

# **Protozoan disease**

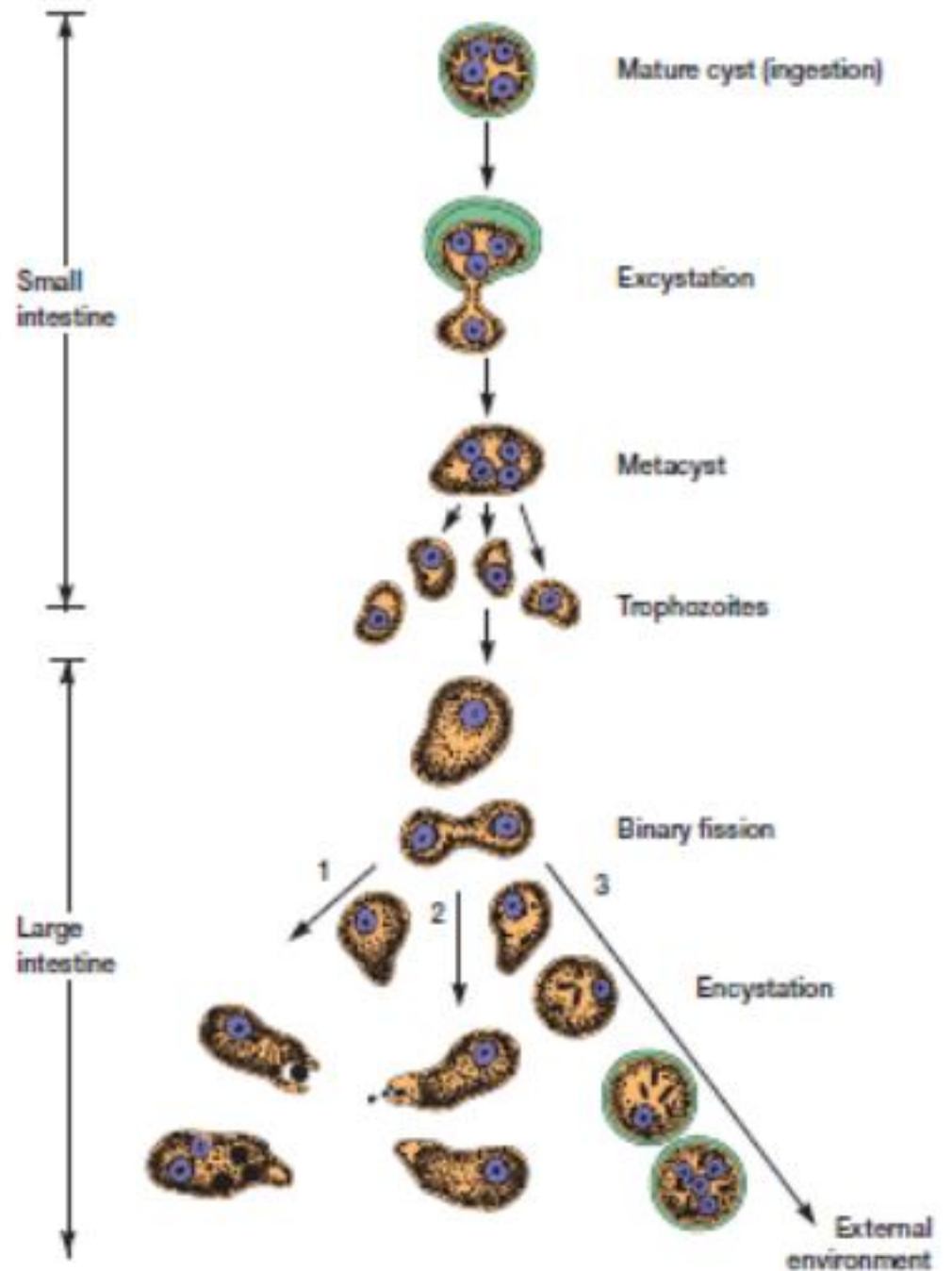
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# Amebiasis

- **Caused by:** *Entamoeba histolytica* is responsible for amebiasis (amebic dysentery)
- This very common parasite is endemic in warm climates where adequate sanitation and effective personal hygiene is lacking.
- **Pathogenesis:** Infection occurs by ingestion of mature cysts.
- After excystation in the lower region of the small intestine, the metacyst divides rapidly to produce eight small trophozoites.
- These trophozoites move to the large intestine where they can invade the host tissue, live as commensals in the lumen of the intestine, or undergo encystation.
- If the infective trophozoites invade the intestinal tissues, they multiply rapidly and spread laterally, while feeding on erythrocytes, bacteria, and yeasts.
- The invading trophozoites destroy the epithelial lining of the large intestine by producing cysteine proteinases.
- Cysteine proteinases possibly are a virulence factor of *E. histolytica* and may play a role in intestinal invasion by degrading extracellular matrix and circumventing the host immune response through cleavage of secretory immunoglobulin A (sIgA), IgG, and complement factors.
- Lesions (ulcers) are characterized by minute points of entry into the mucosa and extensive enlargement of the lesion after penetration into the submucosa.
- *E. histolytica* also may invade and produce lesions in extraintestinal foci, especially the liver, to cause hepatic amebiasis.

