Replicative (vegetative) stage
Cyst	Cyst	Trophozoite

<sup>3</sup> a class of relationships between two organisms where one organism benefits from the other without affecting it.  
علاقة معايشة

- **Cyst stage:** (the infective form) → Resists harsh conditions of the environment
  - **Trophozoite stage:** (causes the invasive disease) → This is the vegetative stage, which means it must encyst to survive in the environment due to its **fragile** structure.
- Mode of infections:
- **Water, food, flies, and sexual transmission** (homosexual)
- Not a zoonosis<sup>4</sup>, which means the infective dose can be as **little as one cyst**, and the incubation period can be from **few days to few weeks**. What's wrong with *Entamoeba histolytica*? It's infective dose is too low (one cyst maybe enough to cause the infection)

### E. Histolytica Life Cycle:

- **Cysts** can survive for weeks at appropriate **temperature** and humidity.
- Excystation occurs in the lower region of the **small intestine** and then production of 8 small amoebae which enter the **large intestine** and may:
- (1) invade the tissue,
  - (2) live in the lumen of large intestine without invasion,
  - (3) encyst (become acysts and pass in the stool).




### -Important-

1. The cysts pass through the stomach to the small intestine
2. They start to encyst to form Trophozoites
3. The trophozoites invade and penetrate the mucous barrier of the colon
4. Tissue destruction colitis occurs and an increase in intestinal secretion
5. Ultimately this will lead to **bloody diarrhea**

Just like the *Giardia* the infective stage is the cyst; there will be Excystation in the lower region of the small intestine (الحين نبدأ نقول فرقتها عن القiardيا) after that Amoeba (trophozoite) enters the large intestine (لو تتذكروا القiardيا كانت تبقى بالديودينوم و تسبب) it might live there without invasion causing mild symptoms like diarrhea and tenesmus (يعني تحارش على خفيف) or encyst and pass in the stools (او انها) (تحترم نفسها و تطلع كذا بدون أذية) or (The worst) it cause sever invasion, ulceration and penetration and it can reach different sites (lungs, liver ..etc.) و عشان هالشيء نحسب لها ألف حساب ^

So here; the infective and the diagnostic stages are the cyst (NOT TROPHOZITE)

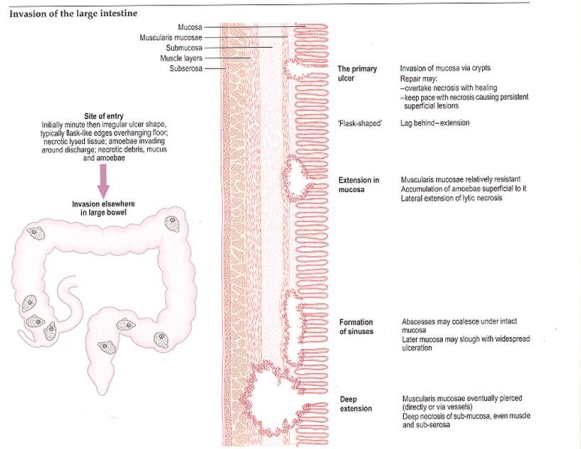
### Pathology:

Intestinal Amoebiasis (Acute amoebic dysentery)	Extra-intestinal Amoebiasis
<ul style="list-style-type: none"> <li>- Remarkable and <b>unique ability to produce enzymes that lyses host tissue</b>.(causing colon ulcer) and also can ingest blood cells</li> <li>(remember when you have patient passing stools with blood and mucus so you should think of both Amoeba and Shigella)</li> <li>- Microscopically: <b>“FLASK ULCER OF AMOEBIA”</b> اهم شي: so the flask ulcer is diagnostic</li> </ul> 	<p>Example case:</p> <p>A 30-year-old male experienced diarrhea for two weeks with fever of 39° C, nausea, vomiting, malaise and right upper abdominal pain. Physical examination revealed hepatomegaly 6 cm below the right costal margin. CT scan showed a single hypodense mass in the right lobe of 7.8 x 5.2 cm, round, with well defined borders.</p> <p><b>Serology</b> was positive for <i>Entamoeba histolytica</i> at 1/512.</p> <p>Amebic liver abscess was diagnosed.</p> <p>ممکن یچی بالاوسینی</p>

<sup>4</sup> It is any infectious diseases of animals (usually vertebrates) that can naturally be transmitted to humans.

