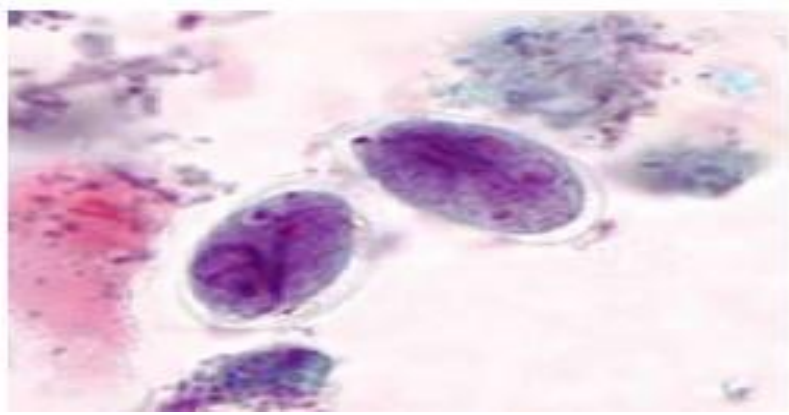
INTESTINAL FLAGELLATES

GIARDIA INTESTINALIS

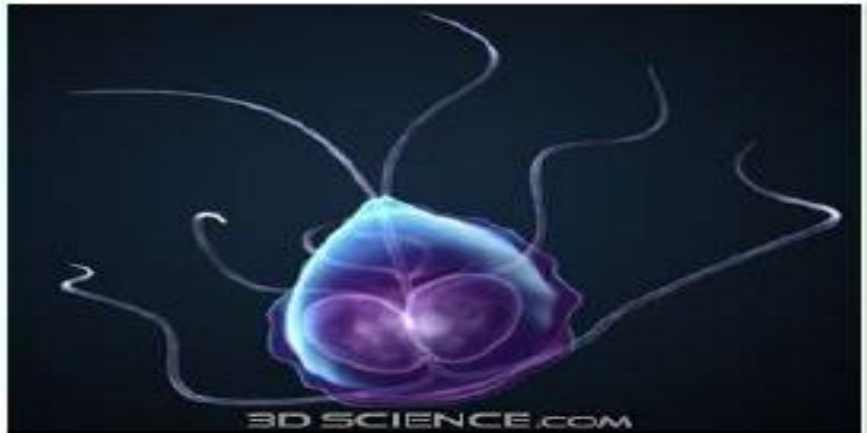
Giardia lamblia

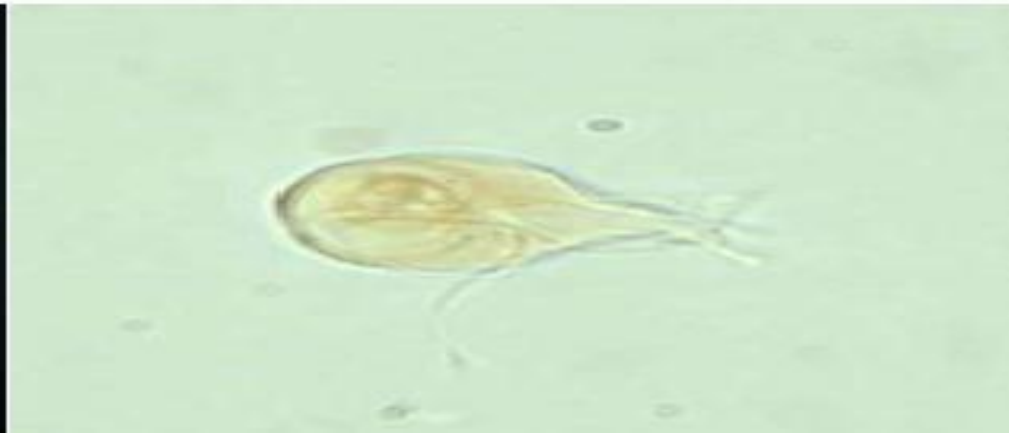
- It is the most common flagellate of the intestinal tract.
- considered as one of the most common cause of infectious diarrhea throughout the world.
- Geog. Dist: Worldwide (tropical and subtropical region)
- It is more common In warm climates .
- Humans are the only important reservoir of the infection.
- Also known as(*Giardia duodenalis*)
- Causes Giardiasis, also called "traveler's diarrhea" or "beaver fever"
- Morphology: exhibit the trophozoite and cyst .



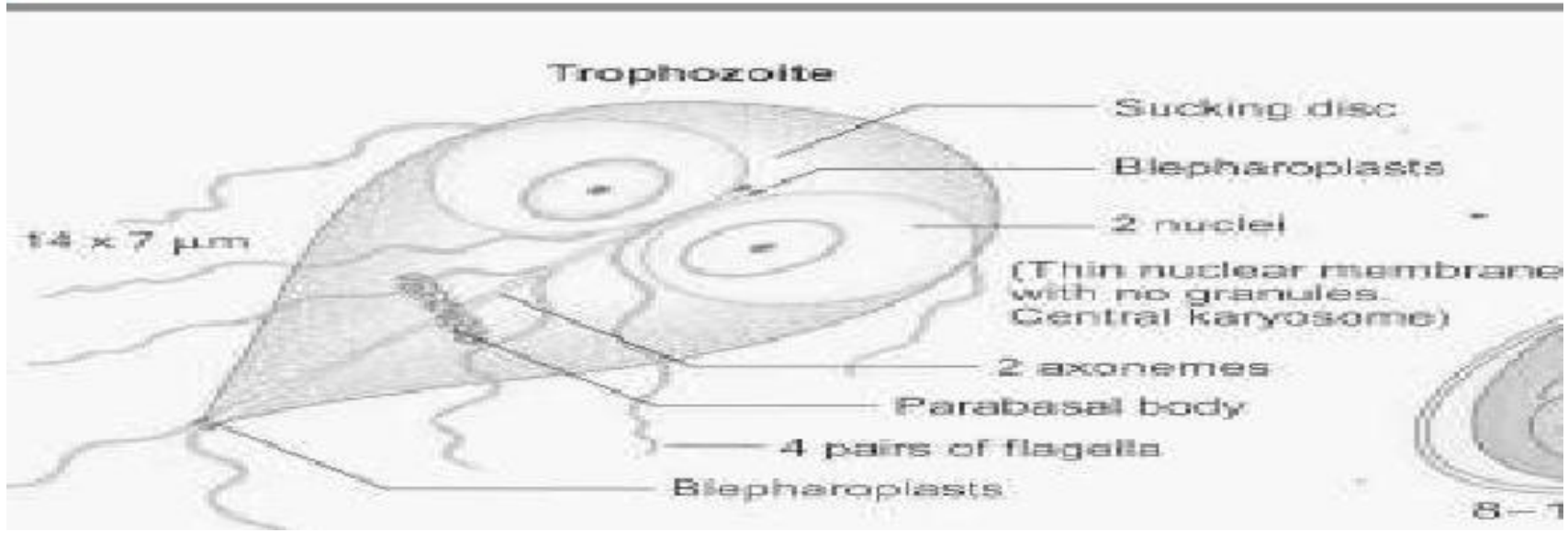
Trophozoite

- pear or pyriform shaped
- found in diarrheic stool
- rounded anteriorly and pointed posteriorly
- bilaterally symmetrical
- size 9-20um L X 5 - 15um W
- looking like tennis rackets without the handle (they are often seen has having a comical face-like appearance
- Divide by binary fission



