



# CILIATES PROTOZOA BALANTIDIUM COLI

Sawsan Hamed

Parasitology - BIO 303

Semester 2

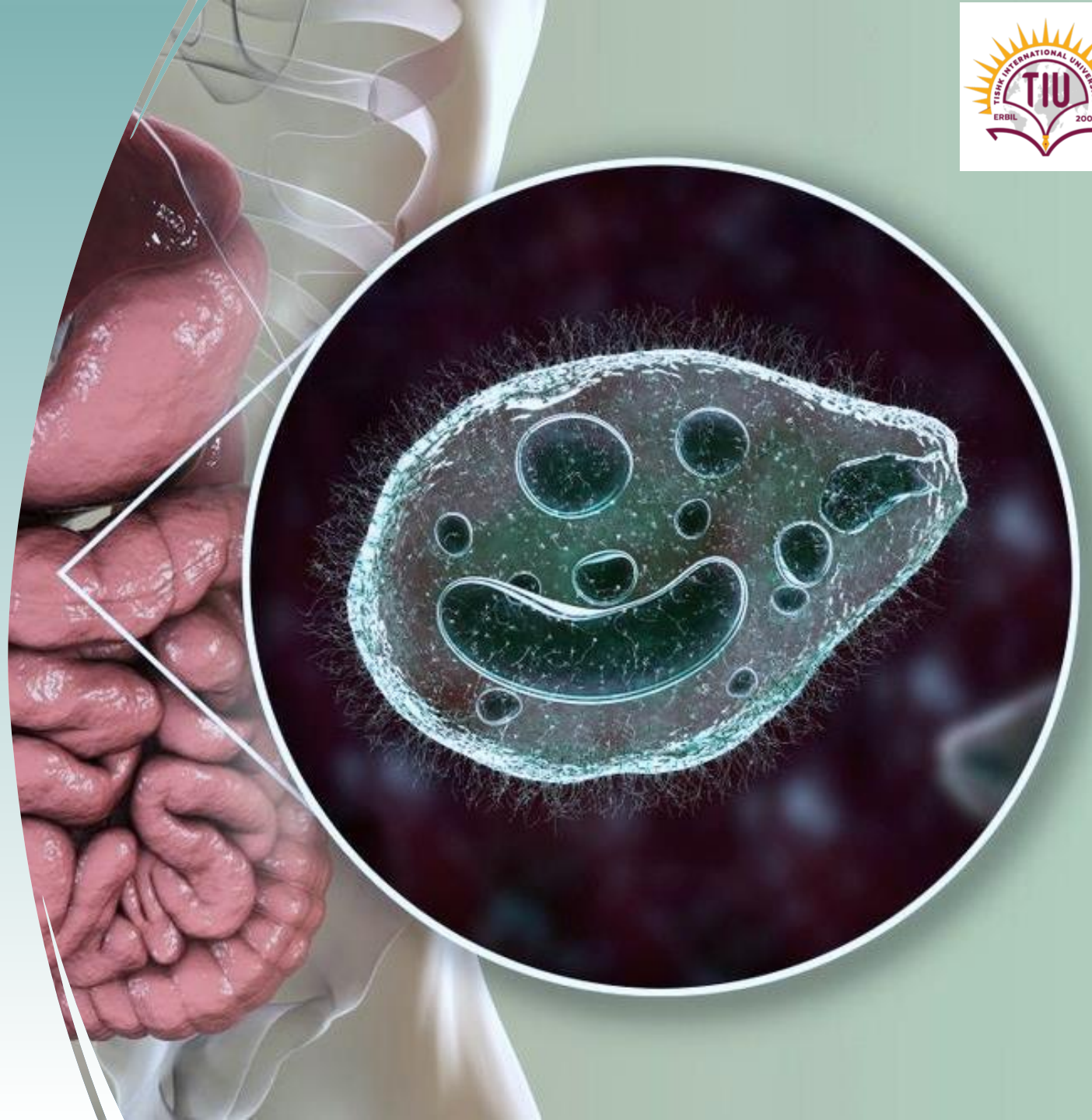
Week 3

Date 13/2/2024

# Outline

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- ❖ **Balantidium spp Taxonomy & Classification**
- ❖ **Geographical Distribution**
- ❖ **Balantidium Morphology**
- ❖ **Balantidium Host**
- ❖ **Balantidium TROPHOZOITE**
- ❖ **Development in large intestine & life cycle**
- ❖ **Reproduction of Balantidium**
- ❖ **Transmission of Balantidium parasite**
- ❖ **Diagnosis of Balantidium parasite**
- ❖ **Control and Prevention**



