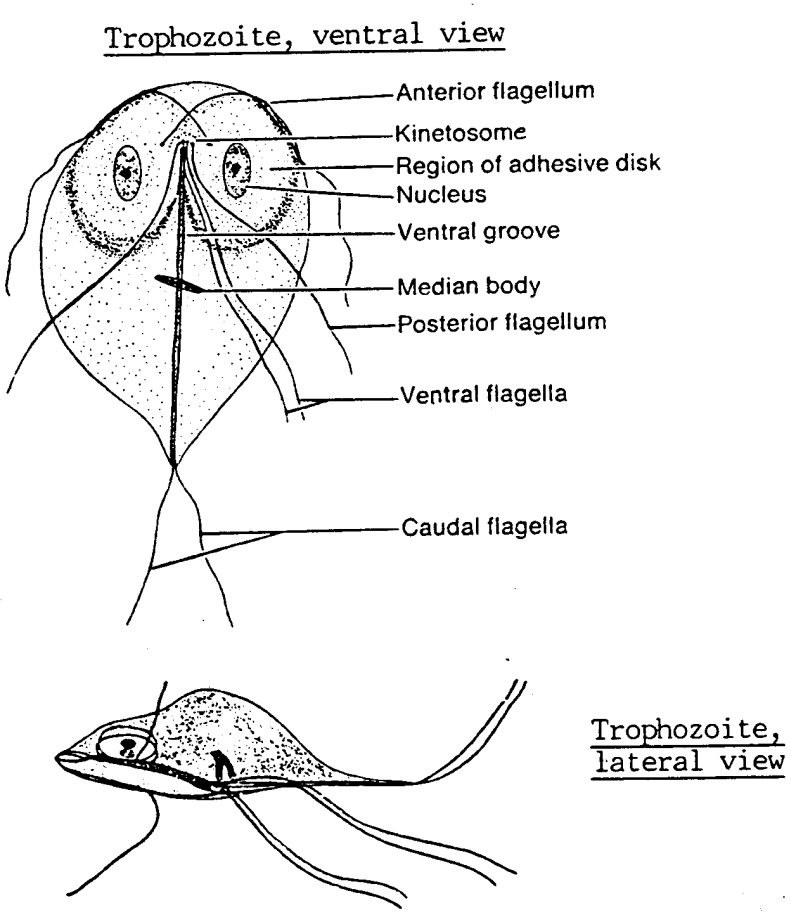
Giardiasis
Giardia lamblia
Giardia intestinalis

Giardiasis

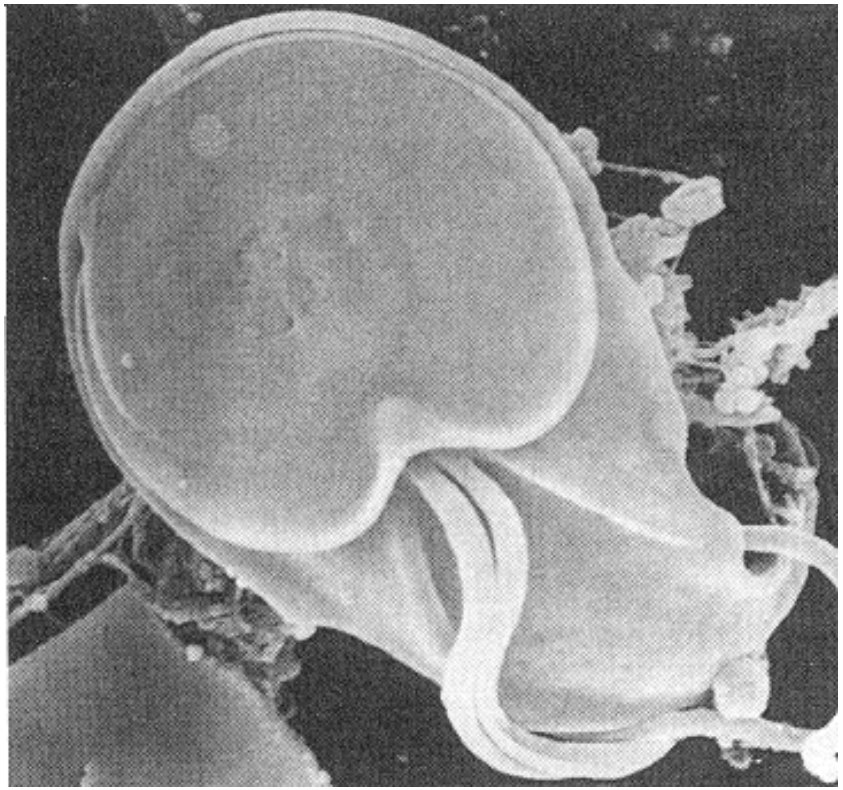
- Most common causative agent of epidemic & endemic **diarrhoea** throughout the world
- Prevalence - 2-5% in industrialised countries
  20-30% in developing countries
- Reported from through out India
- Caused by *Giardia intestinalis/ Giardia lamblia*
- Man is the main reservoir
- Inhabit duodenum, jejunum & upper ileum
- *G. intestinalis* exists in 2 stages – **trophozoite & cyst**

Morphology of *Giardia lamblia* trophozoite

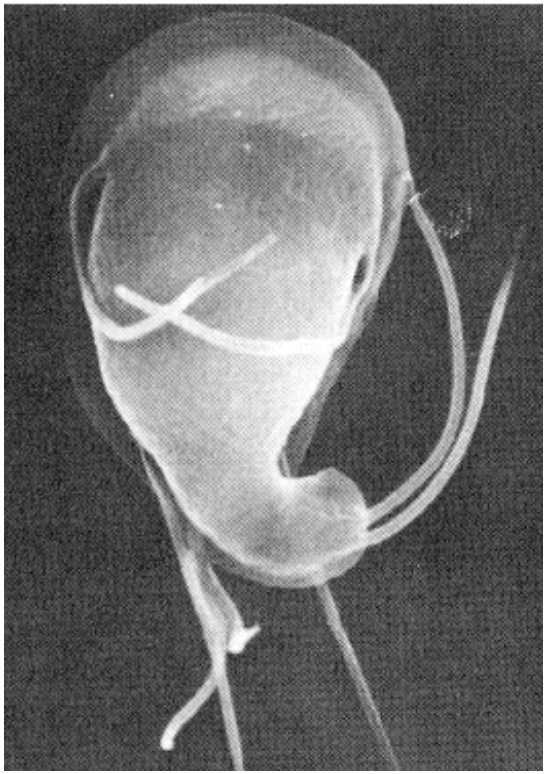


- Pear shaped, rounded anterior end, posterior end pointed (looks like monkey face)
- Size: 12 to 15 µm long x 5 to 9 µm wide
- Dorsal surface convex, ventral surface concave
- Ventral surface bears **sucking disk** to adhere to surface of intestinal cell
- Bilaterally symetrical: 2 **nuclei,** 2 **axostyles**, 4 pairs of **flagella** (2 anterior, 2 posterior, 2 ventral, and 2 caudal)
- actively moving and feeding stage
  - Habitat: small intestine
  - May invade the common bile duct.

