Department of Medical Laboratory Technology

University of Al-Maarif

Fourth Stage

Flagellates—I

(Intestinal and Genital)

Giardia lamblia:

1. **Classification**

- *Giardia* can be differentiated to various species based on the origin of the host.
- *G. lamblia* infects humans and other mammals.
- *G. lamblia* can further be differentiated into seven genotypes from A to G, out of which genotype A and B usually infect humans.

2. **Epidemiology**

G. lamblia is worldwide in distribution, it is considered as one of the most common parasitic diseases, causing both endemic and epidemic intestinal disease and diarrhea.

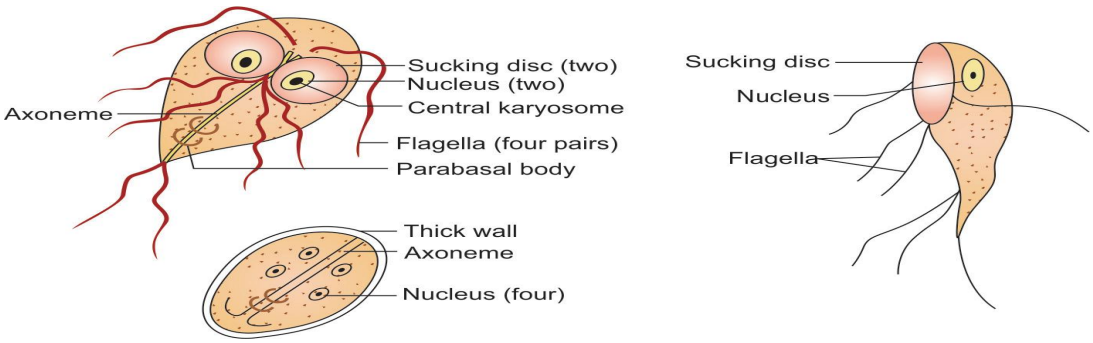
3. **Geographical area:** More common in warm climate of tropics and subtropics.

4. **Habitat**

Duodenum and upper part of jejunum.

5. **Morphology**

It occurs in two forms—(1) trophozoite and (2) cyst (Fig. 4.1).



Figs 4.1 A to C: *Giardia lamblia*(schematic diagram)(A) trophozoite front view; (B) trophozoite lateral view; (C) cyst.

a) Trophozoite

The trophozoite has a falling leaf-like motility

Shape: In front view: it is pear shaped (or tear drop or tennis racket shaped) with rounded anterior end and pointed posterior end

Laterally: it appears as sickle shaped

Trophozoite is bilaterally symmetrical and It consists of :

1. One pair of nuclei
2. Pair of median bodies
3. Four pairs of basal bodies or blepharoplast
4. Four pairs of flagella—two lateral, one ventral and one caudal pair of flagella
5. Pair of parabasal bodies (connected to basal bodies through which the axoneme passes)
6. Pair of axoneme or axostyle (the intracellular portion of the flagella).

B) Cyst

- *Giardia* cyst is oval shaped, measures 11–14 µm in length and 7–10 µm in width.
- It contains four nuclei and remnants of axonemes, basal bodies and parabasal bodies
- It is the infective form as well as the diagnostic form of the parasite.

6. **Life Cycle (Fig. 4.2)**

Host: *Giaridia* completes its life cycle in one host.

Infective form: Mature cyst.

Mode of transmission: Man acquires infection by ingestion of food and water contaminated with mature cysts.

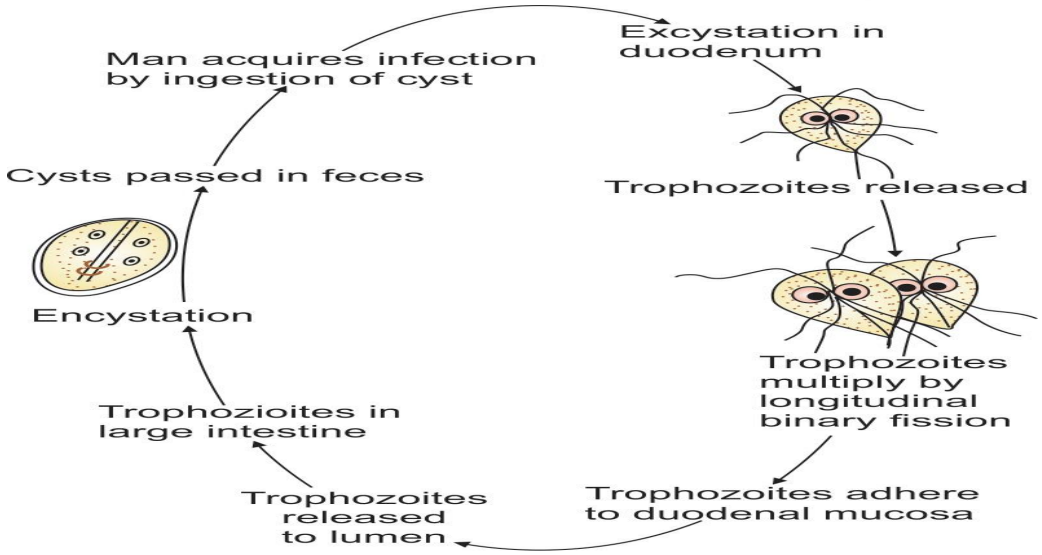


Fig. 4.2: Life cycle of *Giardia lamblia*.

