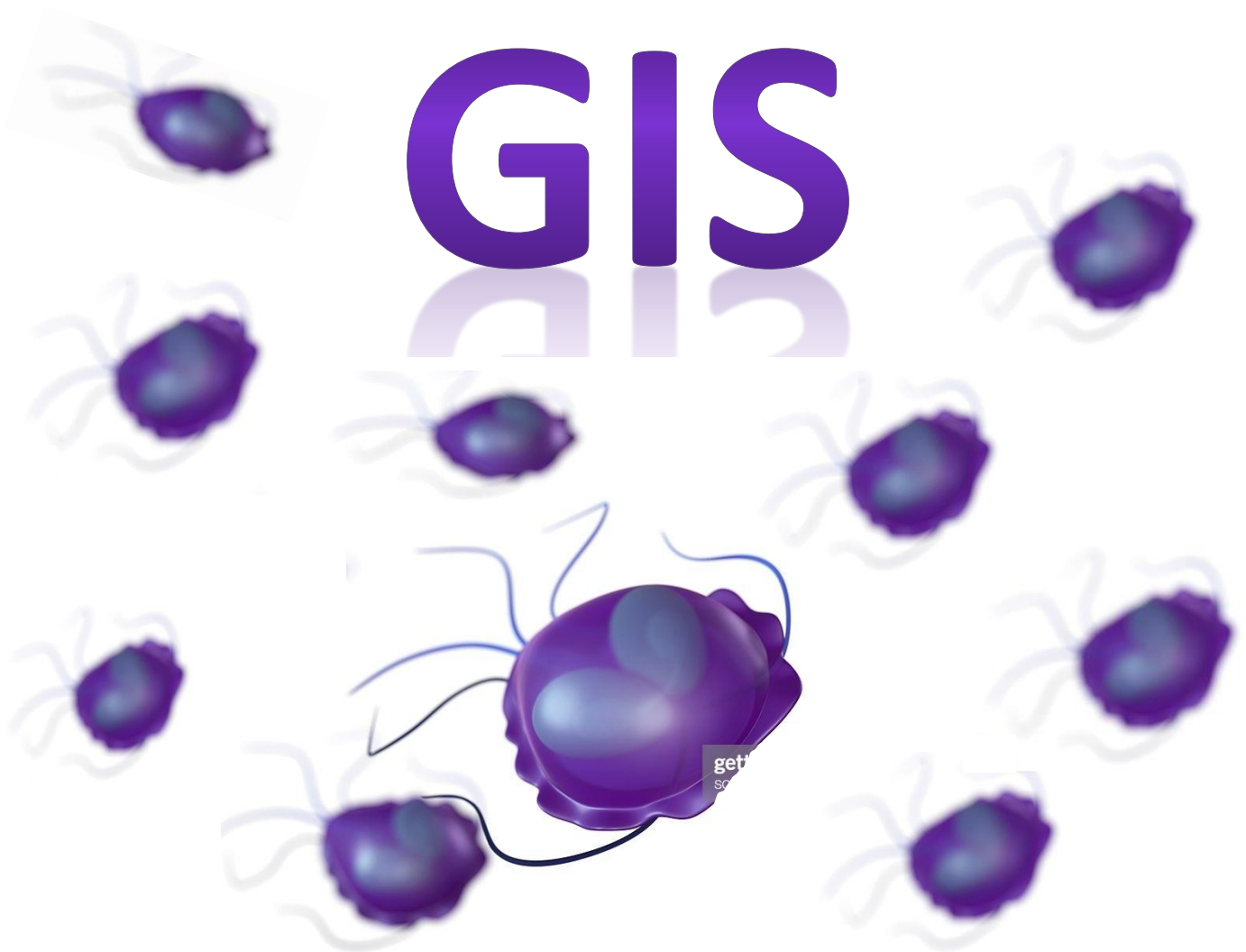


GIS



SUB-SYSTEM: MICROBIOLOGY

LECTURE: GIARDIA LAMBLIA – SHEET 7

DOCTOR: HALA AL DAGHISTANI

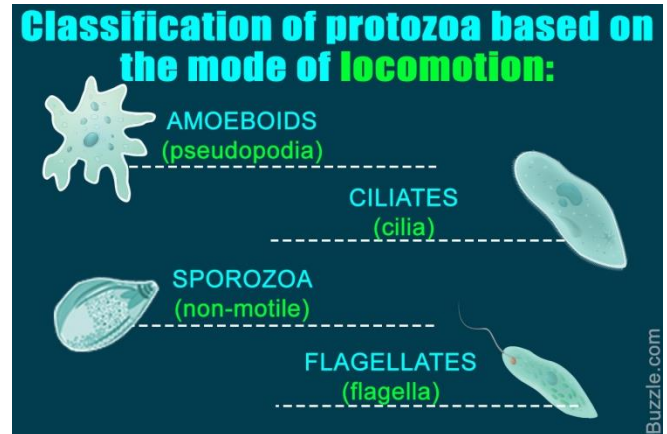
DATE: 25-4-2019

DONE BY: YAMAN KARAJEH & ASEM KHALAYLAH

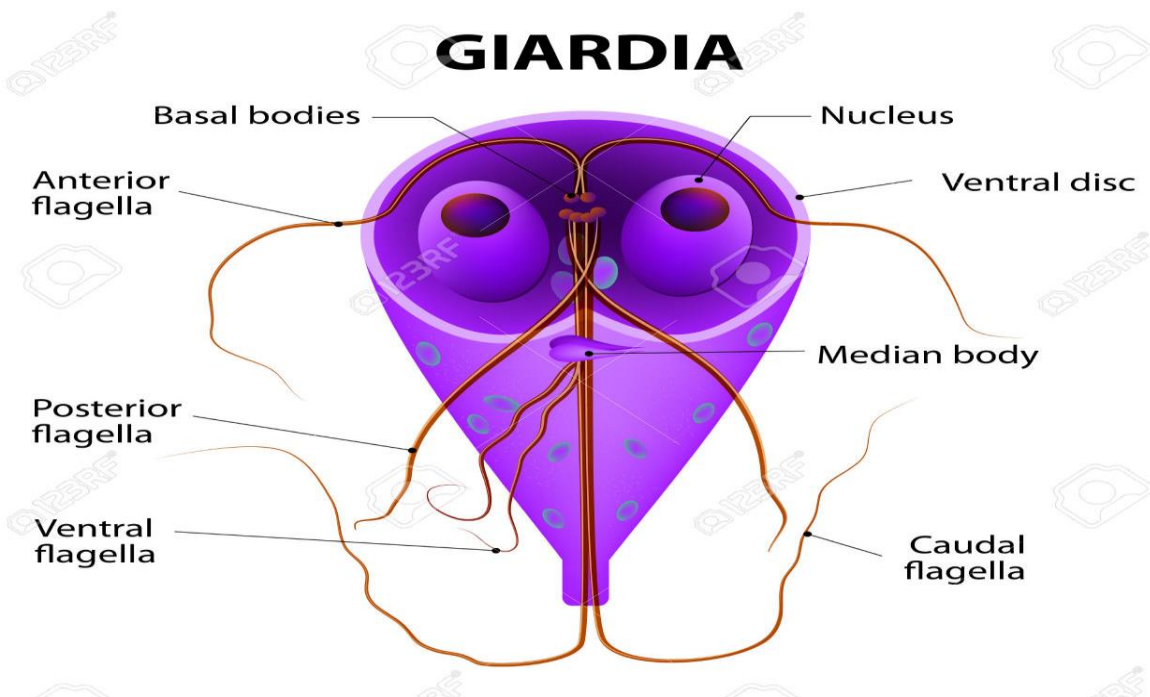
Parasitic Protozoa: Intestinal protozoa

Intestinal protozoa include

- *Giardia lamblia* (Flagellate)
- *Entamoeba histolytica* (Ameba)
- *Cryptosporidium hominis* (Sporozoa)
- *Cyclospora cayetanensis* (Sporozoa)



GIARDIA LAMBLIA



Giardia lamblia (*Giardia duodenalis* or *Giardia intestinalis*) is the causative agent of **Giardiasis** and is the only common pathogenic protozoan found in the duodenum and jejunum of humans (The upper part of the small intestine) .