# Balantidium coli parasite

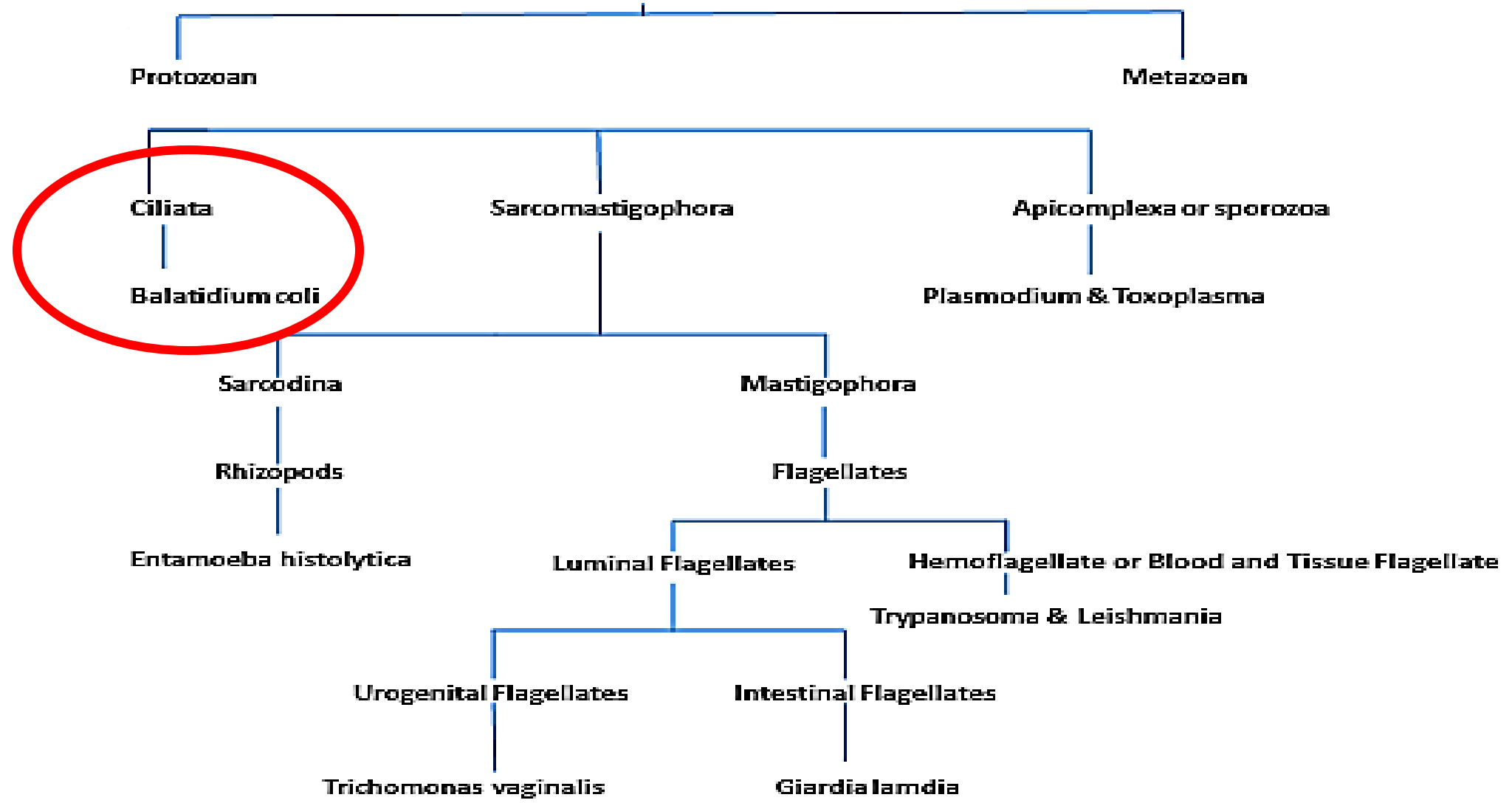


## Objective

Students should know how to describe, explain, and analyze the following

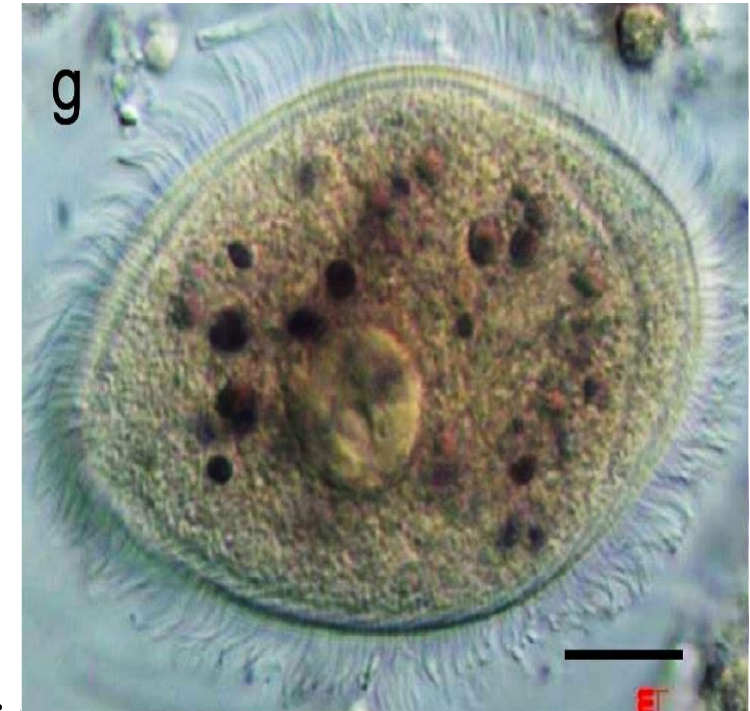
- Balantidium coli parasite & vector, and host
- Balantidium spp
- Classification
- Balantidium diseases
- Balantidium life cycle
- Transmission of Balantidium parasite
- Diagnosis of Balantidium parasite
- Balantidium pathology, prevention, and control

# Parasites



# INTRODUCTION

- **Balantidium coli** is the largest protozoan and the only ciliate parasite that infects humans
- Causes **Balantidiasis: a disease that transmit by the ....**  
Taxonomy belongs to:
  - Phylum **Ciliophora**
  - Class: Litostomatea
  - Order: Vestibuliferida
  - Family: Balantidiidae
- Habitat: large intestines of man, pig (main reservoir) and other animals.