Morphology of *Giardia lamblia* trophozoite



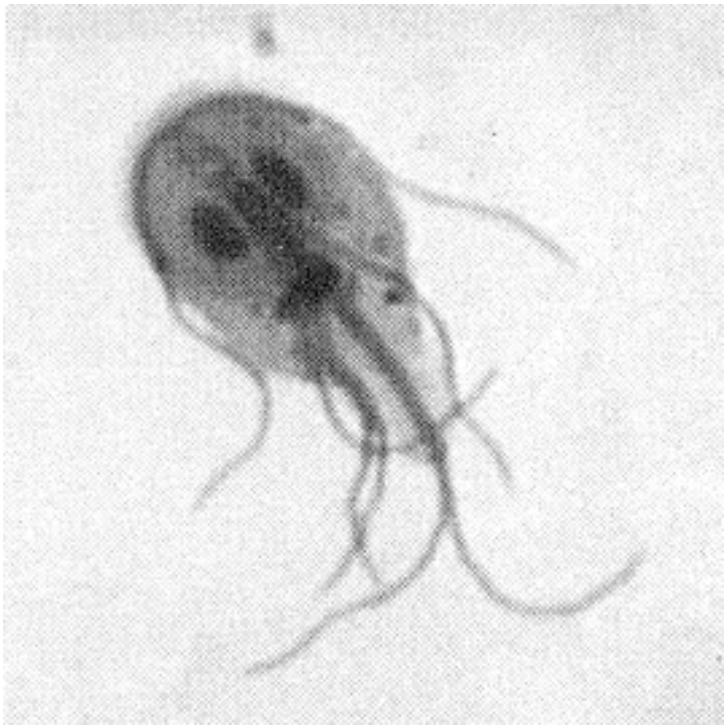
ventral

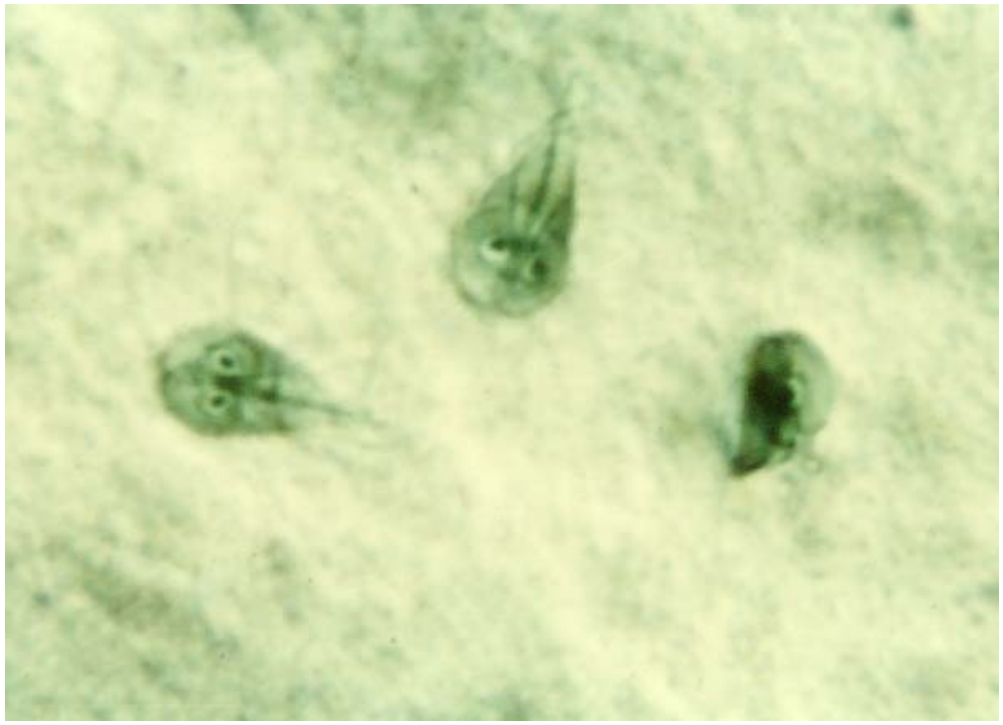


dorsal

Scanning EM view of trophozoite surface showing the adhesive disk
(text photo on p. 92)

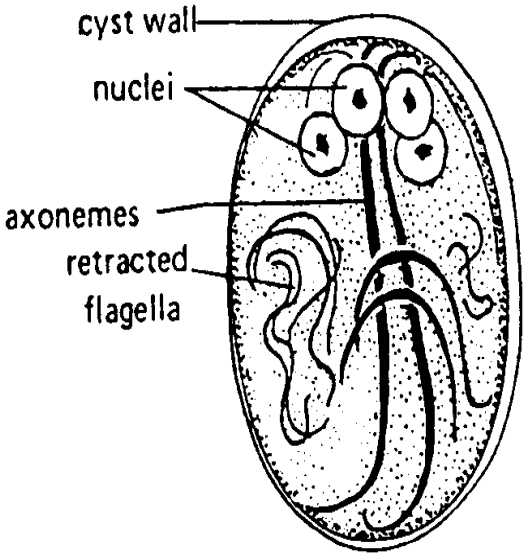
Morphology of *Giardia lamblia* trophozoite





