



Intestinal Protozoa

CLASSIFICATION OF PARASITES

PROTOZOA	HELMINTHS
<p>Unicellular Single cell for all functions</p>	<p>Multicellular Specialized cells</p>
<p>1: <u>Amoebae</u>: move by pseudopodia 2: <u>Flagellates</u>: move by flagella 3: <u>Ciliates</u>: move by cilia 4: <u>Apicomplexa</u> (Sporozoa) tissue parasites</p>	<p><u>Round worms</u> (Nematodes) - elongated, cylindrical, unsegmented <u>Flat worms</u>: - Trematodes: leaf-like, unsegmented - Cestodes: tape-like, segmented.</p>

Flagellates

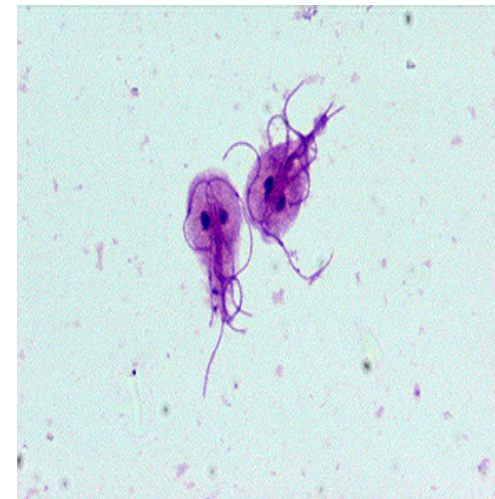
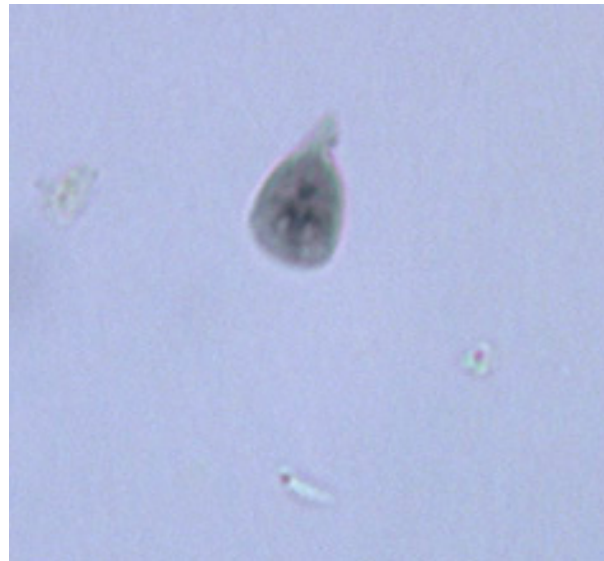
Giardia lamblia

Giardia trophozoites
(electron microscopy)



Giardia trophozoites
(light microscope)

can not survive in the environment, can not resist gastric acidity, diagnostic stage



Trichrome stain

Cyst

can survive in the environment

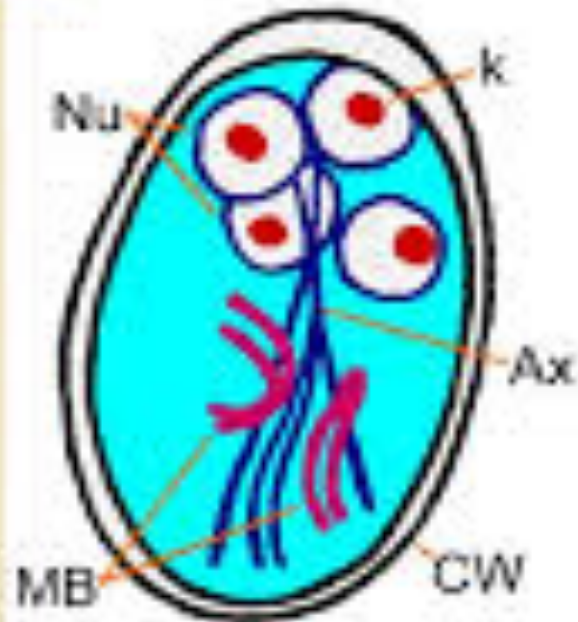
resist the gastric acidity

infective and diagnostic stage.



Giardia

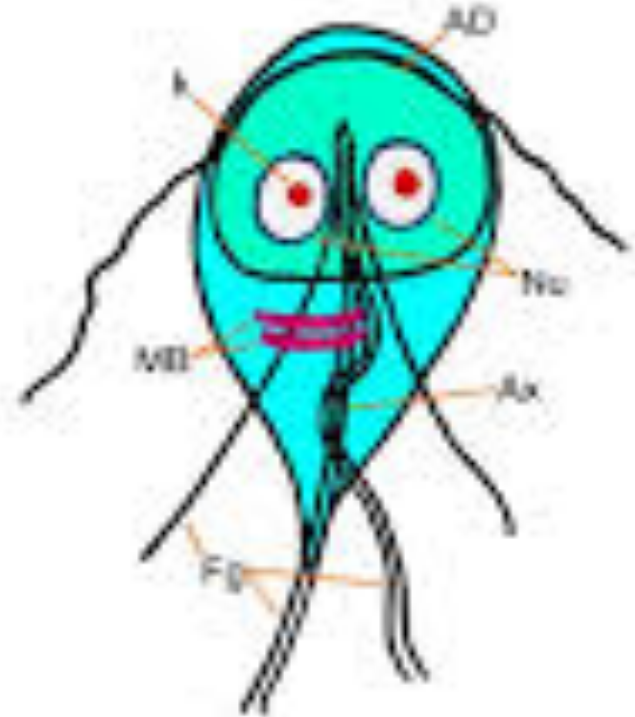
CYST



Infective stage
Multi-nucleated



TROPHOZOITE



Replicative stage
2 nuclei & adhesive disc
8 flagella

Giardia lamblia

causing sporadic or epidemic **diarrheal** illness.

waterborne and foodborne disease

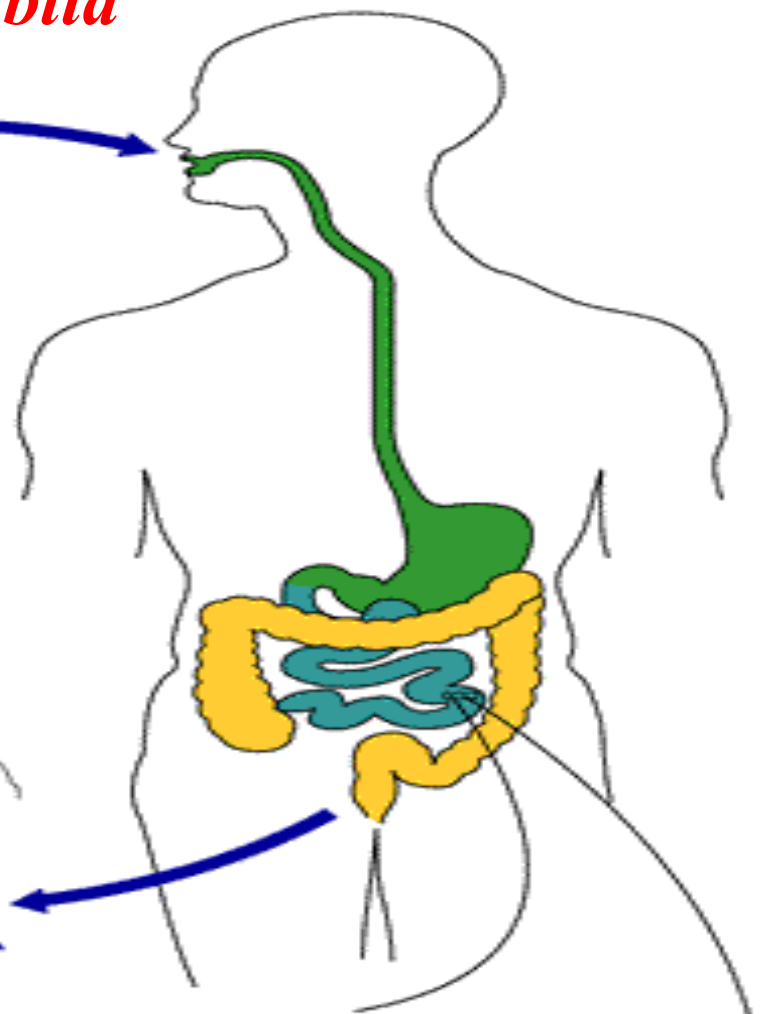
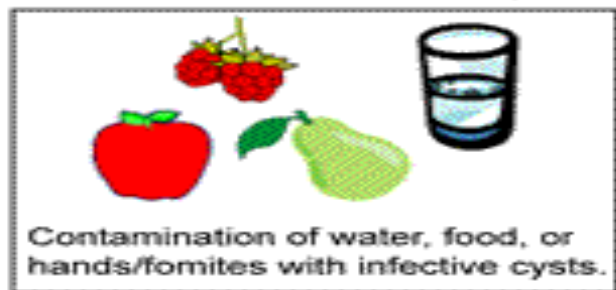
daycare center outbreaks

