

Common Protozoal infections of the GI tract

☆ اي كلام مكتوب زياده هو حكي الدكتور

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ميس قشوع : Done by

Protozoa of the GI tract

❖ **Entamoeba histolytica** The causative agent of amebiasis

❖ **Giardia Lamblia** (Giardia duodenalis or Giardia intestinalis)
causative agent of Giardiasis

❖ **Cryposporidium** the causative agent of cryptosporidiosis



2 species: Cryptosporidium hominis and cryptosporidium parvum

- Protozoa are unicellular microorganisms, and they can be categorized in two ways:

1. If they possess an organ of locomotion
2. If they have sexual multiplication in their life cycle

- The first family according to locomotion is Rhizopoda (Amoeba) possess pseudopods (move by pseudopodia الأرجل الوهمية/الكاذبة) and they asexually multiply by binary fission. They include *Entamoeba histolytica*.

- Amoeba is divided into :

1. intestinal amoeba, which include :

- A. *E. histolytica* (only pathogenic member).

- B. *E. hartmanni*, *Entamoeba moshkovskii*, *E. dispar* and *E. polecki* (non pathogenic).

2. Amoeba of the buccal cavity: *E. tenax*

3. Free living amoeba: *Acanthamoeba* (brain eating amoeba), and *Naegleria fowleri*.

Acanthamoeba causes primary meningoencephalitis (PAM) and keratitis to people who frequently use eye lenses and GAE (Granulomatous Amoebic Encephalitis).

Naegleria fowleri causes primary amoebic encephalitis.

But Entamoeba histolytica causes secondary amoebic encephalitis.

- All infections of Entamoeba histolytica , Giardia Lamblia, and Cryposporidium are associated with poor sanitation and poor personal hygiene. all of them are transmitted by feco-oral route.



Entamoeba histolytica

It is a prototype invasive protozoal infection, it invades the intestinal mucosa and submucosa of the large intestine

❖ **Geographical distribution:** Worldwide especially tropical and subtropical climate
in the temperate zone and more common in areas
with poor sanitary conditions.

❖ **Habitat:** Large intestine (caecum, colonic flexures
and sigmoidorectal region), transverse, ascending and descending colon

❖ **D.H:** Man (Definitive host)

❖ **R.H:** (Man), Dogs, pigs, rats and monkeys. (reservoir host)

❖ **Disease:** Amoebiasis or amoebic dysentery الزحار الأميبي

dysentery (bloody stool and mucus)

especially in places that there are fecal stasis and low peristaltic movements

But Giardia Lamblia and Cryosporidium in small intestine

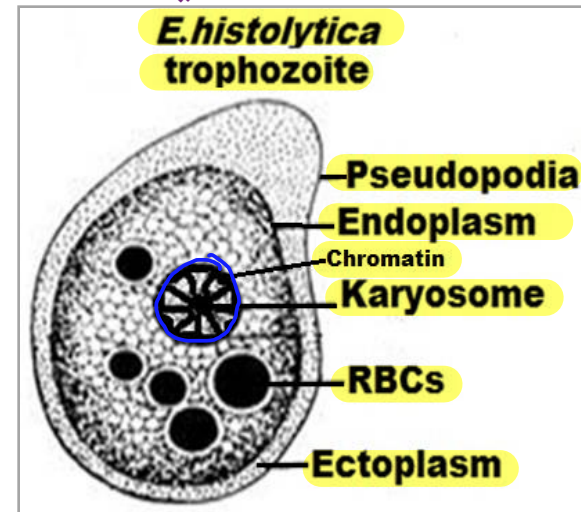
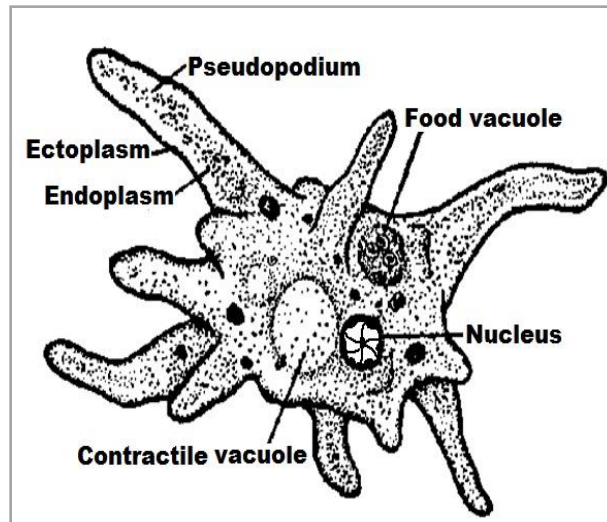
most commonly asymptomatic (cyst passers)

Morphological characters

1- Trophozoite stage (Vegetative form or tissue form):

Active, Motile, Feeding and replicating form (which causes pathogenesis)

هذا الشكل الفعلي إليه



It contains a central nucleus that is surrounded by chromatin (cartwheel appearance [هاد اشي مميز لهم]), ectoplasm, endoplasm, pseudopodia, food vacuoles and ingested RBCs.

