

Giardia lamblia

Presented by

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INTRODUCTION

- Phylum: SARCOMASTIGOPHORA
- Subphylum: MASTIGOPHORA
- Class: ZOOMASTIGOPHORA

- The parasites belonging to this group possess one or more **whip-like flagella**.
- So they are known as flagellates.

CLASSIFICATION

- Depending on their habitat, they are placed under two groups.
 - Lumen dwelling flagellates : Intestinal /Oral /Genital tract parasite.
 - Hemoflagellates : Blood & Tissue parasite.
 - ✓ *Leishmania* spp : RE cells
 - ✓ *Trypanosoma brucei* : Connective tissue & blood
 - ✓ *Trypanosoma cruzi* : RE cells & blood

LUMEN-DEWLLING FLAGELLATES

| GENUS | PARASITE | HABITAT |
|------------------|--|----------------------------------|
| Giardia | <i>G. lamblia</i> | Duodenum |
| Chilomastix | <i>G. mesnili</i> | Caecum |
| Enteromonas | <i>E. hominis</i> | Colon |
| Retromonas | <i>R. intestinalis</i> | Colon |
| Pentatrichomonas | <i>P. hominis</i> | Ileocaecal region |
| Trichomonas | <i>T. Vaginalis</i> <i>T. tenax</i> | Vagina & Urethra Teeth & Gums |
| Dientamoeba | <i>D. fragilis</i> | Colonic mucosal crypts |

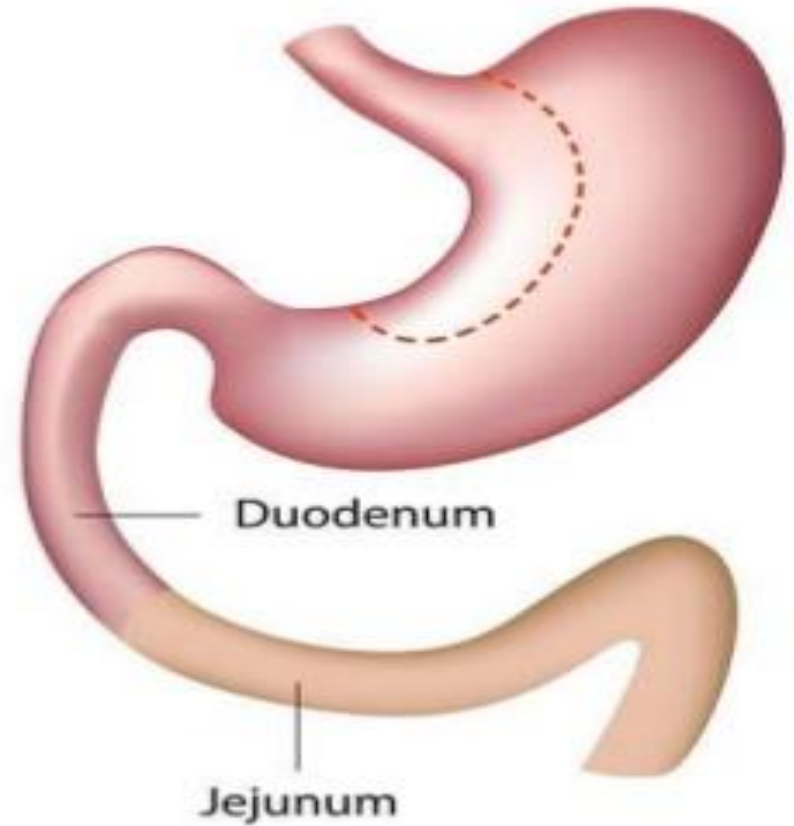


GEOGRAPHICAL SPREAD & EPIDEMICS

- **GEOGRAPHICAL DISTRIBUTION** : m/c protozoan pathogen, worldwide distributed.
- **EPIDEMIOLOGY** :
 - Areas with poor sanitation , especially tropics & subtropics.
 - Common in younger age group.
 - Traveller's diarrhea is common among visitors caused by giardiasis through contaminated water.

