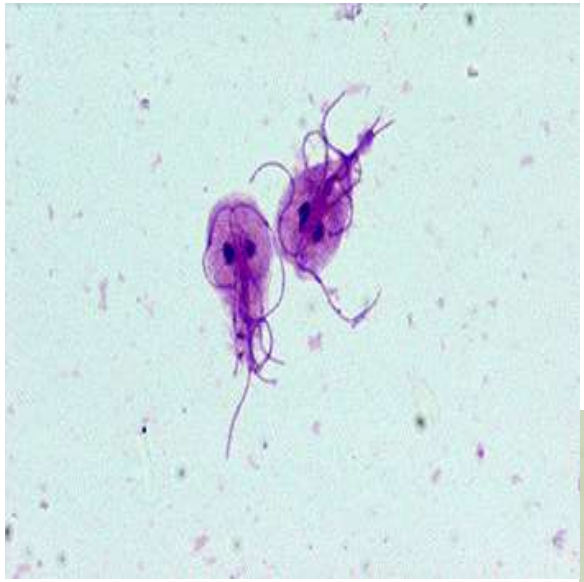
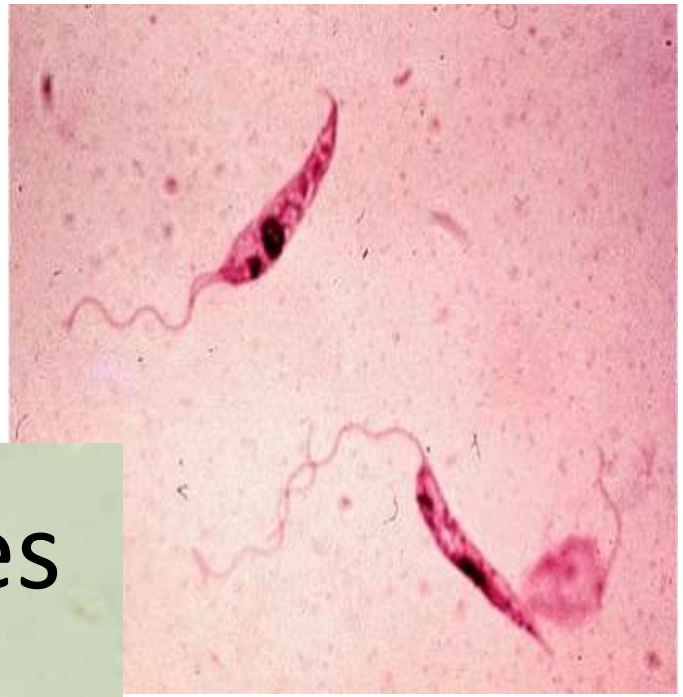




Flagellates

By Dr. Raghed Mohammed

- **Kingdom :- Protozoa**
- **Phylum :- Sarcomastigophora.**
- **Subphylum :- Mastigophora.**

The most important characteristic feature are

1- Move by one or multiple flagella

2-Asexual reproduction by binary fission.

3- Anaerobic eukaryotes lack mitochondria.

Flagellates are classified according to their occurrence in their vertebrate host body

- **1- intestinal and atrial flagellates which live in the alimentary canal (ex:-** (Giardia) **and the urinogenital tract** (Trichomonas)
- **2-Blood and tissue flagellates which live in the blood , lymph and tissue of the host** (Trypanosoma, Leishmania)

Giardia lamblia

- A flagellate, is the only common pathogenic protozoan found in the humans GIT. It is the cause of giardiasis.
- Normal habitat small intestine (duodenum and jejunum).
- Definitive host is human and the reservoir host animals (zoonosis)
- Infection range from asymptomatic colonization to acute or chronic diarrhea and malabsorption . It is more prevalence in children

life cycle of *G. lamblia* is composed of 2 stages:

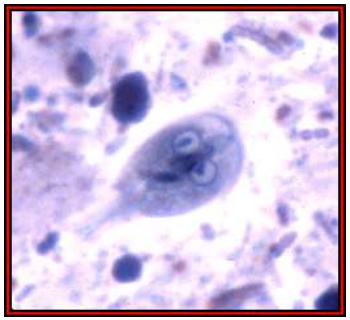
- Trophozoites
- Cysts
- Trophozoite not penetrated epithelial cell of small intestine (remain in intestine)

