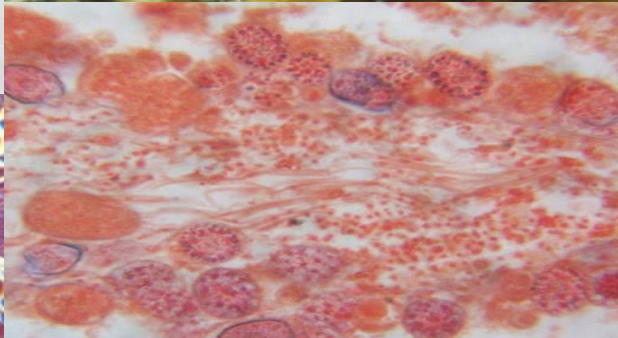
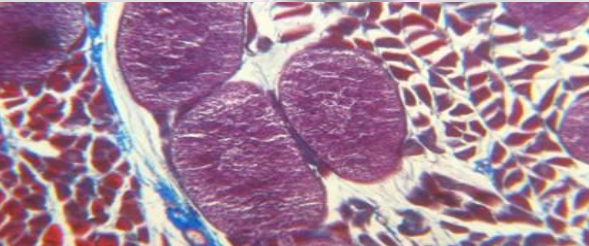
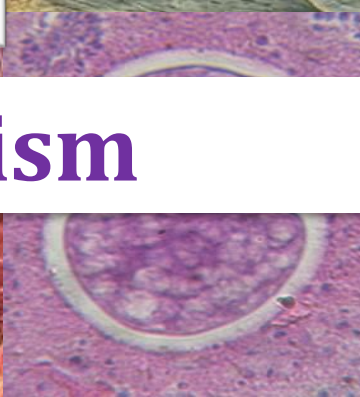
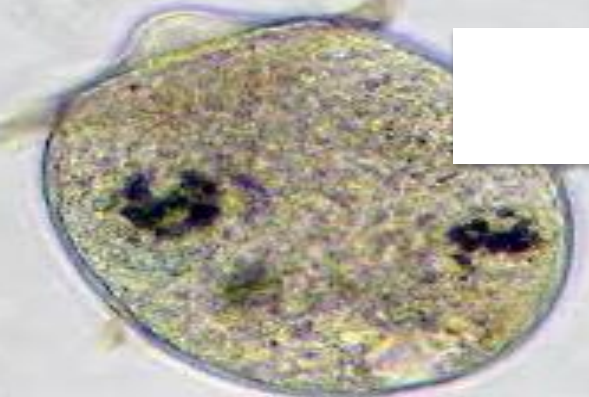


# Lecture (1)

## Parasitology and parasitism



# Course

- Course title: **Applied Entomology and Parasitology**
- Credit hours: **2 (1+1)**
- Teacher name: **Dr Rewaida Abdel-Hakim**
- Office: 105 (3<sup>rd</sup> floor)
- For contact: Office hours: Sunday and Thursday
- E-mail : [rewaida@sci.cu.edu.eg](mailto:rewaida@sci.cu.edu.eg)
- E-mail : [rabelgaber.c@ksu.edu.sa](mailto:rabelgaber.c@ksu.edu.sa)

# Evaluation and Assessment

	<b>Activities</b>	<b>%</b>
<b>1</b>	<b>First midterm exam</b>	<b>15%</b>
<b>2</b>	<b>Second midterm exam</b>	<b>15%</b>
<b>3</b>	<b>Practical</b>	<b>30%</b>
<b>4</b>	<b>Final Examination</b>	<b>40</b>
	<b>Total</b>	<b>100</b>

**25% absence from both lectures and labs (approximately 10 hrs.), student will be deprived from the course.**

## **Times of the exams**

**First mid- term exam: Tuesday 3/4/2018**

**Time: 9 - 10 am**

**Final exam: Tuesday 24/4/2018 - 26/4/2018**

**Time: 9 - 11 am**

# Parasitism

Is the relationship between organisms of different species in which one organism called parasite that lives on or in another organism called the host. The host gives the parasite their food and shelter.

