

## **Intestinal Flagellates**

### **Introduction:**

The flagellates belong to the Magistophora and possess more than one flagellum. Beating these flagella enable them to move. A cytosome may be present which helps in the identification of the species.

**Intestinal parasites** are **parasites** that can infect the gastro-**intestinal** tract (**GIT**) of humans and other animals. They can live throughout the body, but most prefer the **intestinal** wall. Means of exposure include ingestion of undercooked meat, drinking infected water, and skin absorption.

There are **pathogenic** and **commensal** species of flagellates. The flagellates which are encountered in the intestinal tract are: *Giardia lamblia*, *Dientamoeba fragilis*, *Chilomastix mesnili*, *Trichomonas hominis*, *Retortamonas intestinalis* and *Enteromonas hominis* (the latter 2 being less common).

### ***Giardia Lamblia***

*Giardia lamblia*, a flagellate, is the only common pathogenic protozoan found in the **duodenum** and **jejunum** of humans. It is the cause of **giardiasis**.

*Giardia duodenalis* is another name commonly ascribed to the parasite that causes human giardiasis; the term *Giardia intestinalis* is frequently used in Europe and *Lambli intestinalis* in the former USSR.

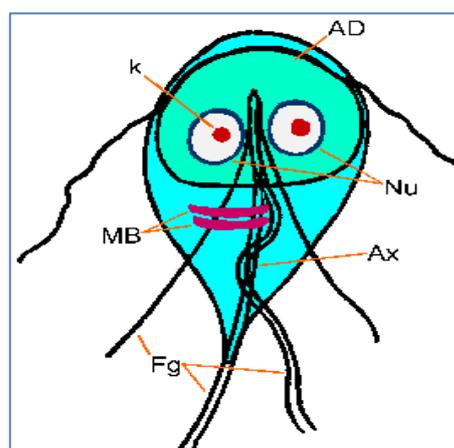
*Giardia lamblia* is a flagellate of worldwide distribution. It is more common in warm climates than moderate climates. It is the most common flagellate of the intestinal tract, causing *Giardiasis*. Humans are the only important **reservoir** of infection. Infection is most common in parts of the world where sanitation levels are the lowest. *Giardiasis* is an infection of the **upper small intestine**, which may cause **diarrhoea**. Only *Giardia* spreads disease.

## Morphology & Identification

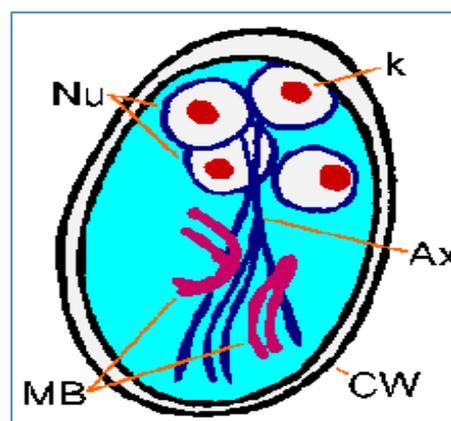
### Typical Organisms:

The **trophozoite** of *G lamblia* is a heart-shaped, symmetric organism 10-20  $\mu$ m in length. There are four pairs of flagella, two nuclei with prominent central karyosomes, and two axostyles (rod-like supporting organelles). A large concave **sucking disk** in the anterior portion occupies much of the ventral surface. The swaying or dancing motion of giardia trophozoites in fresh preparations is unmistakable. As the parasites pass into the colon, they typically encyst. **Cysts** are found in the stool-often in enormous numbers. They are thick-walled, highly resistant, 8-14  $\mu$ m in length, and ellipsoid and contain two nuclei as immature, four as mature cysts.