pathognomonic signs for *E. histolytica*

Outside the human body , resistant stage for harsh environmental conditions

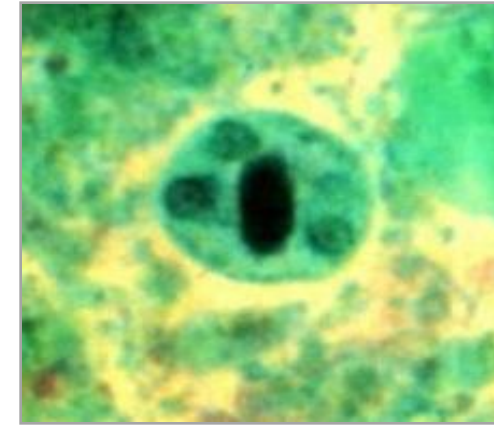
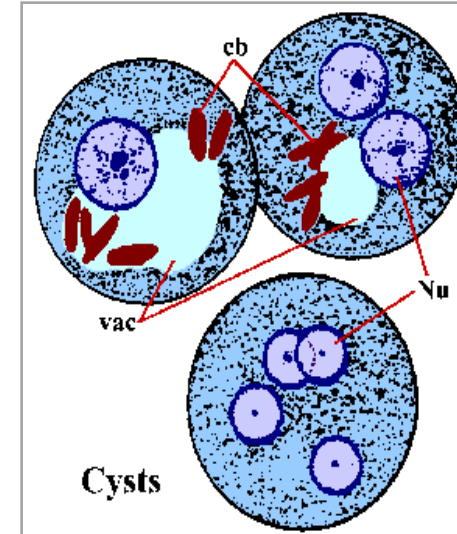
2- Cyst stage (Luminal form):

(a) Immature cyst (Uninucleate cyst and Binucleate cyst):

❖ Uninucleate cyst (one nucleus)

❖ Binucleate cyst (2 nucleus)

b) Mature cyst (Quadrinucleate cyst)



▼ خلي بيالك بس ال Quadrinucleate cyst هو الي يكمل ال transmission cycle of Amoebiasis

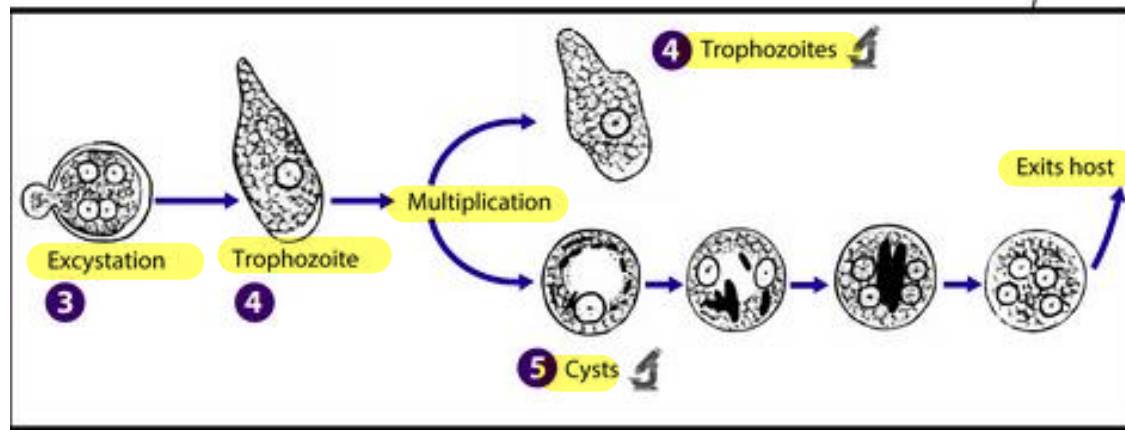
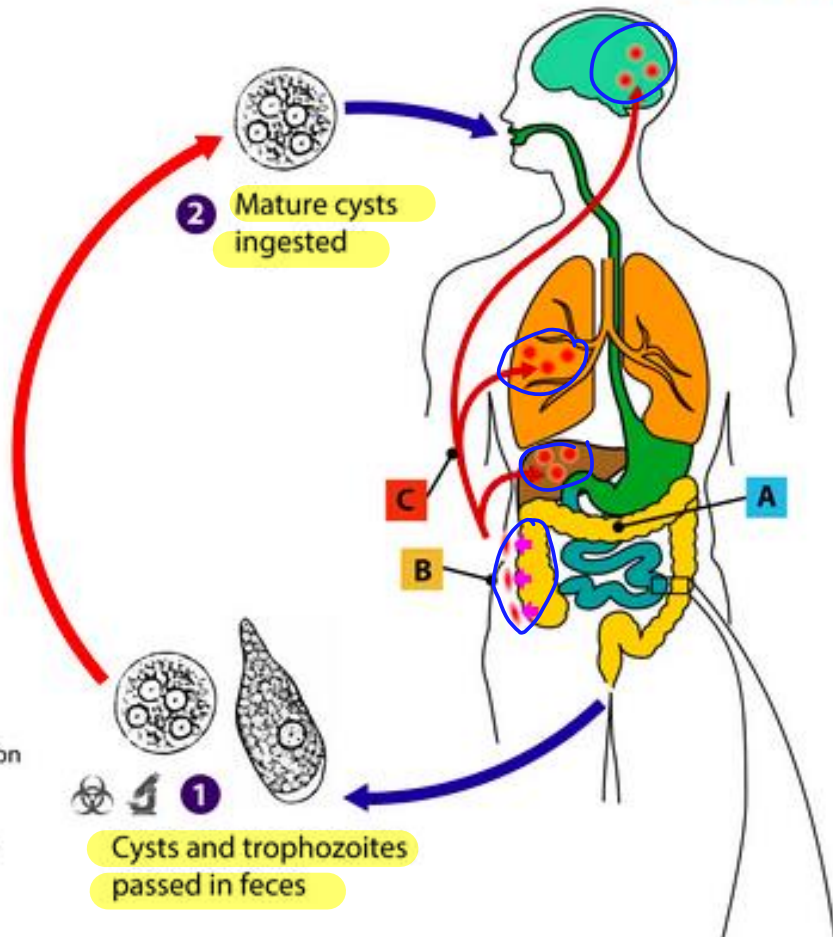
1. ingestion of quadrinucleate cysts through contaminated water or food.
 2. They pass the stomach and reach the small intestine where the "excystation process" takes place each cyst divides by binary fission to give off 8 trophozoites.

