Flagellates(Mastigophora)

-The flagellates protozoa that are parasites of man including:

1- Flagellates of digestive tract and genital organs such as:

a-Flagellates of digestive tract:
-*Giardia lamblia* ,
-*Chilomastix mesnili* ,
-*Trichomonas hominis*.

b-Flagellates of genital organs:
-*Trichomonas vaginalis.*

2- Flagellates of blood and tissue.
-*Trypanosoma* sp
-*Leishmania* sp

-The flagellates protozoa are distinguished by having in their trophozoite stage one to several thread-like extensions of the ectoplasm (flagella) ; each of which contains an axial structure "axoneme" arising from a basal body , associated with kinetoplast.
-The flagellum , basal body and kinetoplast constitute the neuromotor apparatus.

➢ Morphological Characteristics :

1. Flagellum(ae) - characteristic organelle of locomotion. It is an extension of ectoplasm and resembles a tail; moves with a whip-like motion.
2. Axostyle - a supporting mechanism; a rod-shaped structure; not all Genera exhibit these.
3. Undulating membrane - a protoplasmic membrane with a flagellar rim extending out like a fin along the outer edge of the body of some flagellates. Moves in a wave-like motion.
4. Costa - a thin, firm rod-like structure running along the base of the undulating membrane in some flagellates.
5. Cytosome - a rudimentary mouth; also referred to as a gullet.

Flagellates of the digestive tract and genital organs

-The flagellate inhabiting the mouth , intestine and genital tract are lumen parasites.

Giardia lamblia

✓ Introduction:

Synonymous, *G. intestinalis* or *G. duodenalis*. *Giardia lamblia* is one of the **most common intestinal parasites** in the world, occurring in both industrialized and developing countries with an estimated 2.8 million new cases annually causing ***Giardiasis***. **Habitat: small intestine (duodenum)**

✓ Morphology:

- **Trophozoites**:

The trophozoites are **flattened pear (Tear) shaped with bilaterally symmetrical body** and an average size of 7x14 µm. The movement of the trophozoites are described as **tumbling leaf motility**.

Trophozoites have **two nuclei** and each nucleus contains a prominent karyosome, giving the parasite its **characteristic face-like appearance**.

In addition it has **four pairs of flagella**, an **axostyle** (a microtubule-containing organelle to which the flagella attach), a **ventral disk (disc-like suckers**) and **two median bodies**.

- **Cysts:**

Cysts are **slightly smaller than trophozoites 8 - 12 µm in length, oval shape**. They **contain 2 - 4 nuclei**. Longitudinal fibrils consisting of the **remains of axostyle and parabasal bodies** may also be seen. Cysts may appear to shrink from the cell wall.