# Geographical Distribution

The protozoa are found worldwide

**Bolivia**

**Papua New Guinea**

**Philippines**



# HOST of Balantidium

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- Humans are the principal host.
- It is also reported in Dogs
- Pigs is the reservoir host.

Because pigs are the primary reservoir, human infections occur more frequently in areas where pigs are raised, and sanitation is inadequate

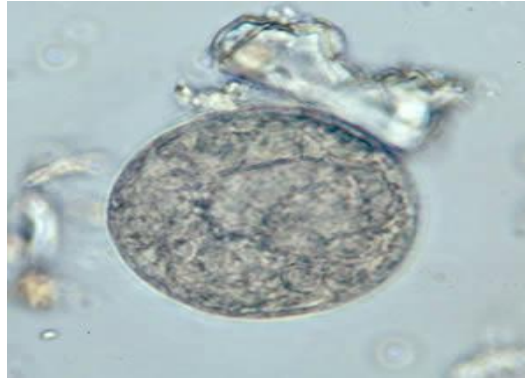


# Balantidium Morphology

*Balantidium coli* has 2 developmental stages

Both forms are binucleated (one large macronucleus and one small micronucleus)

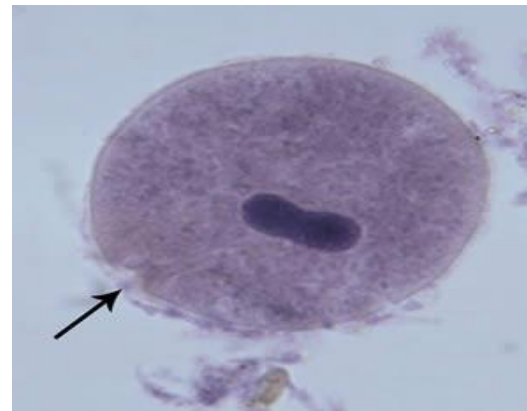
## 1. Cyst stage



## 2. Trophozoite stage

The cytostome (black arrow) and the bean shaped macronucleus.

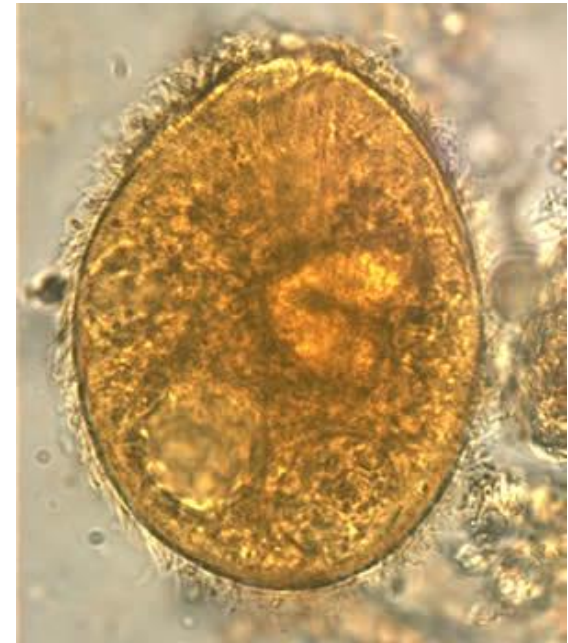
Visible cilia on the cell surface.





# TROPHOZOITE

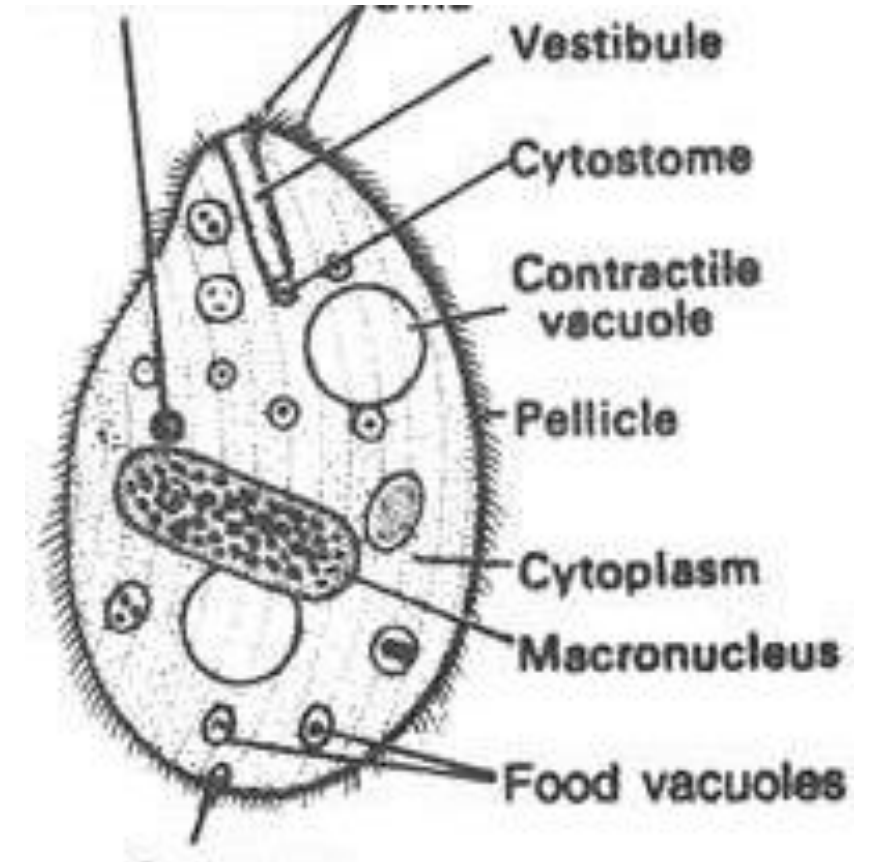
- Found in active stage of disease – invasive form
- shape: oval
- Size: 30-300  $\mu\text{m}$  long x 30-100  $\mu\text{m}$  breadth
- Whole body covered with a row of tiny delicate cilia which are organ of locomotion
- Cilia present near the mouth part – longer  $\rightarrow$  called “**adoral cilia**”
- Anterior end- narrow
  - Bears a groove (**peristome**) that leads to a mouth (**cytostome**)
  - Followed by a short funnel shaped gullet (**cytopharynx**) extending up to one-third of the body.
- Posterior end- broad, round
  - Bears an excretory opening (**cytopyge**)