The patients will have A. intestinal amoebiasis or B. Extra-intestinal amoebiasis.

infective ▼ كثير مهم تعرف
 and diagnostic stages

Infective stage
 Diagnostic stage

A Noninvasive colonization
B Intestinal disease
C Extraintestinal disease



A. Intestinal amoebiasis:

1. Some of these trophozoites stay in the lumen of the large intestine , we call it intestinal or luminal amoebiasis.(they don't invade mucosa or submucosa of the large intestine). This is the most common scenario in people with *E.histolytica*, and we call them asymptomatic carriers or cyst passers.

These trophozoites undergo encystation and leave the body with stool as cysts.

2. Some trophozoites invade the mucosa and submucosa, patients usually present with acute or chronic amoebic dysentery, as well as complications of invasion & perforation

B. Extra-intestinal amoebiasis:

Through the blood circulation and seed in other places, or direct extension, from the right colonic flexure to the liver or right lobe of the lung.

باقي الشرح موجود نفسه بالاسلايدات صفحة ١٣ و ١٤

Mode of infection

- 1- Contaminated water and foods (ex. green vegetables) or drinks or hands with human stool containing mature cyst.
fingers to mouth
- 2- Handling food by infected food handlers as cooks and waiters.
- 3- ^(vector) Flies and cockroaches that carry the cysts from faeces to exposed food.
- 4- Autoinfection (faeco-oral or hand to mouth infection).
- 5- Homosexual transmission.

Clinical pictures

I) Intestinal amoebiasis

1-Asymptomatic infection

the majority (60%-80%)

Most common and trophozoites remain in the intestinal lumen feeding on nutrients as a commensal without tissue invasion

(Asymptomatic patient known as a healthy carrier and cyst passers)

they don't produce bloody diarrhea

principle reservoir (responsible for the continuation of transmission cycle)

2-Symptomatic infection

cysts and trophozoites are diagnostic stages for amoebiasis

a) Acute amoebic dysentery

Presented with fever, abdominal pain, tenderness, tenesmus and frequent motions of loose stool containing mucus, blood (amoebic dysentery) and trophozoites.

trophozoites leave the large intestine before undergoing encystation.

b) Chronic infection

**-Occurs if acute dysentery is not properly treated.
-With low grade fever, recurrent episodes of diarrhea alternates with constipation.
- Only cysts are found in stool.**

3-Complications

① **•Haemorrhage due to erosion of large blood vessels.**

② **•Intestinal perforation → peritonitis.**

→ **Appendicitis.** ← *بیبی*

→ **Amoeboma (mass like)**

→ **(Amoebic granuloma) around the ulcer → stricture of affected area.**

Right iliac fossa pain

With heavy infection and lowering of host immunity

The trophozoites of *E. histolytica* invade the mucosa and submucosa of the large intestine by secreting lytic enzymes → **amoebic ulcers**

The ulcer ^{inverted} **flask-shaped** with **deeply undermined edges** **containing cytolized cells, mucus and trophozoites.**



The most common sites of amoebic ulcers are caecum, colonic flexures and sigmoidorectal regions due to decrease peristalsis & slow colonic flow at these sites that help invasion.

- 50% of extraintestinal cases don't show intestinal amoebiasis at the beginning (without showing symptoms related to GI tract, so its presentation will be according to the site it happens in)

II) Extra-intestinal amoebiasis

Due to invasion of the blood vessels by the trophozoites in the intestinal ulcer → reach the blood → to spread to different organs as:

→ **Liver** →
most common site

-Amoebic liver abscess or diffuse amoebic hepatitis.

-Affect commonly right lobe either due to spread via portal vein or extension from perforating ulcer in right colonic flexure.

-CP: include fever, hepatomegaly and pain in right hypochondrium.