illness in international travelers

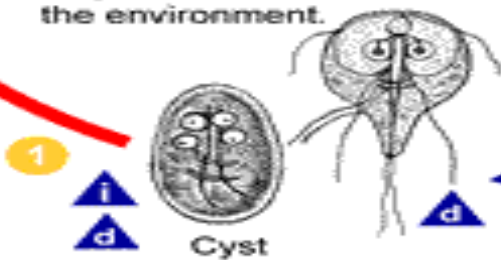
Giardiasis common in areas with poor sanitary
conditions and limited water-treatment facilities

Water is a major source of giardiasis transmission.

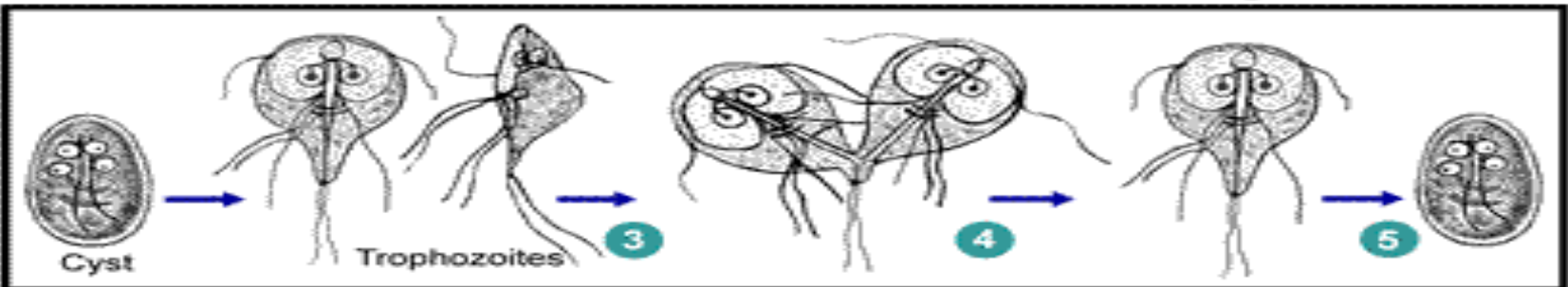
Giardia lamblia



Trophozoites are also passed in stool but they do not survive in the environment.



i = Infective Stage
d = Diagnostic Stage



Giardia lamblia

Life cycle

Giardia have two forms **cysts & trophozoites**

Cysts are the **infectious stage** of the parasite

They are excreted in stool.

Following cyst ingestion, excystation occurs in the small intestine with release of trophozoites.

Trophozoites

are pear-shaped, bi-nucleate, multi-flagellated parasite forms

Following cyst ingestion, infections have an incubation of a week or more before symptoms of acute giardiasis may develop.

Trophozoites are localize to the small intestine

Trophozoite attachment to the mucosal surface of the duodenum

Clinical manifestation

It is mainly asymptomatic infection occurs in both children and adults.
asymptomatic cyst & trophozoites shedding can last six months or more.

If symptoms occur will be as

Diarrhea

Malaise

abdominal cramps

Flatulence

weight loss & vomiting

Complications

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.

Giardia trophozoites in tissue section










Giardiasis: Laboratory diagnosis

- **Stools examination**
 - Microscopy for cysts or trophozoites
 - Detection of *Giardia* antigens in stools
- **Examination of duodenal contents: trophozoites**

Chemotherapy

- **Drug of choice: Metronidazole**

Intestinal Amoebae

Stained	<i>Entamoeba coli</i>	<i>Endolimax nana</i>	<i>Iodamoeba bütschlii</i>	<i>Dientamoeba fragilis</i>	<i>Entamoeba histolytica</i>	<i>Entamoeba dispar</i>	<i>Entamoeba hartmanni</i>
Cytoplasm inclusions	With haematoxylin, stains bluish-grey Stain black except glycogen as clear area				RBCs also stain black		
Nuclear characteristics							
Membrane	Thick	Thin	Thick	Very delicate		Delicate	
Chromatin on membrane	Coarse	None	Sometimes granular	None		Fine granules	
Karyosome	Coarse, generally eccentric	Large irregular	Large lateral	Central granules		Small central	
Fibril network	May be chromatin particles	No chromatin	No chromatin	Delicate fibrils		Not often seen	
Pathogenicity	Harmless commensal	Harmless commensal	Harmless commensal	Disputed	Invasive	Harmless commensal Non-invasive	Harmless commensal Non-invasive

Entamoeba histolytica

500 million people are infected. 100,000 deaths per year.

It is a waterborne infection.

There are 6 species of *Entamoeba*:

1. ***E. histolytica*** Amoebae that are pathogenic & invasive
2. ***E. dispar***. The non-pathogenic, non invasive form
3. ***E. hartmanni***
4. ***E. coli***
5. ***E. gingivalis***
6. ***E. polecki***

E. histolytica and *E. dispar* can't be distinguished by microscopic observation

Entamoeba histolytica

Amebiasis occurs worldwide

increased in developing countries because of poor socioeconomic conditions and sanitation levels

The parasite exists in two forms:

Cyst stage (the infective form)

Trophozoite stage which causes invasive disease.

The **cysts** pass through the stomach to the small intestine, where they excyst to form **trophozoites**.

The **trophozoites** can invade and penetrate the mucous barrier of the colon, causing tissue destruction colitis and increased intestinal secretion and can thereby ultimately lead to bloody diarrhea.