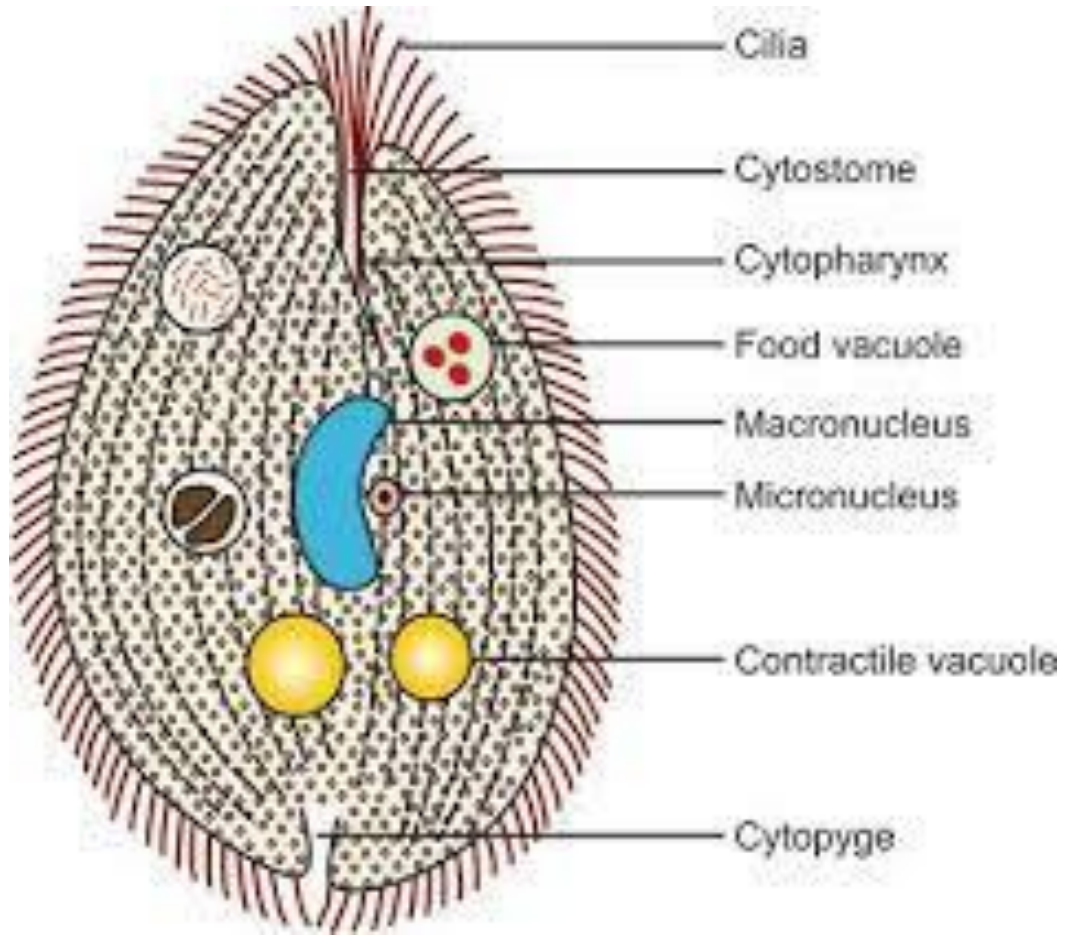


# TROPHOZOITE Of Balantidium

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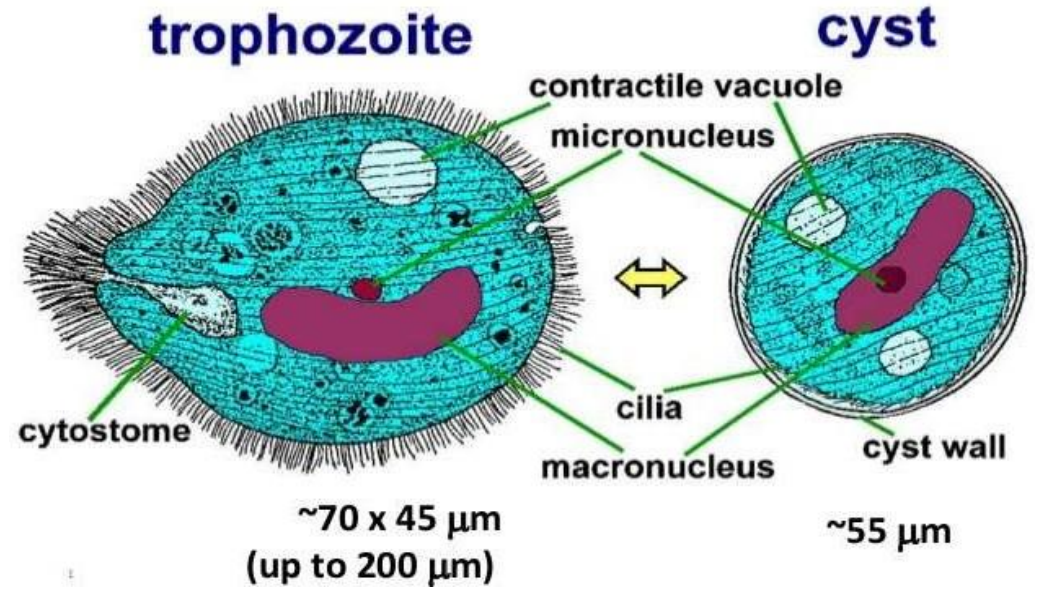
- No anus
- Cytoplasm- outer clear ectoplasm and inner granular endoplasm
- Endoplasm
- Contains two nuclei: large kidney shaped macronucleus in center and a small micronucleus in the concavity of the macronucleus
- Two contractile vacuoles: lie side by side or one above the other to maintain the proper osmotic pressure inside cell
- Numerous food vacuole contains food particles like debris from host gut, bacteria, starch grains, fat droplets and occasional RBCs, etc. Where digestion of food particles takes place.