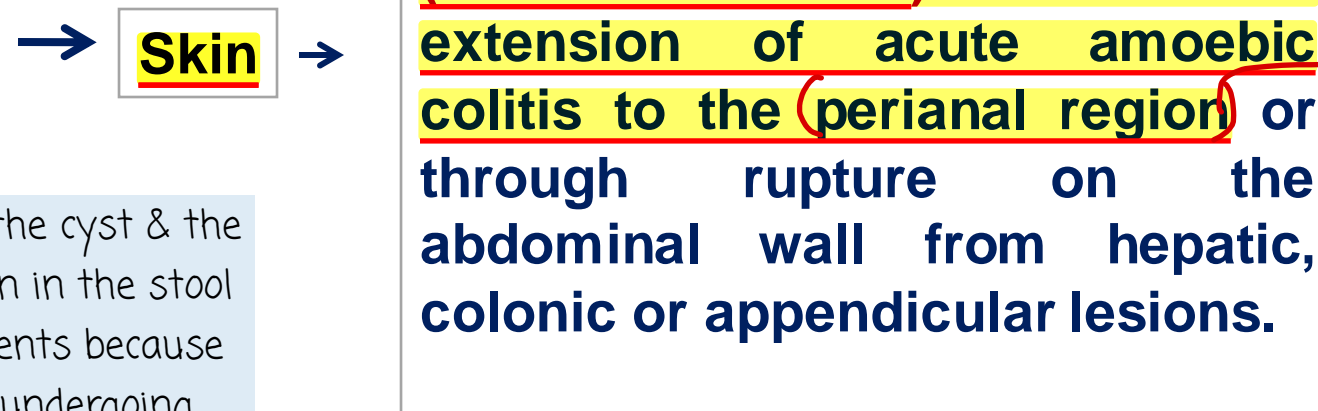
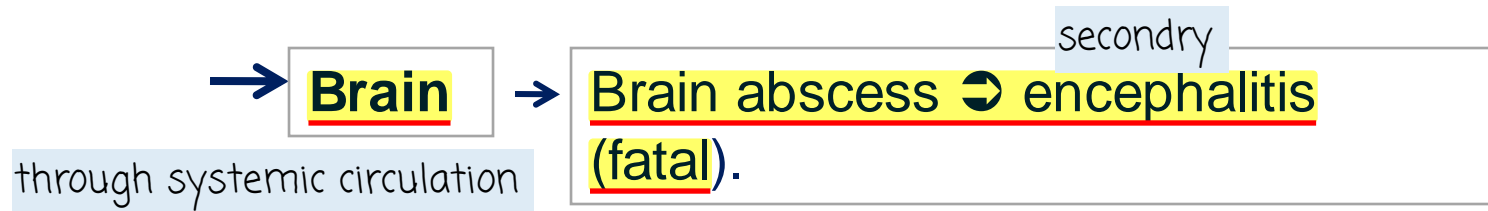
• **Lung abscess** → **pneumonitis** with chest pain, cough, fever.

• **Amoebic lung abscess usually occur in the lower part of the right lung due to direct spread from the liver lesions through the diaphragm or very rarely trophozoites may reach the lung via blood.**

→ **Lung** →

▼ خلي بيالك انه بعمل Amoebic liver abscess خصوصا للناس الي عمرهم بين ٢٠-٤٠ سنة

The treatment of abscesses is I&D (incision and drainage), the drained material is described as having "anchovy paste consistency", (بتشبه معجون الاسنان).



most common infected areas of cutaneous amoebiasis

▼ The diagnostic stage is both the cyst & the trophozoite. Trophozoites are seen in the stool of acute amoebic dysentery patients because they leave with the stool before undergoing encystation.

▼ The infective stage is the mature Quadrinucleate Cyst.

Laboratory diagnosis

I) Intestinal amoebiasis

a) Direct

•Macroscopic: Offensive loose stool mixed with mucus and blood. amoebic dysentery

•Microscopic:
1-Stool examination: Reveals either trophozoites (in loose stool) or cysts (in formed stool) by direct smear, iodine stained & culture.

2-Sigmoidoscopy: To see the ulcer or the trophozoites in aspirate or biopsy of the ulcer.

3-X-ray after barium enema: to see the ulcer, deformities or stricture.

b) Indirect

Antigen or antibody detection test

-Serological tests: CFT, IHAT, IFAT, ELISA and GDPT (gel-diffusion precipitin test).

N.B. These serological tests are positive only in invasive intestinal amoebiasis but negative in asymptomatic carriers. (luminal amoebiasis)

PLDH: parasite lactate dehydrogenase test, and lastly Gal/Gal lectin test

CFT = Complement fixation test
IHAT = indirect hemagglutination assay
IFAT = indirect fluorescent antibody test
ELISA = enzyme-linked immunosorbent assay

low sensitivity and specificity

يعني بنحتاج نوخذ العينة اكثر من مرة و اذا ما لقيتها هذا لا يعني انها غير موجودة

The presence of WBCs (leukocytes) in stool >> amoebic dysentery not bacillary dysentery

II) Extra- intestinal amoebiasis

According to the organ affected

a) Direct

1- X- ray:

In liver ⇒ **space occupying lesion.**

In lung ⇒ **pleuritis with elevation of the diaphragm**

2- Ultrasonography, CT scan & MIR: For liver abscess.

3- Aspiration of abscess content: For liver abscess to detect trophozoites.