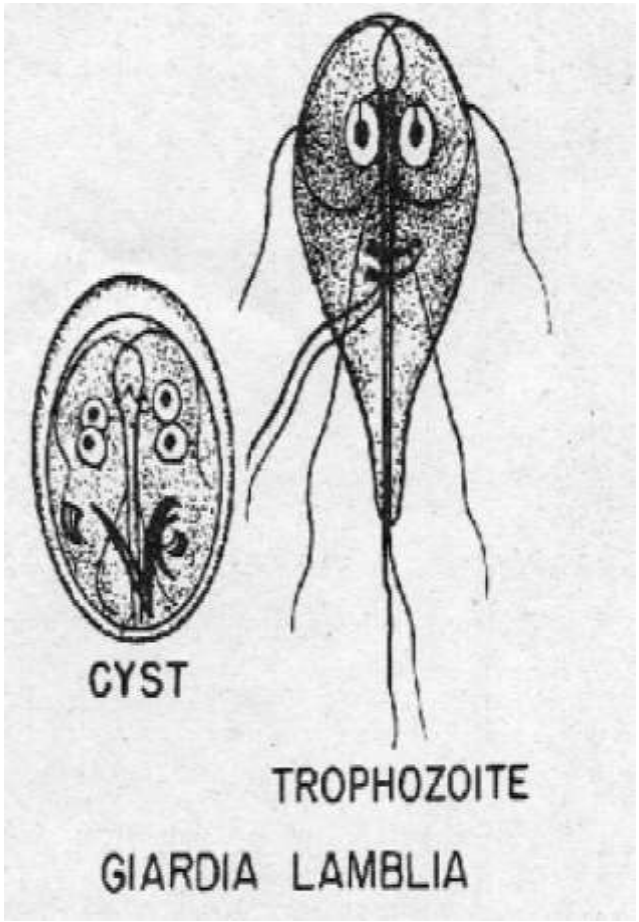
Mode of infection :

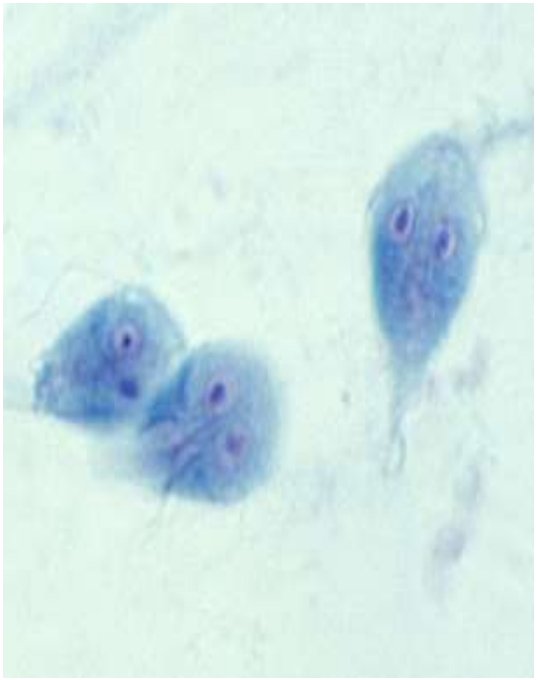
1.Contaminated food or water.

2.Flies and food handlers.

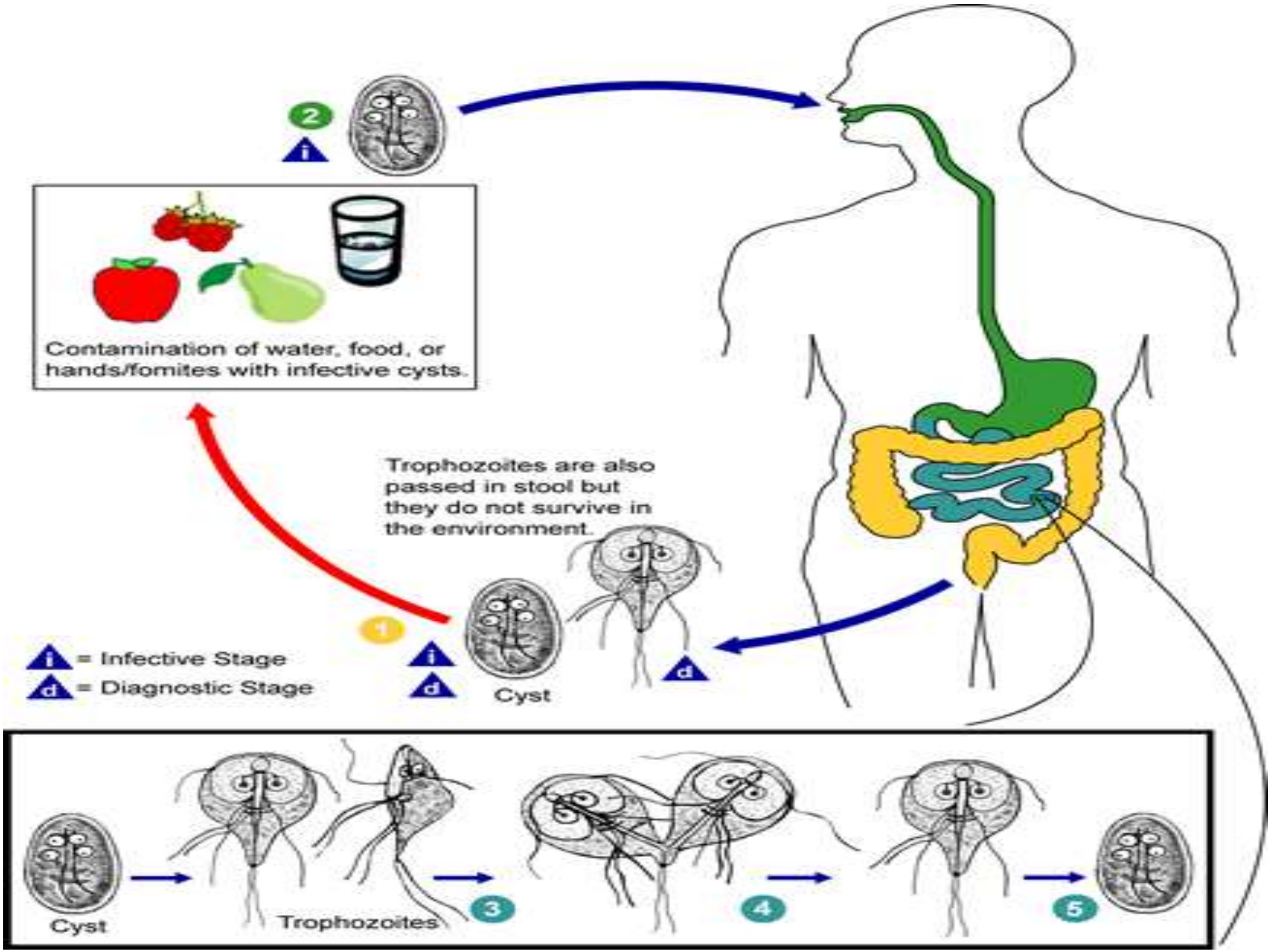
3.Faeco-oral (autoinfection)