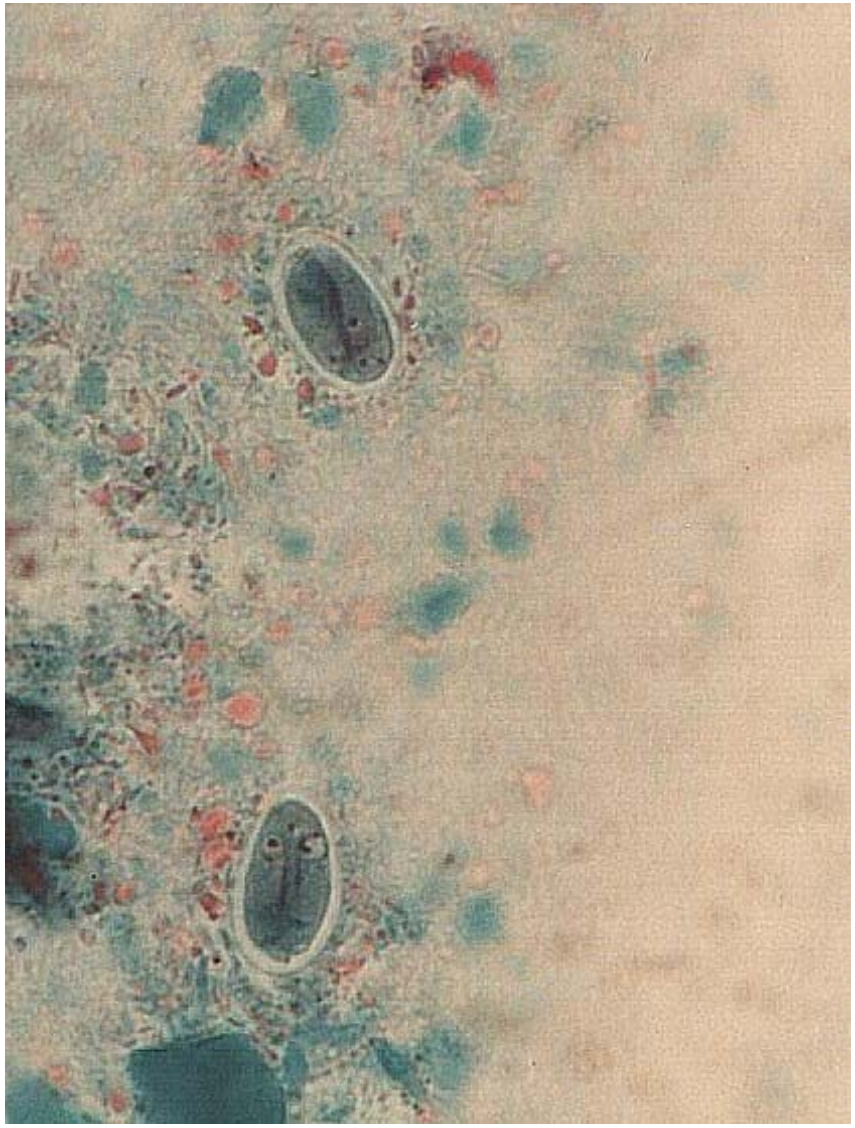
Light microscope photos of trophozoites

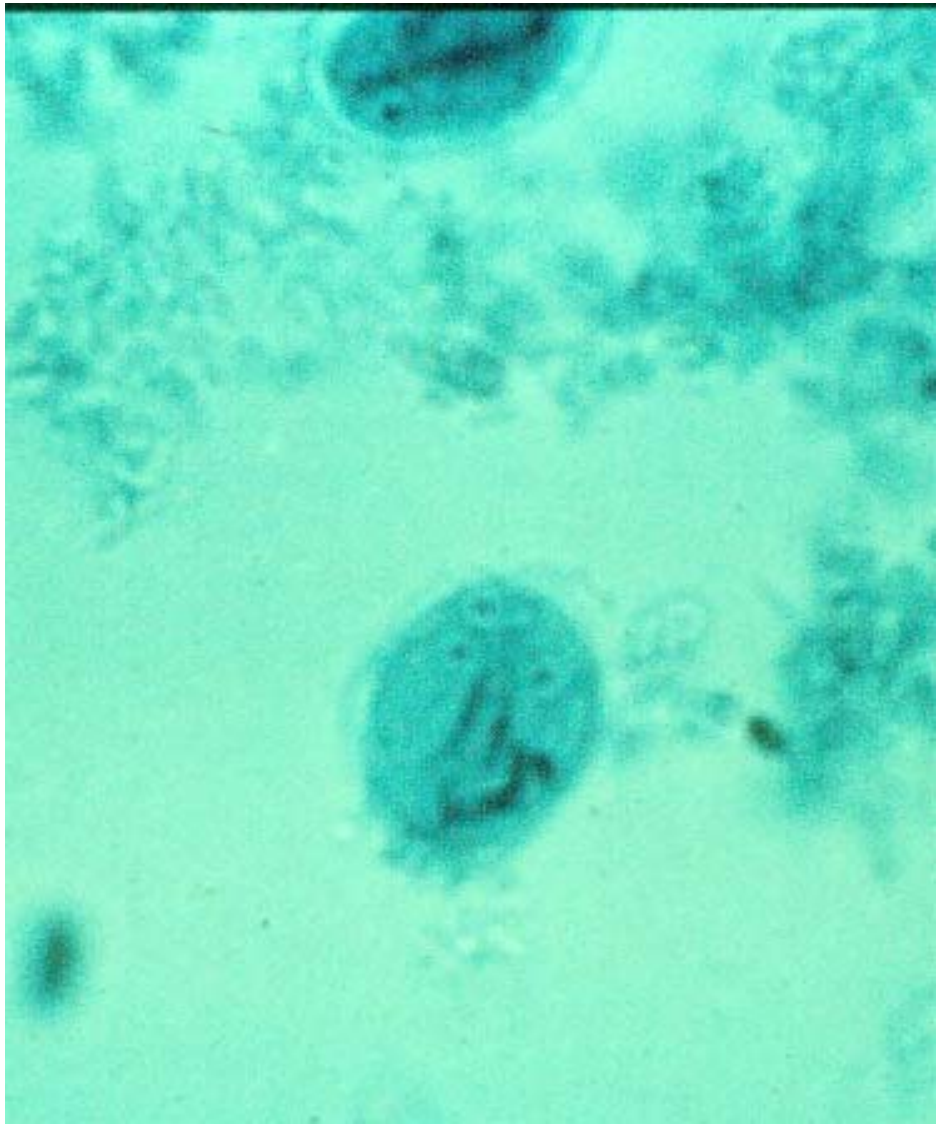
Morphology of *Giardia lamblia* cyst



- ovoid in shape
- 8-12 µm long x 7-10 µm wide
- thick cyst wall
- 4 **nuclei** present, either clustered at on end or present in pairs at opposite ends
- **Axostyle** runs diagonally through the cyst
- **flagella** shorten and are retracted within cyst
  - provide internal support
- The cyst forms as trophozoites become dehydrated when they pass through the large intestine
- Cyst may remain viable in the external environment usually water) for many months.