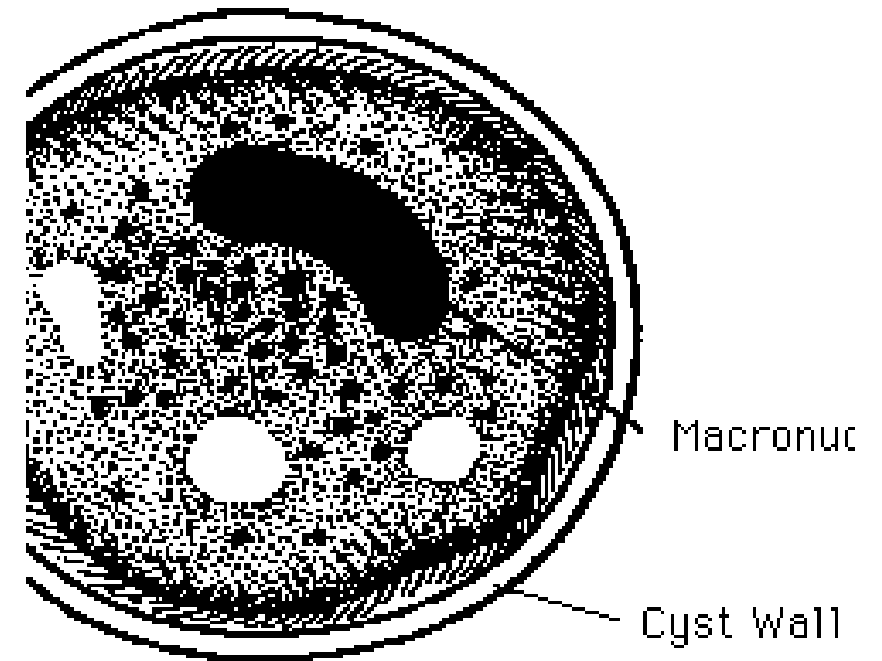
**trophozoite**

***Balantidium coli***



# CYST of Balantidium

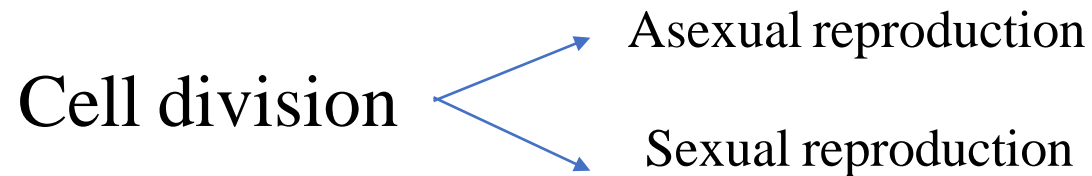
- Shape: round
- Infective stage: cyst
- Size: 40-60  $\mu\text{m}$
- Immobile and dominant
- Non-reproductive
- Surrounded by a thick transparent cyst wall□ allows the cysts to resist degradation in the acidic environment of the stomach and the basic environment of the small intestine
- Contains two nuclei- macronucleus and micronucleus and vacuoles
- Cilia- seen in younger cyst but is absorbed on maturity□ movement ceases



Cyst  
50 x 60 $\mu$

# Transmission & Development in large intestine

- Mode of transmission: **faecal-oral route**
- **Excystation: occurs in small intestine- when trophozoites are produced from cysts**
  - Multiplication in large intestine
  - Single trophozoite forms from each cyst
  - trophozoite- is the feeding stage of the parasite → multiply either in gut lumen or enter the sub mucosa of large intestine