Clinical manifestation:

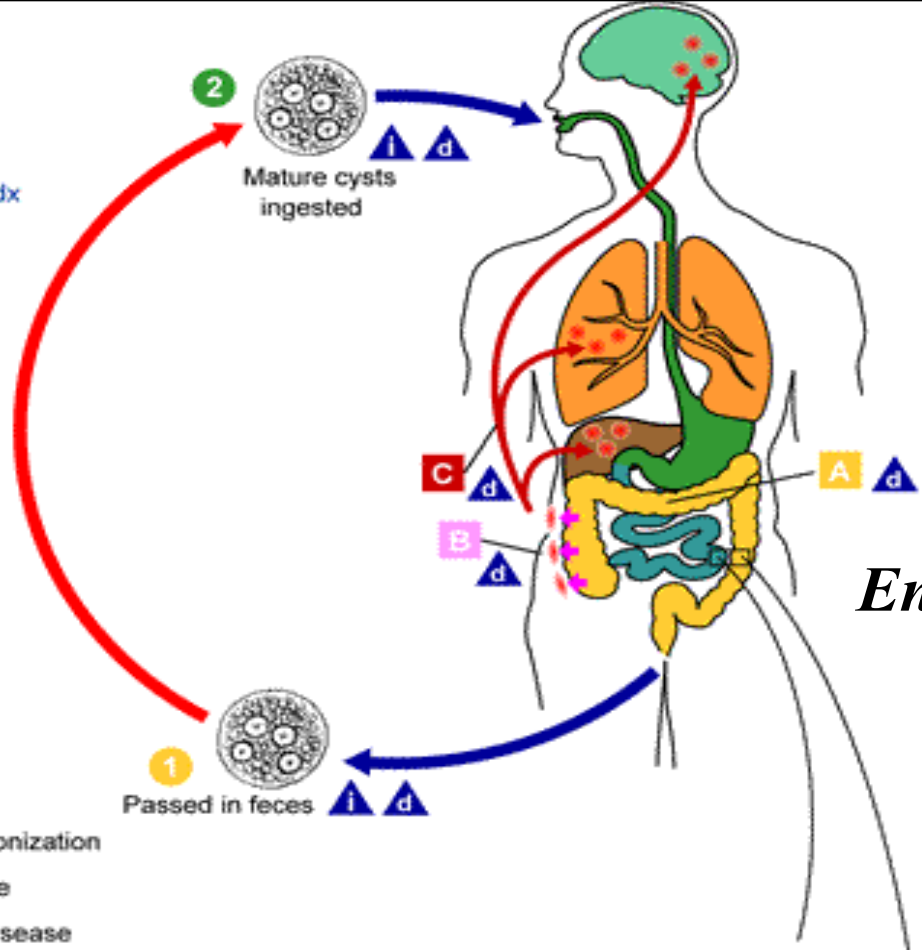
The majority of *Entamoeba* infections are **asymptomatic** some have Symptoms which range from mild diarrhea to severe **amebic dysentery (abdominal pain, bloody diarrhea and mucus in stools) & fulminant amebic colitis.**

Weight loss occurs in about half of patients, and fever can occur.

Fulminant colitis with **bowel necrosis** leading to **perforation**, and **peritonitis** has been observed in approximately **0.5 %** of cases; associated mortality rate is more than 40 percent.



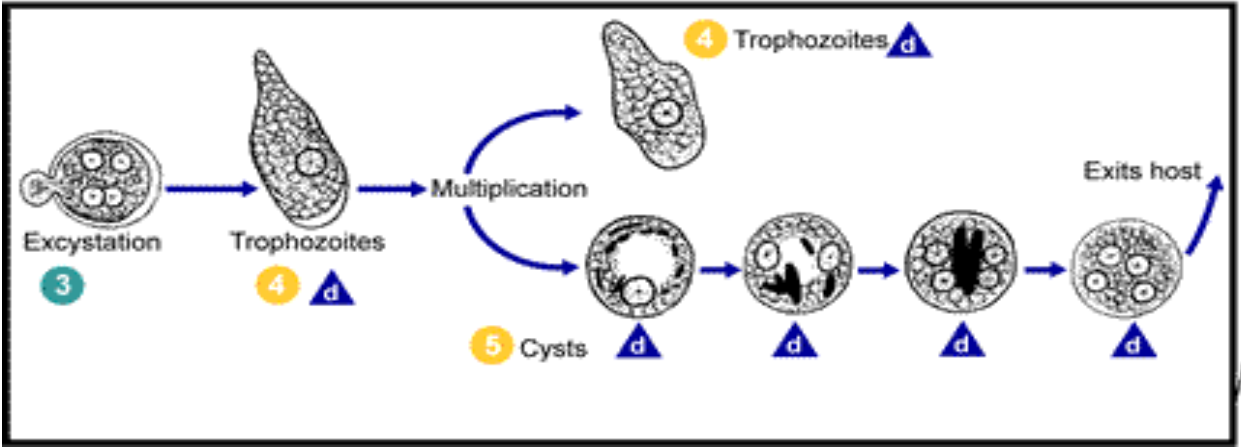
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Entamoeba histolytica

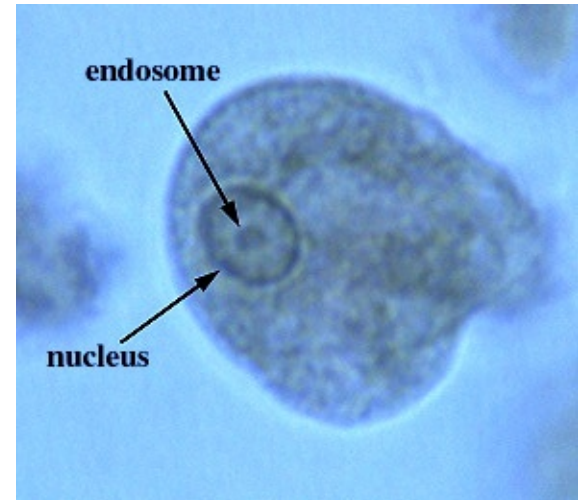
i = Infective Stage
d = Diagnostic Stage

A = Noninvasive Colonization
B = Intestinal Disease
C = Extraintestinal Disease

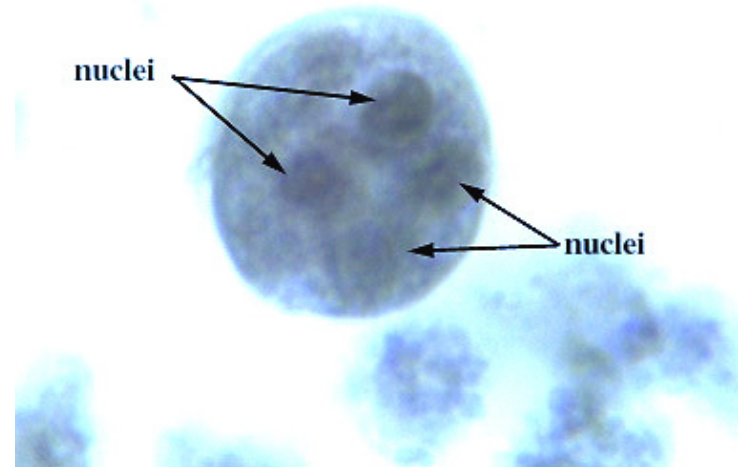


Entamoeba histolytica

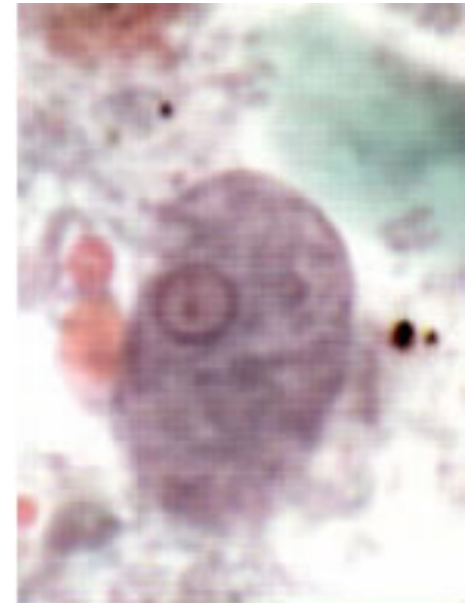
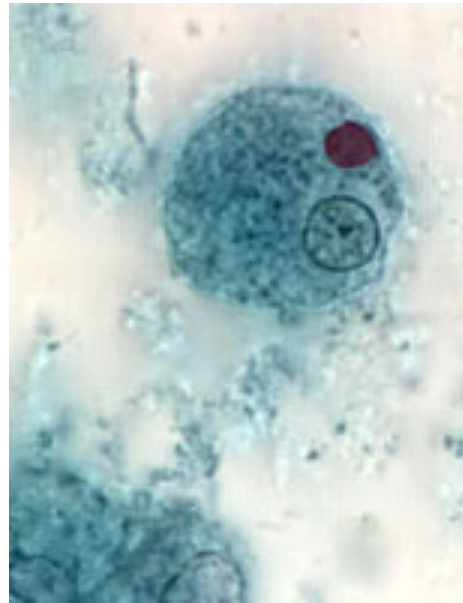
Trophozoite: vegetative stage, must encyst to survive in the environment. It is a fragile structure.