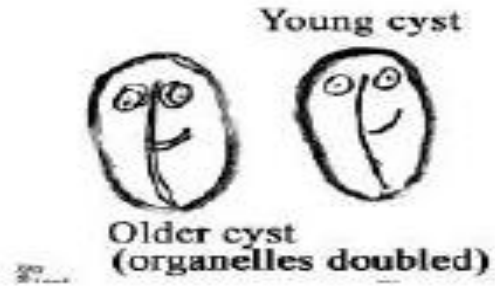


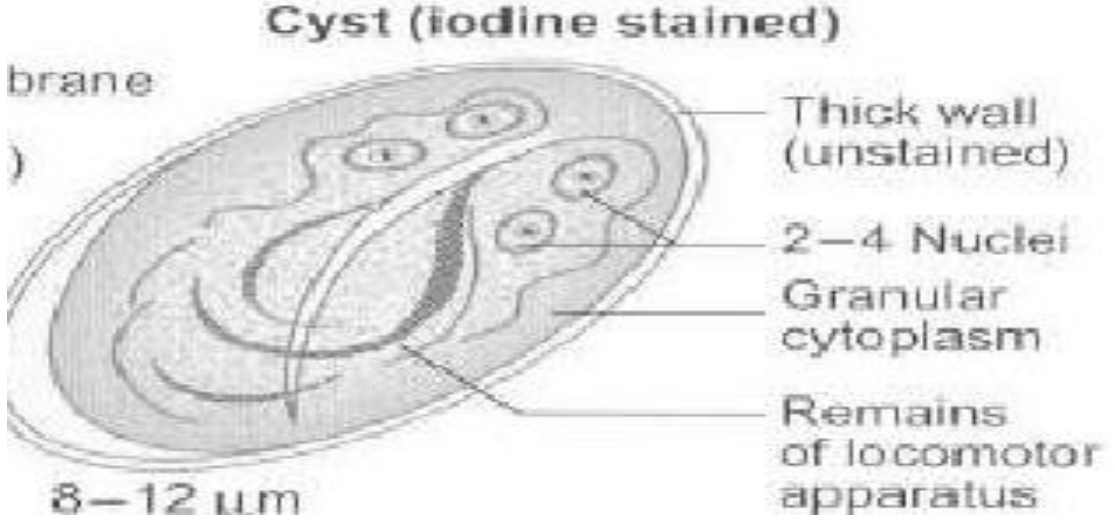
- sucking disc occupying 1/2 - 3/4 of the ventral surface (used for attachment of jejunal or duodenal mucosa)
- axoneme (axostyle) at the anterior end terminating posteriorly
- 4 pairs of lateral flagella, 2 ventral and 2 caudal (enhance falling leaf movement)
- 2 pairs of blepharoplast: 1 pair at anterior end 1 pair at caudal end
- 2 oval-shaped nuclei with large central karyosome on each side near the anterior end.
- 2 deeply stained (parabasal bodies) found posterior to the sucking disc

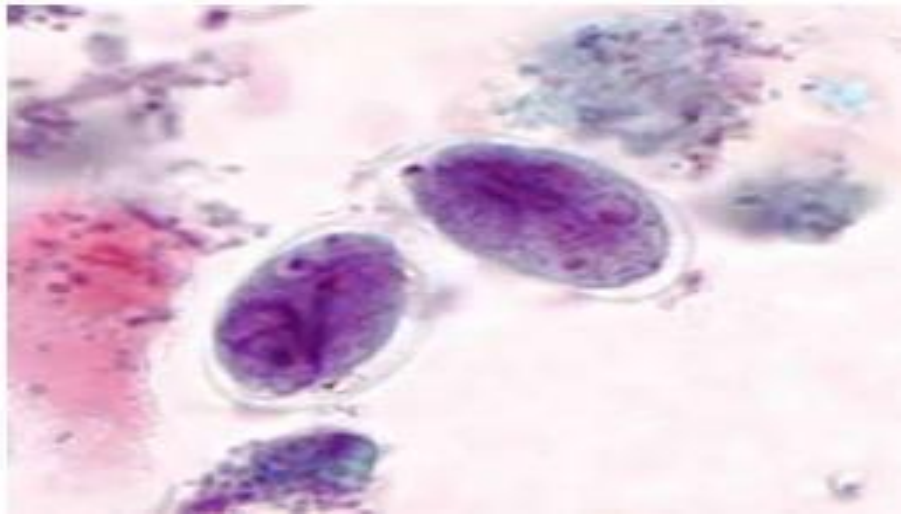


Cyst

- ovoidal/ellipsoidal – shaped thick wall .
- size 8–12um L X 7 – 10um
- contains 2-4 nuclei located at one end axoneme, parabasal bodies and other remnant organelles of the trophozoite .
- Habitat: duodenum and jejunum
- Mature cyst is the infective stage, at least 10 cysts are required to cause infection.





