

Subphylum Mastigophora

□ Characterized by having **flagellae** in its trophozoite stage, connected to an **axonemes** and **kinetoplast** (like brain in human). The microorganism flagellum, an axonemes and kinetoplast performing the neuromotor apparatus. The last one kinetoplast is energizing & the first one is motor part.

The kinetoplast formed from the **blepharoplast** & **parabasal body**, The blepharoplast either connected together or scattered.

□ Some of flagellate is free living, and other are parasitizing arthropods, plants, animal & man.

□ **The flagellates which parasites human are:**

1) Flagellate of **digestive tract & urogenital system**.

2) Flagellate of **blood** (haemoflagellate) & **tissues**.

□ **The flagellate of digestive tract & urogenital systems:-**

□ Live in the lumen.

□ Not tissues invader, but the (**Giardia lamblia**) & (**Trichomonas vaginalis**) may evoke symptoms.

The flagellate of digestive tract & urogenital systems:-

1) **Giardia lamblia**

It also called *Giardia intestinalis*, a parasite of small intestine, cosmopolitan, common in warm & temperate climates.

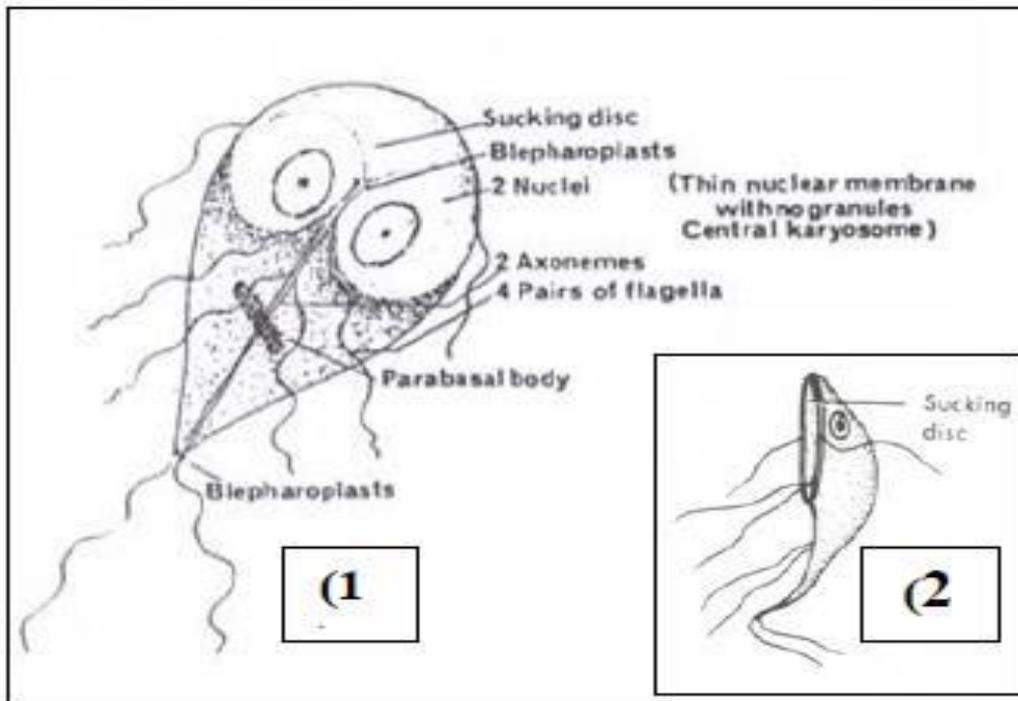
Morphology

□ Both **trophozoite** & **cyst** stages are considered as **a diagnostic stages**, while the **infection stage** is only the **cyst stage**, because the trophozoite stage when ingested it will be killed by the gastric acid.

□ **The trophozoite stage**

□ The shape of trophozoite is pear shape, broad rounded anteriorly, tapered to point posteriorly. Anteriorly there is a sucking disk & side bilaterally, so the trophozoite is described by bilaterally symmetrical. In middle of sucking disk situated 2 nuclei in stage of trophozoite. In middle of trophozoite from anterior to posterior is complex system of an axoneme. There is transverse curve broad, called the parabasal body. The trophozoite length (9-21µm) width (5-15 µm) thick (2-15µm)

- The profile also called side view, show outside curvature, anterior concavity and posterior curvature, flagellae are distributed on many sites.



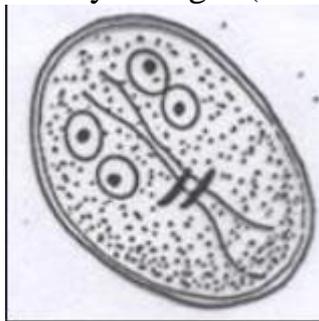
Giardia lamblia trophozoite stage: (1), ventral view; (2), lateral view

The cyst stage

Thick hyaline membrane around avoidal shape cyst stage.