Cyst: infective stage. Resist the harsh conditions of the environment.



E. histolytica cyst



E. histolytica trophozoite

Entamoeba histolytica

Mode of infection (fecal-oral route)

Water, food

Flies can act as vector.

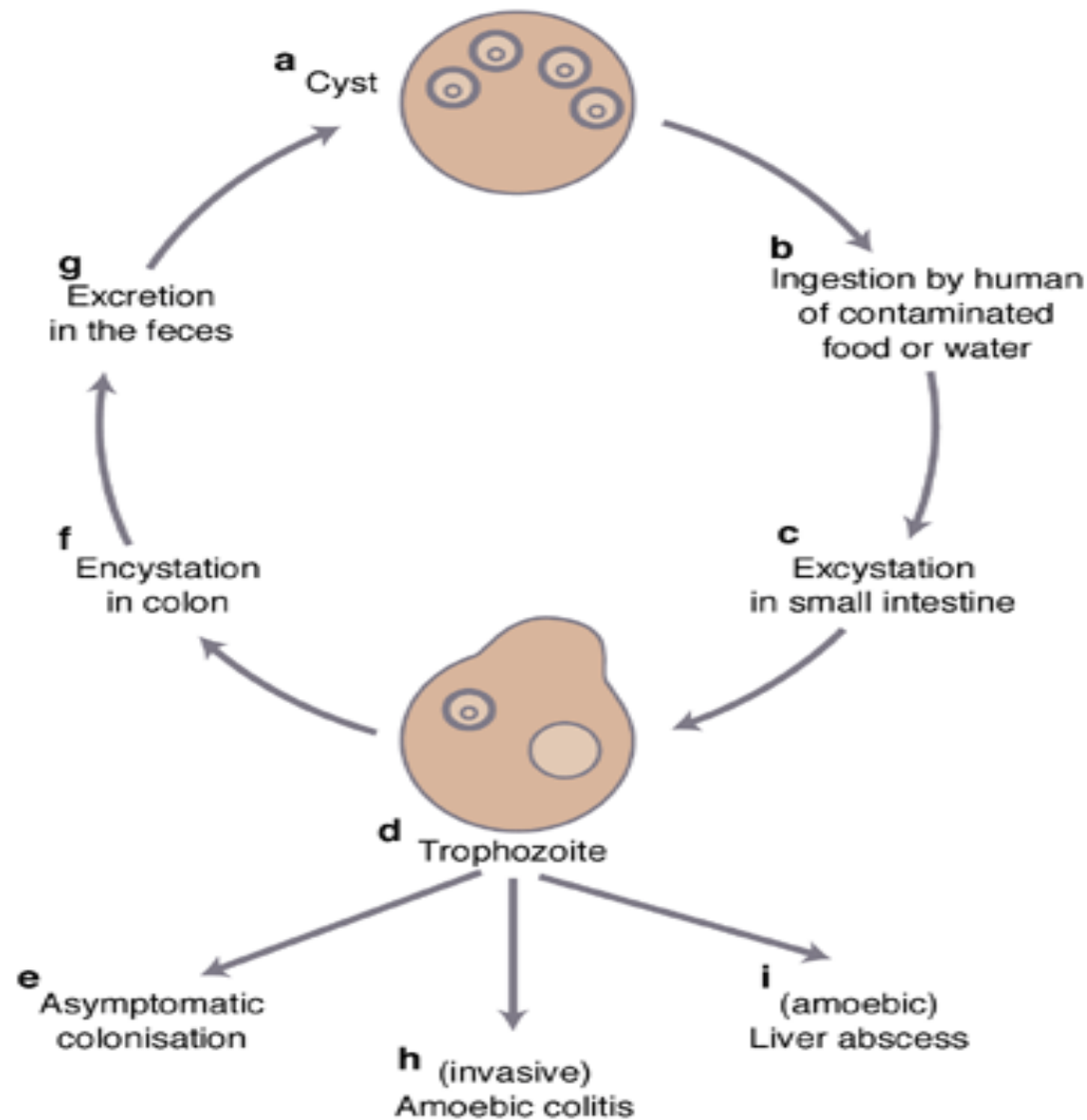
Can be sexually transmitted person to person contacts

Not a zoonosis

The infective dose can be as little as 1 cyst (very virulent).

The incubation period can be from few days to few weeks depending on the infective dose

Cysts can survive for weeks at appropriate temperature and humidity.



Life cycle of *Entamoeba histolytica* and the clinical manifestations of infection in humans

Entamoeba histolytica

PATHOLOGY

Intestinal amoebiasis :

Remarkable and unique ability to produce **enzymes** that lyses host tissues.

Lesions are found mainly in the **colon**.

They may heal.

Or it may cause **serious complications:**

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

PATHOLOGY: Intestinal amoebiasis

Invasion of the large intestine

Mucosa
Muscularis mucosae
Submucosa
Muscle layers
Subserosa

The primary ulcer

Invasion of mucosa via crypts
Repair may:
-overtake necrosis with healing
-keep pace with necrosis causing persistent superficial lesions

'Flask-shaped'

Lag behind-extension

Extension in mucosa

Muscularis mucosae relatively resistant
Accumulation of amoebae superficial to it
Lateral extension of lytic necrosis

Formation of sinuses

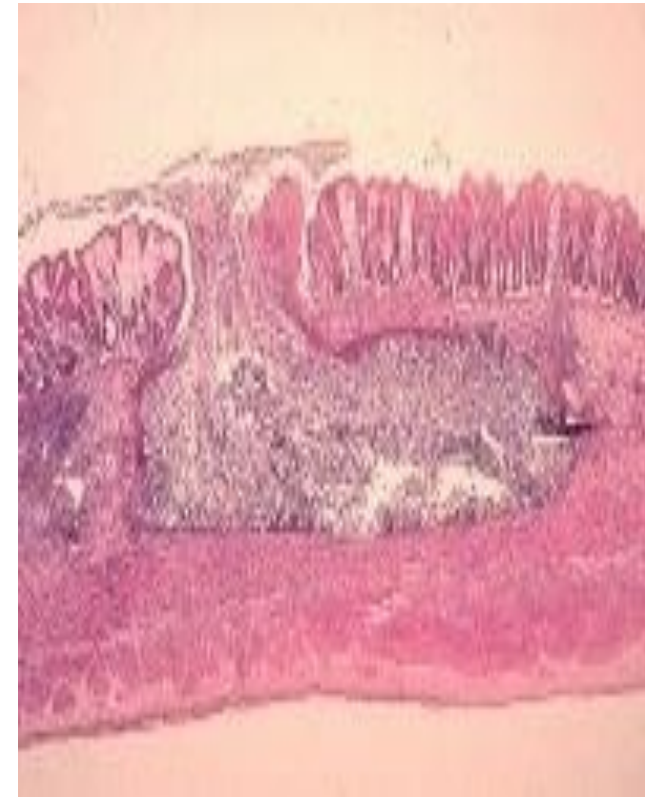
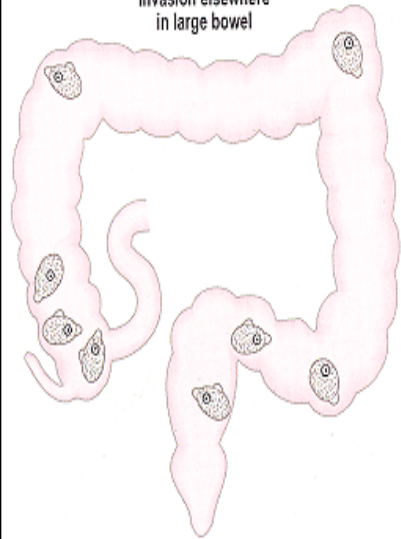
Abscesses may coalesce under intact mucosa
Later mucosa may slough with widespread ulceration