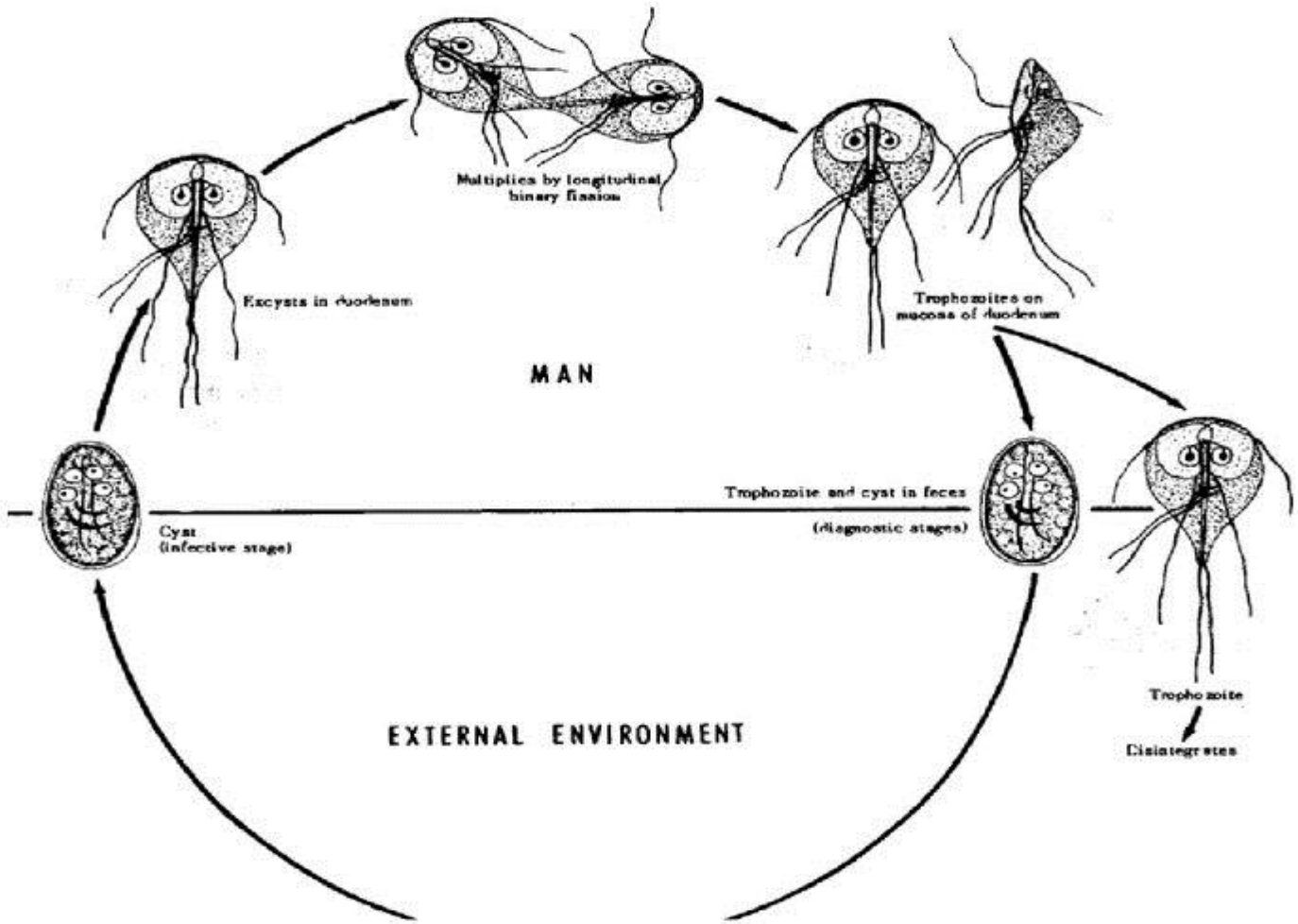


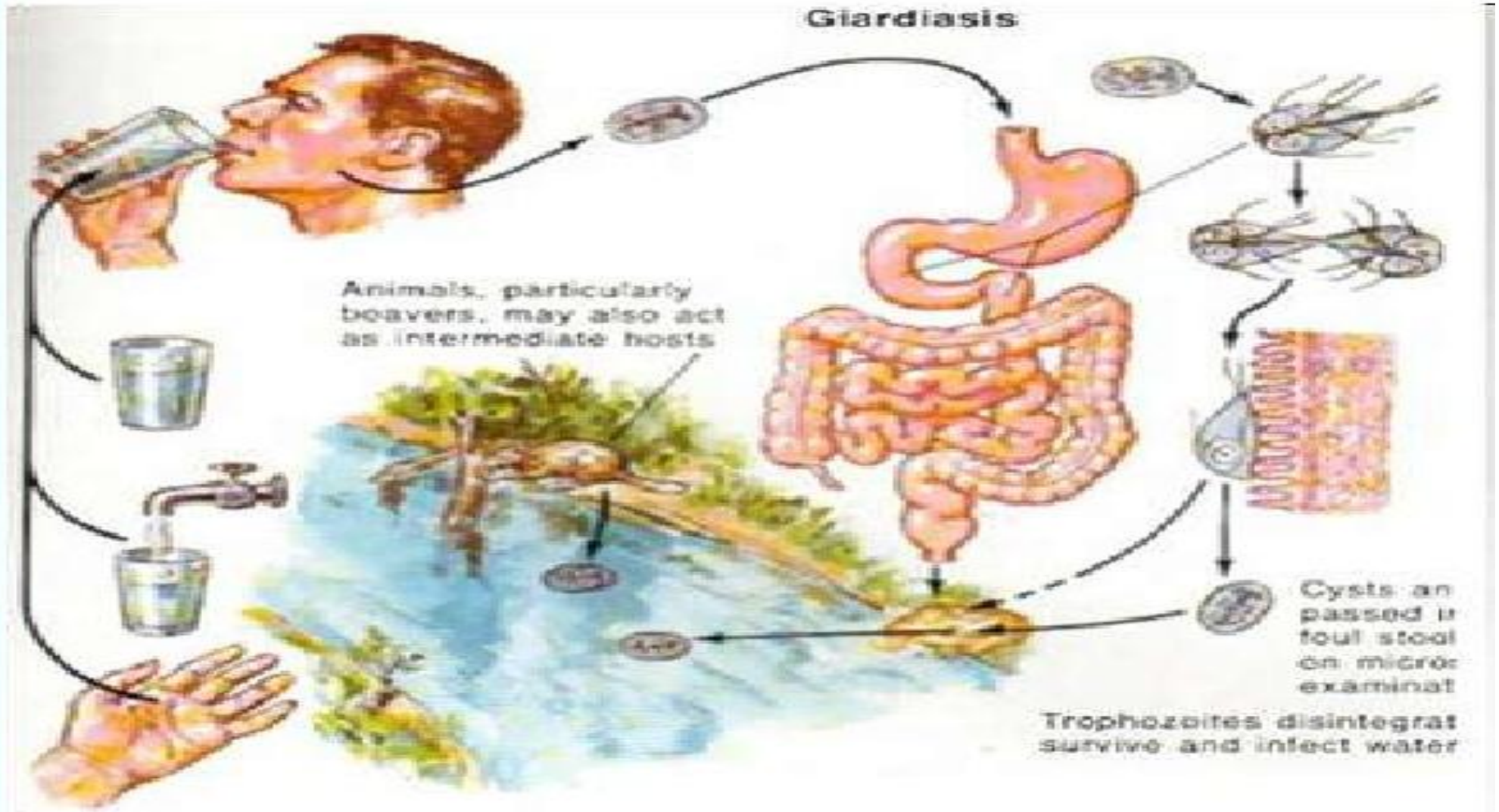
Life cycle

Parasite life cycle;

The life cycle begins with a non infective cyst being excreted with the feces of an infected individual. The cyst is hardy, providing protection from various degrees of heat and cold, desiccation, and infection from other organisms. A distinguishing characteristic of the cyst is four nuclei and a retracted cytoplasm. Once ingested by a host, the trophozoite emerges to an active state of feeding and motility. After the feeding stage, the trophozoite undergoes asexual replication through longitudinal binary fission. The resulting trophozoites and cysts then pass through the digestive system in the faeces. While the trophozoites may be found in the faeces, only the cysts are capable of surviving outside of the host.