Parasite can't live without host but host can live without parasite

There are two types of Parasitism

**Temporary**

Ex. Mosquitoes



**Permanent**

Ex. Body Louse



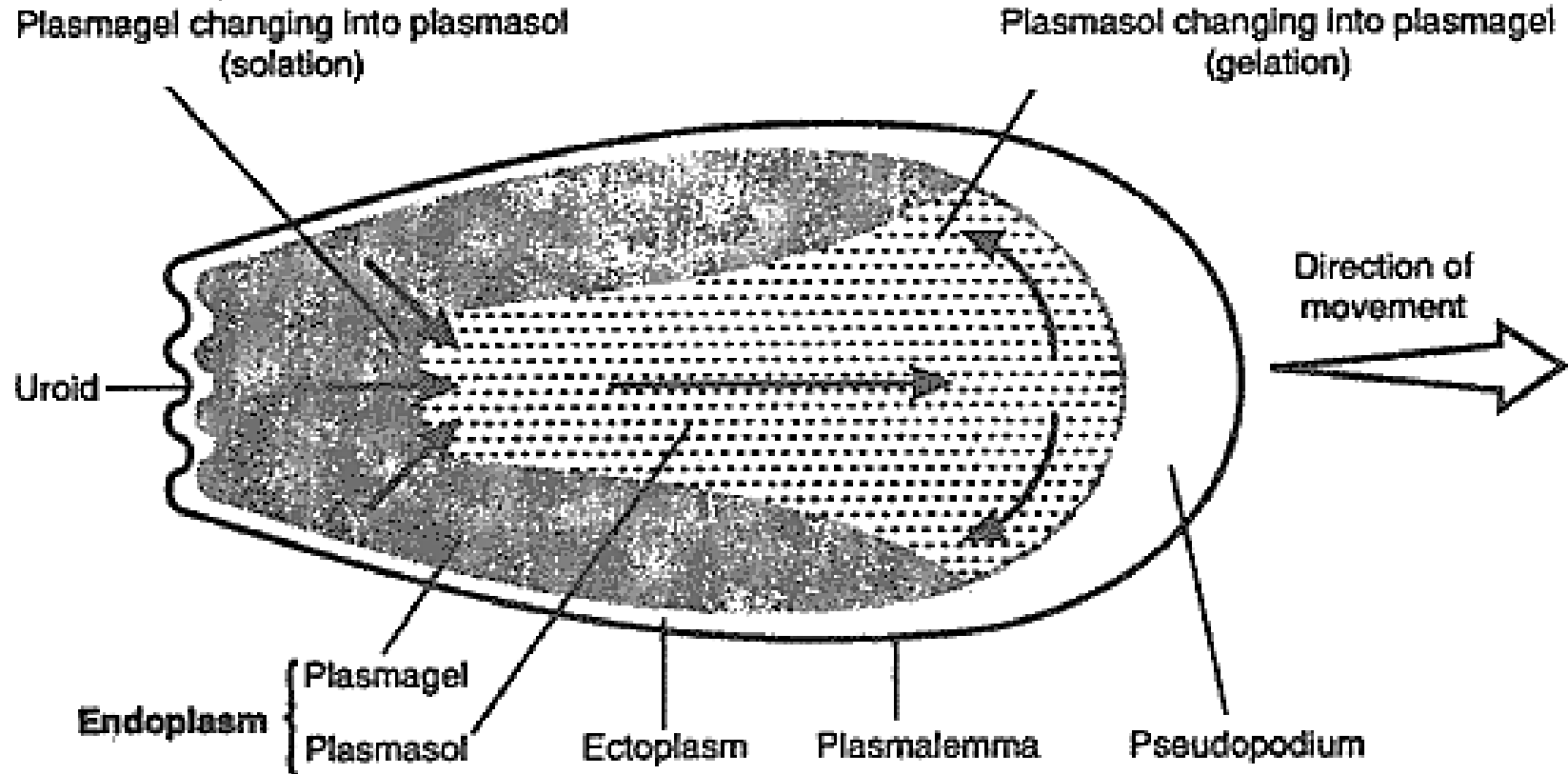


# Host parasite relationship

- Once the infecting organism is introduced into the body of the host, it reacts in different ways and this could result in:
  - a. Carrier state** - a perfect host parasite relationship where tissue destruction by a parasite is balanced with the host's tissue repair. At this point the parasite and the host live harmoniously, i.e. they are at equilibrium.
  - b. Disease state** - an imperfect host parasite relationship where the parasite dominates the upper hand. It can result either from lower resistance of the host or a higher pathogenicity of the parasite.
  - c. Parasite destruction** – occurs when the host takes the upper hand.

# Characterization of Sarcodina

- ❑ **Infectious Sarcodina** (Amebas), widely distributed in aqueous environments.
- ❑ **Amoebae** are unicellular organisms with no truly defined shape, consist of a mass of moving **cytoplasm** which is divided into **granular endoplasm** and **clear ectoplasm**.
- ❑ They move and acquire food by pushing out the ectoplasm to form **pseudopodia** (false feet) into which the endoplasm then flow.
- ❑ Only a few species can infect humans and cause disease such as *Acanthameoba* and *Entameoba histolytica*.