HABITAT

- Duodenum & the upper part of the jejunum.
- THE ONLY PROTOZOAN PARASITE FOUND IN THE LUMEN OF HUMAN SMALL INTESTINE.





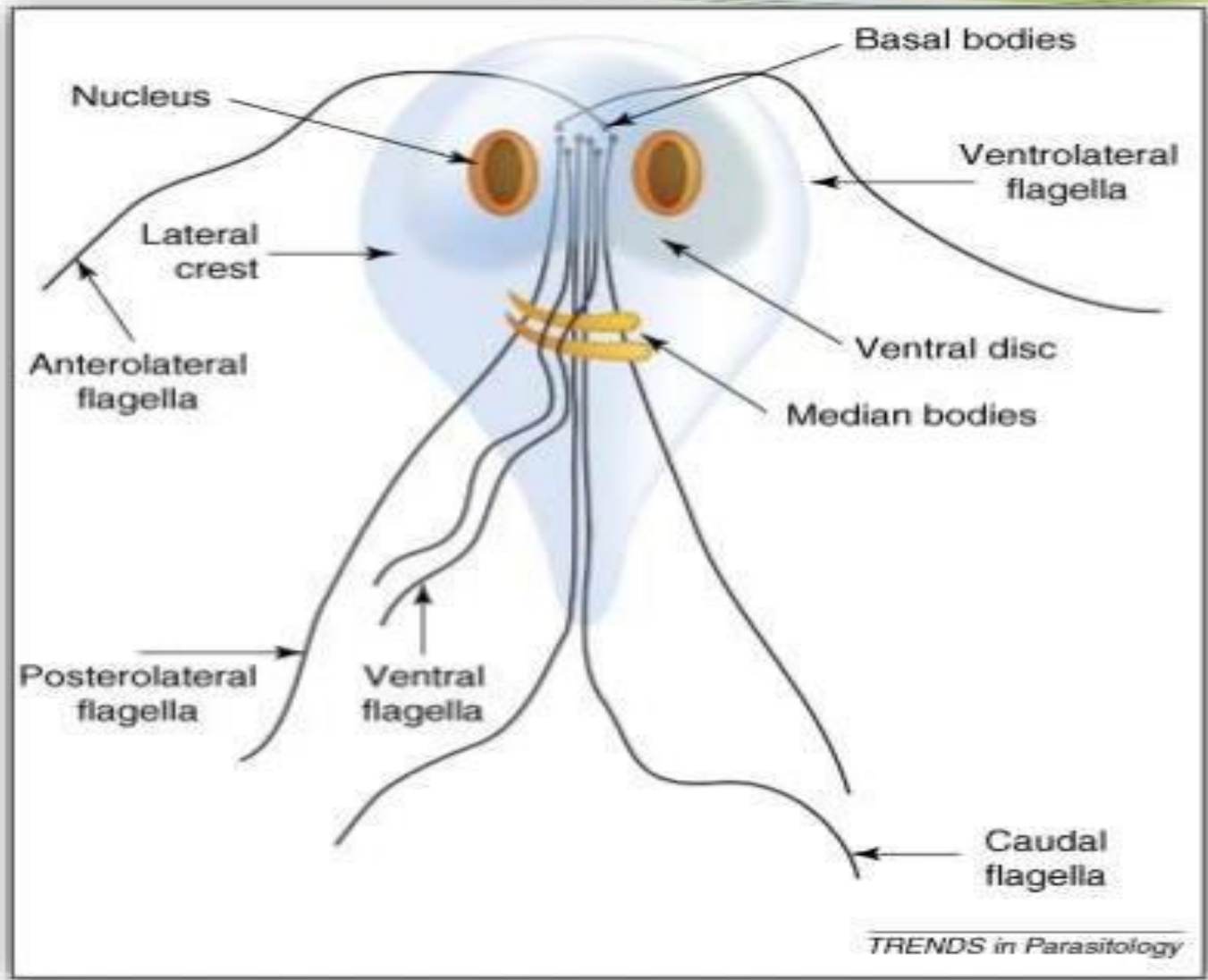
MORPHOLOGY

- It exists in two forms –
 - 1) Trophozoit (Vegetative form)
 - 2) Cyst (Infective form)