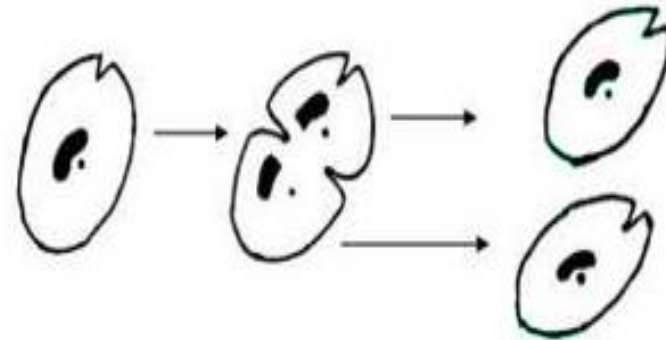


# Reproduction of Balantidium

## 1- Asexual reproduction

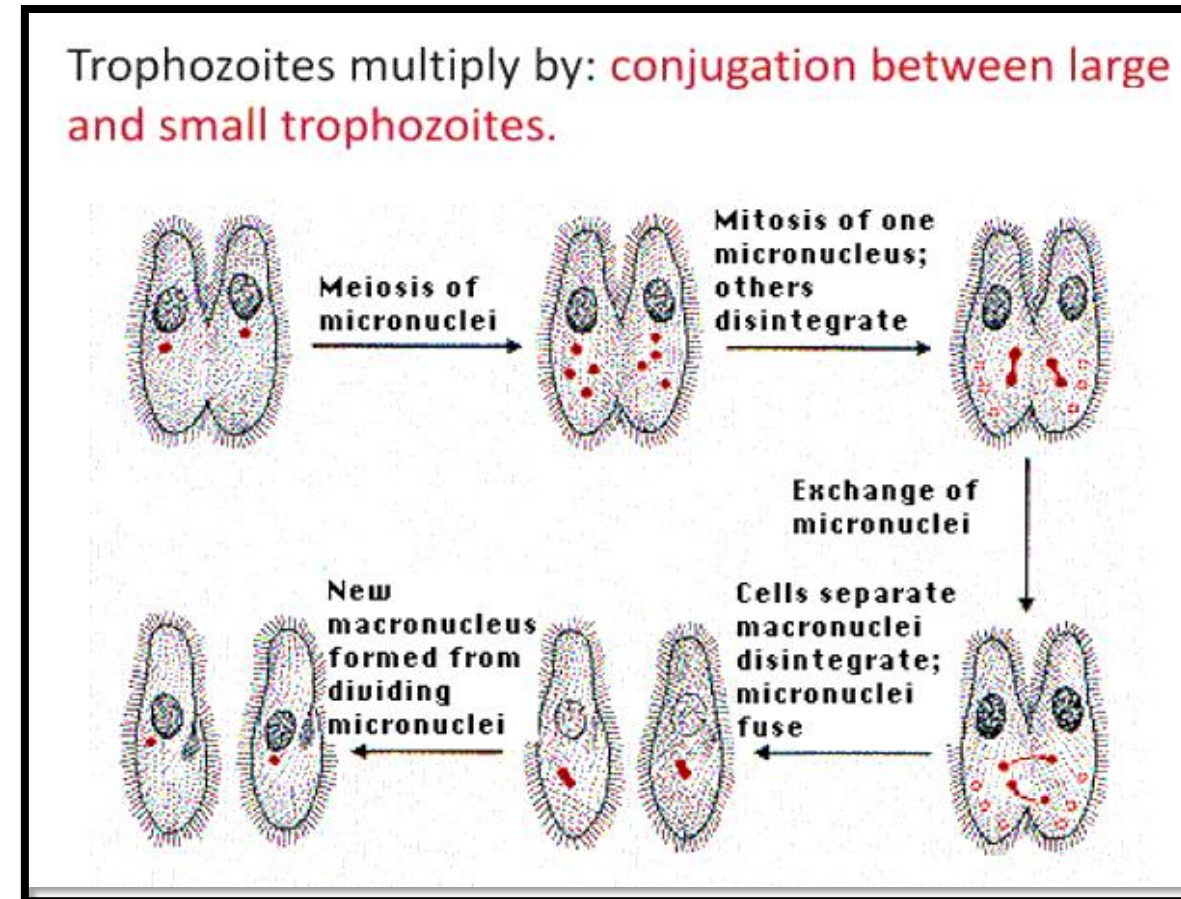
- Division by binary fission
- Micronucleus divide first followed by macronucleus
- A transverse septum forms – separates the cytoplasm into halves.

Trophozoites multiply by:  
**transverse binary fission**



## 2- Sexual reproduction

- Replicate sexually (**Syngamy**) by conjugation
- Two trophozoites meet each other at their anterior ends
- Exchange the nuclear material for few moments then they detach
- No increase in number of trophozoites
- Both trophozoite and cyst are excreted in faeces
- Trophozoites disintegrate, cysts are resistant and are infective to man and pig