b) Indirect

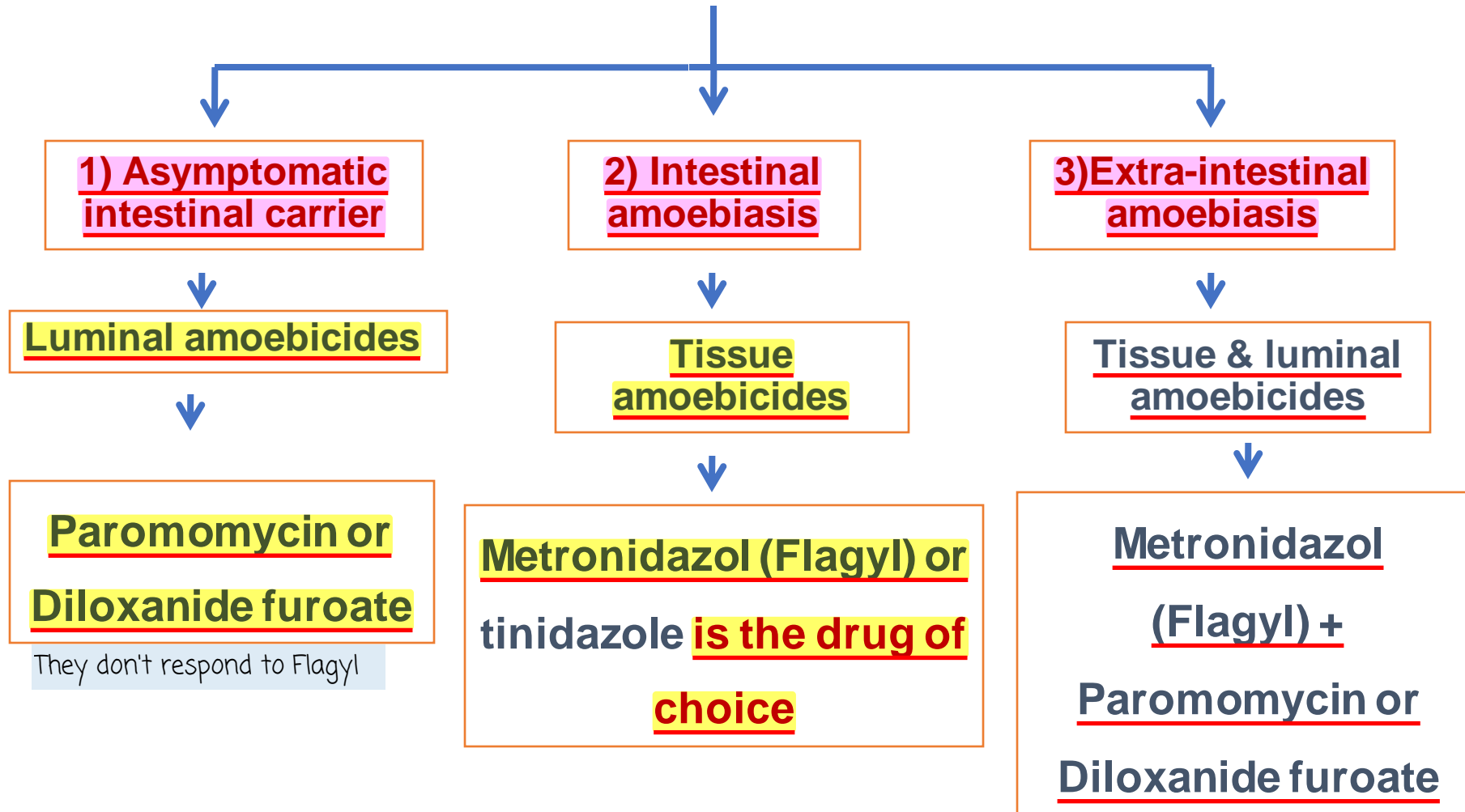
1- Serological tests: As intestinal amoebiasis. They are positive and can persist for years.

2- Molecular by PCR. on serum or stool

3- Blood examination: Leucocytosis.

4- Liver function tests: Increased in amoebic liver abscess.

Treatment



• Prevention:

- Amoebic infection is prevented by eradicating fecal contamination of food and water
- Water is a prime source of infection and therefore the most contaminated foods are vegetables such as lettuce
- Amoebic cysts are not killed with low doses of chlorine or iodine
- Bringing water to a boil ensures the absence of amoeba and mechanical filtration

2 Giardia duodenalis (Giardia Lamblia and Giardia intestinalis)

- Common cause of intestinal infection worldwide
- Flagellated
- Both the trophozoite and the cyst are included in the life cycle.
- found most commonly in the crypts in the duodenum.
- Trophozoites are attached to the epithelium of the host villi by means of the **ventral disk**.
- Cyst formation takes place as the organisms move down through the jejunum after exposure to biliary secretions.

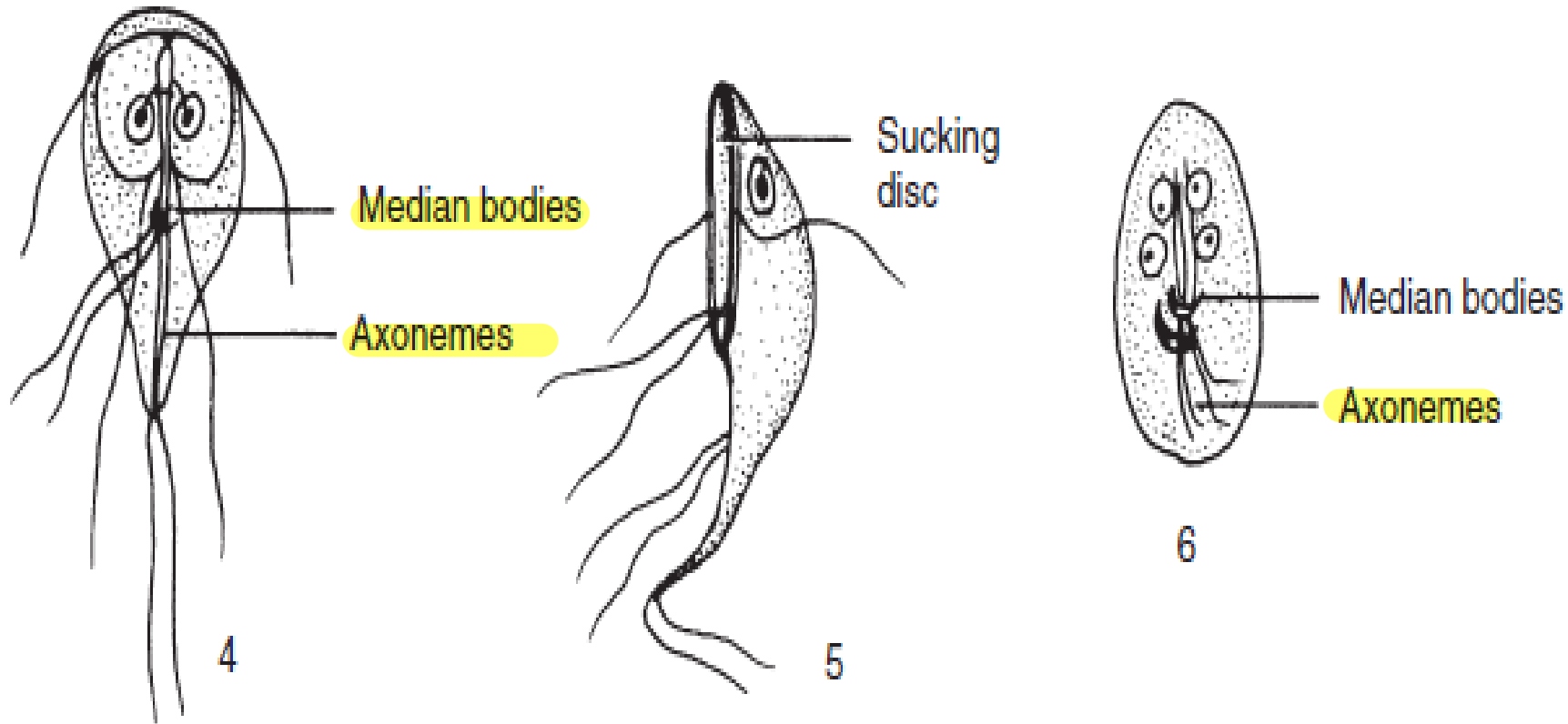
- ▼ The diagnostic stage is both trophozoite and cyst.
- ▼ The infective stage is only cysts.