CYST
TROPHOZOITE
GIARDIA LAMBLIA



Life cycle


2
i
Contamination of water, food, or hands/fomites with infective cysts.
Trophozoites are also passed in stool but they do not survive in the environment.
1
i = Infective Stage
d = Diagnostic Stage
Cyst
Cyst
Trophozoites
3
4
5

1- Giardia cysts are the infective stage of *Giardia spp*. As few as 10 cysts can cause infection .These cysts are ingested with contaminated food or water, or fecal-orally.

2. When cysts are ingested, the low pH of the stomach acid produces excystation, in which the activated flagella breaks through the cyst wall. This occurs in the small intestine, specifically the duodenum.

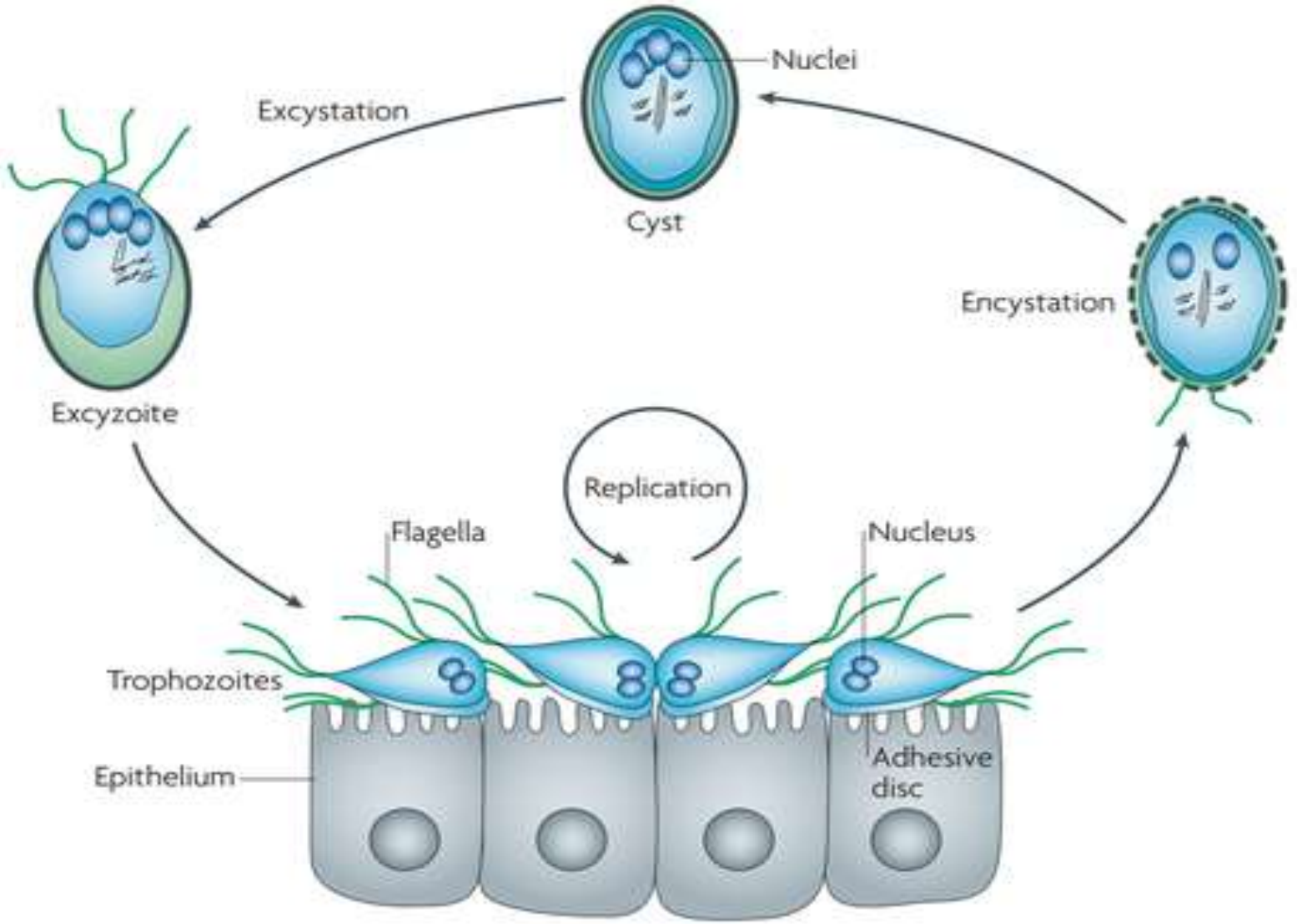
3. Excystation releases trophozoites, with each cyst producing two trophozoites. Within the small intestine, the trophozoites reproduce asexually (longitudinal binary fission) and either float free or are attached to the mucosa of the lumen.