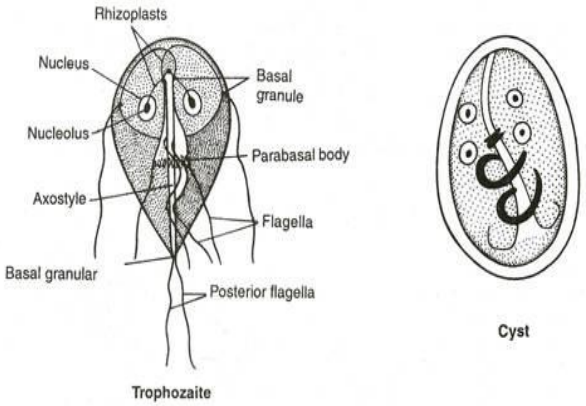
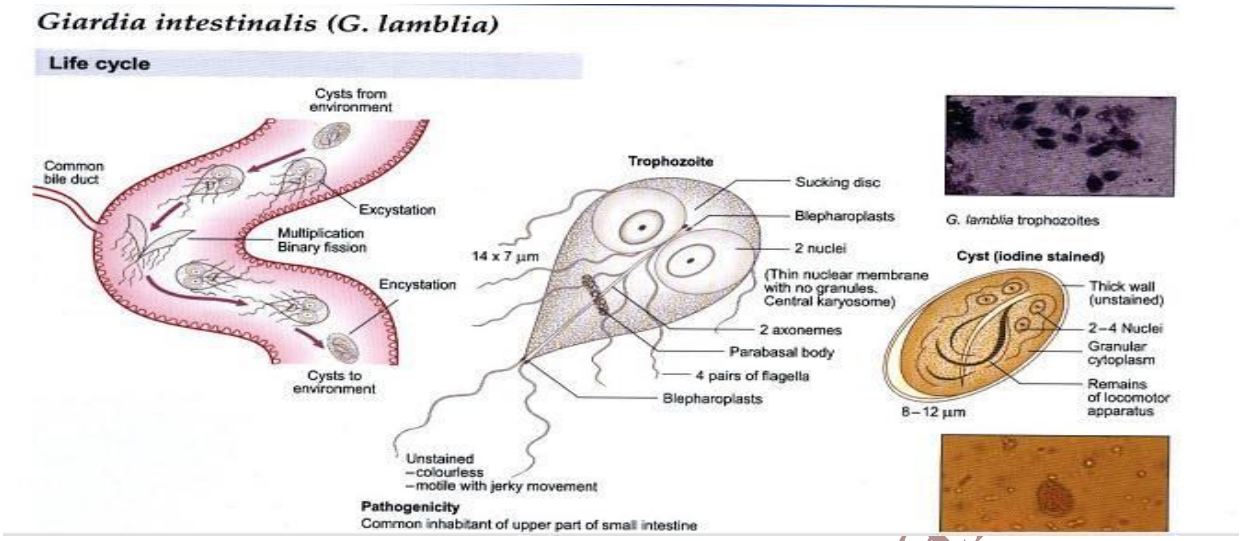
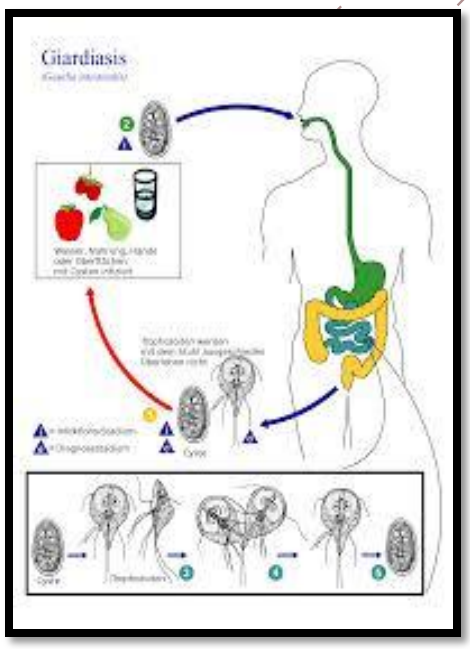


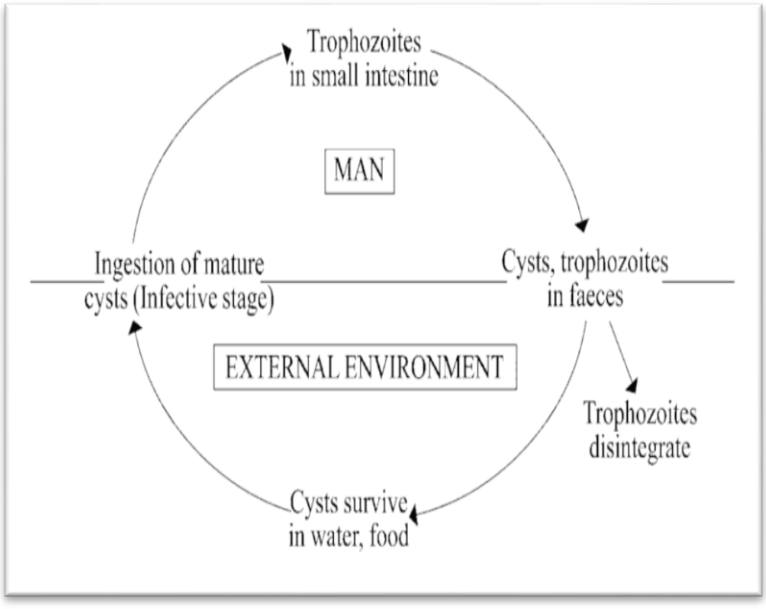
Fig. 181. Stages of life cycle of *Giardia intestinalis*.