Disease : Giardiasis, another name for Giardiasis, is a Beaver fever (specifically people who go to Canada).

▪ It has 2 morphological forms:

1. Trophozoites (زبي شخص لابس نظارة): Binucleated (one pair of nuclei), has parabasal bodies (ventral disc, which help them in attachment on the brush border of epithelial cell of small intestine) and 4 pairs of flagella.

2. Cyst (quadrinucleated cyst): Oval in shape (elliptical) has the axonemes (source of the flagella).



most commonly associated with epidemics and outbreaks, especially in , day care centers, mental institutions, and prisons.

Epidemiology

Associated with poor sanitation and poor personal hygiene

- Transmission of *G. lamblia* occurs by ingestion of viable cysts by fecal oral route highly person to person transmission
- high incidence of giardiasis occurs in patients with immunodeficiency syndromes. IgA deficiencies
- The incubation period ranges from approximately 1-2 weeks and infectious dose is 10. (low)

clinically

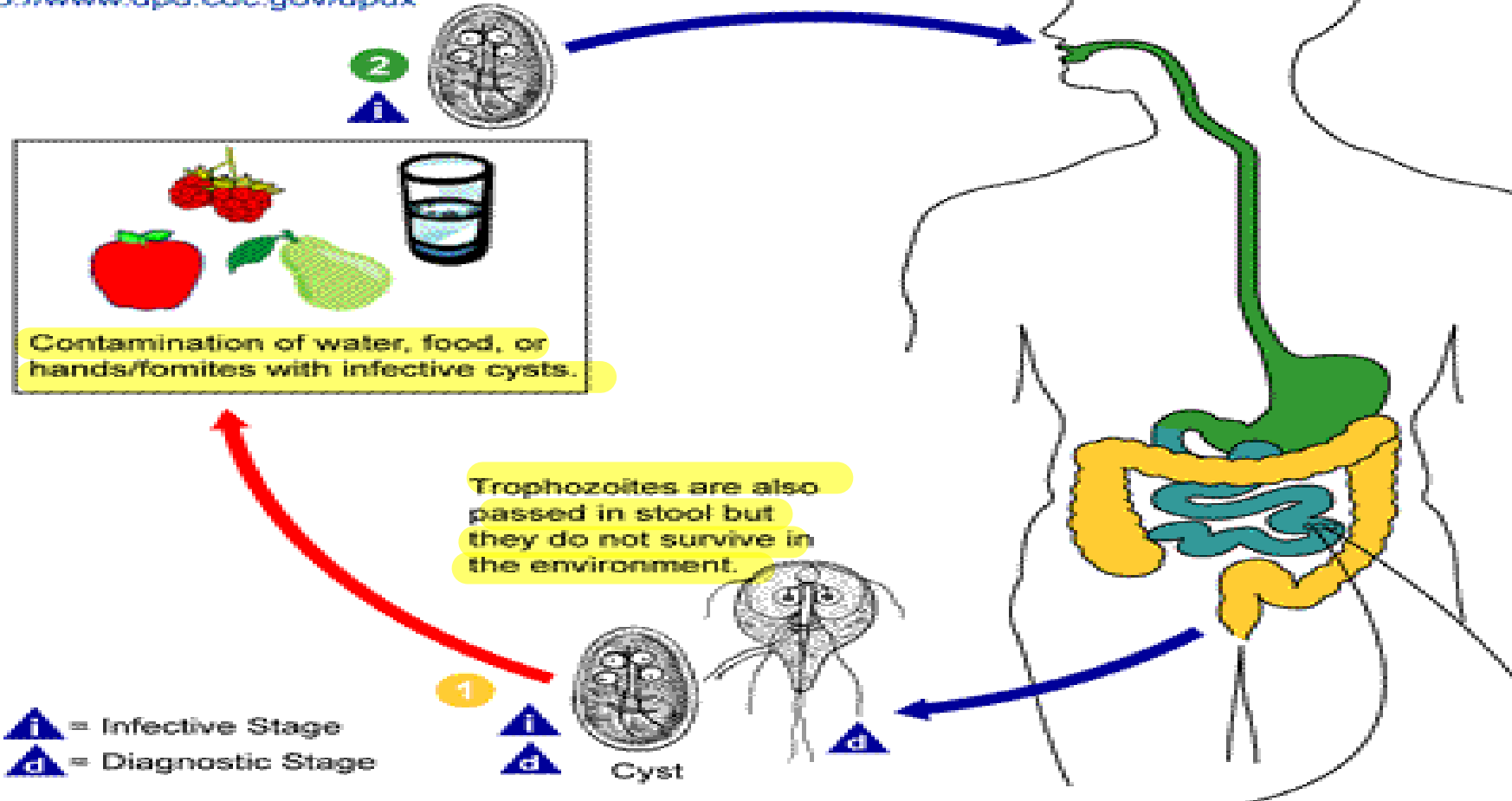
There is no invasion of mucosa or submucosa and no bloody diarrhea