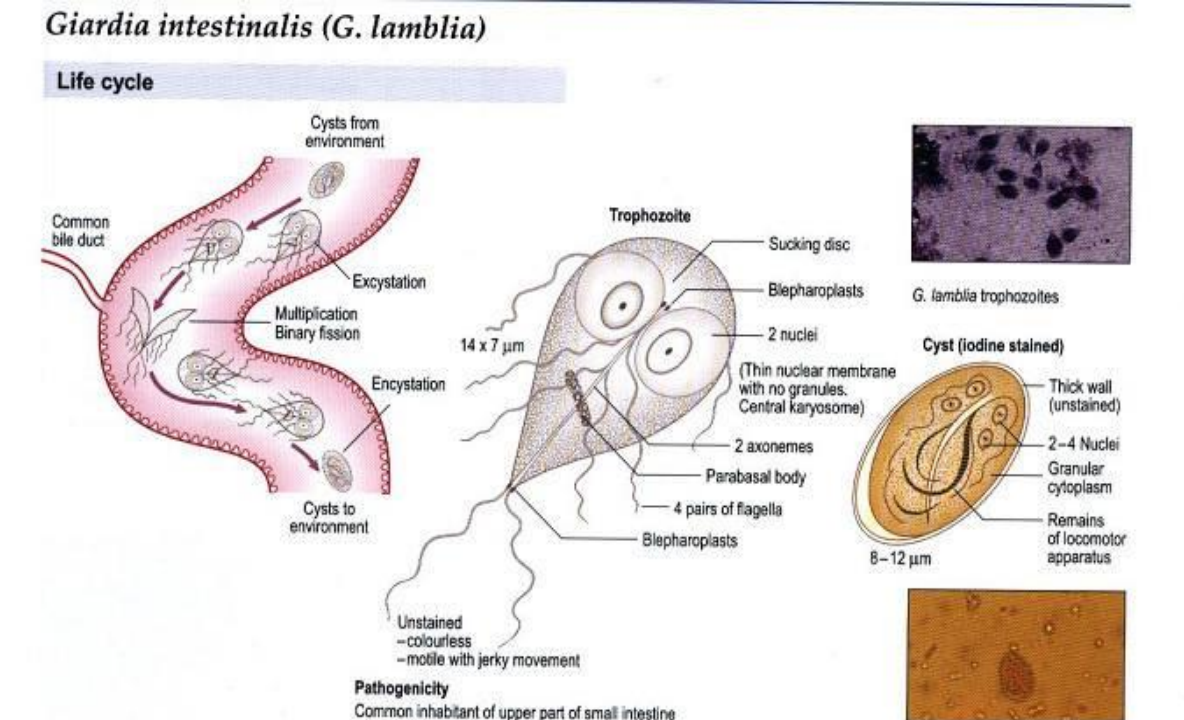
Giardia exists in two forms:

1. The **trophozoites** form **الطور النشط أو التكاثري**
2. The **cyst** form **الطور المتحوصل**.

- The **trophozoite** of *G. lamblia* is a heart-shaped organism, has **four pairs** of flagella, and is approximately **15 µm** in length.
- A large concave sucking disk on the ventral surface helps the organism to **adhere to intestinal villi**.
- As the parasites pass into the colon, they typically encyst, and the **cysts** are passed in the stool. They are ellipsoid, thick-walled (**for protection**), highly resistant, and **8–14 µm** in length; they contain **two nuclei** as Immature forms and **four** as mature cysts.

Sheet Note: As all parasites, trophozoites may stay in stool for hours but eventually it develops into the cyst form, which is responsible for the environmental conditions .

The cyst form is the diagnostic form which causes the giardiasis (mild disease)



Pathology and Pathogenesis

- Giardia lamblia is usually only **weakly pathogenic for humans**. Cysts may be found in large numbers in the stools of entirely **asymptomatic persons**.
- In some persons, however, **large numbers** of parasites attached to the bowel wall may cause irritation and low-grade inflammation of the duodenal or jejunal mucosa, with consequent acute or chronic diarrhea associated with **crypt hypertrophy, villous atrophy or flattening, and epithelial cell damage**.
- Stool of patients may be
 - **Watery**
 - **Semisolid**
 - **Greasy**
(One study provided that G.lamblia doesn't have mitochondria, and needs bile of the gallbladder to feed on, and may also cause blockage for the bile duct, thus the bile can't reach the duodenum and aid in fat digestion and this explains the greasy stool)
 - **Bulky**
(High volume)
 - **Foul smelling at various times during the course of the infection**
(Sometimes has the smell of sulfur) .

Symptoms of giardiasis include: **malaise, weakness, weight loss, abdominal cramps, distention, and flatulence may continue for long periods.**

Stool Collecting

Multiple stool samples over several days is recommended to increase the likelihood of microscopically detecting cysts in smears.