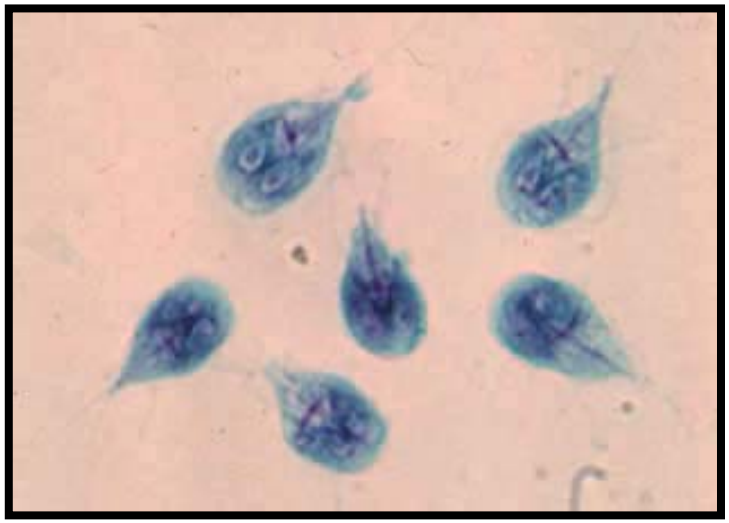
Giardia lamblia cyst



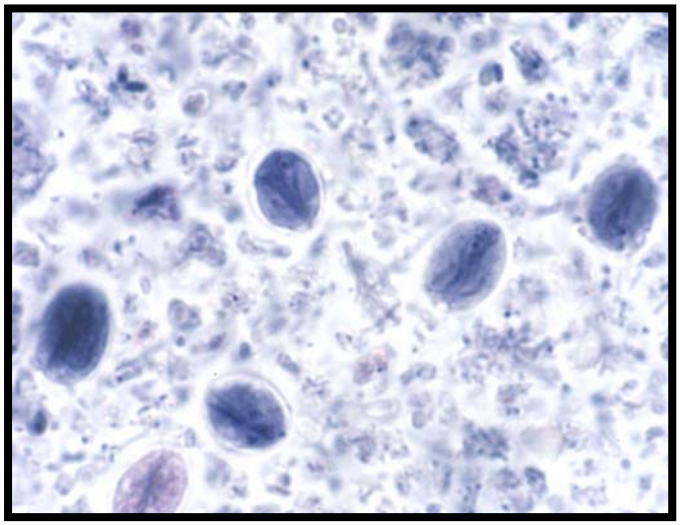


Giardiasis

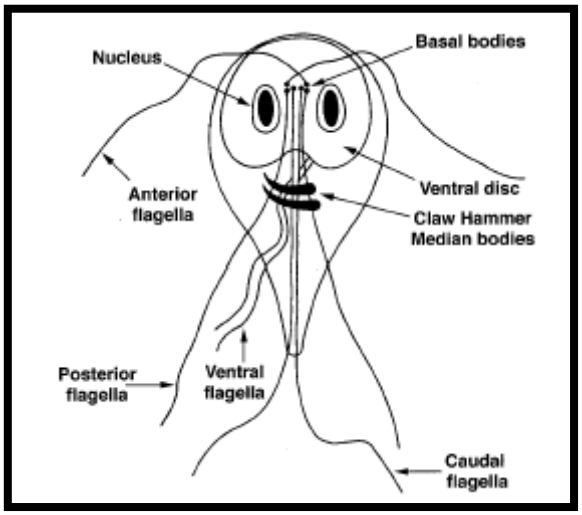
Giardia intestinalis =(lamblia)



Trophozoites



Cysts

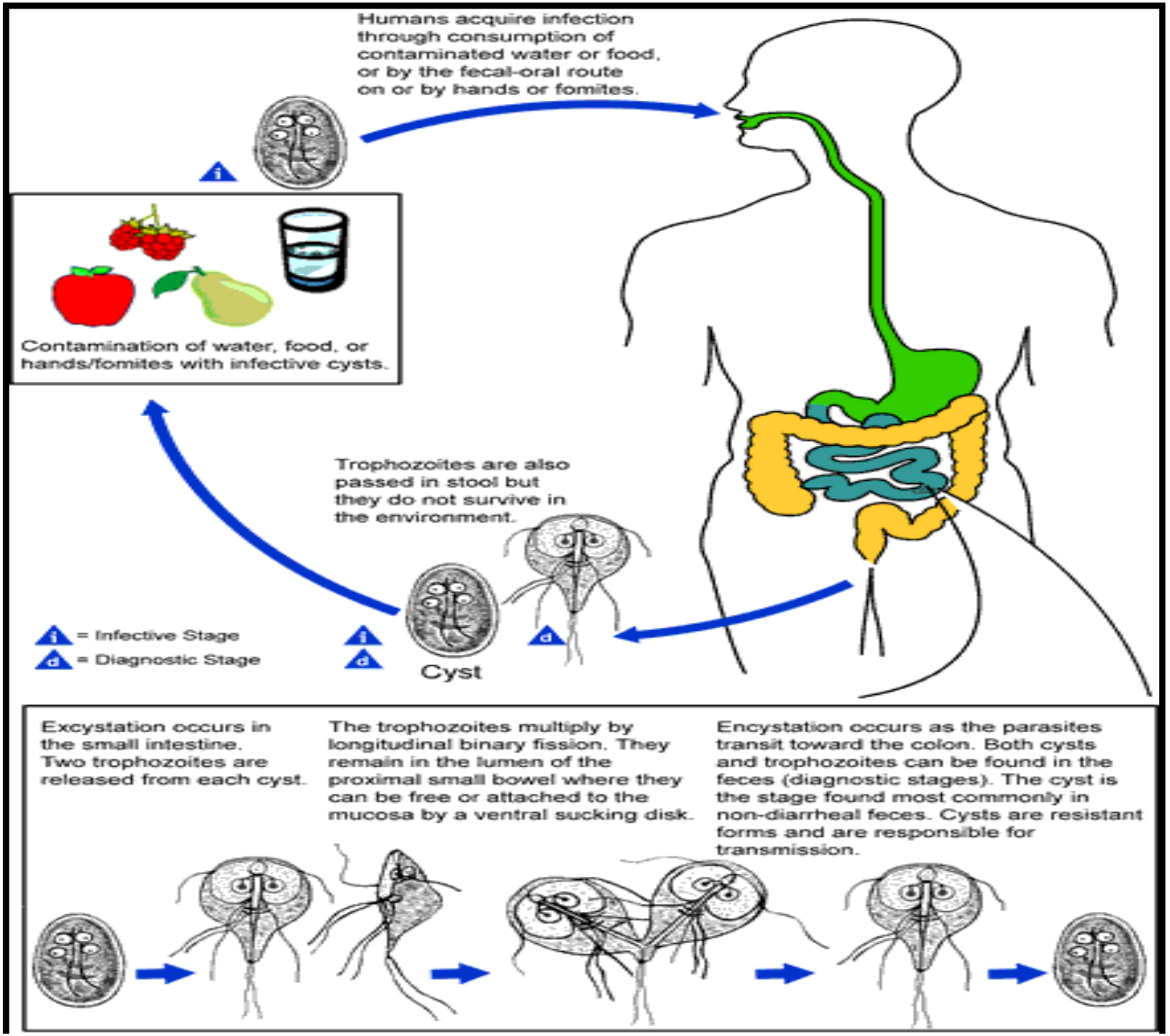


- Infective form – **mature cyst** passed in feces of man
- Routes of transmission
  - Feco-oral
    - ingestion of contaminated water – most important
    - Ingestion of contaminated food
  - Person to person – day care, nursing homes, mental asylums (poor hygiene)
  - Sexual – sexually active homosexual males