4. Some trophozoites then encyst in the small intestine. Encystation occurs most likely as a result of exposure to bile salts and fatty acids, and a more alkaline environment.

5. Both cysts and trophozoites are then passed in the feces, and the cysts are infectious immediately or shortly afterward .

6. Person-to-person transmission is possible. Animals can also be infected with Giardia.

Pathogenesis



- **Pathogenesis is determined by:**

  1.Strain virulence

  2.Host’s susceptibility

Infection with Giardia intestinal can range from asymptomatic to severe diarrhea. Trophozoites attach themselves tightly to the free surface of the small intestinal epithelia through the adhesive discs . They cause increasing of mucous production, diarrhea, dehydration, intestinal pain, distention and weight loss.

Due to their attachment, the parasite prevent mechanically, the absorption of fats and fat-dissolved vitamins. Giardiasis demonstrated by the occurrence of greasy, mucous, watery but not bloody diarrhea. The parasite may enter the bile duct, and the gall bladder which can cause jaundice and colic.

Clinical signs :-

In symptomatic individual, the incubation period lasts 1-3 weeks. Symptoms consist of diarrhea ((Steatorrhoea))(fatty diarrhea- Stool is light-coloured and greasy), and foul-smelling at various times during the course of the infection. Malaise, weakness, weight loss, abdominal cramps, distention, epigastric pain, digestive disturbances can occur. Symptoms may continue for long periods.

The acute stage lasts about 3–4 days and in some patients may be prolonged illness with episodes of recurring diarrhea.

Children are more liable to clinical giardiasis than adults and it has been associated with growth stunting and repeated *Giardia* infections

Immunosuppressed individuals are also susceptible to massive infection with severe clinical manifestations

Giardiasis should be considered in :-

- young children in child care center
- in any person who has had contact with an index case
- In person with a history of recent travel to an endemic area who has persistent diarrhea, intermittent diarrhea and constipation, malabsorption, abdominal pain and bloating, failure to thrive, or weight loss

Diagnosis:

- Specimen: stool, duodenal biopsy
- General stool examination: finding the distinctive cysts in formed stools, or cysts and trophozoites in liquid stools.
- Examination of the duodenal contents may be necessary to establish the diagnosis, as cyst production may be sporadic and not found in the stool by smear examination.
- Negative stool samples is suspected . So a series of three or more stool examinations on alternate days is therefore recommended.
- Serological tests: Development of a stool enzyme-linked immunosorbent assay (ELISA) has been shown to be both a specific and sensitive rapid diagnostic tool

Treatment:

Metronidazole (Flagyl) will clear over 90% of G. lamblia infections. (drug of choice)

Epidemiology

Usually occurs sporadically

- **major reservoir for spread :water contaminated with *Giardia* cysts**
- ***Giardia* cysts are relatively resistant to chlorination and to ultraviolet light irradiation and freezing . As well as it is very resistant to environmental factors and can be survive more than 2 months in water at 8 C° and about 1 month at 21 C°**
- **Person-to-person spread also occurs .**

Prevention &control

- **Boiling is effective for inactivating cysts.**
- **Proper washing of uncooked green vegetables**
- **Human stool not be used as fertilizer.**
- **Human milk contains secretory IgA antibodies that may provide protection to nursing infants.**