TROPHOZOITE

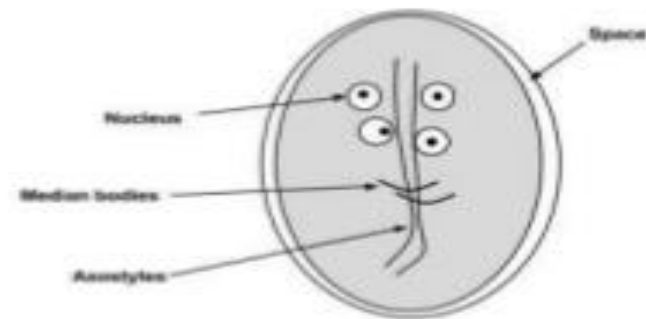
- Tennis racket or heart shaped or pyriform shaped.
- Dorsal surface – convex
- Ventral surface – concave & having sucking disk (for attachment)
- $14\ \mu\text{m} \times 7\ \mu\text{m} \times 4\ \mu\text{m}$
- Anterior end – broad & rounded
- Posterior end – tapers to a sharp point
- Bilaterally symmetrical :
 - Nuclei – 1 pair
 - Flagella with blepharoblast – 4 pair
 - Axostyle – 1 pair (along the midline)
 - Parabasal / Median body – 1 pair (transverse & posterior to sucking disc)
- Falling leaf motility around its long axis.





CYST

- Round or oval in shape.
- Surrounded by hyaline cyst wall.
- $12\mu\text{m} \times 7\mu\text{m}$.
- Axostyle – diagonally placed, form a deviding line within cyst.
- 4 nuclei – clustered at one end or at opposite poles (each pairs).
- Remnants of flagella and margins of the sucking disc may be seen inside the cytoplasm of a young cyst.
- An acid environment often causes the parasite to encyst.





CULTIVATION

- Discovered by Karapetyan :
- Giardia together with yeast (*Candida guilliermondi*)
- **Medium :**
 - Chick embryo extract
 - Human serum
 - Hottinger's digest (tryptic meat digest)
 - Hank's solution



IMMUNITY & RISK FACTORS

- Common in younger age & uncommon in adult, suggesting that an efficient immunity has developed.
- Both humoral & cell mediated immunity are important.
- **RISK FACTORS :**
 - IgA deficient person (hypo- or agammaglobulinaemia)
 - Blood group A
 - Achlorhydria
 - Malnutrition
 - Use of cannabis
 - Chronic pancreatitis
 - Immune defects (19A deficiency)



MODE OF TRANSMISSION

- Infection is occurred by ingestion of cyst in contaminated food & water.
- Direct transmission from person to person may occur in children, male homosexuals, mentally ill persons.

LIFE CYCLE

- Giardia passes its life cycle through **one host**.
- Infective form – mature cyst (10 to 100 cysts are enough to infection).

Ingestion of the cyst via food or drink.

Within 30 min of ingestion, the cyst hatches out into two trophozoites.