Deep extension

Muscularis mucosae eventually pierced (directly or via vessels)
Deep necrosis of sub-mucosa, even muscle and sub-serosa

Site of entry
Initially minute then irregular ulcer shape, typically flask-like edges overhanging floor; necrotic lysed tissue; amoebae invading around discharge; necrotic debris, mucus and amoebae

Invasion elsewhere in large bowel



Flask shaped ulcer

PATHOLOGY: Intestinal amoebiasis

Complications

Complications and sequelae

Perforation
Haemorrhage (rare)

Secondary infection

Amoeboma (rare)
(Clinically simulates neoplasm)
- intussusception
- obstruction

Invasion of blood vessels

Direct extension outside bowel



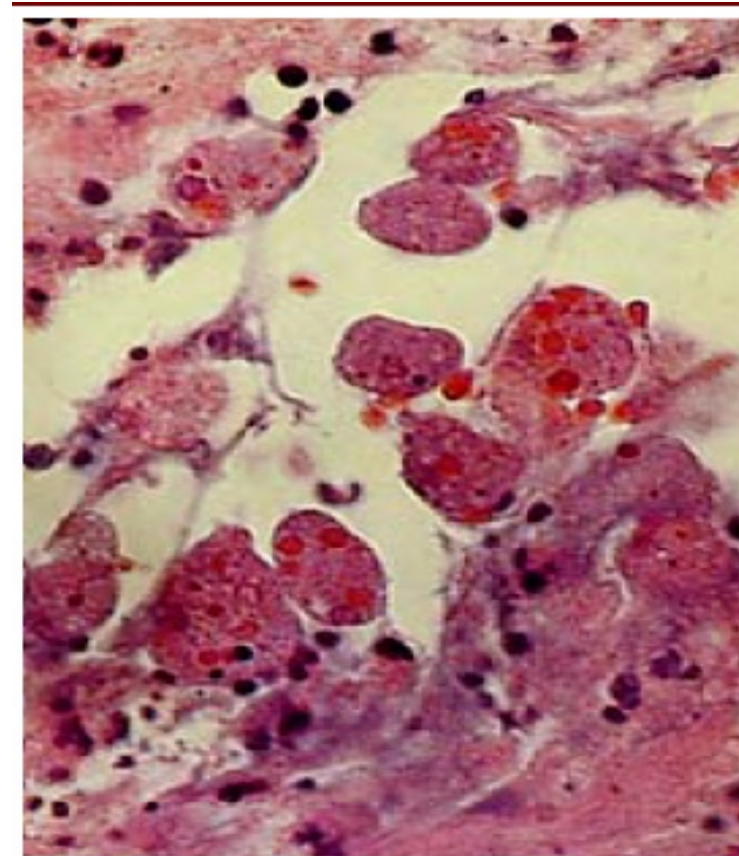
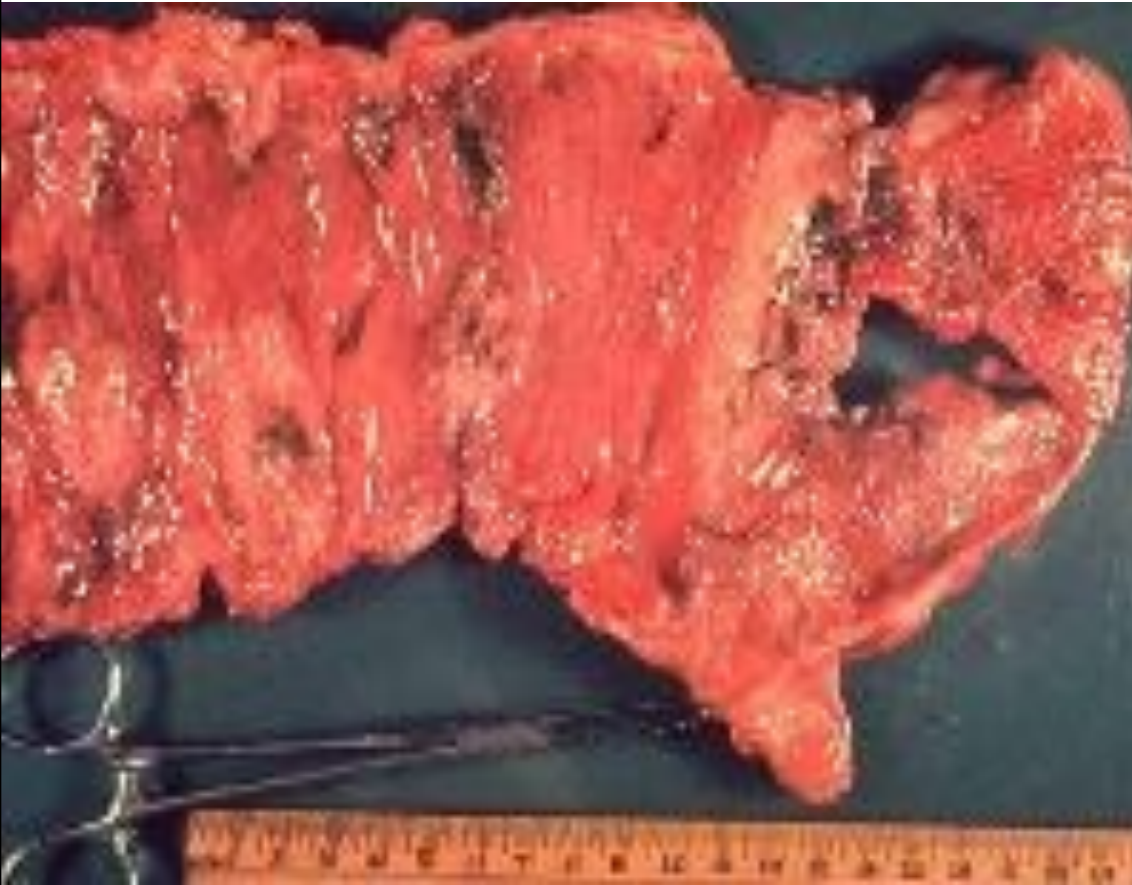
Peritonitis
Haemorrhage

Surrounding inflammatory reaction and
fibroblastic proliferation

A mass under oedematous mucosa with
- internal abscesses of necrotic tissue and amoebae
- surrounding granulomatous tissue zone with eosinophils,
lymphocytes and fibroblasts
- outer firm nodular fibrous tissue