Trichomonas

The most important characteristic features members of this genus are :-

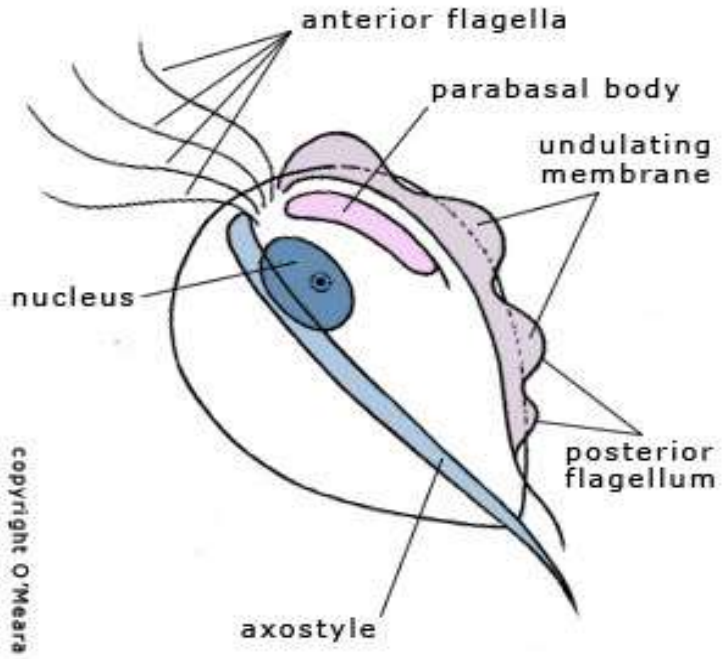
- They have trophozoites only.
- The trophozoite is ovoid or pear shaped, with 3-5 anterior flagella and another flagellum curving back along the margin of undulating membrane.
- The trophozoite has one nucleus presents in the anterior part of the body.

Three species of *Trichomonas* lives in human body

Trichomonas tenax

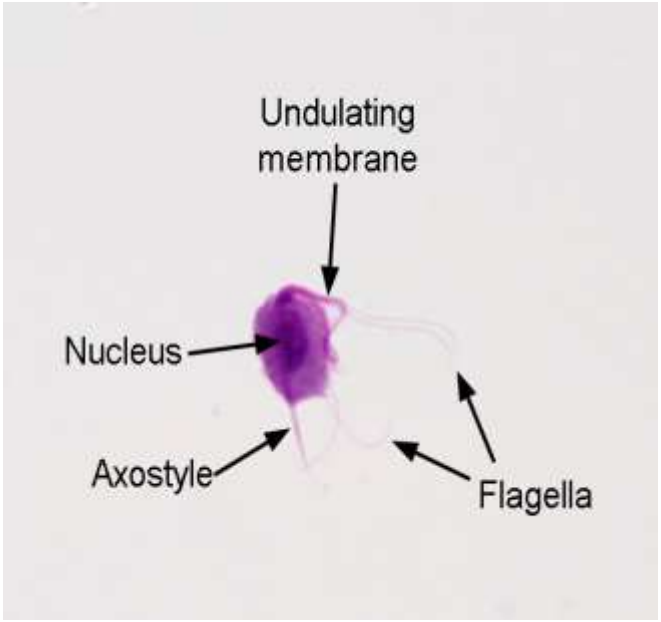
- Is a species of trichomonas found in the oral cavity of humans, dogs and cats.
- Is an anaerobic commensal of the human oral cavity but this parasite is not pathogenic.

- Transmitted directly by contacted with mucous membrane (saliva, droplet spray, and kissing) or use of contaminated dishes , spoons and drinking water with same tools .



- *Trichomonas tenax* can easily be detected by phase contrast microscopy on a fresh mounted smear of periodontal pocket biofilm infection.

- Routine hygiene is generally not sufficient to eliminate the parasite, hence its Latin name, meaning "tenacious".

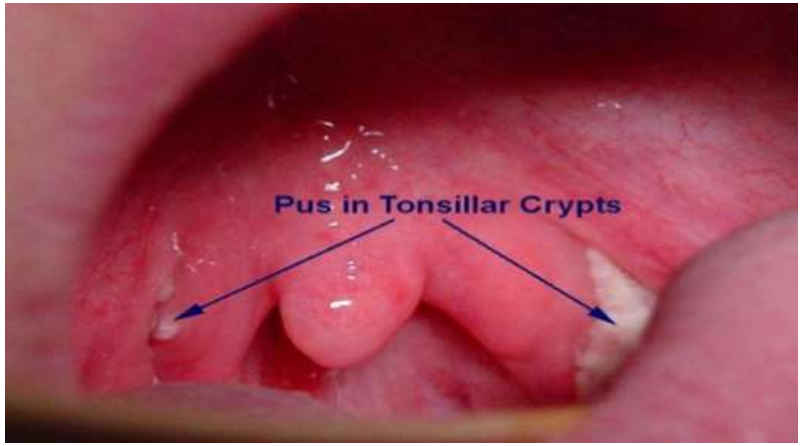


- It is the smallest of the three type of Trichomonas (6-8)µm long & (5-6) µm in wide.

Life cycle

Trichomonas tenax trophozoites survive in the oral cavity as mouth scavengers that feed primarily on local microorganisms & cellular debris ,it trophozoites multiply by longitudinal binary fission. It located in

Tartar between the teeth



Tonsillar crypts

Gingival margin around the gums

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. It 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.