- K= Karyosome
- Nu= Nucleus
- MB= Median body
- Fg= Flagella
- Ax= Axoneme
- AD= Adhesive disk



- Nu= Nuclues
- K= Karyosome
- Ax= Axoneme
- MB= Median body
- CW= Cyst wall



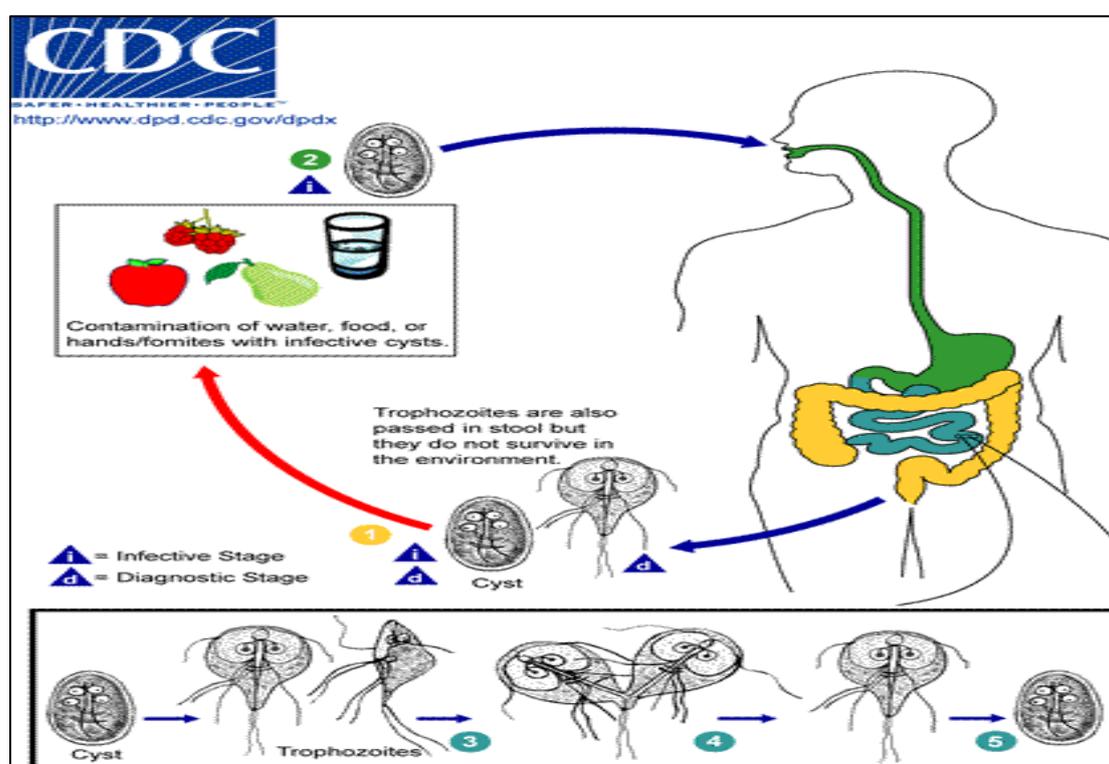
## Life Cycle of Giardia:

< **Infection** occurs by ingestion of cysts (generally from fecally contaminated food or water)

< **Excystation** occurs in the small intestine

< **Trophozoites** multiply by binary fission in the small intestine. *G. lamblia* attach to the mucosal surface by means of its adhesive disk.

< **Cyst** formation is triggered by the dehydration of gut contents moving through the large intestine.



**Encystation:** is the process of forming the cyst or the process becoming enclosed in a capsule. This event takes place in the rectum of the host as feces are dehydrated or soon after the feces have been excreted.

**Excystation:** produces a trophozoite from the cyst stage, and it takes place in the Upper Small Intestine of the host after the cyst has been ingested.

## Pathogenesis & Clinical Findings

These include protozoan damage to mucosa and villi structures, disturbance of the natural flora, and increased intestinal permeability via localized cytokine production. *G 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. The stools may be watery, semisolid, greasy, bulky, and foul-smelling at various times during the course of the infection. Malaise, weakness, weight loss, abdominal cramps, distention, and flatulence can occur. **Children** are more liable to clinical giardiasis than adults. **Immunosuppressed** individuals are especially liable to massive infection with severe clinical manifestations. Symptoms may continue for long periods.

### **Histological aspects :**

Shortening of villi, Cellular infiltration of lamina propria of mucous membrane functional impairment of enterocytes Abdominal cramps Induce motility disturbance. **Severe cases:** get malabsorption syndrome and **steatorrhea**, and weight loss.

### **How the parasite attaches to the intestinal mucosa?**

By the sucking disc /adhesive disc located on the ventral side of the cell. Attachment of *Giardia lamblia* trophozoites to enterocytes is essential for colonization of the small intestine and is considered a condition for parasite-induced enterocyte dysfunction and clinical disease.