Giardia lamblia life cycle




Giardiasis
Animals, particularly beavers, may also act as intermediate hosts
Cysts an passed i foul stool on micro examinat
Trophozoites disintegrat survive and infect water

Pathogenesis&Ipathology

- Infection resulted in crypt hyperplasia associated with an increased enterocyte migration rate. Villus height was decreased in the duodenum, unchanged in the jejunum, and increased in the ileum of infected animals. Epithelial microvilli were markedly shortened, and brush border surface area decreased in the jejunum and ileum of infected animals. Thymidine kinase activity was increased in isolated duodenal villus enterocytes but did not differ in the jejunum and ileum.

Pathogenesis&Ipathology

- *Giardia lamblia* generally does not penetrate the intestinal wall, but may cause inflammation and shortening of the villi in the small intestine. Extremely large numbers of trophozoites may be present and may lead to a direct, physical blockage of nutrient uptake, especially in fat soluble substances such as vitamin B12. Infection with *Giardia lamblia* can range from asymptomatic to severe diarrhea

Symptoms

- Watery diarrhea that may alternate with soft, greasy stools
- Fatigue
- Abdominal cramps and bloating
- flatulence
- Nausea
- Weight loss
- failure to absorb fat, lactose, vitamin A and vitamin B12

Signs and symptoms of giardia infection usually improve in two to six weeks, but in some people they last longer or recur.

Diagnosis

1. Stool microscopy
2. Stool Ag detection
3. Duodenal content examination
4. Duodenal biopsy
5. Serodiagnosis
6. Molecular diagnosis

Stool examination

- 3 stools taken at 2-day intervals, are examined for ova and parasites. The cysts are detected 50–70% of the time in the first stool specimen examined, and 90% of the time the cysts are detected after 3 stool specimen examinations.
- Trophozoites disintegrate rapidly outside of the body but may be found in fresh, watery stools.
- Cysts are found in soft and (semi)formed stools. Cyst passage is variable and not related to clinical symptoms. If not fresh, stool should be preserved in polyvinyl alcohol or formalin. Cyst passage may fall behind the onset of symptoms by a week

Stool antigen detection

- Commercially available tests use either an immunofluorescent antibody (IFA) assay or a capture enzyme-linked immunosorbent assay (ELISA) against cyst or trophozoite antigens. a specificity of 90–100%.

These examinations are limited to the detection of *Giardia*.

Serum antibody detection

- ELISA assays for serum antibodies against *Giardia* are not readily available.
- It is difficult to make a diagnosis of acute giardiasis because immunoglobulin G (IgG) levels remain elevated for long periods.
- However, serum anti-*Giardia* immunoglobulin M (IgM) can be helpful in distinguishing between acute and past infections.

TRANSMISSION:

- Only the cyst form is infectious by the oral route; trophozoites are destroyed by gastric acidity. Most infections are sporadic, resulting from cysts transmitted as a result of fecal contamination of water or food, by person-to-person contact.

RESERVOIR AND INCIDENCE

- The parasite occurs worldwide and is nearly universal in children in developing countries. Humans are the reservoir for Giardia, but dogs and beavers have been implicated as a zoonotic source of infection. Giardiasis is a well-recognized problem in special groups including travelers, campers, and persons with impaired immune states.

Treatment

- Metronidazole
- Paramomycin
- Quinacrine hydrochloride
- Furazolidone.
- Tinidazole
- Albendazole

Trichomonas

- Belongs to :

➢ Class : Trichomonadea.

➢ Order : Trichomonadida.

➢ Family : Trichomonadidae.

- Three species infect humans :

1. *Trichomonas vaginalis* : pathogen, resides in genital tract.
2. *Pentatrichomonas hominis* : nonpathogen, resided in large intestine.
3. *Trichomonas tenax* : nonpathogen, resided in mouth.

Trichomonas vaginalis

INTRODUCTION

- Trichomonas is the simplest of all the protozoan parasites because it has only trophozoite stage.
- Trichomonas infects the urogenital tract unlike other members of the order Trichomonadida which inhabit the intestinal tract.
- Sexually transmitted infection known as Trichomoniasis.

Significance

- 7.4 million cases reported every year.
- 180 million people infected worldwide.
- 50% asymptomatic carriers.