Extraintestinal lesions-page 52

PATHOLOGY: Intestinal amoebiasis



Entamoeba histolytica

E. Histolytica in mucosa.

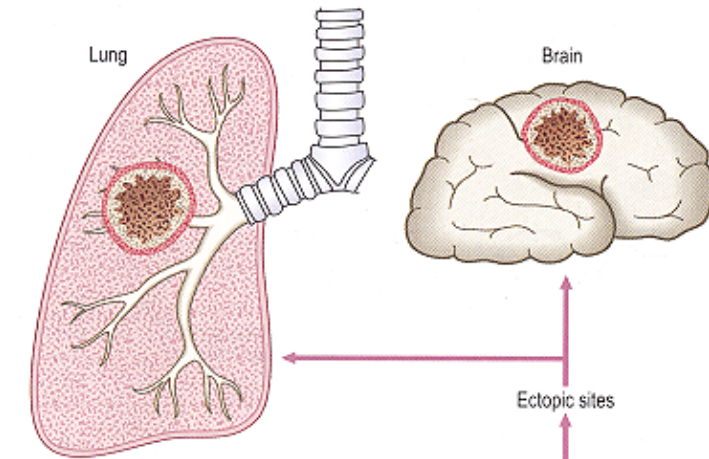
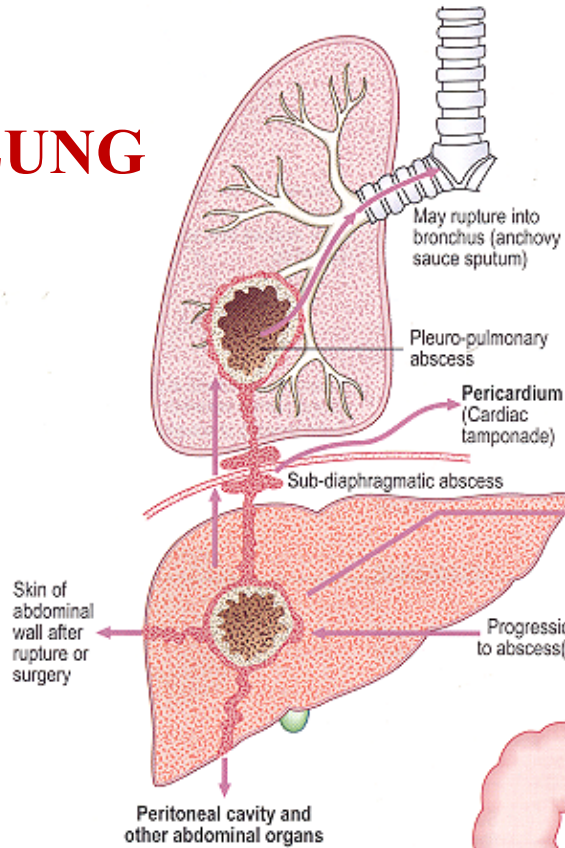
Numerous trophozoites can be seen with ingested erythrocytes

PATHOLOGY: Extra-intestinal amoebiasis :

Direct extension

Haematogenous spread

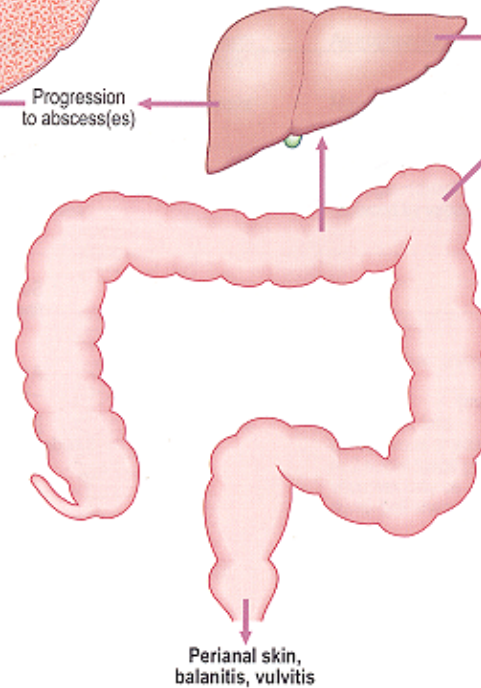
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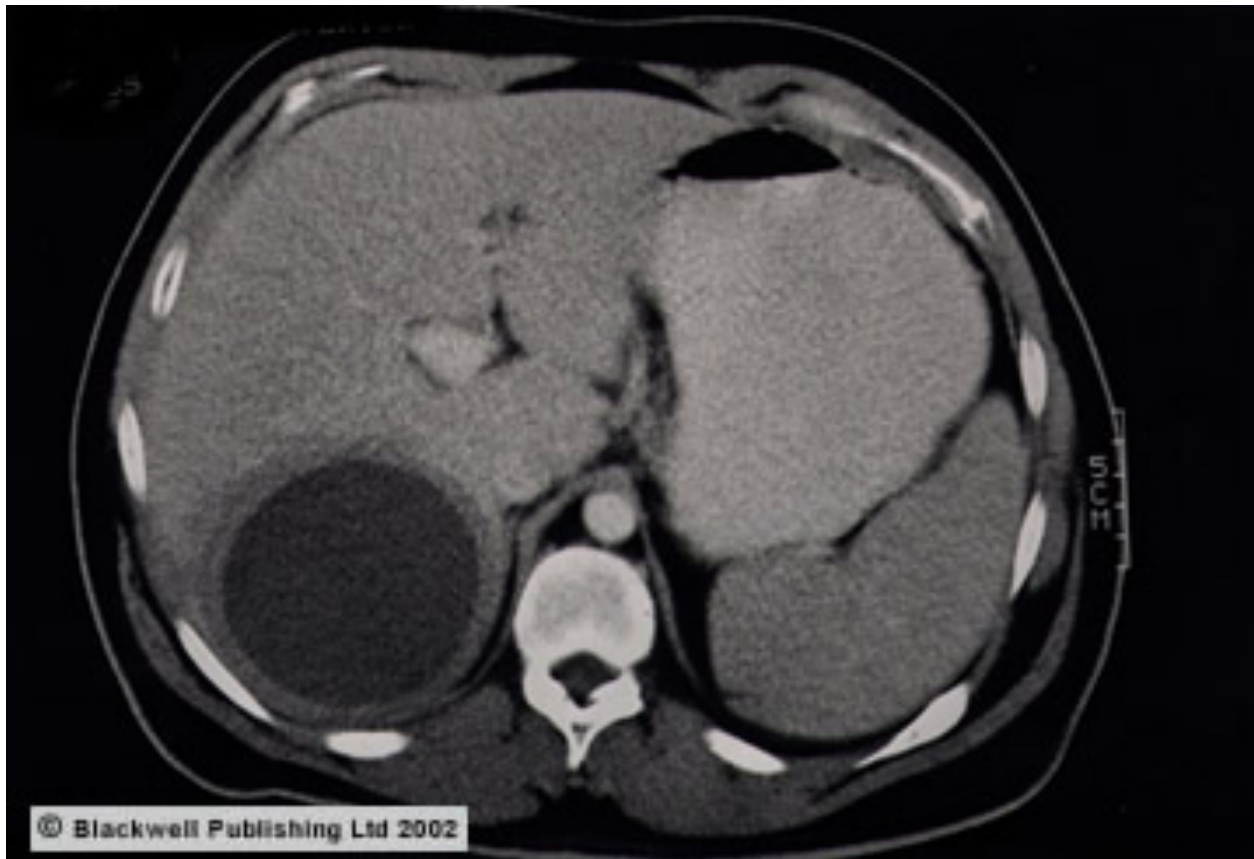