(Recommended: Two samples in two days at least with 5 grams for each)

Epidemiology

- ❖ G. lamblia occurs worldwide. Humans are infected by ingestion of fecally contaminated water or food containing cysts or by direct fecal contamination, as may occur in **day care centers, refugee camps, and institutions, or during oral–anal sex.**
- ❖ **Cysts can survive in water for up to 3 months (which increase its distribution and infectious period).**

Cryptosporidium spp. (Cryptosporidiosis) داء خفيات الأبواغ

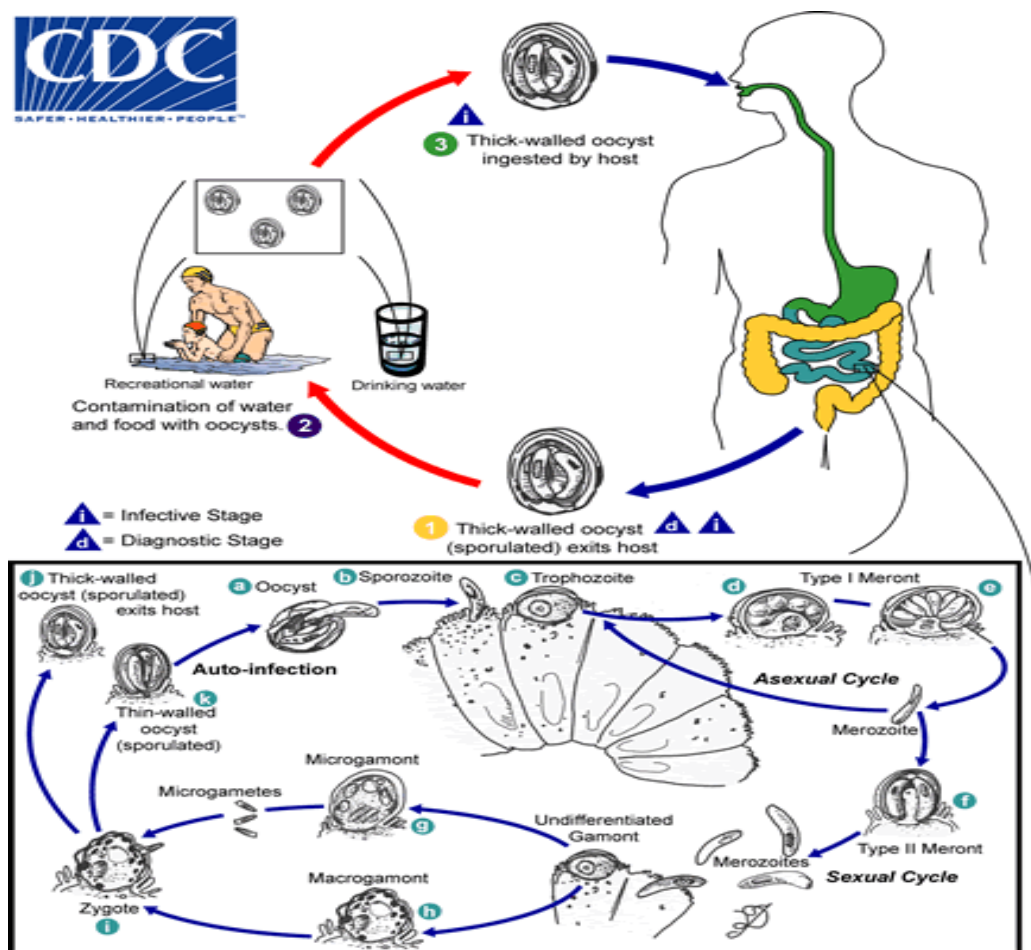
- + It is an obligate parasite of humans that can colonize the gastrointestinal tract resulting in the **gastroenteritis and diarrhea**.
- + *C. hominis* is almost exclusively a parasite of humans (**But may also exist in monkeys, rodents, fowl طيور بحرية and cattle**).
- + It is spread through the fecal-oral route usually by drinking contaminated water of oocyst (**the infective stage**) or rarely through the **respiratory tract**.
- + Cryptosporidium infections are **large contributors of child death** and illness in heavily affected areas المناطق الوبائية
- + Occasionally **food sources, such as chicken salad**, may serve as vehicles for transmission.
- + Many outbreaks in the United States have occurred in water parks, community swimming pools, and day care centers.
- + Following ingestion (**and possibly inhalation**) by a suitable host, excystation occurs.
- + The **sporozoites** are released and **parasitize** epithelial cells of the gastrointestinal tract or other tissues such as the respiratory tract.
- + In these cells, the parasites undergo
 1. Asexual multiplication (**schizogony or merogony**) تكاثر انقسامي divisions
 2. Sexual multiplication (**gametogony**) producing microgamonts (male) and macrogamonts (female).
- + After fertilization (**inside the human body**) of the macrogamonts by the microgametes, **oocysts** develop that sporulate in the infected host (**this form that goes out with stool and resists environmental conditions**).
- + **Two different types of oocysts are produced:**
 1. The thick-walled, which is commonly excreted from the host (**diagnostic**)
 2. The thin-walled oocyst, which is primarily involved in **autoinfection (reform again into sporozoites and causes reinfection)**.