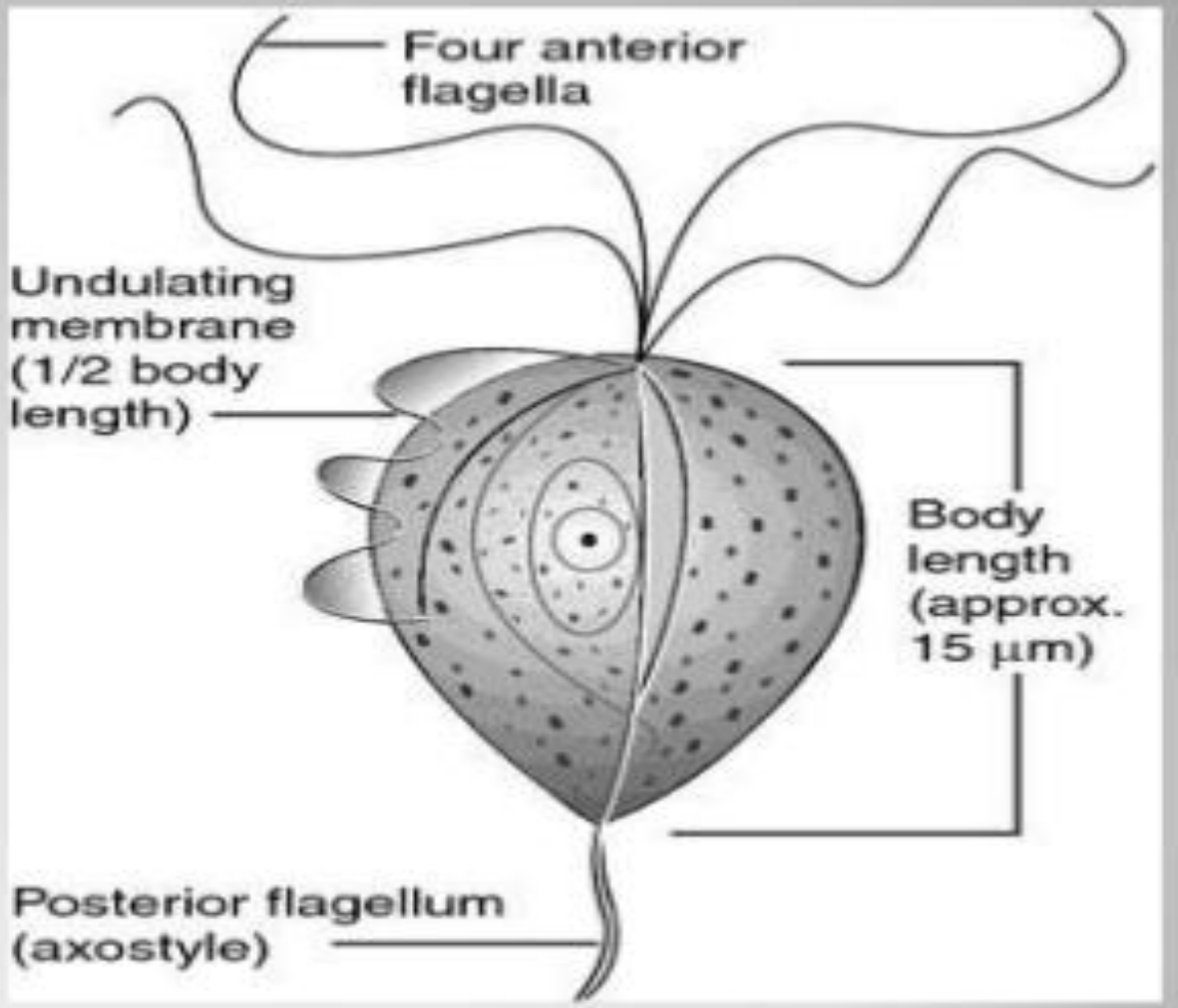
HABITAT:

- *T.vaginalis* trophozoite inhabits the vagina in female the prostate & seminal vesicles in males and urethra in both sexes.

Characteristics

Trichomonas shows the following important characteristics:

- **An anterior tuft of flagella**
- **Undulating membrane**
- **An axostyle**
- **Only trophozoite stage.** (It can survive outside the body at temp as low as 15 C for up to 48 hours.)

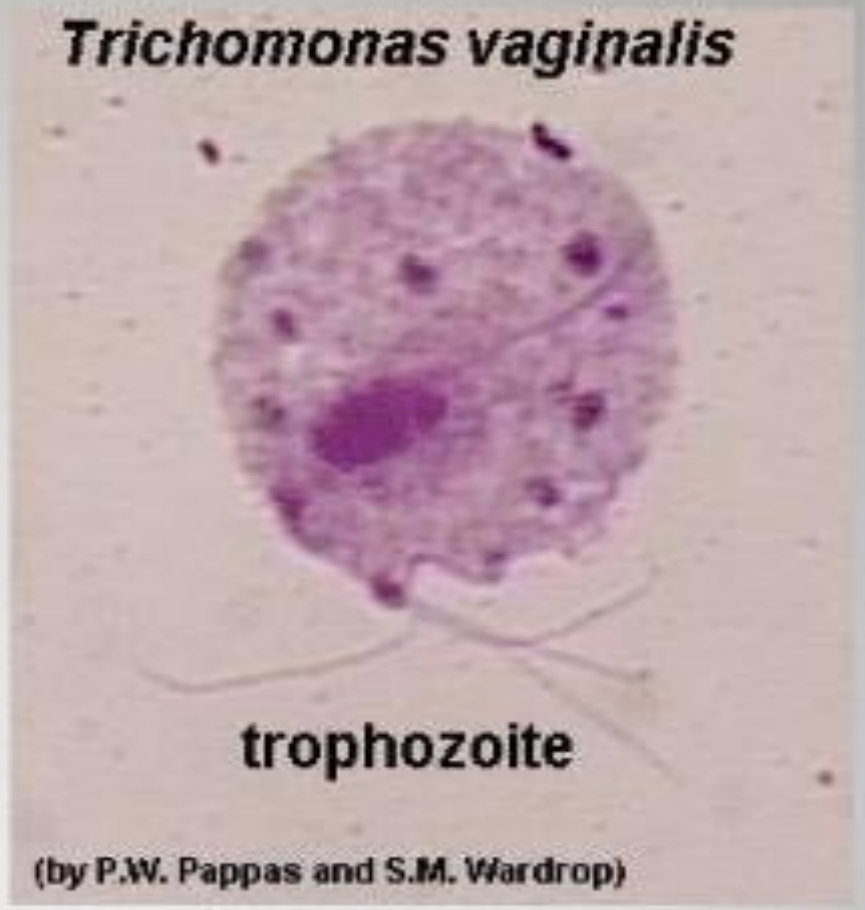


Trichomonas vaginalis

- ***Trichomonas vaginalis*** :is an anaerobic flagellated protozoan a form of microorganism.
- The parasitic microorganism is the causative agent of trichomoniasis and is the most common pathogenic protozoan infection of humans in industrialized countries.

Trichomonas vaginalis

- Facultative anaerobic parasite
- It produces energy by fermentation of sugars in a structure called **Hydrogenosome**
- A modified mitochondria in which enzyme of oxidative phosphorylation is replaced by enzyme of anaerobic fermentation