(majority) ➤ Asymptomatic Infection (treatment not recommended)

➤ Symptomatic:

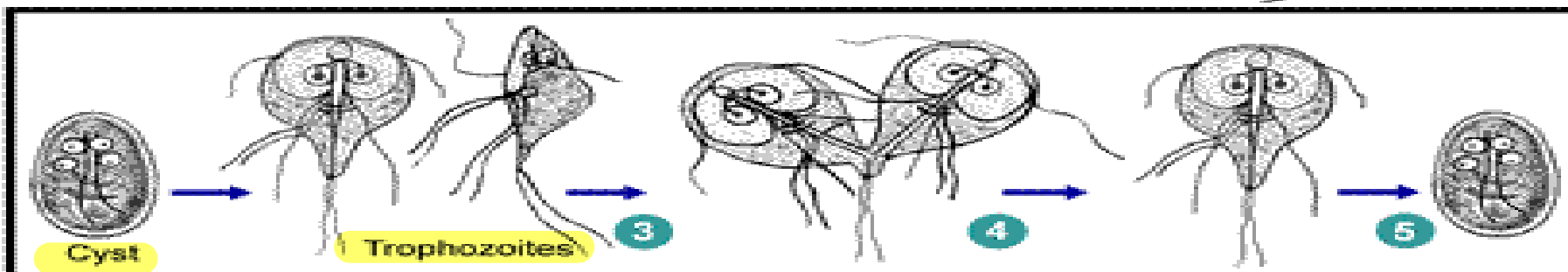
- Diarrhea usually watery: profuse watery diarrhea that later becomes greasy foul smelling and may float (steatorrhea)
- Abdominal cramps, bloating, malaise, weight loss,
- Malabsorption and weight loss of fat, proteins, and disaccharides may cause chronic diarrhea, which can cause mental retardation in the pediatrics population.
- Vomiting and tenesmus are not common

because the surface area for reabsorption decreases



1. Ingestion of Quadrinucleated cysts through the feco-oral route of contaminated water, mainly or food.

2. They reach the small intestine, excystation occurs, and every cyst gives 2 trophozoites, and this cyst either attaches to the brush border of small intestine, causing typical Giardiasis or shedd with stool either in trophozoite or cyst form.



Lab Diagnosis

- **Routine Methods:**

- **Stool analysis: cysts and sometimes trophozoites**

- **Antigen Detection:** ELISA(looking for antigens in stool)

- Sensitive and specific in detecting *G. lamblia* in fecal specimens.

Treatment: Metronidazole or tinidazole

☆ Another method for diagnosis is the "string test or the Entero-test," which is a gelatin capsule that's tied to a string and it is ingested by the patient, after several hours, we pull the string to pull out the capsule that carries the duodenal content.

▪ Remember, protozoa can be categorized according to organ of locomotion into:

1. Rhizopoda (Amoeba).

2. Flagellates (Giardia Lamblia).

3. ciliates (Balantidium coli).