May cause complications: Since it has the ability to invade the tissue we should expect the “peritonitis” as one of the possible complication, also through perforation it can go to invade the liver and causes (Amoebic abscess)

- **Perforation** of the colon
- Amoeboma: Granulomatous mass obstructing the bowel
- **Blood invasion**
- Amoebic liver, lung, or brain **abscess**
- Direct extension



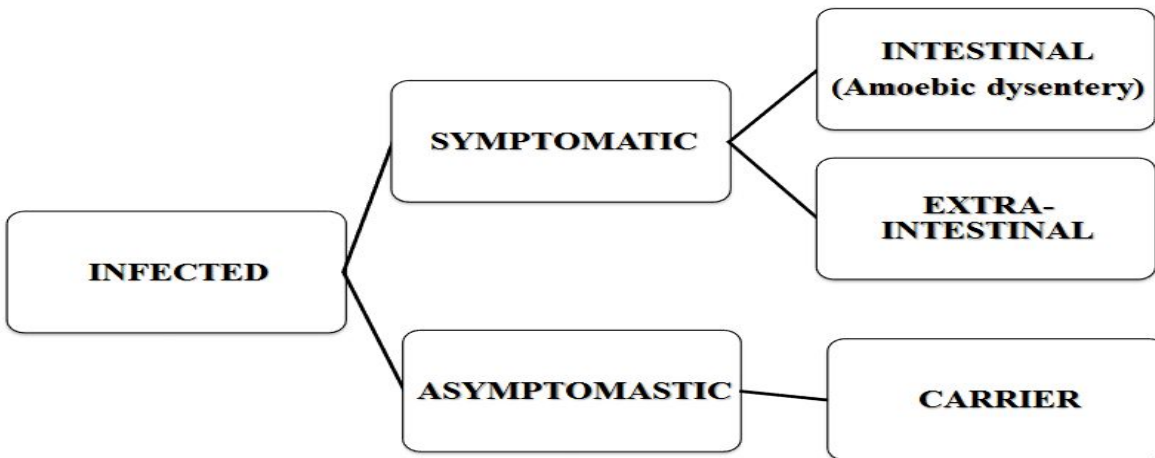
what test would u perform??

**Main Drugs for Treatment**

- **Asymptomatic** (cysts only): **diloxanide furoate (Furamide)**
- **Symptomatic** (cysts and trophozoites): **metronidazole**

**Metronidazole**

**THE CLINICAL OUTCOMES OF INFECTION WITH *Entamoeba histolytica***



# Cryptosporidium Parvum

زمان ما كانوا يعرفوها و لا كانوا يدرسوها ، ليش يا ترى؟ عشان حظنا يعني زادت المعلومات؟ ممكن بس الأكيد انه عشان هي ما طلعت و لا حسوا بوجودها الامع الأيدز

<b>Cryptosporidium</b>	<p>It is an <b>intracellular</b> protozoan parasite that is associated with <b>غالباً في مرضى الإيدز</b></p> <ul style="list-style-type: none"><li>- Self-limited diarrhea <b>in immunocompetent</b> hosts</li><li>- So remember this parasite (protozoa) it mainly affect <b>immunocompromised patient ,like HIV,</b> or those undergoing immunosuppressive therapy</li></ul> <p>فباختصار شديد أول ما تشوفوا الكريبتوسبورديوم (بليز اقررو الاسم تعبت عليه) في السؤال دوروا على شيء يخص ضعف المناعة</p>
<b>Diagnosis</b>	by Either Acid fast stain (like TB) or immunofluorescence
<b>Infective &amp; diagnostic stage</b>	<ul style="list-style-type: none"><li>- Infection is caused by ingestion of (<b>sporulated oocysts</b>)</li></ul>
<b>Treatment</b>	<ul style="list-style-type: none"><li>- It is usually <b>self-limited</b> in immunocompetent patients.</li><li>- <b>However,</b> in patients with AIDS: <b>Paromomycin</b></li></ul>

**SUMMARY:)** هنا جوهرة المالكي كتبت كل الي قالة الدكتوراة منى انه مهم

**GIARDIA LAMBLIA**

Infective stage	Diagnostic stage	Replicative (vegetative) stage
Cyst	Cyst & Trophozoite	Trophozoite

Notes

Remember the cyst resists the environment that's why it's the (infective stage)  
 If I drank water or ate vegetables (not properly washed) contaminated with cyst, it will go to the stomach and for sure it's strong enough to resist the acidity and from there it goes to the **DUODENUM** and causes malnutrition, diarrhea, vomiting and abdominal discomfort for the baby, the baby then will have the Trophozoite and cysts in the stool. Why do you think he got trophozoite in the stool? he was infected with the cyst? yes true; but the cyst was only for protective purposes once it's in the duodenum Excystation occurs (تشلح الجاكيت) (تبعها) and then we have the trophozoite which does everything (So in duodenum we have the trophozoite not the cyst), and again if it wants to go to the large intestine it will think مش حينفع لحالي مش حينفع again it uses cyst (encystation) that's why the baby got the Trophozoite and cysts in the stool The cyst (Infective stage) مين يعدي؟ الي مين  
 Remember it's like DHL only to transport the trophozoite The trophozoite (replicative stage) مين الي يعمل مشاكل؟