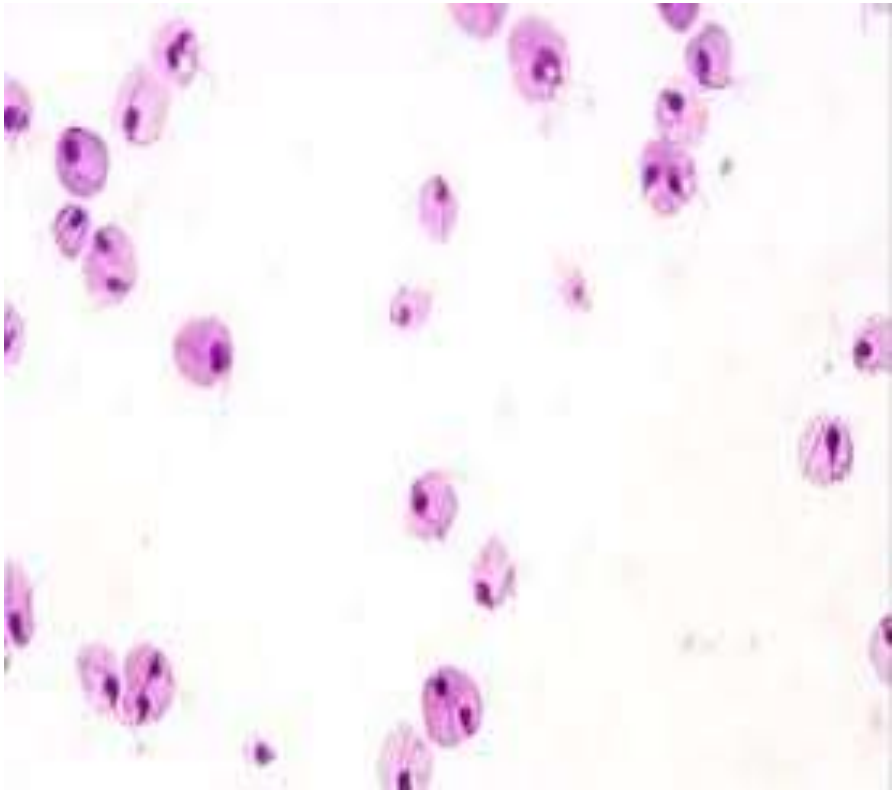
Clinical symptoms

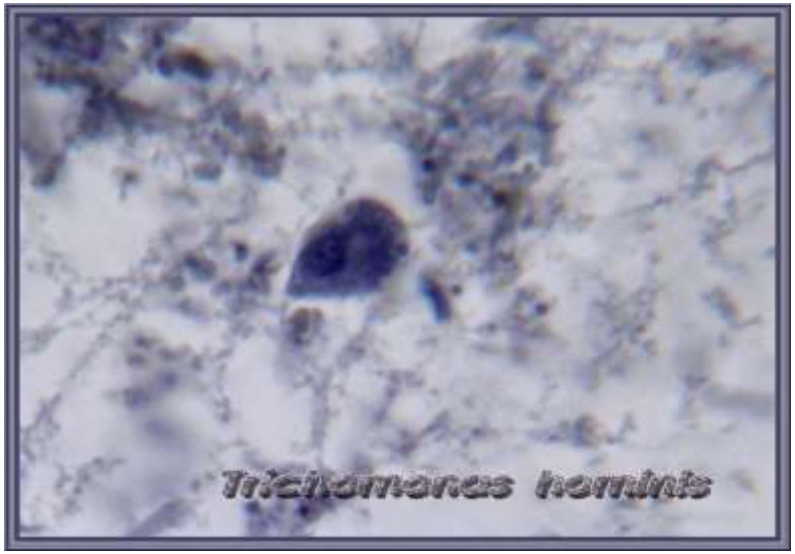
The typical *Trichomonas tenax* infection does not produce any notable symptoms. On a rare occasion, *T. tenax* has been known to invade the respiratory tract, but this appears to have mainly occurred in patients with underlying thoracic or lung abscesses .

Laboratory diagnosis

The specimen for diagnosing *Trichomonas tenax* trophozoite is mouth scrapings. Microscopic examination of tonsillar crypts and pyorrhea pockets (periodontitis) of patients suffering from T. tenax infections often yields the typical trophozoites.

Tartar between the teeth and the gingival margin of the gums are the primary areas of the mouth that may also potentially harbor this organism. T. tenax may also be cultured onto appropriate media .




Trichomonas hominis

Trichomonas hominis

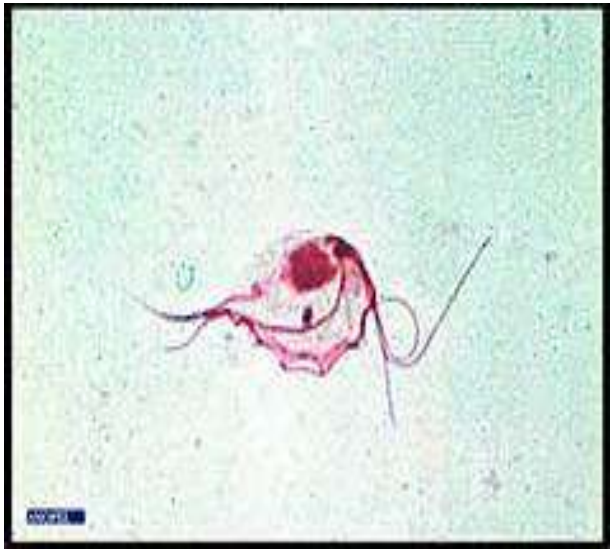
A relatively common flagellate (has a variable number of anterior flagella (3 to 5) but typically 5)) which may be unrecognized during examination of fecal specimens for parasites. It is a harmless commensal found in the caecum and colon .