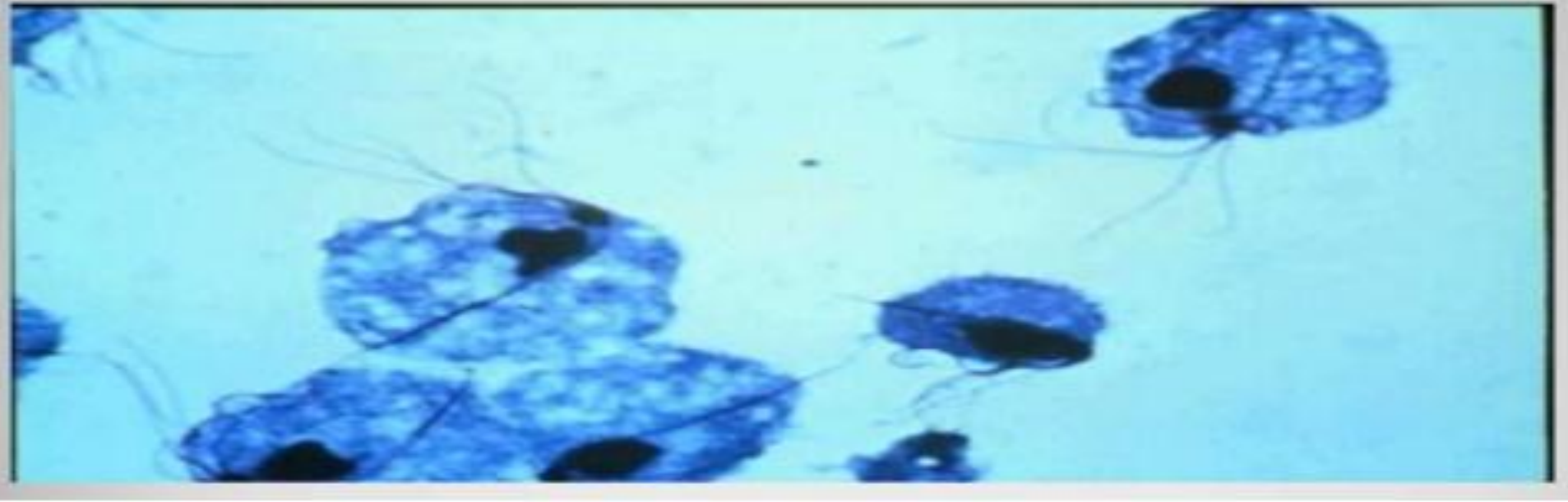


MORPHOLOGY

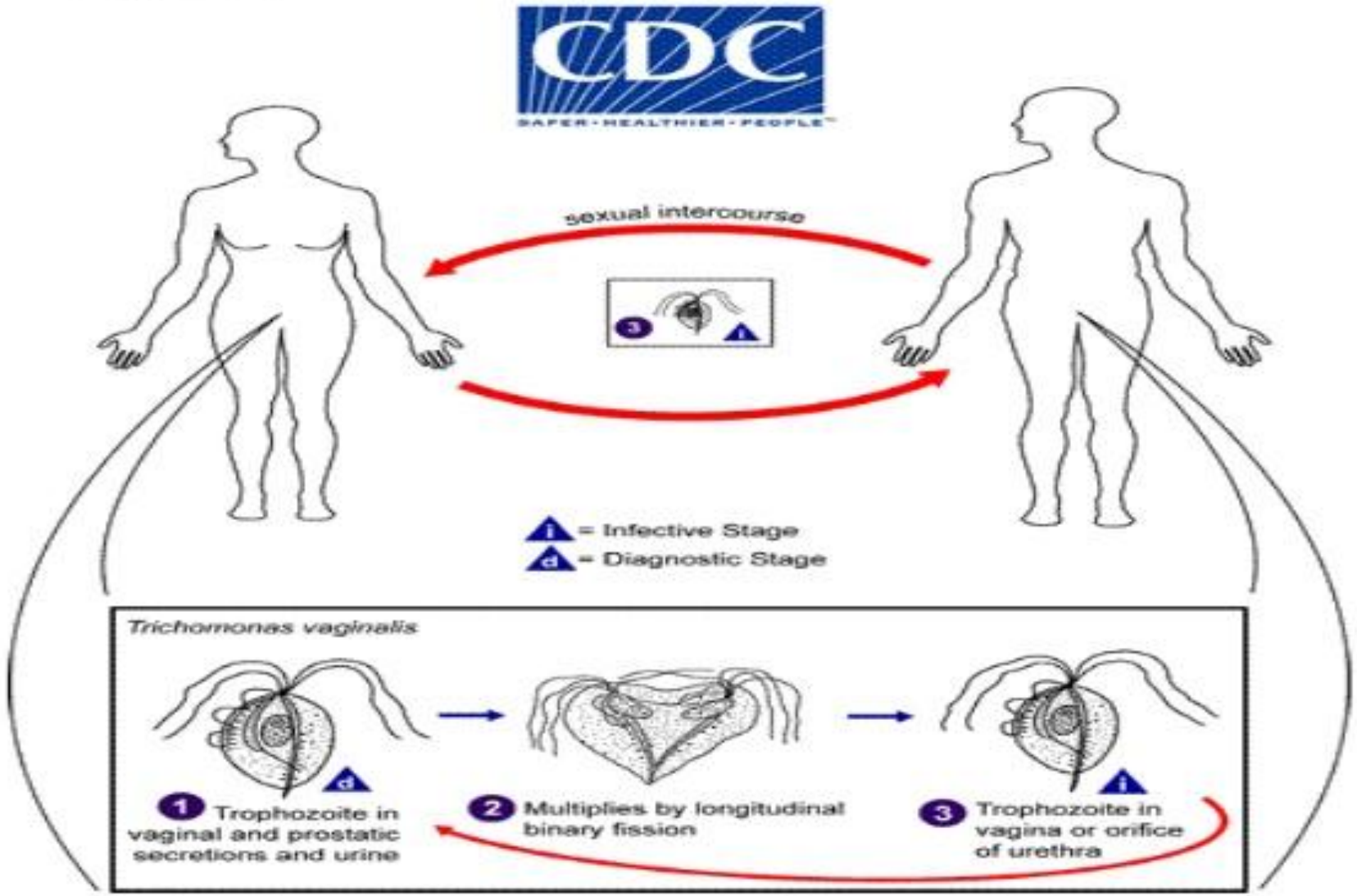
- *Trichomonas vaginalis* is a flagellated protozoan
- **Trophozoite is the only stage present in the life cycle Infective stage of the parasite. No cystic stage.**
- It is 7-30 µm long by 5-10µm wide
- Trophozoite is pear shaped & shows "TWITCHING TYPE" of motility due to the presence of 5 number of flagellae.