### **Severe cases of this disease:**

- Attachment of trophozoites to the brush border could produce a mechanical irritation or mucosal injury.
- In addition, normal villus structure is affected in some patients. For example, villus blunting (atrophy) and crypt cell hypertrophy and an increase in crypt depth have been observed to varying degrees.
- The increase in crypt cells will lead to a repopulation of the

intestinal epithelium by relatively immature enterocytes with reduced absorptive capacities. An increased inflammatory cell infiltration in the lamina propria has also been observed and this inflammation may be associated with the pathology.

- *Giardia* infection can also lead to lactase deficiency as well as other enzyme deficiencies in the microvilli. This reduced digestion and absorption of solutes may lead to an osmotic diarrhea and could also explain the malabsorption syndromes. Thus far, no single virulence factor or unifying mechanism explains the pathogenesis of giardiasis

### **Diagnostic Laboratory Tests**

Diagnosis depends upon finding the distinctive cysts in formed stools, or cysts and trophozoites in liquid stools.

Differentiation is based on morphological examination of fecal preparations.

- Microscopic examination
- Serological assays
- Immunofluorescence methods
- Enzyme immunoassays

### **Treatment**

**Metronidazole** (Flagyl) will clear over 90% of *G lamblia* infections. Oral **quinacrine** hydrochloride (Atabrine) and **furazolidone** (Furoxone) are alternatives. **Tinidazole** (Fasigyn), used for 1-day treatment, is widely and effectively used but is not available in the United States. **Paromomycin** (Humatin) may be useful in pregnancy.

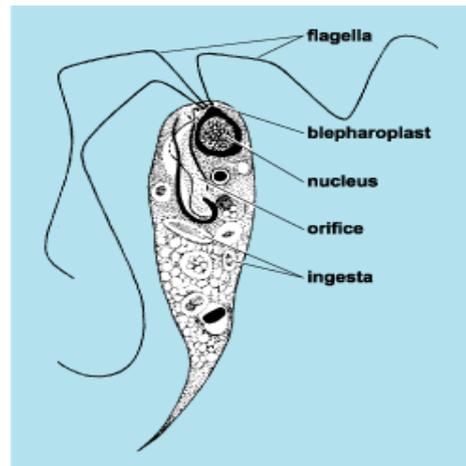
**And Vit.B12 because???** Giardiasis should be considered as a cause of vitamin B<sub>12</sub> deficiency as a result of the problems caused within the intestinal absorption system. Treatment may be repeated if necessary. Only symptomatic patients require treatment.

**Prevention:**

- By avoidance of contaminated water.
- Filtration (this parasite resistant to chemicals such as chlorine).
- Protecting water supplies from reservoir hosts such as beavers, muskrats and voles.
- Exercising good personal hygiene.
- Safe sexual practices.

**Genus: Chilomastix**

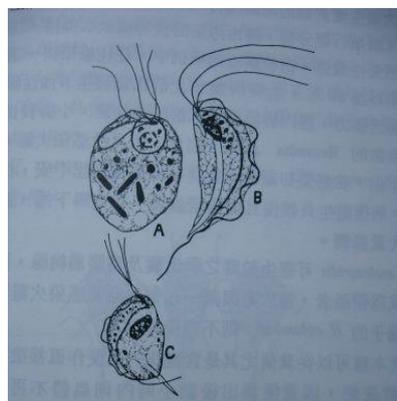
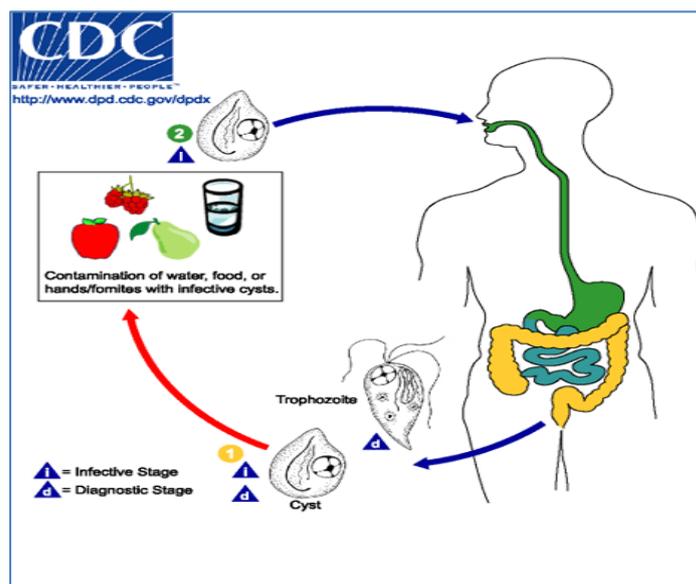
- **Spc:** *C. mesnili*.
- **Geog. Distribution:** all over the world.
- **Habitat:** in the caecal area of the large intestine.