✓ Life Cycle:

Infection occurs by the ingestion of **cysts (Infective stage)** in contaminated **water, food, or by the fecal-oral route (hands or fomites)**. In small intestine, excystation releases trophozoites (Each cyst produces two trophozoites). Trophozoites multiply by longitudinal binary fission, remaining in the lumen of the proximal small bowel (Anaerobic parasite that donot contain mitochondria) where they can be free or attached to the mucosa by a ventral sucking disk. Encystation occurs as the parasites transit toward the colon. The cyst is the stage found most commonly in nondiarrheal feces and both cysts and trophozoites can be found in the feces (diagnostic stages).





✓ **Epidemiology:**

The significant features of *Giardia* cysts that influence disease transmission include
1) Their **stability** in the environment (survive several months in cold water),
2) Their **immediate infectivity** upon leaving the host and
3) The **small number of cysts** required to cause infection.

✓ **Pathogenicity:**

Ingestion of cysts results in one of three outcomes:
1) No infection (35 to 70%),
2) Asymptomatic infection with excretion of cysts (5 to 15%), or
3) Symptomatic infection (15 to 60%).

✓ **Symptoms:**

1- Early Symptoms may range from **abdominal pain**, **flatulence nausea** , often **watery diarrhea**
2- The stool contains **Excess fat or lipid(steatorrhea) , but very rarely may blood or necrotic tissue**
3- The chronic stage is associated with vitamin **B12 malabsorption disaccharides deficiency** and **lactose intolerance** and **significant weight loss.**

Symptoms usually begin 7 to 14 days after cyst ingestion and the majority of symptoms are **self-limited** lasting for 7 to 15 days. This disease is more common in children from 6 to 10 years.

✓ **Diagnosis:**

1- Symptoms, history, epidemiology.
2- General stool examination by identification of cysts or trophozoites in the **feces** or **duodenal aspirate.**

✓ **Treatment:**

1- Metronidazole (flagyle)
2- Tinidazole 2g as single dose
3- nitazoxanide

Trichomonas sp

**** The general characteristics of *Trichomonas* sp.**

-These are common flagellates of the tropical areas,.
-They exist **only in trophozoite stage.**
-They are **pear-shaped body** and measures 10-12 microns in length, **a single ovoid nucleus** is situated at the rounded anterior end and **a cleft-like depression (mouth)** lies at its side.
-There are **3-5 free flagella**, a thicker flagellum passes backwards along the side of the body forming the undulating membrane and coming out free at the posterior end.
-The **undulating membrane is supported at the base** by a rod like structure **(costa)**.
-The **axostyle** runs down the middle of the body and ends in the pointed end.

**** Genus *Trichomonas* is classified into 3 species**:

1- *T.hominis*: inhabiting the large intestine & colon.

2- *T.tenax*: inhabiting the oral cavity(mouth).

3- *T.vaginalis*: inhabiting the female genital tract, also found in the urinary tract of both males and females.

- ***Trichomonas vaginalis***

-The motile organism is **larger than** *T.hominis* and *T.tenax* reaching in length 27 microns and 18 microns in breadth.

-It is motile with a rapid **jerky or twitching** type movement.
-*T.vaginalis* is a **pathogenic flagellate that infects the urogenital tracts of males and females**. Diseased caused is called **Trichomoniasis** or **Trichomonas vaginitis**.