TRANSMISSION

- Sexual intercourse
- Mutual masturbation
- Mother to child during vaginal delivery



Life Cycle :


CDC
SAFER · HEALTHIER · PEOPLE
sexual intercourse
i = Infective Stage
d = Diagnostic Stage
Trichomonas vaginalis
1 Trophozoite in vaginal and prostatic secretions and urine
2 Multiplies by longitudinal binary fission
3 Trophozoite in vagina or orifice of urethra

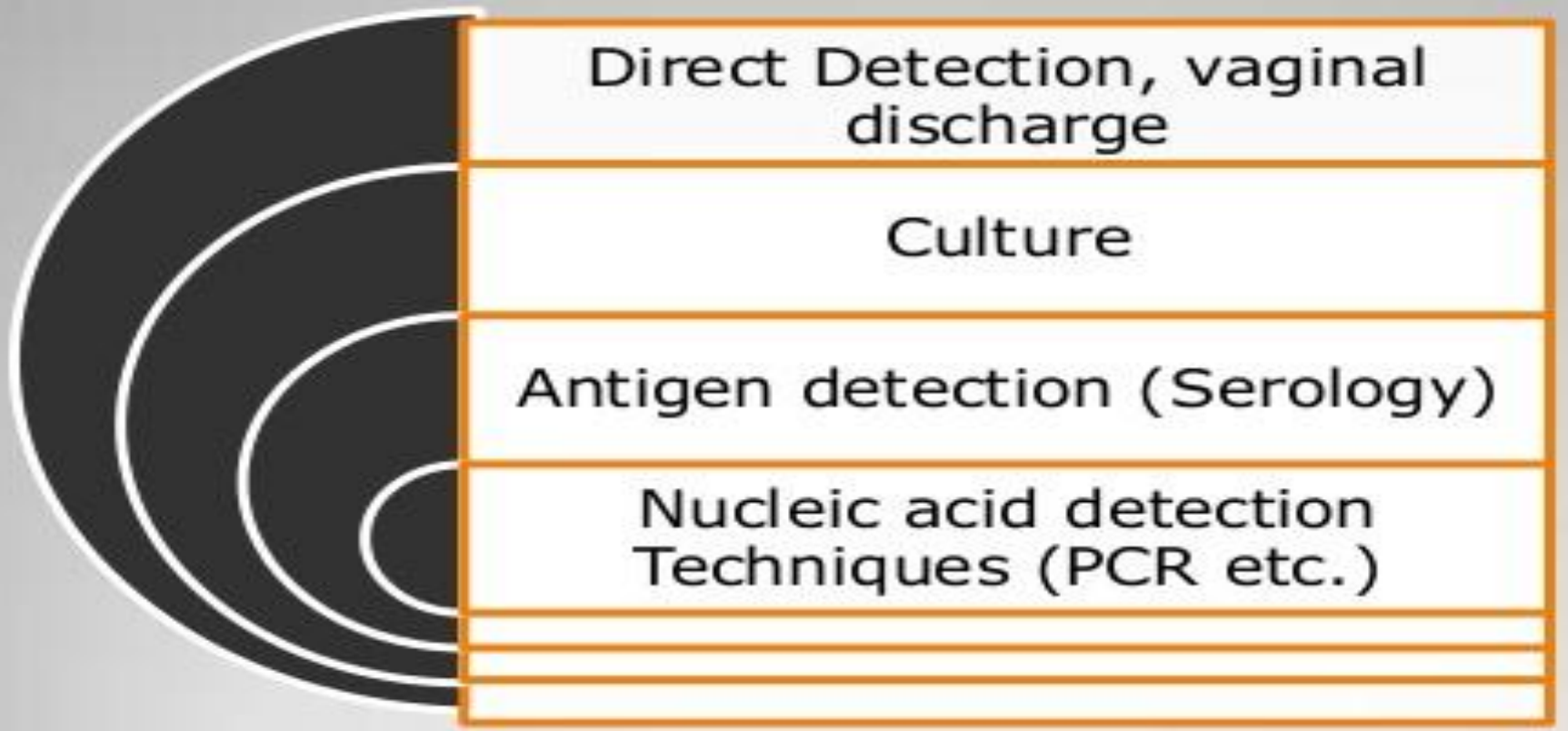
PATHOGENESIS

- It is **not** an invasive parasite
- It remains adherent to the **squamous epithelium but not columnar epithelium**
- **VIRULENCE FACTORS:**
- **Protein liquids & proteases** –help in adherence.
- **Lactic acid and Acetic acid** which lowers the vaginal ph low ph is cytotoxic to vaginal epithelial cells..
- PATHOLOGY:
- Intracellular edema and **" chicken like epithelium" is the most characteristic feature**.

SIGNS & SYMPTOMS

- inflammation of the vaginal canal
- vulvar itching leading to edema
- tenderness and chaffing
- redness
- yellow and green foul smelling discharge
- painful urination-dysuria
- dyspareunia
- punctuate hemorrhages on the cervix known as **colpitis macularis or strawberry cervix.**

LABORATORY DIAGNOSIS



TREATMENT

- Treatment : Single dose of Metronidazole 2 gm once or Metronidazole PO 500 mg TDS for 7 days
- Treat the male sexual partner
- Tinidazole is an alternate drug
- Prognosis a full recovery (100%)

PREVENTION

- Personal hygiene
- Barrier precautions
- Avoidance of sexual contact with infected partners.
- Detection & Treatment of cases either males/females.
- NO VACCINE IS AVAILABLE

TRICHOMONAS TENAX

Trichomonas tenax

- Also called *Trichomonas buccalis*.
- Habitat : mouth, in gums and tartar of the teeth. Occurs most frequently in pyorrheal pockets and tonsillar crypts.
- Morphology : smaller and more slender; 5-12µm long and 5-10µm wide.
- A harmless commensal; but if aspirated, transitory bronchial or pulmonary infection, pulmonary abscess occurs.
- Prevalence may vary from 0-0.25%, depending on oral hygiene.
- Treatment is directed at the underlying conditions.

DIENTAMOEBA FRAGILIS

Dientamoeba fragilis :

It is classified as an amoeboflagellate as the flagellum is internal.