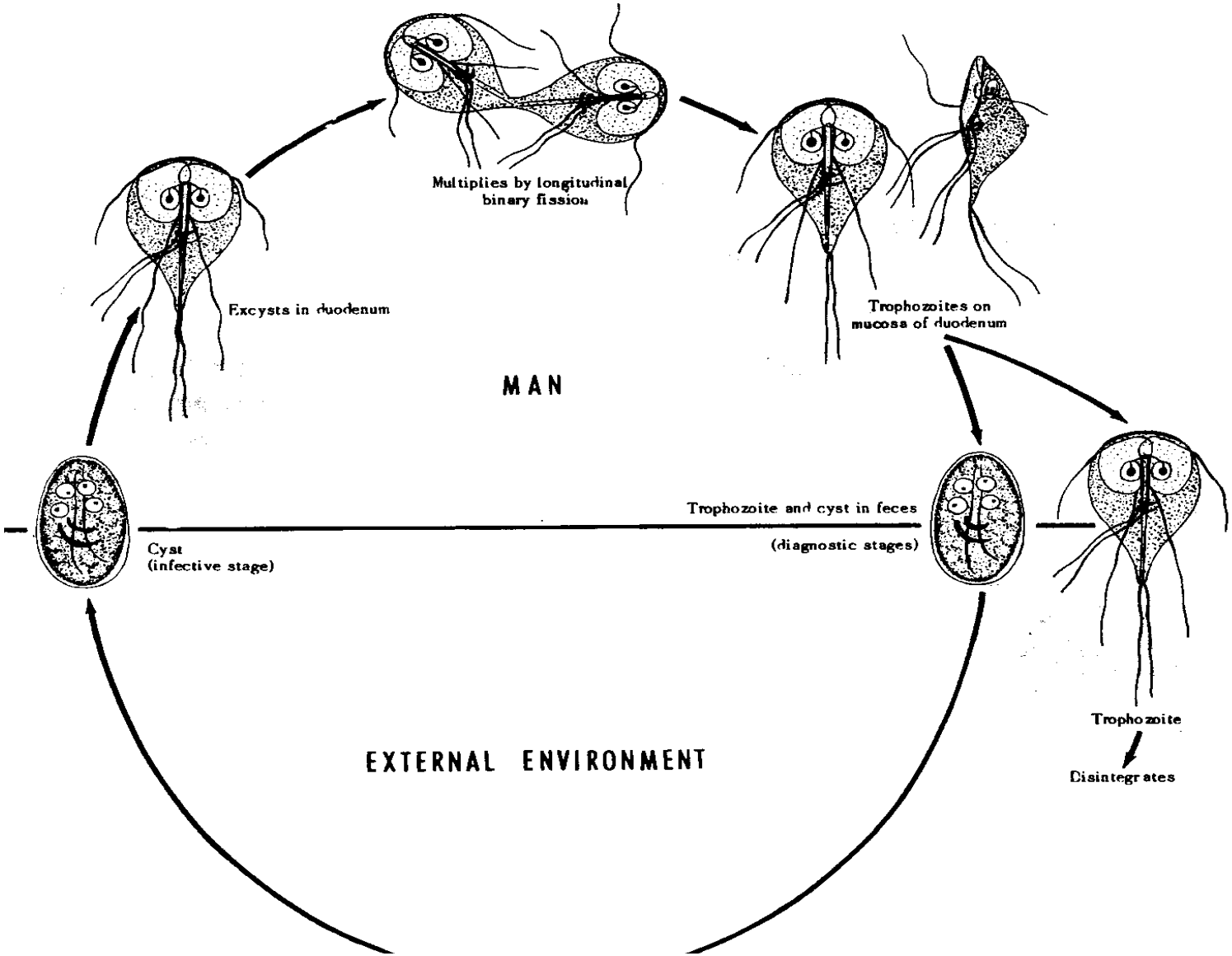
Life Cycle

- Acquire infection – ingestion of mature cysts
- **Excystation** occurs in stomach & duodenum within 30 minutes
- **2 trophozoites** hatch from one cyst
- Trophozoites multiply by binary fission & colonize in duodenum & upper jejunum
- Trophozoites adhere to enterocytes by ventral suckers
- **Encystation** occurs in transit down the colon
- Axonemes retract, cytoplasm condense & thin tough hyaline wall is secreted
- Encysted trophozoite undergo nuclear division – mature **quadrinucleate cyst**

Giardia – Life cycle



Giardia lamblia life cycle



Pathology

- Do not invade tissues
- Feed on mucous secretions
- May localise in **biliary tract** to avoid the acidity of duodenum
- Cause inflammation of duodenum & jejunum
- Cause **malabsorption** as the parasite coats the mucosa & damage epithelial brush border
- Stool contains large amounts of mucous & fat but no blood

Giardiasis: The Disease

- Asymptomatic : largest group
- Acute : self-limiting infection, acute watery **diarrhoea**, abdominal cramps, bloating, flatulence
  - Stool is profuse & watery in earlier disease
  - Voluminous, foul smelling & greasy (**steatorrhoea**) later
- Chronic : chronic diarrhoea with **malabsorption** syndrome, steatorrhoea

Laboratory Diagnosis
Parasitic Diagnosis

Samples

- Stool
- Duodenal contents
  - Duodenal fluid(Entero test)
  - Duodenal/ jejunal biopsy

Entero test – gelain capsule containing a nylon string with a weight is swallowed by the patient. Free end of the string is fixed to the mouth. Capsule dissolves & the string is released in the duodenum. After overnight string is removed & bile stained mucus collected.

Parasitic Diagnosis
Microscopy

Microscopy

Direct Wet Mount

- Trophozoite with **falling leaf motility** in saline mount
- Cyst in iodine mount

Stained stool smears

- Trichrome
- Iron haemotoxylin

Laboratory Diagnosis
Parasitic Diagnosis

Antigen detection (Coproantigen)

- ELISA
- Sensitivity & specificity high

Culture

- Not done routinely
- Diamonds medium

Laboratory Diagnosis

Serodiagnosis

- ELISA
- Epidemiological purpose

Molecular diagnosis

- DNA probes & PCR for research purpose

Prevention

- Avoid food & water that might be contaminated
  - filtration of water (be sure filter is fine enough to trap the cysts)
  - boiling water
  - addition of a tincture of iodine are effective in killing cysts (chlorination of water does not effect the cysts)
- Practice good hygiene
  - Wash hands thoroughly with soap and water
    - after using the toilet
    - before handling or eating food

Treatment

- Nitroimidazole derivatives
  - Metronidazole
  - Tinidazole

    drugs of choice
- Acridine dye
  - Quinacrine
- Nitrofurans
  - Furazolidone

Trichomoniasis
Trichomonas vaginalis

Trichomoniasis

- Sexually transmitted disease of worldwide importance

- It is cosmopolitan in distribution, however prevalence is not uniform because of sanitary and hygiene habits (depends on surroundings).