**ENTAMOEBA HISTOLYTICA**

Infective stage	Diagnostic stage	Replicative (vegetative) stage
Cyst	Cyst	Trophozoite

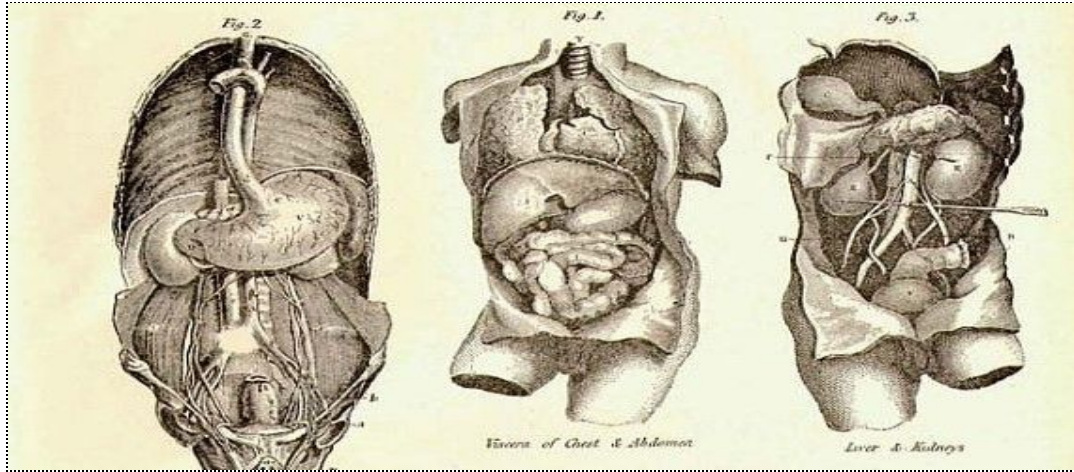
What's wrong with Entamoeba histolytica?  
 It's **infective dose is too low** (one cyst maybe enough to cause the infection)  
 Just like the Giardia the infective stage is the cyst; there will be Excystation in the lower region of the small intestine (الحين نبدأ نقول فرقها) (لو تتذكرون القيارديا كانت تبقى بالديدونيوم وتسبب البلاوي كلها لكن هنا الموضوع غير) (عن القيارديا) after that Amoeba (trophozoite) enters the large intestine (تحرش على خفيف يعني) or encyst and pass in the stools (او انها تحترم نفسها وتطلع بدون اذية) or  
 (The worst) it cause sever **invasion**, ulceration and penetration and it can reach different sites (lungs, liver ..etc.)  
 So here; the infective and the diagnostic stages are the cyst (NOT TROPHOZITE) remember when you have patient passing stools with **blood and mucus** so you should think of both Amoeba and Shigella  
 The type of ulcer caused by Amoeba is called "**FLASK ULCER OF AMOEBIA**" so the flask ulcer is diagnostic for amoeba histolytica  
 Since it has the ability to invade the tissue we should expect the "peritonitis" as one of the possible complication, also through perforation it can go to invade the liver and causes (**Amoebic abscess**)  
 So put in mind **hydatid cyst** in the liver or lungs caused by **Echinococcus granulosus** but no abscess, but here we have amoebic **ABCESS** (ريجته زي سمك الانشوفة)

**CRYPTOSPORIDIUM PARVUM**

Infective stage and Diagnostic stage
Sporulated oocysts

Remember this parasite (protozoa) it mainly comes for an **immunocompromised patient** like HIV, or those undergoing immunosuppressive therapy (فباختصار شديد أول ما تشوفوا الكريبتوسبورديوم في السؤال دوروا على شيء يخص ضعف المناعة)  
 How we diagnose it? by Either **Acid fast stain** (like TB) or immunofluorescence





إِنَّا كُلُّ شَيْءٍ خَلَقْتَهُ بِقَدْرِ ٤٩

### Team Leaders

Rawan Aldhuwayhi & Ali Alzahrani

### Heartful thanks to our phenomenal team members

Afnan Almalki  
 Alanoud Alomair  
 Asrar Batarfi  
 Amjad Alduhaish  
 Farrah Mendoza  
 Ghadah Alqasimi  
 Johara Almalki  
 Lamees Altamimi  
 Luluh Alzeghayer  
 Morooj Alharbi  
 Norah Alakeel  
 Reham Alobaidan  
 Raghad Alnafisah  
 Reem Albahlal  
 Reem Alageel  
 Reneem Aldubaikhi  
 Sara Alkhalifah

Abdulrahman Alanazi  
 Abdulrahman alsayyari  
 Fawzan Alotaibi  
 Ibrahim Yousef  
 Majed Alosaimi