7. ***Development in Man***

- **Excystation:** Two trophozoites are released from each cyst in the duodenum within 30 minutes of entry

- **Multiplication:** Trophozoites multiply by longitudinal binary fission in the duodenum.
- **Adhesion:** Trophozoites adhere to the duodenal mucosa by the bilobed adhesive ventral disc

✓ This is achieved by the microtubules of median bodies, contractile proteins and lectins present on the surface of adhesive disc that bind to the intestinal receptors (sugar molecules)

- **Encystation:** Gradually when the trophozoites pass down to large intestine, encystation begins
- **Promoting factors for encystation** are the conjugated bile salts, alkaline pH and cholesterol starvation.

8. **Pathogenicity**

Several pathogenic mechanisms

1. Trophozoites adhere to the duodenal mucosa and cause disruption of the intestinal epithelial brush border that leads to increase permeability and malabsorption
2. Malabsorption of fat (steatorrhea)
3. Disaccharidase deficiencies (lactate, xylose)—leading to lactose intolerance
4. Malabsorption of vitamin B12 and folic acid
5. Protein loosing enteropathy.

9. **Clinical features :**

1. **Asymptomatic carriers**
2. **Acute giardiasis:** Common symptoms include diarrhea, abdominal pain, bloating, belching, flatus and vomiting
3. **Chronic giardiasis:** Common symptoms include recurrent episodes of foul smelling diarrhea, foul flatus, sulfurous belching with rotten egg taste, and profound weight loss leading to growth retardation

Trichomonas vaginalis

- It is the most common parasitic cause of sexually transmitted diseases (STDs)
- Females are commonly affected than males

Morphology

Trophozoites are the only stage, there is no cystic stage.

Trophozoites

- It is pear (pyriform) shaped, measures 7–23 µm and 5–15 µm wide (Fig. 4.6), resides in vagina and urethra of women and urethra, seminal vesicle and prostate of men.

- It bears five flagella—four anterior flagella and one lateral flagellum called as **recurrent flagellum**.

- The undulating membrane is supported on to the surface of the parasite by a rod like structure called as **costa**
- It has a single nucleus containing central karyosome with the cytoplasm contains a number of siderophore granules along the axostyle .
- The respiratory organelle is called as **hydrogenosome**.

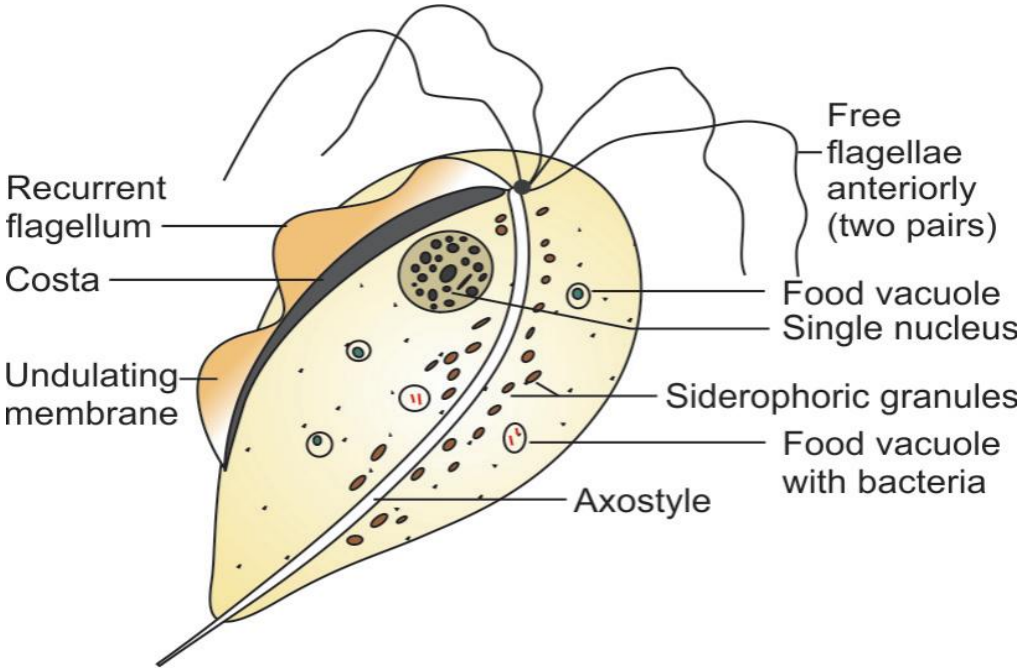


Fig. 4.6: Trophozoite of *Trichomonas vaginalis*

Life Cycle

1. Trophozoites are the infective stage as well as the diagnostic stage.

2. Trophozoites divide by longitudinal binary fission giving rise to a number of daughter trophozoites in the urogenital tract which can infect other individuals.

Pathogenicity and Clinical Features

- It is worldwide in distribution and accounts for 10% of cases of vulvovaginitis
- Incubation period is variable (4–28 days)

Predisposing factors:

1. Binding to the vaginal epithelium by various metabolic enzymes secreted by the trophozoites like proteolytic enzymes, iron regulated proteins, erythrocyte binding proteins, etc .
2. Vaginal pH of more than 4.5 facilitates infection
3. Hormonal levels
4. Strain and relative concentration of the organisms present in the vagina

✓ **Asymptomatic infection:** 25–50% of individuals are asymptomatic, harboring the trophozoites and can transmit the infection

✓ **Acute infection (vulvovaginitis):**

1) Females are commonly affected and are presented as vulvovaginitis, characterized by profuse foul smelling purulent vaginal discharge. yellowish green color mixed with a number of polymorphonuclear leukocytes

2) Strawberry appearance of vaginal mucosa **(Colpitis macularis)** is observed in 2% of patients. It is characterized by small punctate hemorrhagic spots on vaginal and cervical mucosa

3) Other features include dysuria and lower abdominal pain

4) In males, the common features are nongonococcal urethritis and rarely epididymitis, prostatitis .