  – 20-40% in Women
  – 15% in Men

Pathology

Women

- Asymtomatic in most cases
- **Vulvovaginitis**
  - Purulent vaginal discharge (**leukorrhea**)
  - Malodourous smell
  - Strawberry cervix
    - Punctate haemorrhages in mucosa
  - Vulval & vaginal epithelium fiery red and inflamed
  - Dyspareunia
- **Urethritis**
  - Dysuria
  - Increased frequency of micturition

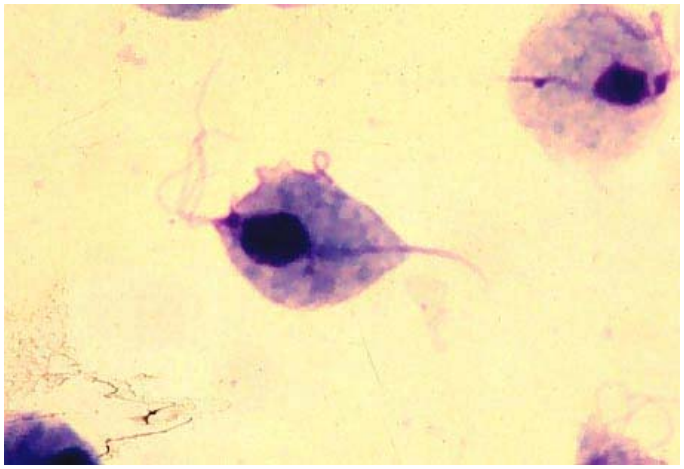
Pathology

Men

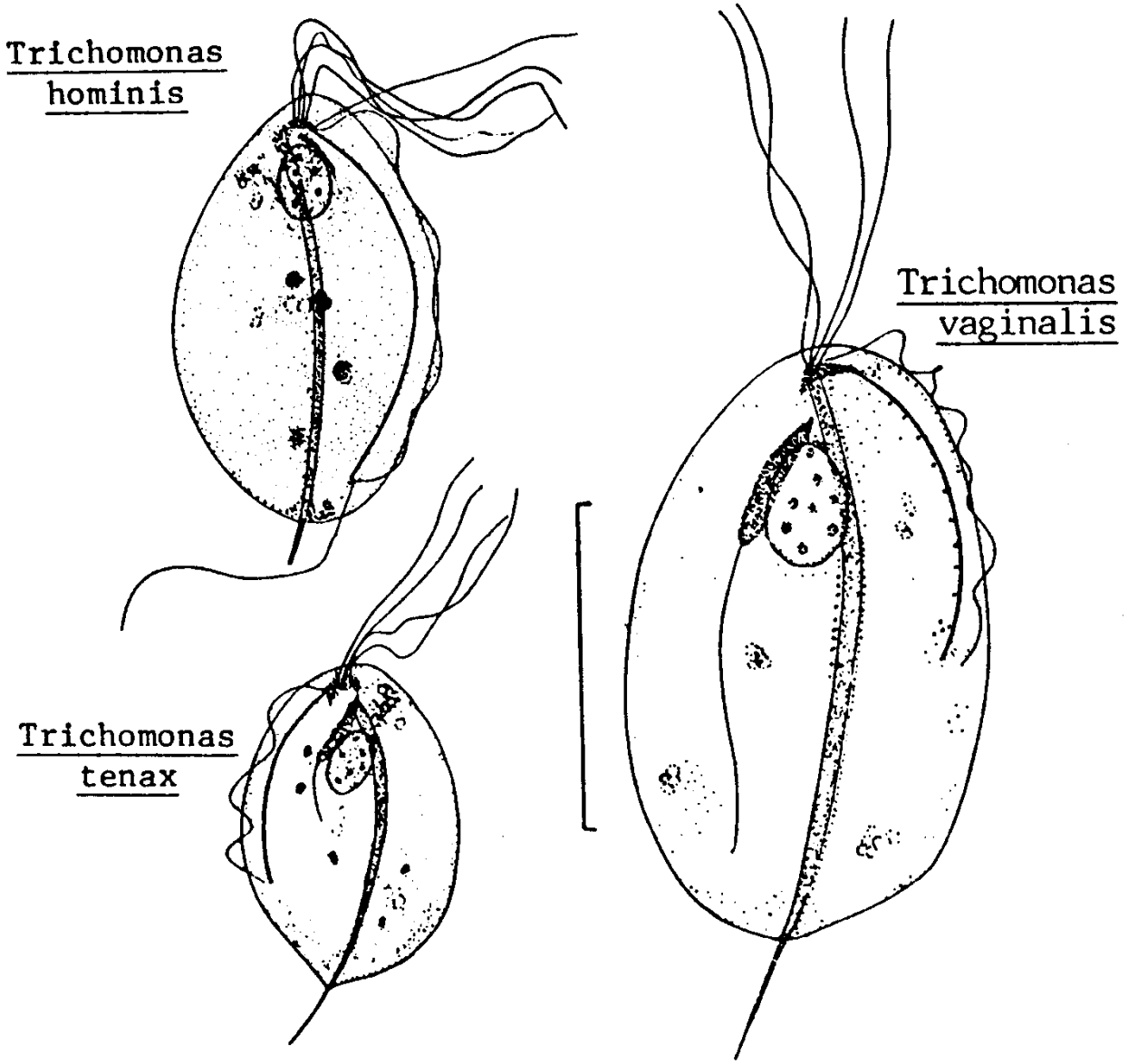
- Usually asymtomatic
- **Nongonococcal urethritis**
  - Pain in urethra
  - Testicular pain
  - Purulent to mucoid discharge
- Epididymitis
- Prostatis
- Superficial penile ulcerations

Trichomonas

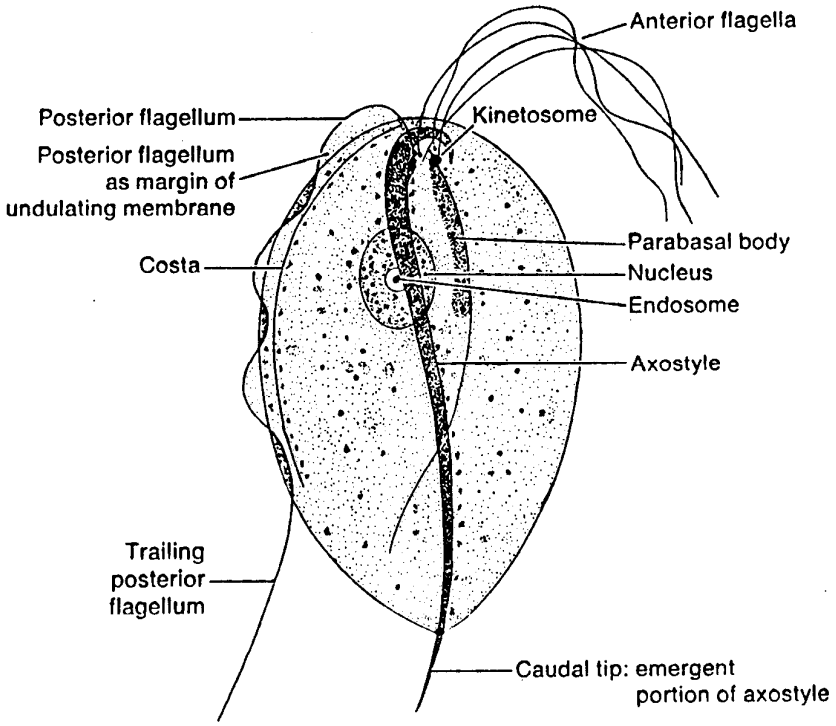
- Trophozite is the only stage present in the life cycle, **cystic stage absent**
- 3 species in humans
  - ***T. vaginalis***
  - *T. tenax*
  - *T. hominis*
- Characteristic jerky motility
- Multiplies by longitudinal binary fission