# Life cycle of *Entamoeba histolytica*



# ...Amebiasis

- **Symptoms:** The symptoms of amebiasis are highly variable, ranging from an asymptomatic infection to fulminating dysentery, exhaustive diarrhea accompanied by blood and mucus, appendicitis, and abscesses in the liver, lungs, or brain.
- **Diagnosis:** is based on finding trophozoites in fresh warm stools and cysts in ordinary stools.
- Serological testing also should be done.
- **Treatment:** The therapy depends on the location of the infection within the host and the host's condition.
- Asymptomatic carriers that are passing cysts should always be treated with iodoquinol or paromomycin.
- In symptomatic intestinal amebiasis, metronidazole (Flagyl) or iodoquinol (Yodoxin) are the drugs of choice.
- **Prevention and control** : of amebiasis is achieved by avoiding water or food that might be contaminated with human feces in endemic areas.
- Viable cysts in water can be destroyed by hyperchlorination or iodination.

# Cryptosporidiosis

- **Caused by:** *Cryptosporidium parvum*
- In 1993 *C. parvum* contaminated the Milwaukee, Wisconsin, water supply and caused severe diarrheal disease in about 400,000 individuals, the largest recognized outbreak of waterborne illness in U.S. history.
- *Cryptosporidium* (“hidden spore cysts”) is found in about 90% of sewage samples, in 75% of river waters, and in 28% of drinking waters.
- **Pathogenesis:** *C. parvum* is a common coccidial Apicomplexan parasite found in the intestine of many birds and mammals.
- When these animals defecate, oocysts are shed into the environment.
- If a human ingests food or water that is contaminated with the oocysts, excystation occurs within the small intestine and sporozoites enter epithelial cells and develop into merozoites.
- Some of the merozoites subsequently undergo sexual reproduction to produce zygotes, and the zygotes differentiate into thick-walled oocysts.
- Oocyst release into the environment begins the life cycle again.
- The incubation period for cryptosporidiosis ranges from 5 to 28 days.

# ...Cryptosporidiosis

- **Symptoms:** Diarrhea, which characteristically may be choleralike, is the most common symptom.
- Other symptoms include abdominal pain, nausea, fever, and fatigue.
- **Diagnosis:** The pathogen is routinely diagnosed by fecal concentration and acid-fast stained smears
- Rapid environmental impact assessment (EIA) and direct fluorescent antibody (DFA) techniques also have been developed.
- **Treatments:** No chemotherapy is available and patients are simply rehydrated.
- Although the disease usually is self-limiting in healthy individuals, patients that have late-stage AIDS or are immunocompromised in other ways may develop prolonged, severe, and life-threatening diarrhea.

# Freshwater Amoeba Diseases

- **Caused by:** *Naegleria* and *Acanthamoeba* are facultative parasites responsible for causing primary amebic meningoencephalitis in humans.
- **Transmission:** They are among the most common protozoa found in freshwater and moist soil.
- **Pathogenesis & Symptoms:** several *Acanthamoeba spp.* are known to infect the eye, causing a chronically progressive ulcerative *Acanthamoeba* keratitis, inflammation of the cornea, which may result in blindness.
- Wearers of soft contact lenses may be predisposed to this infection and should take care to prevent contamination of their lens cleaning and soaking solutions.
- **Diagnosis:** Diagnosis of these infections is by demonstration of the amoebae in clinical specimens.
- **Treatments:** Most freshwater amoebae are resistant to commonly used antibiotic agents.

# Giardiasis

- **Caused by:** *Giardia lamblia* a flagellated protozoan.
- *G. lamblia* is worldwide in distribution, and it affects children more seriously than it does adults.
- **Transmission:** is most frequent by cyst-contaminated water supplies.
- Epidemic outbreaks have been recorded in wilderness areas, suggesting that humans may be infected from “clean water” with *Giardia* harbored by rodents, deer, cattle, or household pets.
- This implies that human infections also can be a zoonosis.
- **Pathogenesis:** Following ingestion, the cysts undergo excystation in the duodenum, forming trophozoites.
- The trophozoites inhabit the upper portions of the small intestine, where they attach to the intestinal mucosa by means of their sucking disks.
- The ability of the trophozoites to adhere to the intestinal epithelium accounts for the fact that they are rarely found in stools.
- It is thought that the trophozoites feed on mucous secretions and reproduce to form such a large population that they interfere with nutrient absorption by the intestinal epithelium.



# ...Giardiasis

- **Symptoms:** Giardiasis varies in severity, and asymptomatic carriers are common.
- The disease can be acute or chronic.
- Acute giardiasis is characterized by severe diarrhea, epigastric pain, cramps, voluminous flatulence (“passing gas”), and anorexia.
- Chronic giardiasis is characterized by intermittent diarrhea, with periodic appearance and remission of symptoms.
- **Diagnosis:** Laboratory diagnosis is based on the identification of trophozoites—only in the severest of diarrhea—or cysts in stools.
- A commercial ELISA test is also available for the detection of *G. lamblia* antigen in stool specimens.
- **Treatments:** Quinacrine hydrochloride (Atabrine) and metronidazole (Flagyl) are the drugs of choice for adults, and furazolidone is used for children.
- Prevention and control involves proper treatment of community water supplies, especially the use of slow sand filtration because the cysts are highly resistant to chlorine treatment.

# Questions

- Discuss in detail about common waterborne protozoan diseases, and their treatments.
- Write short note on:
  - Giardiasis
  - Amebiasis