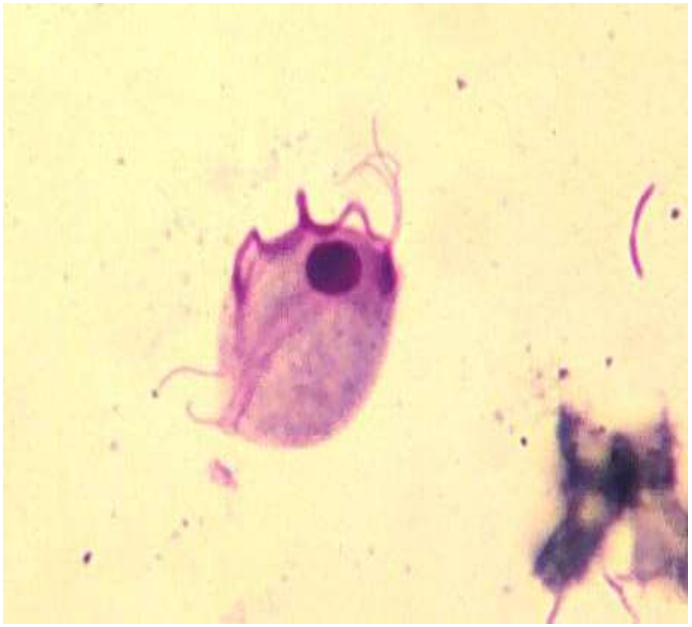
Its detection in fecal specimens does not seem to be related to gastrointestinal illness although it is often recovered from diarrheic stools. *Trichomonas hominis* is considered to be non-pathogenic.

there is no known cyst stage therefore it must be acquired by ingesting the trophozoite directly (with contaminated food & water) . The trophozoite probably survives in the acid stomach environment by ingestion along with some protective substance such as milk. After passing through the stomach, they tend to take up residence in the caecum region of the large intestine where the feed on bacteria.

Trophozoites are about 5 to 15 µm length by 7 to 10 µm in width (Diagnostic and infective stage)

Prevalent of this parasite is a worldwide with greater frequency in warmer climates and in children more than in adults & it has wide host range (man, other primates, dogs and cats). Prevention is by interrupting transmission which is accomplished though increased hygiene and improved sanitary conditions. Treatment is not warranted.





Trichomonas vaginalis

- Anaerobic, flagellated protozoan parasite and the causative agent of trichomoniasis (sexually transmitted disease) & it is a common parasite of both males and females that infected urogenital tract.
- It has only trophozoite stage. There is NO CYST. So it dies outside the human body unless protected against drying, a moist environment is critical for transmission to occur. Indeed, *Trichomonas* can survive 1-2 days in urine and 2-3 hours on a wet sponge
- Morphology
- *T. vaginalis* is a pear-shaped protozoan 10-23µm (about the size of a white blood cell)
- A single elongated nucleus lies at the round anterior end.
- Four flagella produce movement and a fifth may help with direction
- High motility contributes to its pathogenicity
- Reproduces by binary fission

Incubation Period

Incubation Period is typically 5 to 28 days

Trichomonas vaginalis is pathogenic in the genitourinary tract in women, it lives in the vagina &in men, it lives in the urethra

Infective stage
Pathogenic stage
Diagnostic stage

Trophozoite

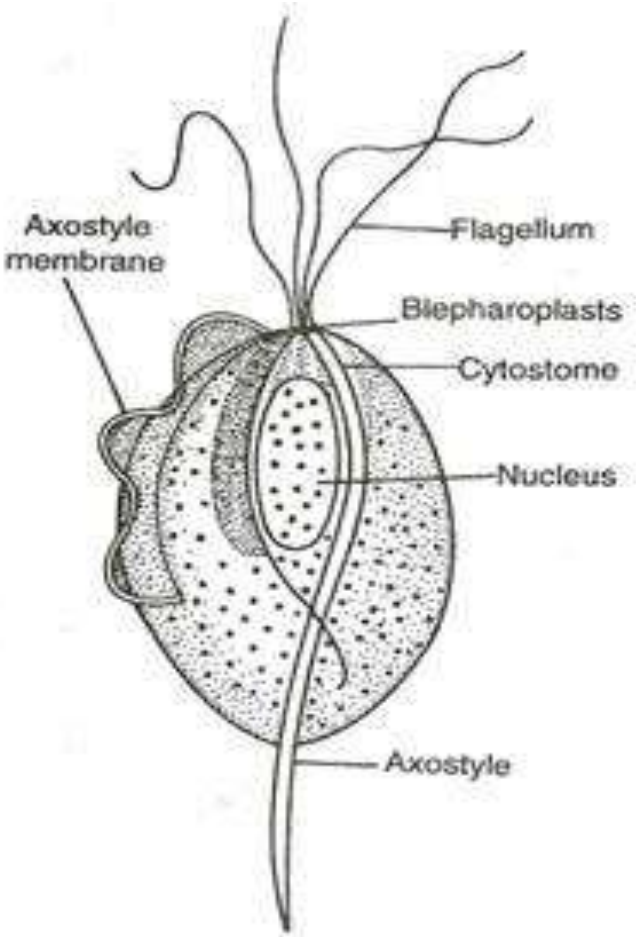


Fig. 182. *Trichomonas vaginalis*.