Oocysts are infective upon excretion, thus permitting direct and immediate fecal-oral transmission.

Pathology and Pathogenesis

Cryptosporidium inhabits the brush border of mucosal epithelial cells of the gastrointestinal tract, especially the surface of villi of the lower small bowel.

The prominent clinical feature of cryptosporidiosis is watery diarrhea, which is mild and self-limited (1–2 weeks) in **normal persons**, but may be severe and prolonged in **immunocompromised or very young or old individuals**. The small intestine is the most commonly infected site, but **Cryptosporidium infections have also been found in other organs, including other digestive tract organs and the lungs**.

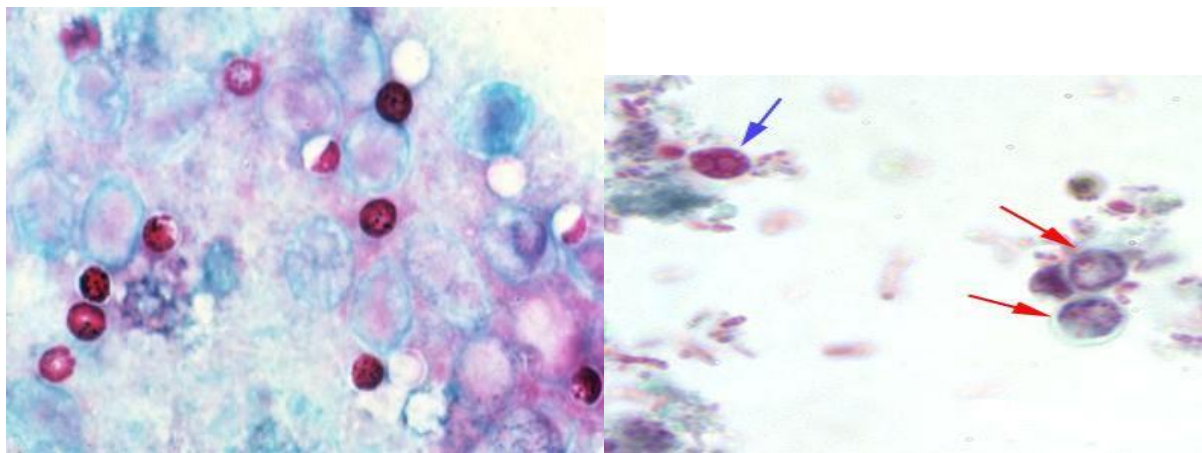


Diagnosis depends on detection of oocysts in fresh stool samples.

- ✚ Monoclonal antibody-based testing can detect low-level infections
- ✚ Fluorescent microscopy with **auramine staining** is useful.
- ✚ EIA tests are now available for the detection of fecal antigen.

Sheet note: Monoclonal antibody is specified antibody test for certain epitope خاص بفصيلة معينة, **and we usually use polyclonal antibodies (the doctor here didn't make it clear, whether using polyclonal antibodies in our bodies as defense mechanism against different pathogens or for tests purposes)**

For Specimens of stool, we look for the oocysts, but serologically we look for fecal antigens and perform antigen antibody examination.



Epidemiology

- ✚ The incubation period for cryptosporidiosis is from **1 to 12 days**, and the disease is acquired from infected animal or human feces or from fecally contaminated food or water. For those at high risk (**immunocompromised and very young or old persons**), avoidance of animal feces and careful attention to sanitation are required.

Sheet note: Cryptosporidium is almost similar to the rest protozoan with a distinguishable feature in having sexual and asexual stages .

Strongyloides stercoralis (human threadworm) الاسطوانيات الشعرية

Sheet note: Strongyloides stercoralis doesn't form oocysts as other protozoa to go out with the stool, but is similar to ancylostoma duodenale in having Rhabditoid larvae and Filariform larvae forms.

Adult females (about 2 mm long) of Strongyloides stercoralis that inhabit the intestine are **parthenogenic**; that is, they don't need to mate with male worms to reproduce.

They lay eggs within the intestine; larvae hatch from the eggs and are passed into the feces. These larvae can either

1. Develop into parasitic forms (**infecting human bodies**)
2. Develop into free-living (**non-parasitic**) male and female worms that mate and produce several generations of worms in the **soil**.