When parasite facing un suitable or unconventional condition, it convert to cyst stage by retracting the flagellae back on axoneme to form the parallel curved fibrils, and each of 2 nuclei divided into 2 to form 4 nuclei in cyst stage.

The cyst length (8-12 um) width (6 um)



Giardia lamblia cyst stage

The Life cycle

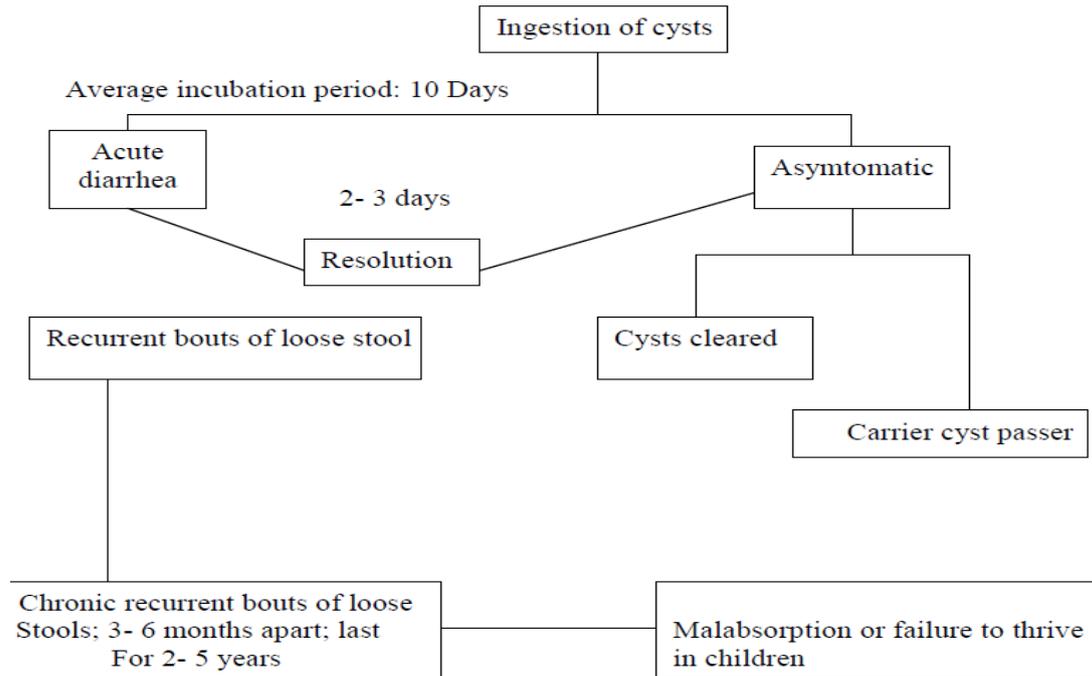
Usually infection arise from ingestion of contaminated food or water, and after passing the stomach the **Excystation** occur in small intestine and immediately 2 trophozoites arises from the cyst. Then the Trophozoite starting the **multiplication** and forming the colonies in small intestine. When trophozoite goes down the **Encystation** occur. So the summary of life cycle is:

- 1) **Exystation**
- 2) **Multiplication**
- 3) **Encystation**

Pathogenesis & Symptoms

Infection with *Giardia* called Giardiasis. The majority of Giardiasis is asymptomatic, but some of them presented with symptoms like fatty diarrhea, weight loss (due to malabsorption), epigastric pain, abdominal cramps.

Giardia lamblia is not tissue invader, but shown that the trophozoite attached tightly to mucosa, so covering and damaging to mucosa, so causing functional derangement & reducing enzymes. Diarrhea & malabsorption may be caused by this mechanism.



Course of giardia infection in humans

Clinical manifestations in Giardiasis

Acute	Chronic
<ul style="list-style-type: none"> • Diarrhea (foul smelling) • Greasy stools • Weight loss • Anorexia , vomiting • Headache • Low grade fever • Chills • Mucous in stools • Abdominal cramps 	<ul style="list-style-type: none"> • Recurrent diarrhea • Periodic constipation • Abdominal distension • Nausea • Substernal burning • Urticaria • Erythema nodosum • Malabsorption syndrome • Fatigue

Diagnosis:

Recovering of cyst stage & trophozoite stage by:

- General stool examination, or by
- Concentration method

Treatment:

By Metronidazole, 250 mg/ 5-10 days.

Epidemiology

Infection occurs by viable cyst from human sources human faeces.

- Giardiasis most common in warm moist climates. Type of living is effecting its transmission, large families, and children asylum.