Mode of transmission

1. Directly by sexual intercourse (common mode of transmission) so *T. vaginalis* is a STD (sexually transmitted disease)

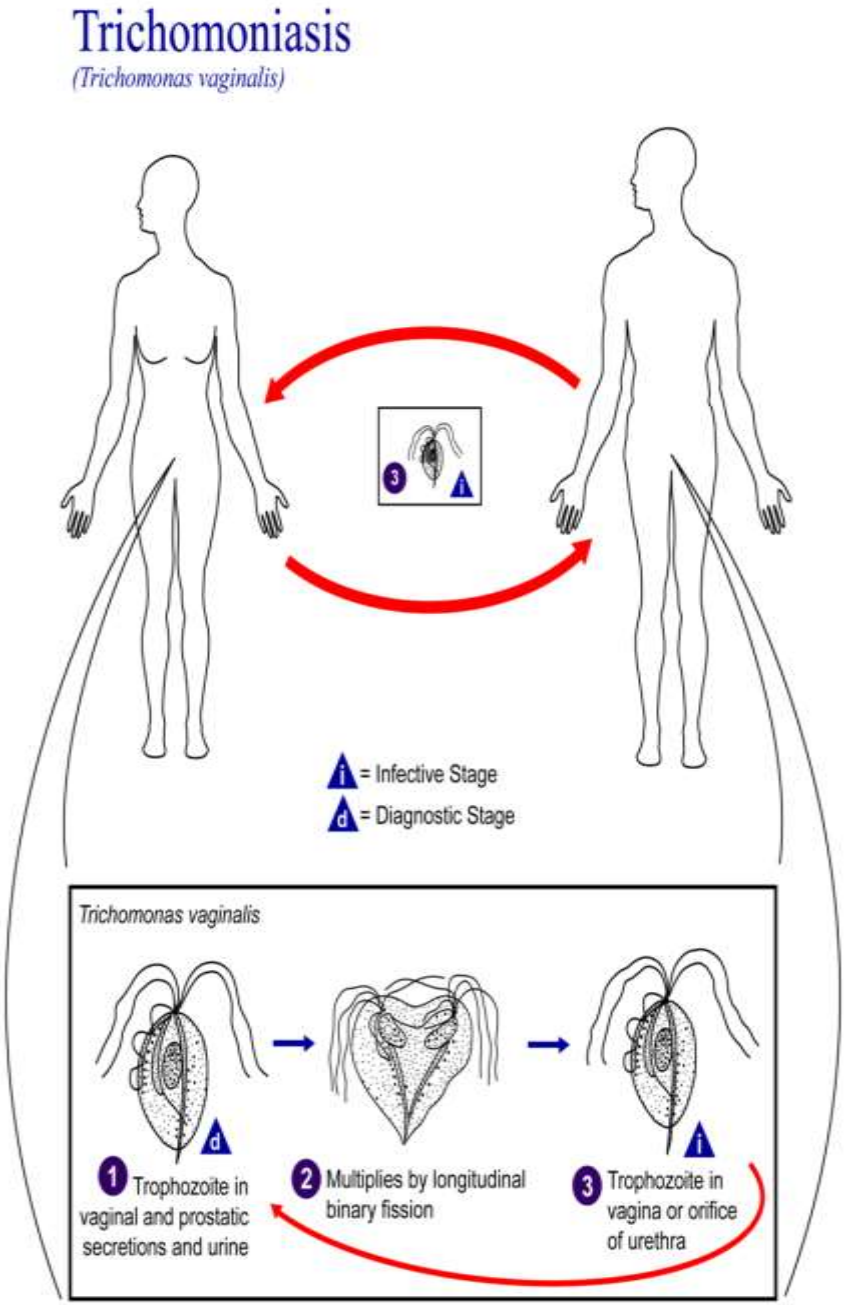
2. Indirect by contaminated towels, examination instruments, and sharing the contaminated underwear.

3. Infants may be infected during birth from infected mother.

Life cycle

trichomoniasis, is caused by *Trichomonas vaginalis* , is one of the most common STDs especially in young women. The natural hosts are human beings &the organism reproduces by binary fission after transmission

Symptoms include painful urination, discharge, vaginal, itching in women while in male usually remain asymptomatic but infrequently there is inflammation of urethra and prostate gland



Diagnosis

- Specimen; vaginal swab, urine, urethral swab, semen
- Direct examination wet preparation slide (looking for trophozoite)
- Serological test

Treatment

Metronidazole (flagyle) drug of choice (local and systemic)

Medication should be for both sexual partner(s) as well because they may be asymptomatic carriers.

TYPES OF TRICHOMONAS

TRICHOMONAS VAGINALIS
(urogenital, vaginal)

TRICHOMONAS HOMINIS
(intestinal)

TRICHOMONAS TENAX
(oral)