BRAIN

- Secondary to
 - Concomitant with
 - Independent of
- Liver involvement

LIVER



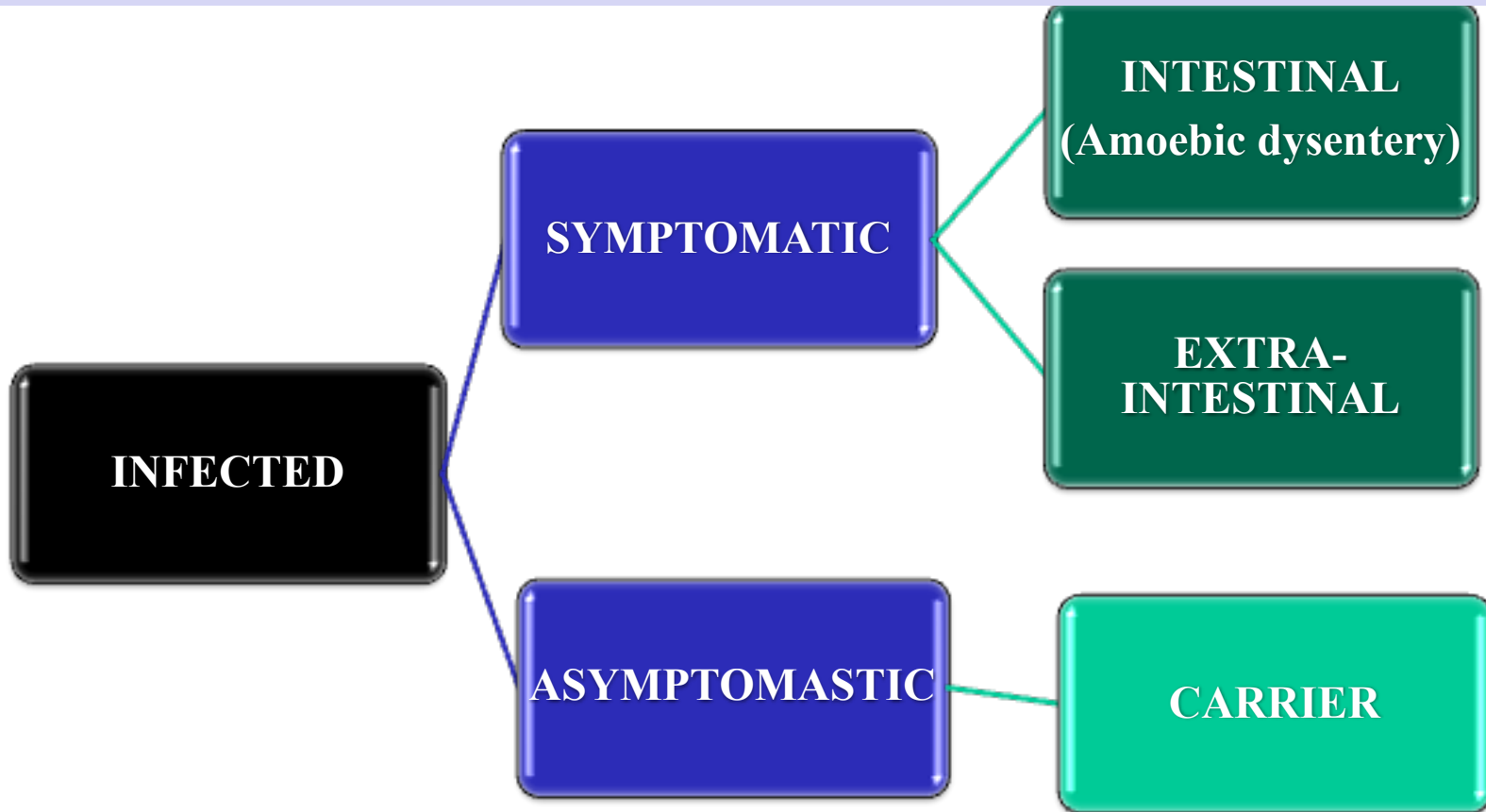


A 30-year-old male experienced diarrhea for two weeks with fever of 39° C, nausea, vomiting, malaise and **right upper abdominal pain**. Physical examination revealed hepatomegaly 6 cm below the right costal margin. CT scan showed a single hypodense mass in the right lobe of 7.8 x 5.2 cm, round, with well defined borders. Serology was positive for *Entamoeba histolytica* at 1/512.

Amebic liver abscess was diagnosed.

THE CLINICAL OUTCOMES OF INFECTION WITH

Entamoeba histolytica



Laboratory Diagnosis of Amoebiasis

- Diagnostic techniques include **microscopy, antigen detection (serology), molecular, and colonoscopy with histological examination.**
 - **Stools examination (Microscopy):**
 - Wet mount (cysts and trophozoites)
 - Concentration methods (only cysts)
 - **Serology antigen detection** (mainly for invasive infections): IHA, ELISA.
 - **Molecular** — Detection of parasitic DNA or RNA in feces via probes can also be used to diagnose amebic infection and to differentiate between the different strains.

- **Extra-intestinal:**

- Serology: IHA, ELISA
- Surgical aspirate (not done as a diagnostic procedure due to risk of extension) trophozoite
- Sigmoidoscopy and/or colonoscopy and taking biopsy: trophozoite.