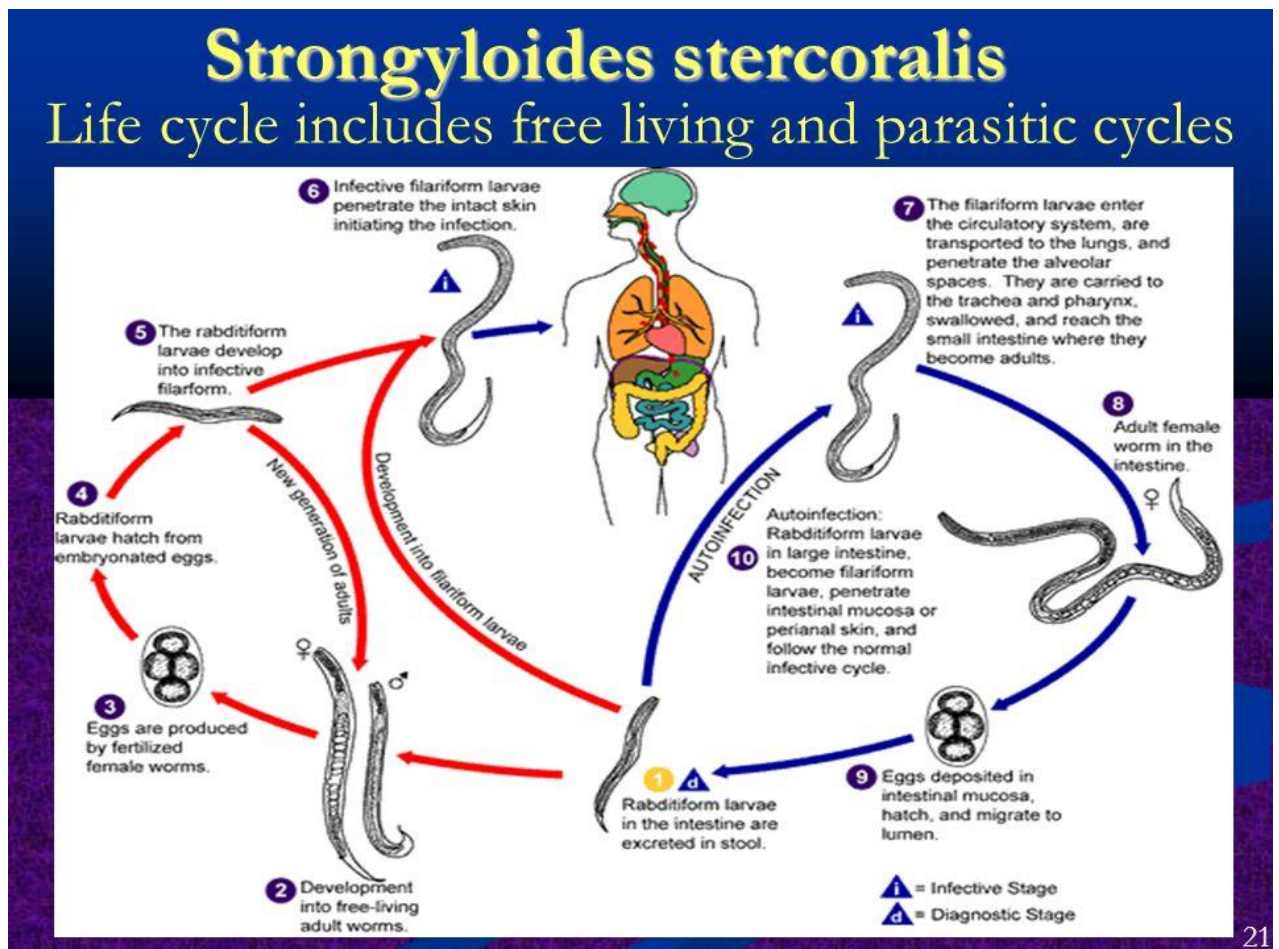
The larvae of the free-living forms, under certain environmental conditions such as temperature, can develop into parasitic forms.

Pathology and Pathogenesis

- Strongyloides can produce an internal reinfection or autoinfection if newly hatched larvae **never** exit the host, but instead, undergo their molts within the intestine.
- These larvae penetrate the intestine, migrate throughout the circulatory system, enter the lungs and heart, and develop into parasitic females in the intestine.
- They are able to sustain an infection for many years and, in the event of immunosuppression, produce a **hyperinfection** in which a fulminating, fatal infection occurs.
- In disseminated infections, clinical signs and symptoms primarily involve the
 - **Gastrointestinal tract** (severe diarrhea, abdominal pain, gastrointestinal bleeding, nausea, vomiting)
 - **Lungs** (coughing, wheezing, hemoptysis)
 - **Skin** (rash, pruritus).
- Larvae migrating from the intestine carrying enteric bacteria (**normal flora**) can cause local infections or sepsis, resulting in death.