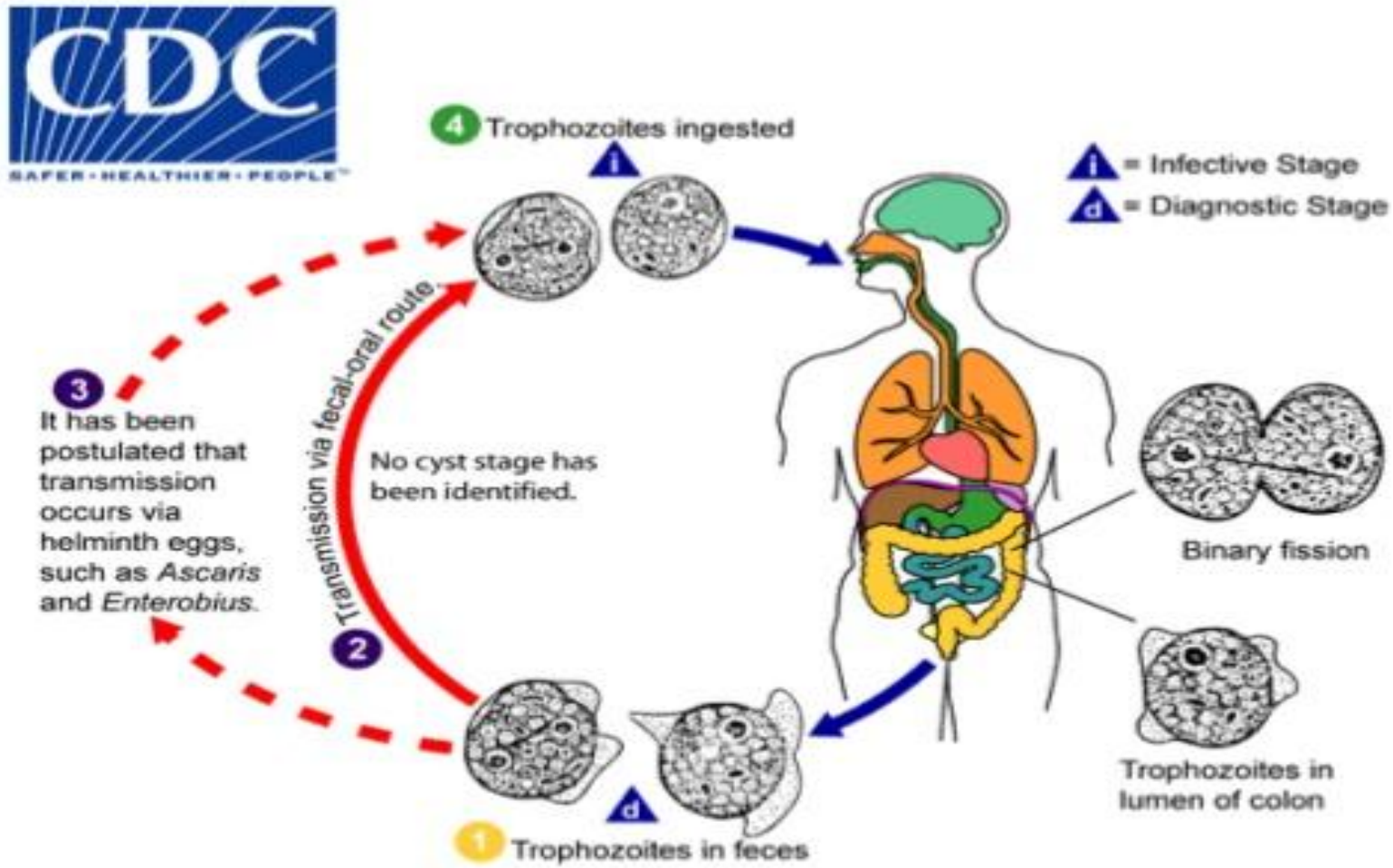
Distribution :

- cosmopolitan in distribution with incidence rate varies from 1.4-19%.
- higher incidence in children.

Morphology :

Trophozoite is the only stage.

Life cycle :


CDC
SAFER · HEALTHIER · PEOPLE™
4 Trophozoites ingested
i = Infective Stage
d = Diagnostic Stage
3
It has been postulated that transmission occurs via helminth eggs, such as *Ascaris* and *Enterobius*.
Transmission via fecal-oral route
No cyst stage has been identified.
2
Binary fission
Trophozoites in lumen of colon
1 Trophozoites in feces

Trophozoite :

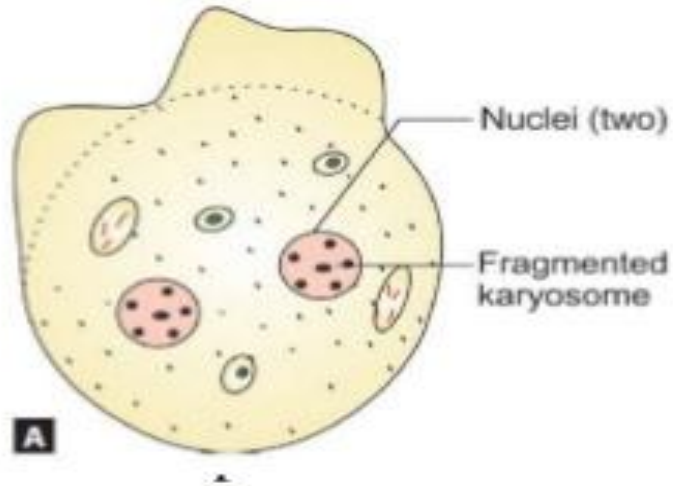
1. size and shape : irregular; 7- 12µm.
2. Nucleus :

-binucleated form;

an extranuclear spindle

extends between the two nuclei.

- delicate nuclear membrane.
- no peripheral chromatin.
- at the center a large mass composed chromatin granule.



3. Cytoplasm : vacuolated, may contain ingested debris.
4. Pseudopodia : hyaline, broad and leaflike in appearance with serrated margins.
5. Motility : progressive.

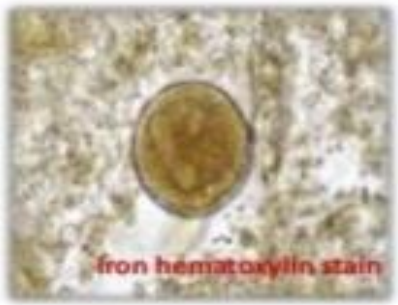
Symptoms :

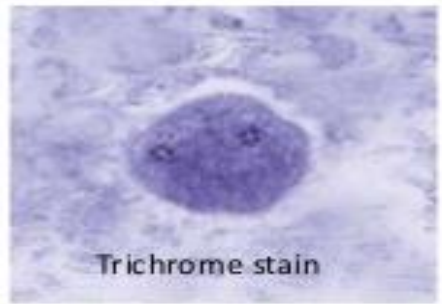
1. Diarrhea (bloody, mucoid, loose stool.) or alternating diarrhea and constipation.
2. Abdominal pain.
3. Flatulence.
4. Fatigue, weakness, nausea, vomiting, wt. loss, low grade fever.

Laboratory diagnosis :

1. Stool examination : fresh direct wet preparation should be examined immediately or stained by permanent stain (recommended stains- Fields', giemsa, iron hematoxylin stain.)

- high percentage of binucleated trophozoites; nuclei without peripheral chromatin; 4-8 chromatin granules in a central mass.





2. Antigen detection in stool : IFA, EIA.
3. Antibody detection in serum : IFA.

Treatment :

1. Iodoquinol is effective.
2. Alternative : tetracycline, paromomycin, metronidazole.
3. Symptomatic treatment is usually preffered, because pathogenecity is not confirmed.