3 species of *Trichomonas* occur in humans

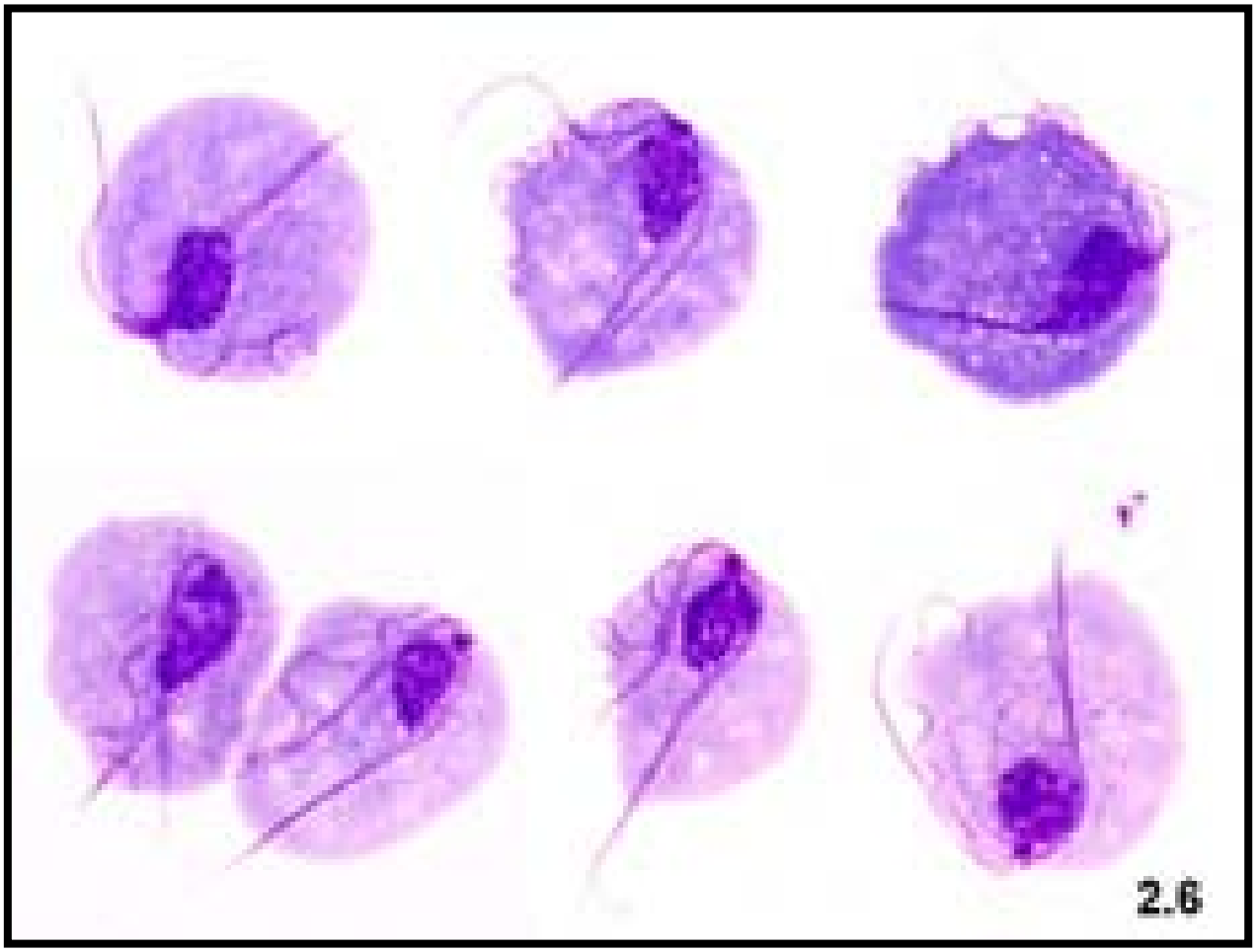


General Morphology of the *Trichomonas* trophozoite



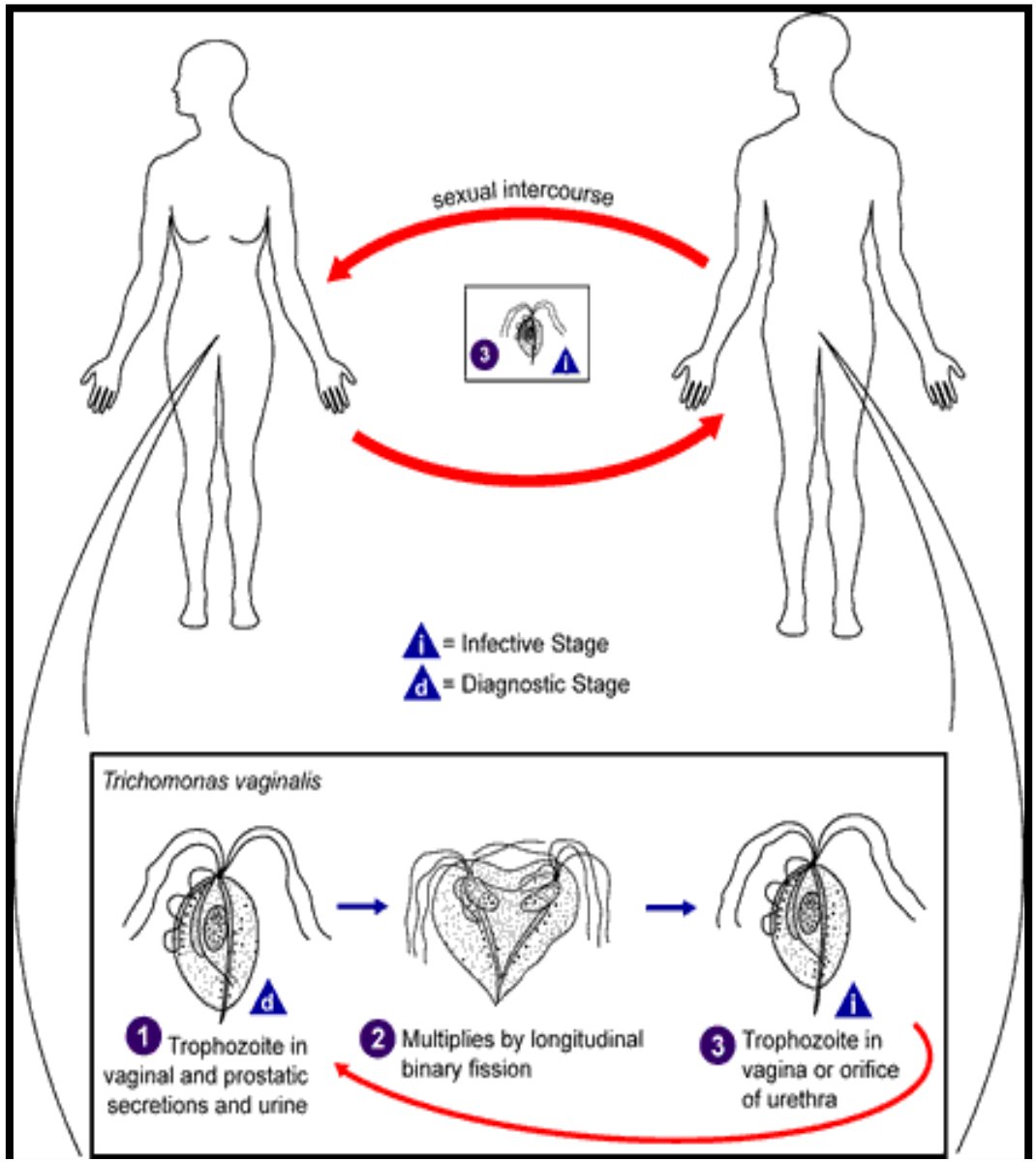
- Pear shaped
- 7 – 23 in length
- 4 flagella extend anteriorly
- 1 flagellum extends posteriorly along the cell membrane to form an **undulating membrane**
- **Costa** , a rigid cord attaches the undulating membrane to the cell membrane and gives the undulating membrane support
- **Axostyle** runs down the middle of the body & ends in a pointed tail like etremity
- Round nucleus in the anterior portion