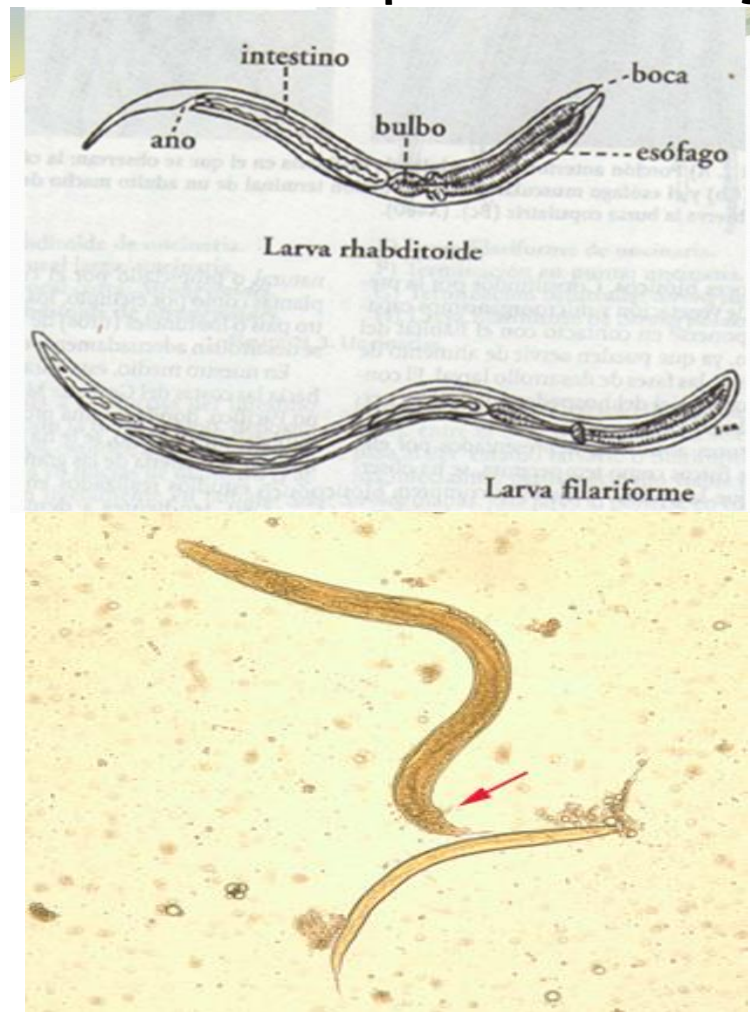
Symptoms-Pathogenicity

1. Dermatitis is produced by migration of the infective juveniles through the skin (cutaneous infection).
2. Mild to severe symptom of pneumonia during migration to air-sacs of lungs.
3. Inflammation of the intestinal mucosa.
4. Diarrhea accompanied by exhaustion.
5. In massive infections death may result unless therapeutic measures are taken.



Sheet note : scars, ancylostoma duodenale, and this type, enters the body by penetration

Diagnosis is based on finding juveniles larvae in freshly passed stools, by a direct smear in cases of heavy infection or following concentration or flotation
(we can concentrate the specimen before testing it)

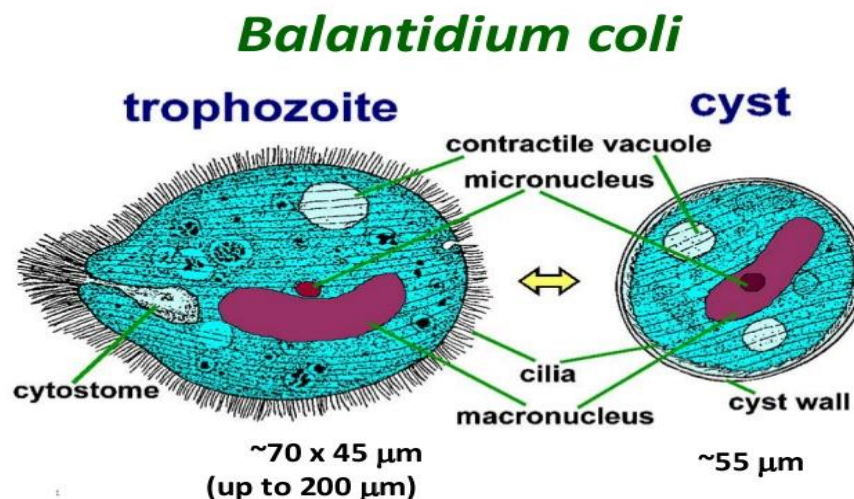


Rhabditoid larvae, is the feeding stage of the parasite, open mouth, club-shaped anterior portion with a post median constriction, molt 4 time before becoming an adult.