Main Drugs for Treatment of Amoebiasis

- **Intestinal :**

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

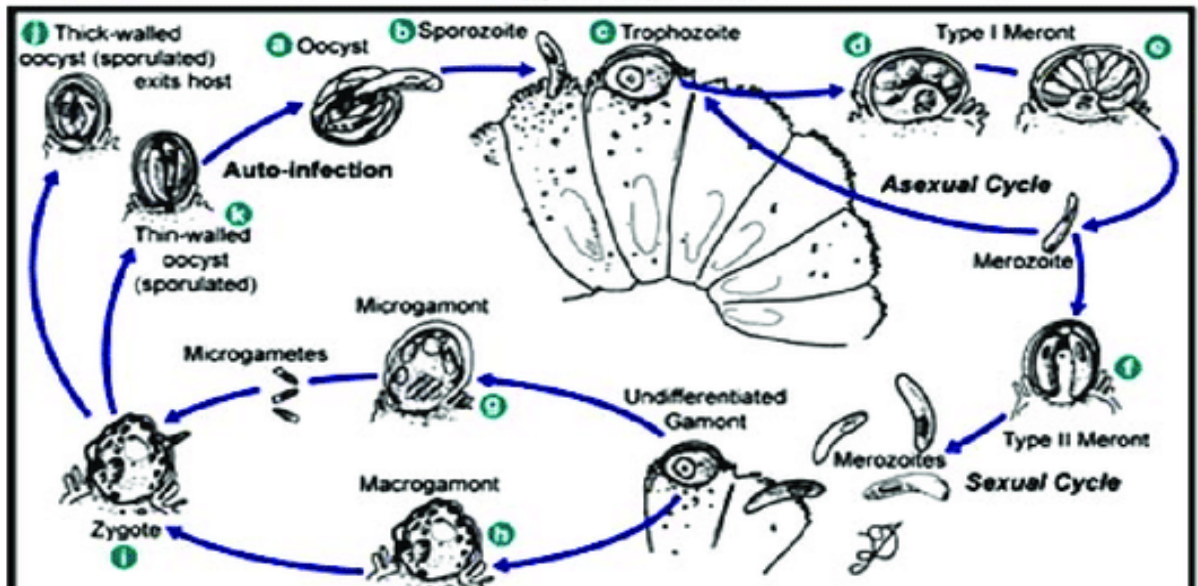
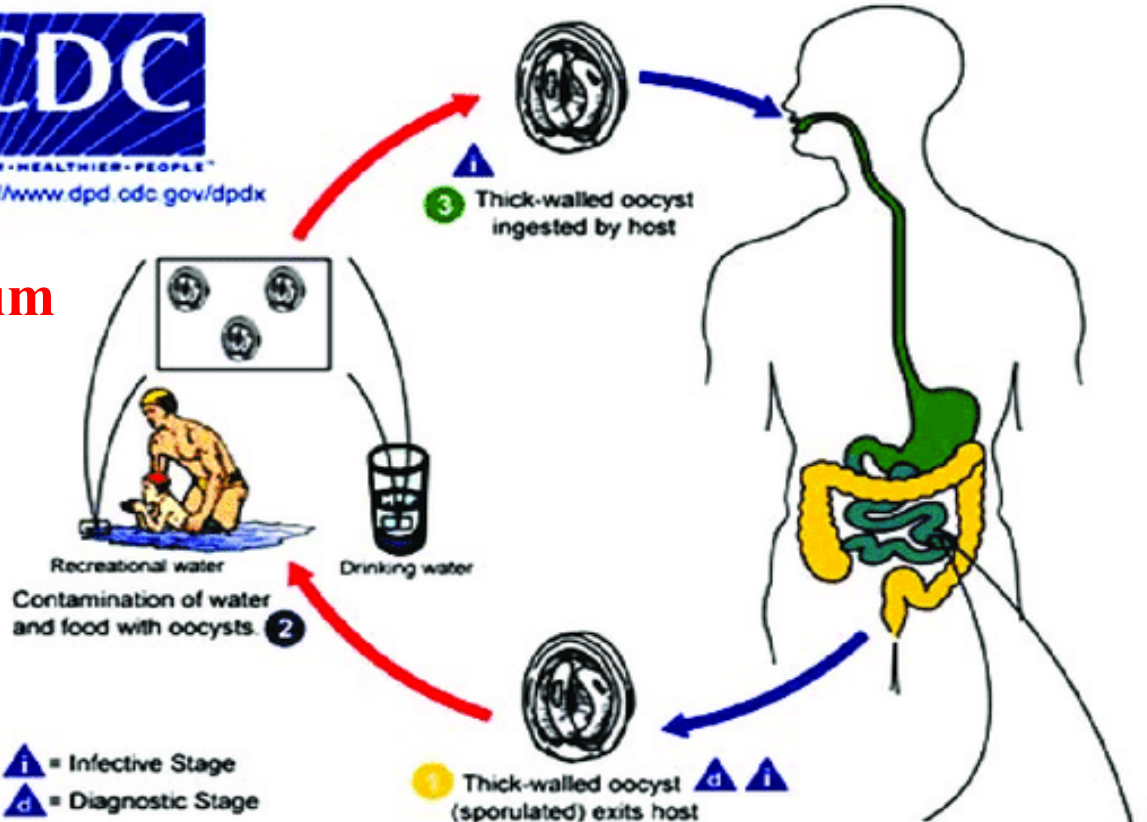
- **Extra-intestinal:**

- Metronidazole



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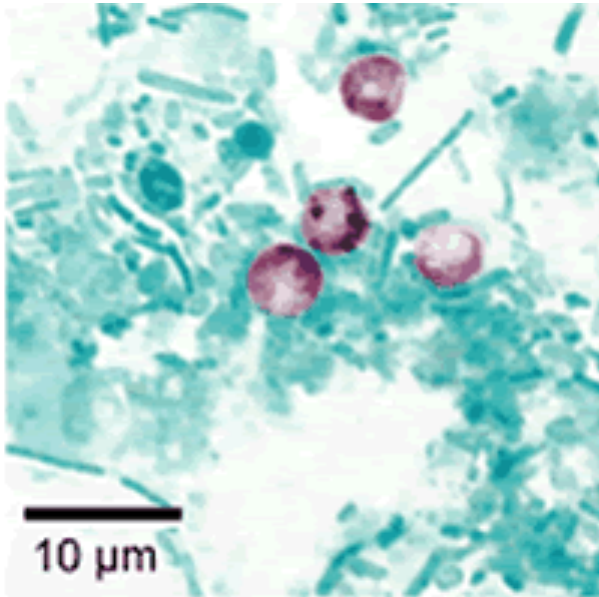
Cryptosporidium



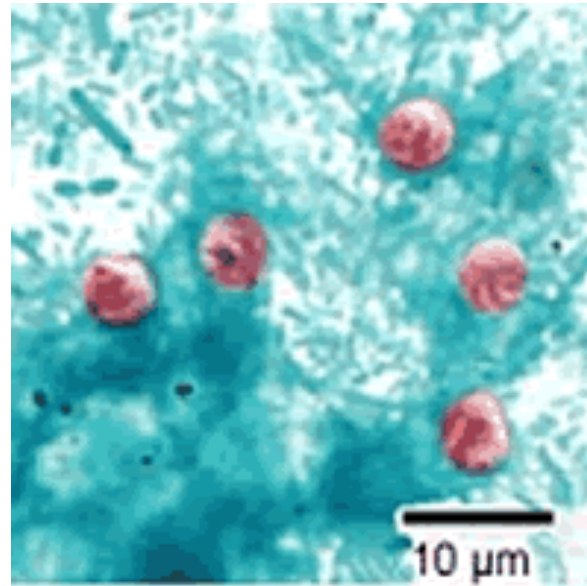
Cryptosporidium

- intracellular protozoan parasite that is associated with **self-limited diarrhea** in normal immunocompetent hosts and severe debilitating diarrhea with weight loss and malabsorption in HIV-infected patients
- The diagnosis of cryptosporidiosis is generally based upon microscopy since *Cryptosporidium* **cannot be cultivated in vitro**
- Transmission of cryptosporidiosis occurs via spread from infected person or animal by fecal-oral rout.

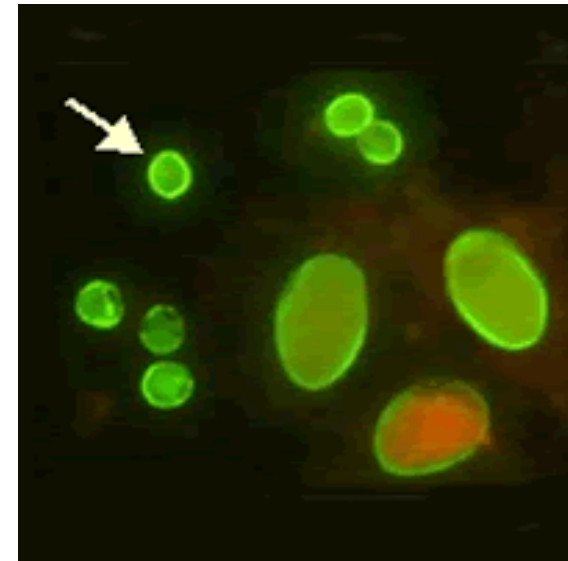
Cryptosporidium Diagnosis



**Modified acid-fast stain
ZN.**



safranin



**IMMUONOFLOURECENT
(IF)**

Cryptosporidium Diagnosis

From stool

by finding **oocysts** in fecal smears when using modified acid-fast stain (ZN)

And by Antigen detection by using ELIZA, IF

From duodenal aspirates, bile secretions & biopsy specimens from affected gastrointestinal tissue

We can also do **PCR**, or enzyme immunoassays **ELIZA & IF**.

Cryptosporidiosis Treatment

- Self-limited in immunocompetent patients
- In AIDS patients: paromomycin