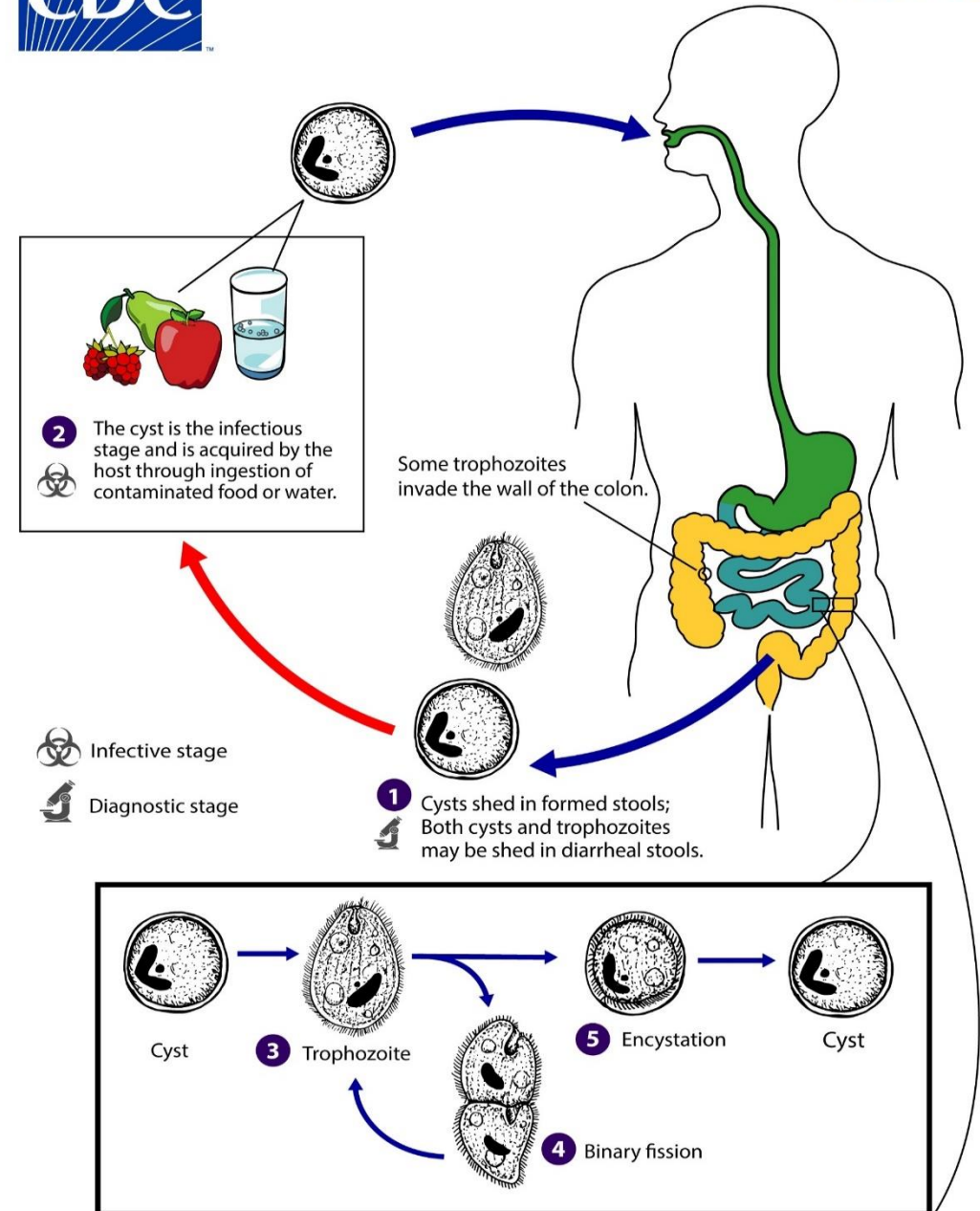


# Life cycle of Balantidium

- The motile trophozoite then resides in the lumen of the large intestine, feeding on intestinal nutrients.
  - Trophozoites multiply by asexual binary fission or sexual conjugation
  - The trophozoite may become invasive and penetrate the mucosa of the large intestine.
  - Trophozoites are released with the feces, and some encyst to form new cyst
- Cysts in the environment are then ready to infect another host.



*Balantidium coli*





# Balantidium Life Cycle

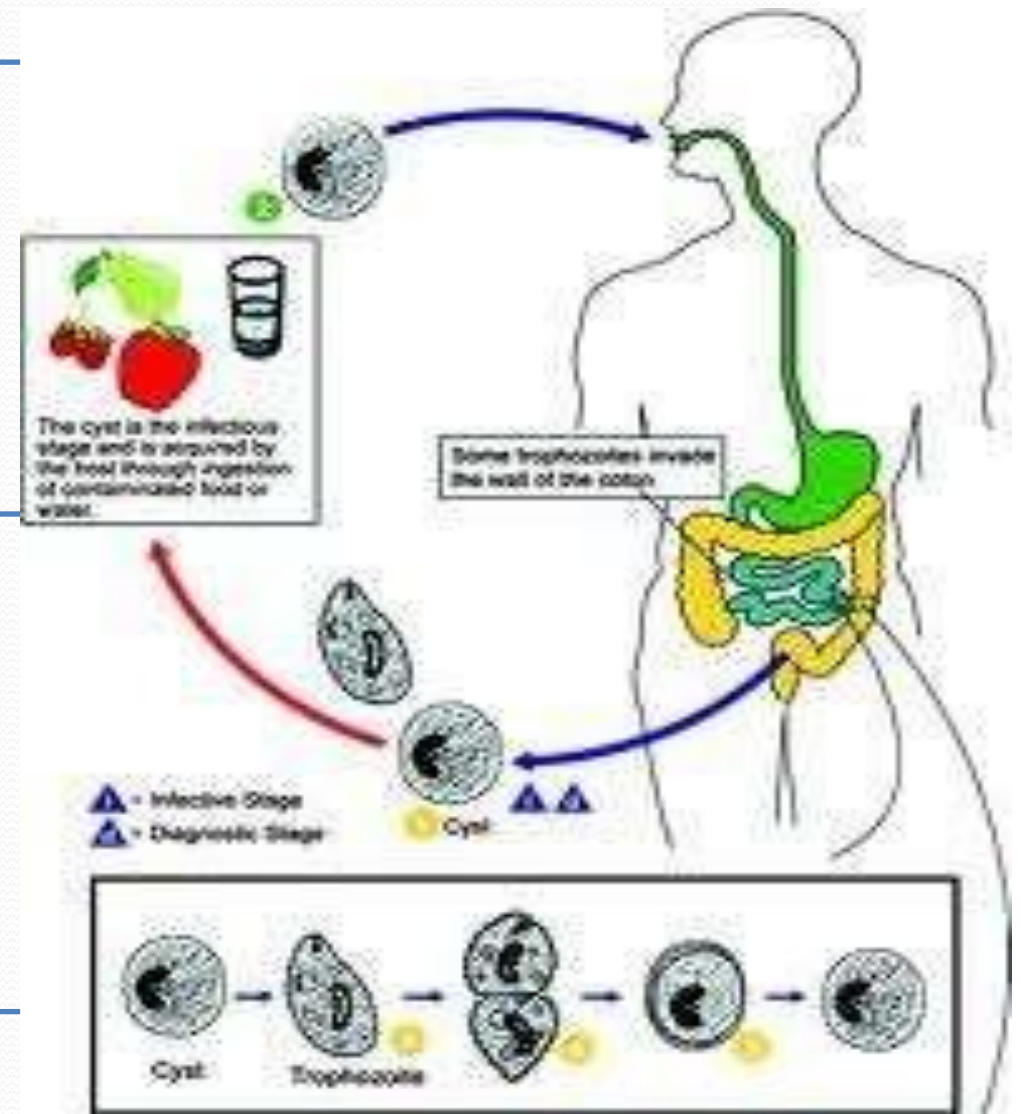
Life cycle is as follow :