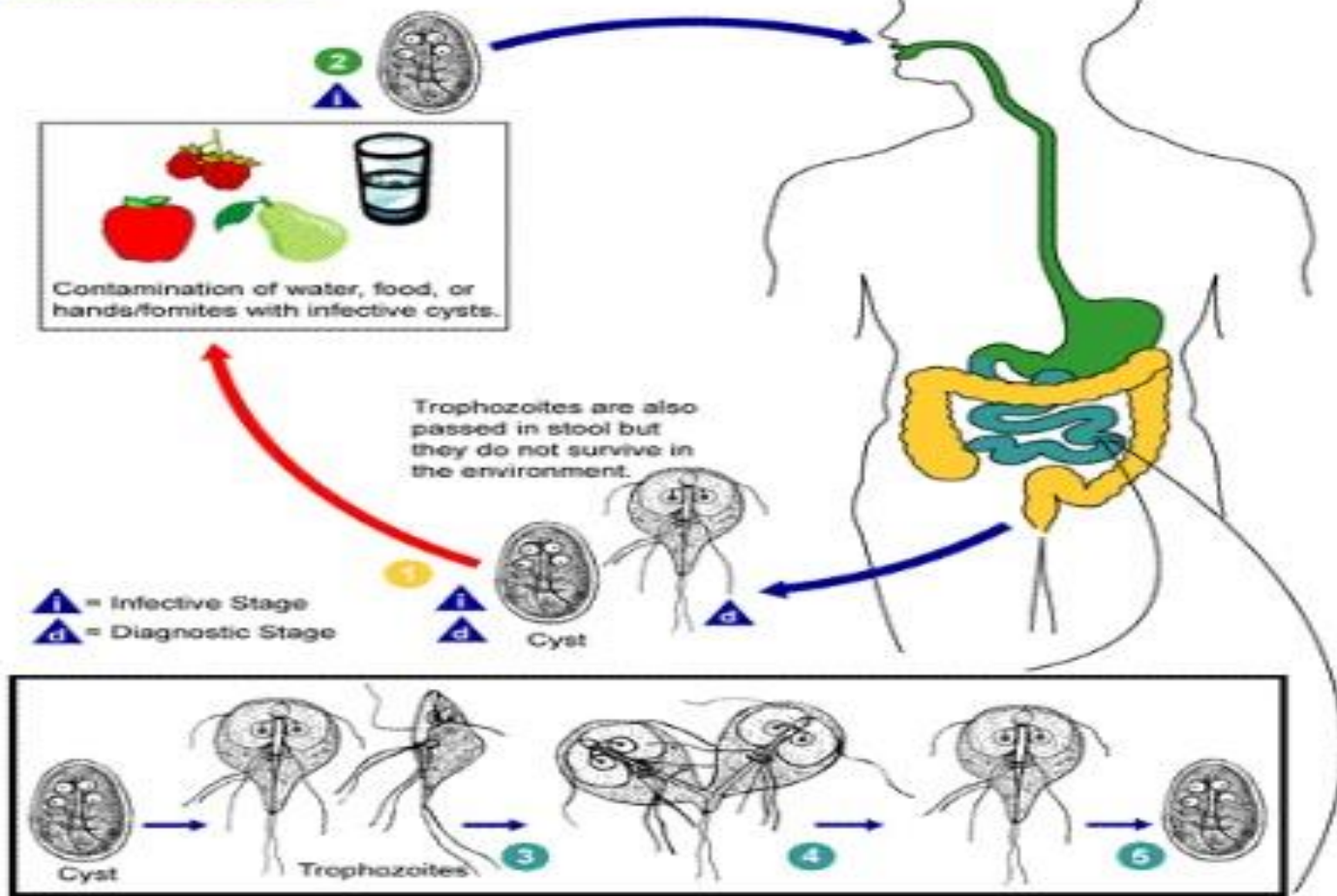
They multiply in enormous numbers by binary fission & colonise in duodenum.

They live in the duodenum & upper part of the jejunum, feeding by pinocytosis.

During unfavourable condition, encystment occurs usually in the colon. A thick resistant wall is secreted by the parasite.

The cystic cell is then divided into two within the cyst wall.

Cysts are passed in stool (may be 200,000) & remain viable in soil & water for several weeks.





PATHOGENESIS

- With the help of sucking disc they adhere to the convex surface of epithelial cells & crypts of intestinal mucosa.
- It doesn't invade the tissues.
- May cause abnormalities of villous architecture by apoptosis.
- Capable of producing harm by the toxic effect (VSSP- Variant Specific Surface Proteins), irritative effect & spoliative action (by diverting the nutrients).
- To avoid the high acidity of proximal duodenum, Giardia often localizes in the biliary tract (gall bladder).