Control

1. Treatment of patient.
2. Ordinary or chlorination water be found not enough to kill cyst stage in endemic or hyperendemic, there for boiling of water is important to kill the cyst stage.
3. Improving the habits of the person & community.

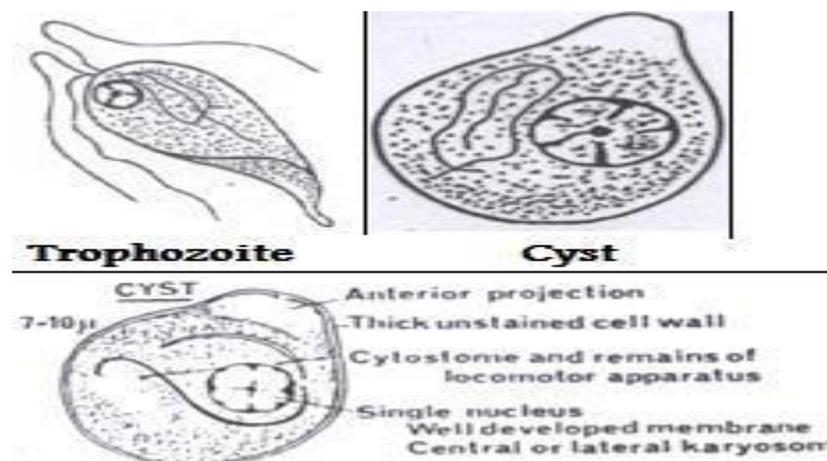
2) *Chilomastix mesnili*

Cosmopolitan, more prevalent in warm climates.

Morphology

- It has 2 stages in its life cycle, trophozoite & cyst stage.
- **The trophozoite stage**

Pear in shape, anteriorly broad and rounded, has one nucleus, beside the nucleus is a groove called **cytostome**, which represent the mouth of it. Regarding the flagella, most of them directed forward & one directed backward toward the cytostome , It has spiral groove which pass in spiral path & its function is the movement. The multiplication is by longitudinal binary division. The movement is a jerky movement with spiraled path.



- **The cyst stage**

Smaller than trophozoite, lemon shaped, (7-10 μm)length & (4.5-6 μm) in width in cyst stage there is thick hyaline wall, there is anterior projection

like a lemon. There is a groove in cyst stage which represents the cytostome. Regarding the flagella, it retracted backward into the organism and appears as a fibril inside the organism as well as inside the cytoplasm. Also it has one nucleus.

3) **Trichomonas**

- Pear shaped, have a single nucleus, in front the nucleus situated the blepharoplast.
- Most of flagella directed forward & one of them directed backward, and this backward directed flagella forming **undulating membrane**, which is a fold of membrane of organism.
- It characterized by presence of **axostyle**, which is semi rigid translucent supported structure.
- There are 3 species adapted to the human host, and only these species contain axostyle.
- There is a cytostome on the lateral side.



Line drawing of the three Trichomonads that parasitized human beings. (1) *Trichomonas vaginalis*; (2) *Trichomonas tenax*; (3) *Trichomonas hominis*.

Trichomonas hominis

Cosmopolitan in distribution pear shaped, marginal flagellum which forms undulating membrane, the undulating membrane extend short distance behind the posterior end. The axostyle is also protruding behind the posterior extremity. It is nonpathogen, although it feeds on bacteria, mucous & RBCs if present. It live in large intestine.

Trichomonas buccalis

It also called *Trichomonas tenax*, smaller than *T. hominis*, has small undulating membrane. It is nonpathogenic, but it is found in diseased gum, Tartar around the teeth and carious teeth, so it is opportunistic parasite. It is existence indicates poor oral hygiene.

Trichomonas vaginalis

It present in male & female, the diseased caused is called **Trichomoniasis** or **Trichomonas vaginitis**. Cosmopolitan parasite of man, size frequently larger than other Trichomonas, it reach up to 27 μ m in size. Marginal flagellum does not extend beyond the undulating membrane.

- It inhabits vagina in female, and urethra + prostate in male. It transmitted by sexual intercourse, although may transmitted by other way . This parasite can survive for few hours on dry fomites & longer if moist.
- 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.
- The chief complaints are dysuria, leukorrhea (white discharge), urticaria, and acute vulvitis. The symptoms vary from mild to severe, but the disease is annoying.
- Phagocytosis & killing of *Gonococci* by *Trichomonas vaginalis* have been reported.

Diagnosis: Made in male by recovery of the organism in urine, prostatic or urethral discharges, by add normal saline to dry smear, we show T. vaginalis. In female, by recovery urine, vaginal discharge or vaginal swabs by also adding normal saline to wet smear.