Trichomoniasis
Trichomonas vaginalis

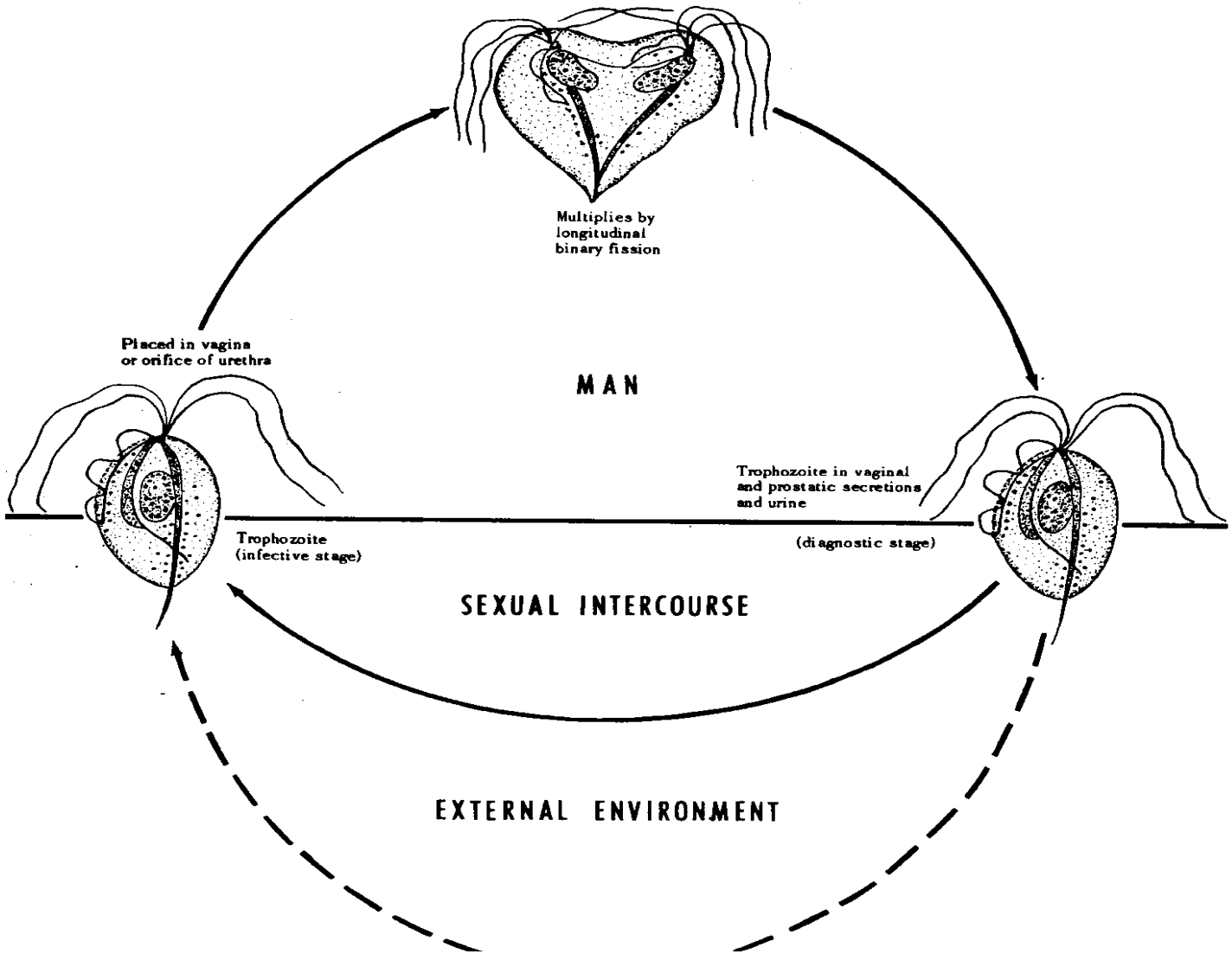


Trophozoites

Trichomonas vaginalis – Life Cycle



Life Cycle of *Trichomonas vaginalis*



Trichomonas vaginalis

- It lives in the reproductive and urinary system of people. (obligate parasite)
- **Obligate parasite –** cannot live without close association with vaginal, urethral or prostatic tissues
- Infects **squamous epithelium** but not columnar epithelium
- High incidence of symtomatic infection is seen in **women**
- Zinc and other inhibitory substances probably inhibit their growth in men

- Natural flora (bacteria) keep the pH of the vagina at 4-4.5 and ordinarily this discourages infections.

- *T. vaginalis* can survive at a low pH.

- Once established it causes a shift toward alkalinity (pH 5-6) which further encourages its growth.

Laboratory Diagnosis

Samples in women

- Vaginal discharge
- Endocervical specimen

Samples in men

- Urethral discharge
- Prostatic fluid
- Early morning first voided urine sediment
- Semen

Laboratory Diagnosis

Parasitic Diagnosis-Methods of examination

- Microscopy
- Culture
- Antigen detection (ELISA)

Serodiagnosis- limited value

Molecular diagnosis

- DNA probes – more sensitive & highly specific
- PCR- highly sensitive & specific

Parasitic Diagnosis
Microscopy

Wet mount

- Easy, useful & economic
- 80% sensitivity in symtomatic females
- T. vaginalis trophozoites seen with characteristic jerky & twitching motility

Acridine orange stain

- Rapid & accurate method
- Sensitivty same as wet mount

Direct flourescent antibody staining

- Rapid & more sensitive
- Requires a flourescent microscope

Parasitic Diagnosis
Culture

- Gold standard
- Most sensitive
- Media – Diamond, Lash & kupferberge
- Media contains yeast extract, horse serum & antibiotics
- Observed for 7 days
- Culture usually positive after 48 hrs
- Done in patients with suspected trichomoniasis but wet mount negative

Treatment

- Metronidazole – highly effective
- Clotrimazole topical

Prevention

- Detection & treatment of cases – both partners
- Avoidance of sexual contact with infected partners
- Use of condoms