-It is primarily a **sexually transmitted disease (STD).**

-The life cycle of *T.vaginalis* includes **only trophozoite stage.**

-The organism is similar in morphology to the other *Trichomonas* and it is characterized by prominent axostyle and undulating membrane that stops half way down the side of the trophozoite. - It is divides by binary fission and it cannot survive long outside the host.

-**Transmission***:* by sexual contact; otherwise (through contact with toilet seats and towels, for example).

-**habitat** *:* vagina, urethra, prostate.

 In male, is often asymptomatic, although it may cause urethritis, also called non-specific urethritis.

 In female, again may be asymptomatic or may produce vaginitis complicated by bacteria, fungus & spirochete.

- The chief complaints are dysuria, leukorrhea (pus cells in urine), urticaria, and acute vulvitis. The symptoms vary from mild to severe, but the disease is annoying rather than disabling.

- There are certain factors that play a role in the pathogenesis of the parasite which include; **age**, **sex**, **glycogen contents**, **pH**, **pregnancy**, **seminal fluid** and **number of parasites needed for infection**.

➢ **Laboratory diagnosis:**

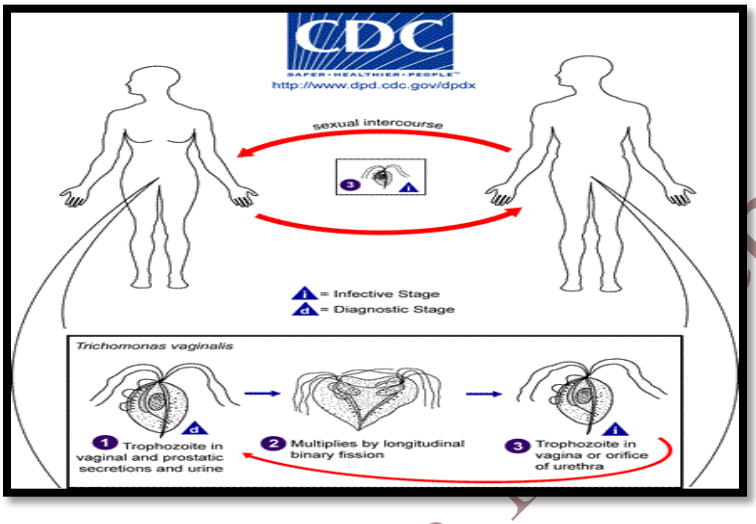
The diagnosis for this organism is commonly based on:

1- examination of wet preparation of vaginal and urethral discharges , prostatic secretions and urine sediments (general urine examination G.U.E.).
2- Culture methods : (gold standard media)
3- Molecular methods: PCR(polymerase chain reaction)

4- Serology : demonstration of antigen in vaginal smear by ELISA.

➢ Treatment

The treatment of choice for *T.vaginalis* infection is metronidazole (Flagyl- 3 times a day for 4-5 days) .



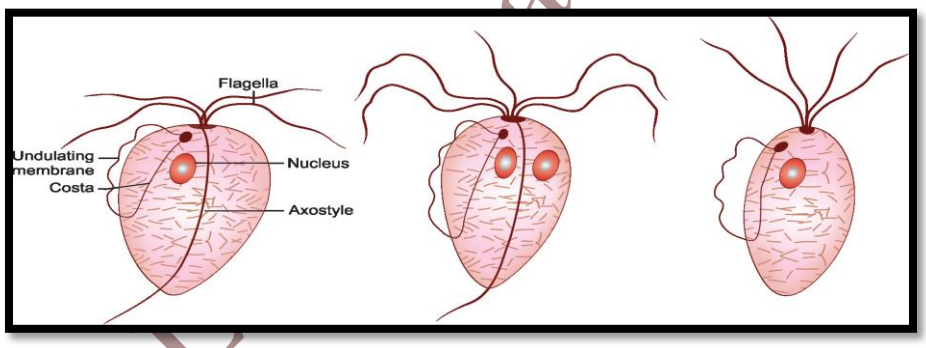


Fig. *Trichomonas* species. **A.** *T. vaginalis*; **B.** *T. hominis*; **C.** *T. tenax*