- **Morphology:**
- **Trophozoite:** pear form.
- **Size:** 7-10µm in length.
- 4 flagella, 3 forewords, 4th in the cleft.
- **Cyst:** pear form, 8µm, single nucleus.
- **Transmission:** ingestion of cyst in contaminated food and drink.
- **Pathogenicity:** none (if present with large numbers, may be result in some disturbance).
- **Diagnosis:**

Specimens: stool. 1-In saline and iodine preparation: cyst and flagellated forms are found in stool, the movement is Rotary.

2-Culture: in laboratory media.



## ***Trichomonas vaginalis*, *Trichomonas hominis*, *T. tenax*, *Enteromonas hominis*, and *Retortamonas intestinalis***

- \* *T. hominis* (intestinal).
- \* *T. vaginalis* (genital organs).
- \* *T. tenax* (human mouth)

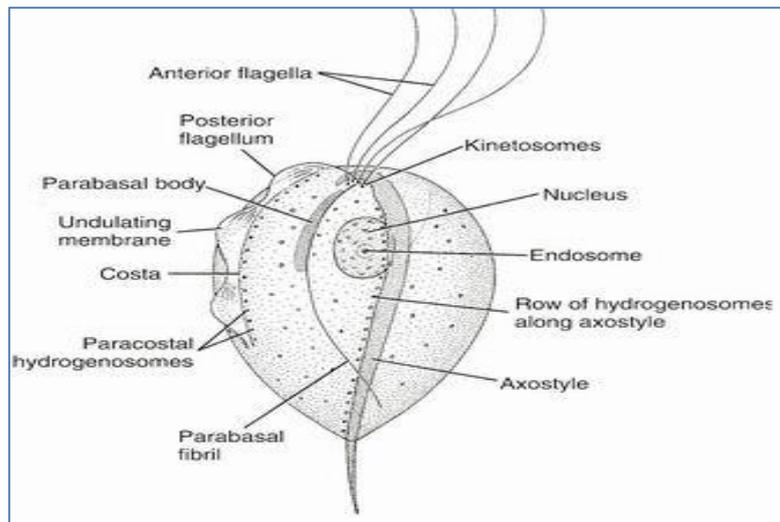
### **Trichomonas**

The trichomonads are flagellate protozoa with three to five anterior flagella, other organelles, and an undulating membrane. *Trichomonas vaginalis* causes the most common form of **trichomoniasis** in humans.