**The cyst is the infective stage of Balantidium coli life cycle.**

Once the cyst is ingested via feces-contaminated food or water, it passes through the host digestive system.

There, excystation takes place in small intestine.

Excystation produces a trophozoite from the cyst stage.



# Balantidium Risk factors

- Pig's faeces carrying vast volumes of *Balantidium coli* → contaminates water sources
- Humans who work with pigs → exposed to *Balantidium coli*.

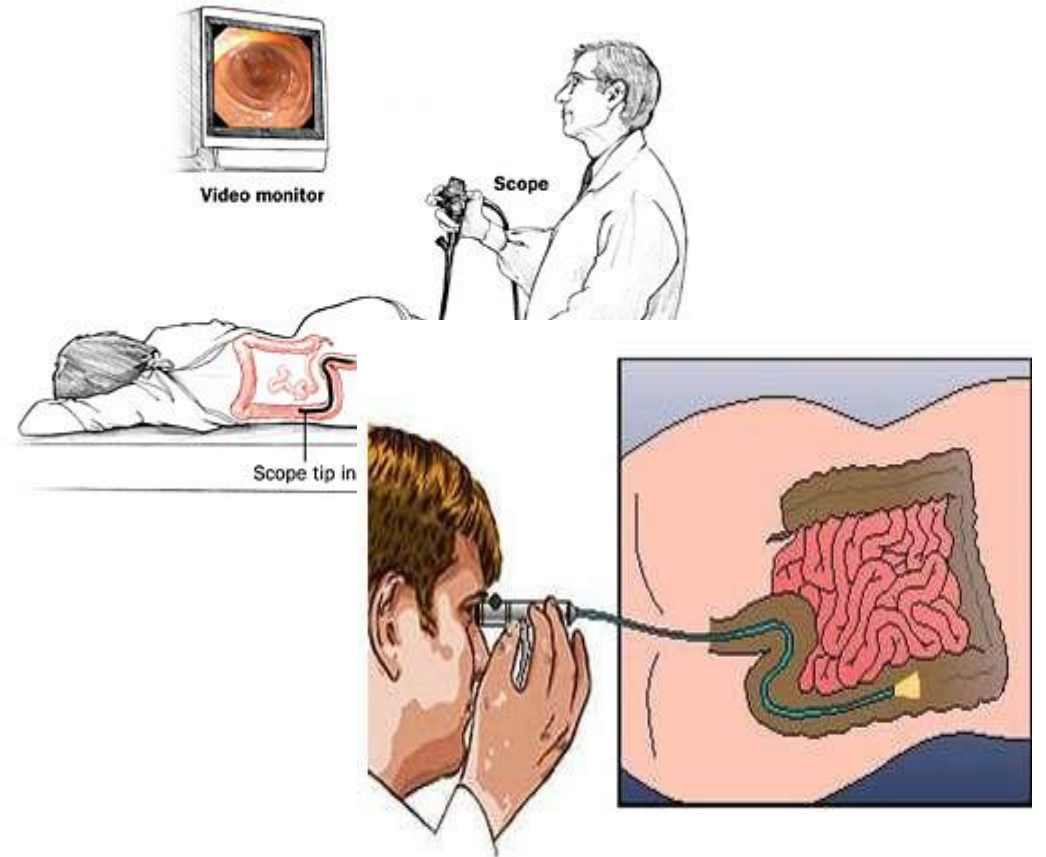
# Sign and Symptoms of Balantidium

- Acute ,even hemorrhagic Diarrhea
- Ulceration to gut wall Dysentery
- Colitis Abdominal pain



# Diagnosis of Balantidium

- Examination of patient`s stool
- Biopsy
- Sigmoid scope is used to visually inspect the last sections of the large intestine



## Treatment of Balantidiasis

- Three drugs are commonly used and administered orally
  - 1) Tetracycline
  - 2) Metronidazole
  - 3) Iodoquinol



**(1) Tetracycline's**

**500 mg four times  
daily for 10 days**

**(2)  
Metronidazole**

**750 mg three times  
daily for 5 days**

**(3) Iodoquinol**

**640 mg three times  
daily for 20 days**

# Control and Prevention

- Avoid ingestion of material contaminated with animal feces
- Prevention and control Sanitary disposal of human and pig feces
- Treatment of infected pigs
- Prevention of fecal contamination of food and water

# References

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- ❖ Pavl C. Beaver & Rodney C. Jung & Eddie W. Cupp. (2008) Clinical parasitology. 9<sup>th</sup>ed. Philadelphia: Lea & Febiger,.
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- ❖ Patrick. R. Murray, Ken. S. Rosenthal, George S. Kabayashi, Michael A. P. Faller. (2002). Medical microbiology 4<sup>th</sup> ed USA: Mosby,