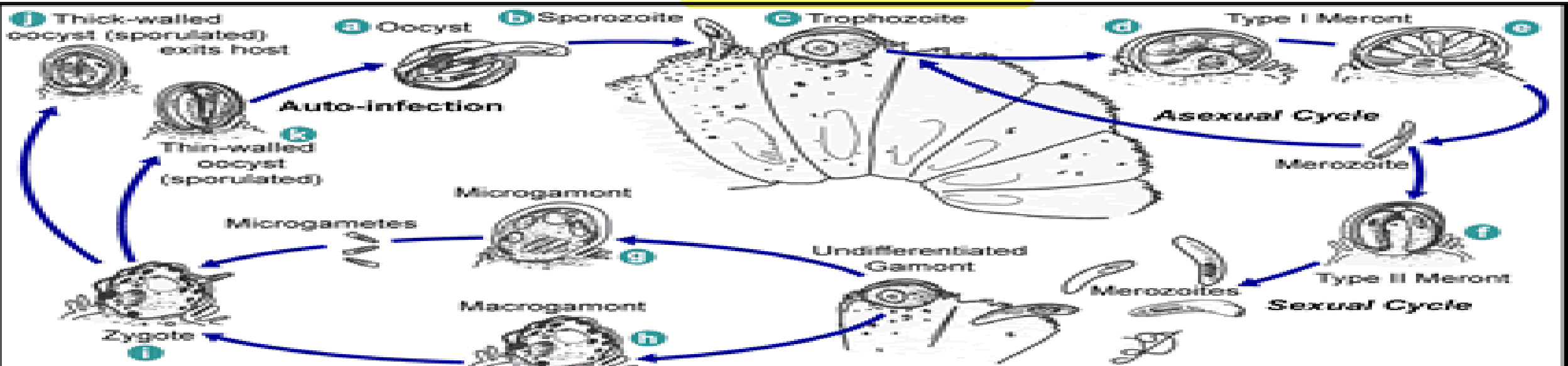
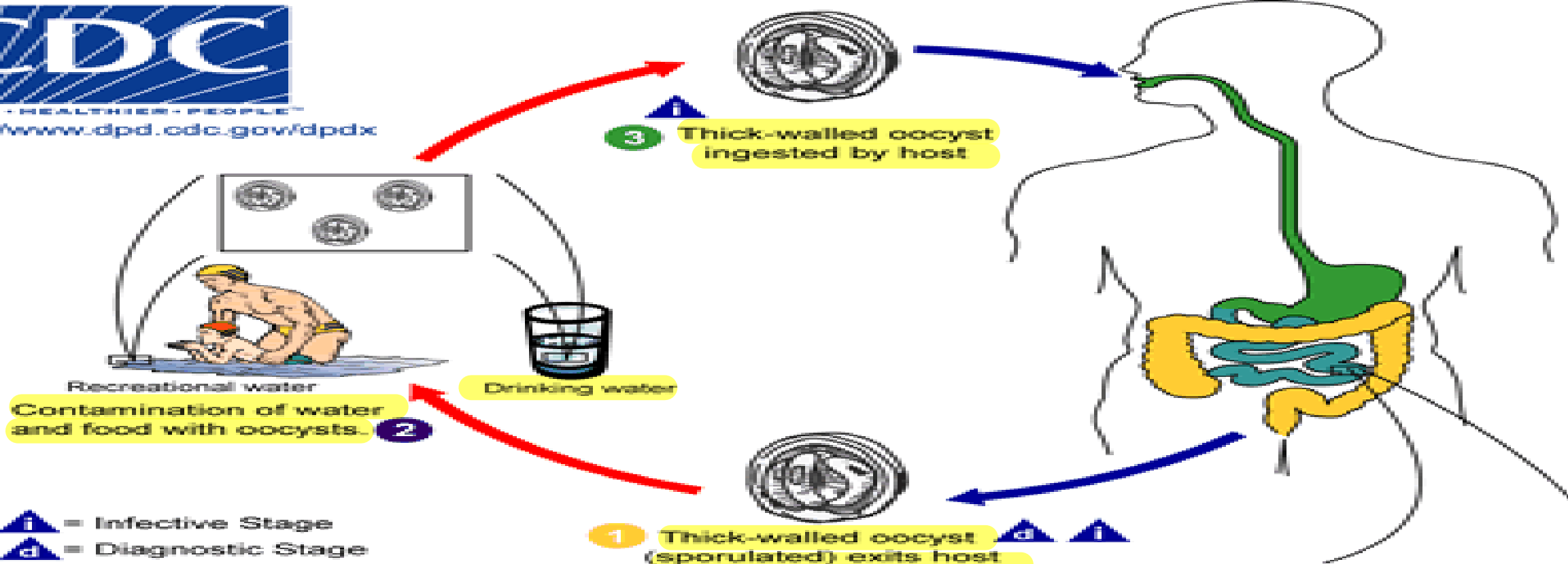
4. sporozoa includes the causative agent in malaria and Coccidia (intestinal sporozoa), which includes Cryptosporidium (C. hominis infects humans and C. parvum infects humans and animals).

The members of this class lack a defined organ of locomotion , they alternate between sexual and asexual reproduction, and they are all obligate intracellular.

3 *Cryptosporidium spp.*

- Intracellular enteric parasites that infect epithelial cells of the stomach, intestine, and biliary ducts.
- *C. parvum* (mammals, including humans) and *C. hominis* (primarily humans).
- infections begin with ingestion of viable oocysts, each oocyst releases four sporozoites, which invade the epithelial cells and develop into merozoites then oocyst.
- Prevalence of fecal oocyst 3-10%

▼ The diagnostic stage and infective stage are thick wall oocysts.



oocysts (due to sexual multiplication in their life cycle).

Thick wall oocysts >> الي بتطلع برا الجسم

Thin wall oocysts >> الي بتضل جوا الجسم

Thin wall oocysts continue the life cycle of cryptosporidiosis without needing to leave the host.

1. Ingestion contaminated water or food.

2. It reaches the small intestine in crypts on the epithelial cell. They alternate in their life cycle between sexual and asexual reproduction.

- Asexual reproduction called schizogony, and the daughter cells we call them merozoites (meront), they go asexual reproduction and give us type 1 meront and they convert into thin wall oocyst which continues the life cycle without the need for leaving the host.

- Sexual reproduction of them will give type 2 meront which will convert to macro and microgametocytes, they will form the zygote and this zygote will form the thick-walled oocyst, that will go out with the stool and continue the transmission cycle outside the host.

In immunocompetants, they may result in self limited mild gastroenteritis

- **Clinically:** The majority of patient are asymptomatic

watery diarrhea
(cholera like
diarrhea)

- **Copious Diarrhea:** These patients may have 3-17 liters of stool per day in immunocompromised individuals especially HIV patients

- Abdominal pain and vomiting

- **Diagnosis:** oocyst in stool using modified acid fast stain (the same test used for mycobacterium tuberculosis)

- **Treatment:**

- Usually self limited with Oral or intravenous rehydration.

- Nitazoxanide is used for immunocompromised individuals e.g HIV patients.

Mays qashou

لا تنسوا أهلنا بغزة من الدعاء

The End