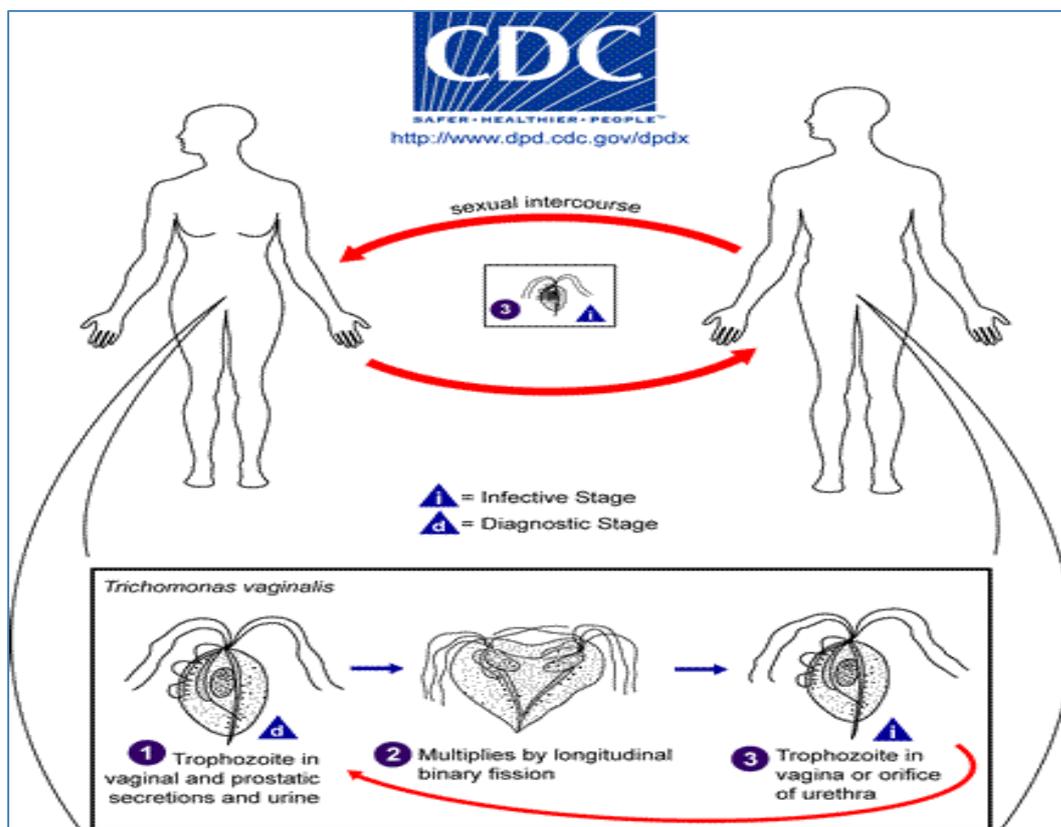
### **Morphology & Identification**

**UROGENITAL FLAGELLATES:** Caused a sexually transmitted disease. Have **only trophozoite** stage. *T vaginalis* is pear-shaped, with a short undulating membrane lined with a flagellum and **four anterior** flagella. The organism moves with a characteristic wobbling and rotating motion. The nonpathogenic trichomonads, *Trichomonas hominis* and

*Trichomonas tenax*, cannot readily be distinguished from *T vaginalis* when alive. For all practical purposes, trichomonads found in the mouth are *T tenax*; in the intestine, *T hominis*; and in the genitourinary tract (both sexes), *T vaginalis*.



**Life Cycle of T. Vaginalis:**



## Pathogenesis, Pathology, & Clinical Findings

*T. hominis* and *T. tenax* are generally considered to be harmless commensals. *T. vaginalis* is capable of causing low-grade inflammation. The intensity of infection, the pH and physiologic status of the vaginal and other genitourinary tract surfaces, and the accompanying bacterial flora are among the factors affecting pathogenicity. The organisms do not survive at normal vaginal acidity of pH 3.8 - 4.4.

**In females**, the infection is normally limited to vulva, vagina (Vaginitis), and cervix; it does not usually extend to the uterus. The mucosal surfaces may be tender, inflamed, eroded, and covered with a frothy yellow or cream-colored discharge. **In males**, the prostate, seminal vesicles, and urethra may be infected. Signs and symptoms in females, in addition to profuse vaginal discharge, include local tenderness, vulval pruritus, and burning. About 10% of infected males have a thin, white urethral discharge and Infected male acting as carrier.

## Diagnostic Laboratory Tests

### **Specimens and Microscopic Examination**

Vaginal or urethral secretions or discharge should be examined microscopically in a drop of saline for characteristic motile trichomonads. Dried smears may be stained with hematoxylin or other stains for later study.

### **Culture**

Culture of vaginal or urethral discharge, of prostatic secretion, or of a semen specimen may reveal organisms when direct examination is negative.

### **Treatment**

Successful treatment of vaginal infection requires destruction of the trichomonads, for which topical and systemic **metronidazole** (Flagyl) is best. **Tinidazole** (Fasigyn) and **ornidazole** (Tiberol) are equally effective, with fewer side effects. The patient's sexual partner should be examined and treated simultaneously. Postmenopausal patients may require treatment with **estrogens** to improve the condition of the vaginal epithelium. Prostatic infection can be cured with certainty only by systemic treatment with **metronidazole** or one of the above-mentioned

nitroimidazoles.