CLINICAL FEATURES

1. Silent cases without any symptoms.
2. Intestinal :
 1. Malabsorption syndrome (Steatorrhoea)
 2. Mucus diarrhea
 3. Dull epigastric pain
 4. Flatulence
 5. Chronic enteritis
 6. Acute enterocolitis
3. General :
 1. Fever
 2. Anaemia
 3. Weight loss
 4. Allergic manifestations.
4. Chronic cholecystopathy.

Incubation period : about 2 weeks

LABORATORY DIAGNOSIS

Stool examination

Macroscopic
Microscopic

Enterotest
(String test)

Antigen
detection

Serological
test

Antibody
detection

Molecular
diagnosis

DNA probe
PCR

STOOL EXAMINATION

- Identification of cysts in formed stool and trophozoites & cysts in diarrhoeic stool or after a purgative.
- In asymptomatic carriers only cysts are seen.
- Macroscopy : offensive odour, pale coloured & fatty stool.
- Microscopy : saline & iodine wet preparations.
- Multiple specimens need to be examined.
- Concentration techniques like formal ether or zinc acetate are used.

ENTEROTEST (STRING TEST)

- Method for obtaining duodenal specimen (upper part of small intestine)
- Procedure :
 - A coiled string with a small weighted gelatin capsule is swallowed by the patient & the free end of the string is attached to the side of the patient's face.
 - The capsule dissolves in the stomach & the string which is weighted at its distal end, passes into the duodenum.
 - After 2-4 hrs the string is withdrawn & placed in a saline with mechanical shaking.
 - The centrifuged deposit of saline is examined by wet mount technique to detect the presence of motility of the organism or specific morphological forms of trophozoites of *Giardia* (and larvae of *Strongyloides stercoralis*).

When the test should performed


- Entero-test is performed when a physician suspects a parasitic infection, but no parasites were found in stool sample.
- As its sensitivity is comparable to duodenal aspirate, it eliminates the need of duodenal intubation.



SERODIAGNOSIS

- Antigen detection in feces –
 - ELISA
 - IIF (Indirect immunofluorescent tests)
 - Immuno-chromatographic strip test

- ✓ Antigen present – active infection.
- ✓ Giardia specific Ag 65 (GSA 65) detection by ELISA kits.
 - Sensitivity - 95%
 - Specificity – 100% compared to microscopy.
 - Tests are not for routine purpose.
 - It is for epidemiological & control purposes.



- Antibody detection –

- IIF
- ELISA

- ✓ Tests can't differentiate between recent & past infection.

- ✓ Lack sensitivity & specificity.

- Antibody detection (anti Giardia IgG Ab) is useful for epidemiological & pathophysiological studies.
- The presence of anti Giardia secretory IgA Ab in breast milk protects breast fed infants from giardiasis.



MOLECULAR METHOD

- DNA based techniques are available now.
- They are used to demonstrate the genome of the parasite.
 - PCR
 - DNA probe

TREATMENT

- Metronidazole – 250mg x 3 times daily x 5 days. **(Cure rate -95%)**
 - Tinidazole – 2 gm single dose. **(More effective)**
 - Furazolidone
 - Nitazoxamide
 - Parmomycin
- Children (less adverse effects)**
- Pregnant female**



PROPHYLAXIS

- Proper disposal of the waste water & feces.
- Maintain personal hygiene like hand washing before eating & proper disposal of diapers.
- Prevention of food & water contamination.
- Boiling of water and filtration by membrane filters are required.
- Chlorination of water is not effective against cysts.



REFERENCES

- Medical PARASITOLOGY : By K. D. Chatterjee
- Text book of Medical PARASITOLOGY : By Paniker
- Internet sources



THANK YOU