Filariform larvae, non feeding stage, close mouth, infective to the man, swim in water , survive in water and soil for several years.

Balantidium coli

- **A giant intestinal ciliate** of humans and pigs, is the only human parasite representative of this group (is considered rare). Is a parasitic species that causes the disease balantidiasis.
 - **the largest protozoa of what we've studied**
- *Balantidium coli* has two developmental stages, a **trophozoite stage** and a **cyst stage**. In trophozoites, the two nuclei are visible. The macronucleus is long and sausage-shaped, and the spherical micronucleus is nested next to it.
- Cysts are smaller than trophozoites and are round and have a tough, heavy cyst wall made of one or two layers.
- **this wall helps it to survive harsh environmental conditions**



Transmission

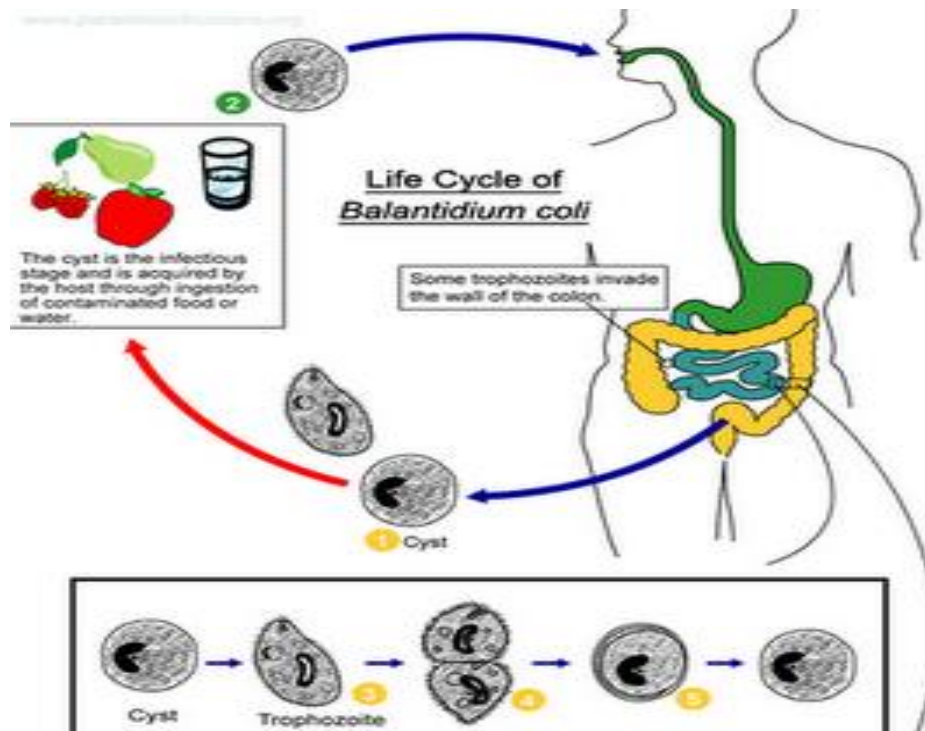
- Balantidiasis is a zoonotic disease and is acquired by humans via the feco-oral route from the **normal host, the pig, where it is asymptomatic**.
- Contaminated water is the most common mechanism of transmission

Pathogenicity

- *Balantidium coli* lives in the cecum and colon of **humans, pigs, rats and other mammals**.
- Infection occurs when the cysts are ingested, usually through contaminated food or water.
- In acute disease, explosive diarrhea may occur as often as every twenty minutes. Perforation of the colon may also occur in acute infections, which can lead to life-threatening situations.

Life cycle of *Balantidium coli*

- Infection occurs when a host ingests a cyst, which usually happens during the consumption of contaminated water or food. The cyst passes through the host's digestive system.
- Once the cyst reaches the small intestine, trophozoites are produced. The trophozoites then colonize the large intestine, where they live in the lumen and feed on the intestinal flora. Some trophozoites invade the wall of the colon using proteolytic enzymes and multiply, and some of them return to the lumen. In the lumen trophozoites undergo encystation. Encystation usually occurs in the distal large intestine, and released into the environment where they can go on to infect a new host.



Epidemiology

Balantidiasis in humans is common in the Philippines, but it can be found anywhere in the world, especially among those that are in close contact with swine (**pigs**).

The disease poses a problem mostly in developing countries, where water sources may be contaminated with swine or human feces.

"Make Your Life A Masterpiece; Imagine No Limitations On What You Can Be, Have Or Do" ♥♥

- Brian Tracy