### Prevention and control

Normal sexual behavior, Fixed sexual partner and Safety sexual behavior

## **Trichomonas Hominis**

**Geog. Distribution:** all over the world, more in warm areas.

**Habitat:** in the large intestine especially caecum of human.

**Morphology:** Trophozoite:

**Movement:** Jerky.

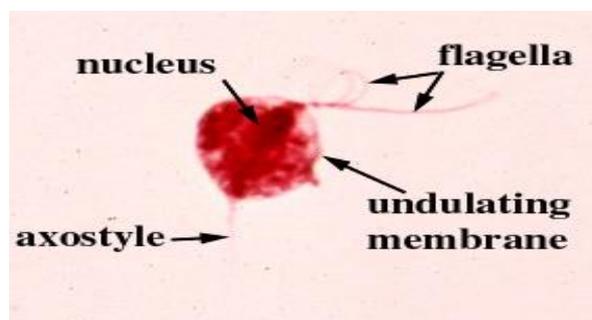
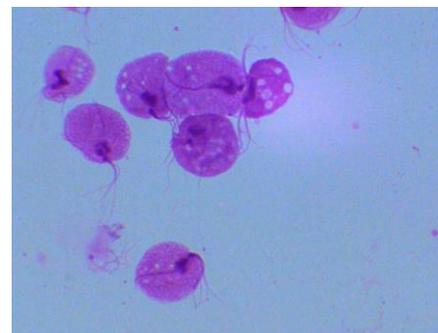
**Cyst:** No cyst stage.

**Transmission:** perhaps by ingestion of the flagella form.

**Infection/pathogenesis:** not known.

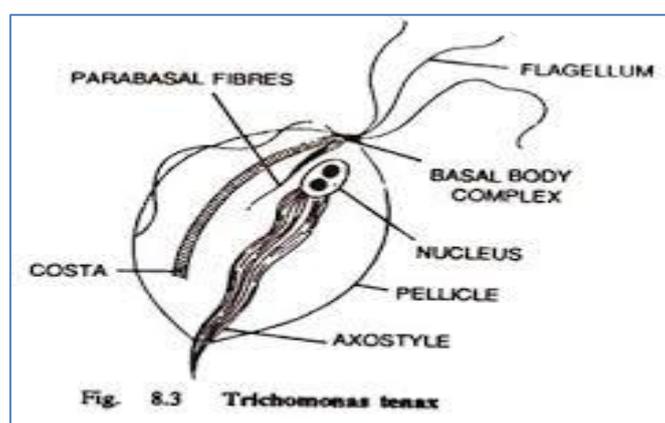
### **Diagnosis:**

1. Wet preparation.
2. Seroimmunological investigations.
3. culture



## ***Trichomonas tenax***

*Trichomonas tenax*, or oral trichomonas, is a species of trichomonas commonly found in the oral cavity of humans, dogs and cats. The parasite is frequently located in periodontal infections, affecting more than 50% of the population in some areas. *Trichomonas tenax* is not found on healthy gums. Its presence in necrotizing ulcerative gingivitis and necrotizing ulcerative periodontitis make it a possible pathogen, worsening the periodontal disease. This parasite is also present in some chronic lung diseases where recovery is brought by removing it.



### Other Intestinal Flagellates

#### ***Dientamoeba Fragilis***

Long classified with the amebas, this occasionally pathogenic organism is now recognized as an **ameboflagellate** in the same order as trichomonas. In its ameba stage it measures 4–18  $\mu$ m, has one or two nuclei, and is often bilobate or bean-shaped. It is commonly found in the **human colon** along with the true amebas, but it contains a flagellate structure (the parabasal body) near the nuclei and, like trichomonas, lacks a cyst stage. *Dientamoeba fragilis* is a parasite of humans but has been found in apes, monkeys, and sheep as well. It is mildly pathogenic in about 25% of infected individuals, who may experience abdominal pain and flatulence, diarrhea, vomiting, weakness, and weight loss similar to giardiasis. Treatment is as for *Entamoeba histolytica* infection. Morphologic distinction from intestinal amebas is included in the section on amebiasis.