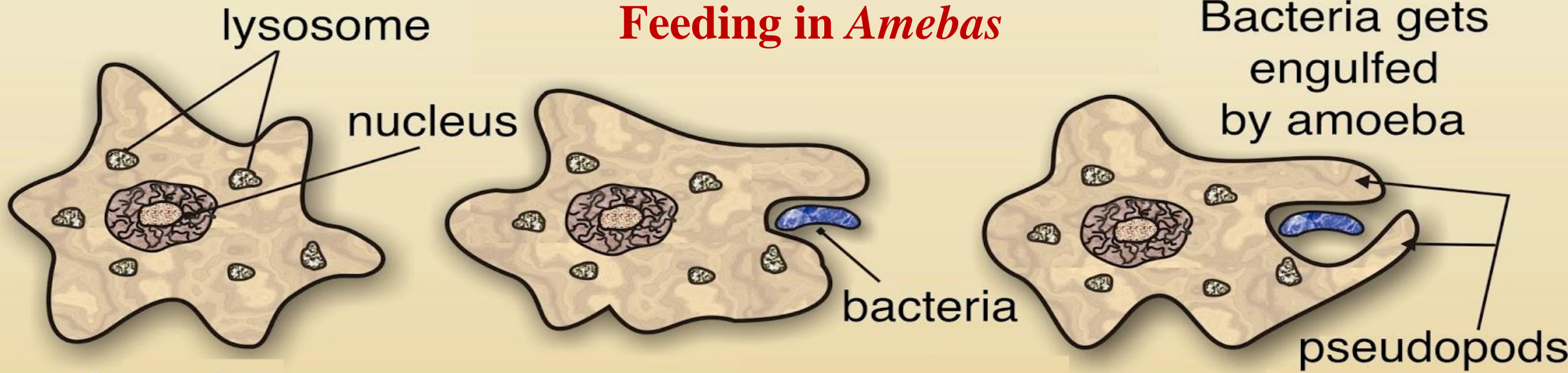
## Sol-gel theory of amoeboid movement

2classnotes

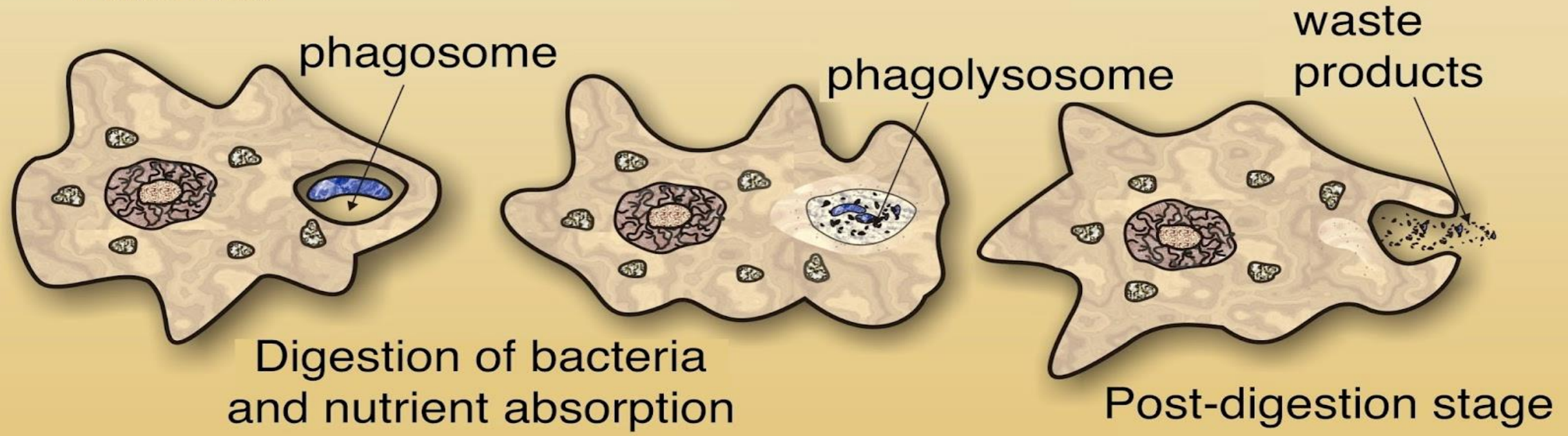
This sort of irregular flowing is termed as **amoeboid movement** which is the result of changes within the colloidal protoplasm, from the fluid “sol” to the more solid “gel” condition.



# Feeding in *Amebas*



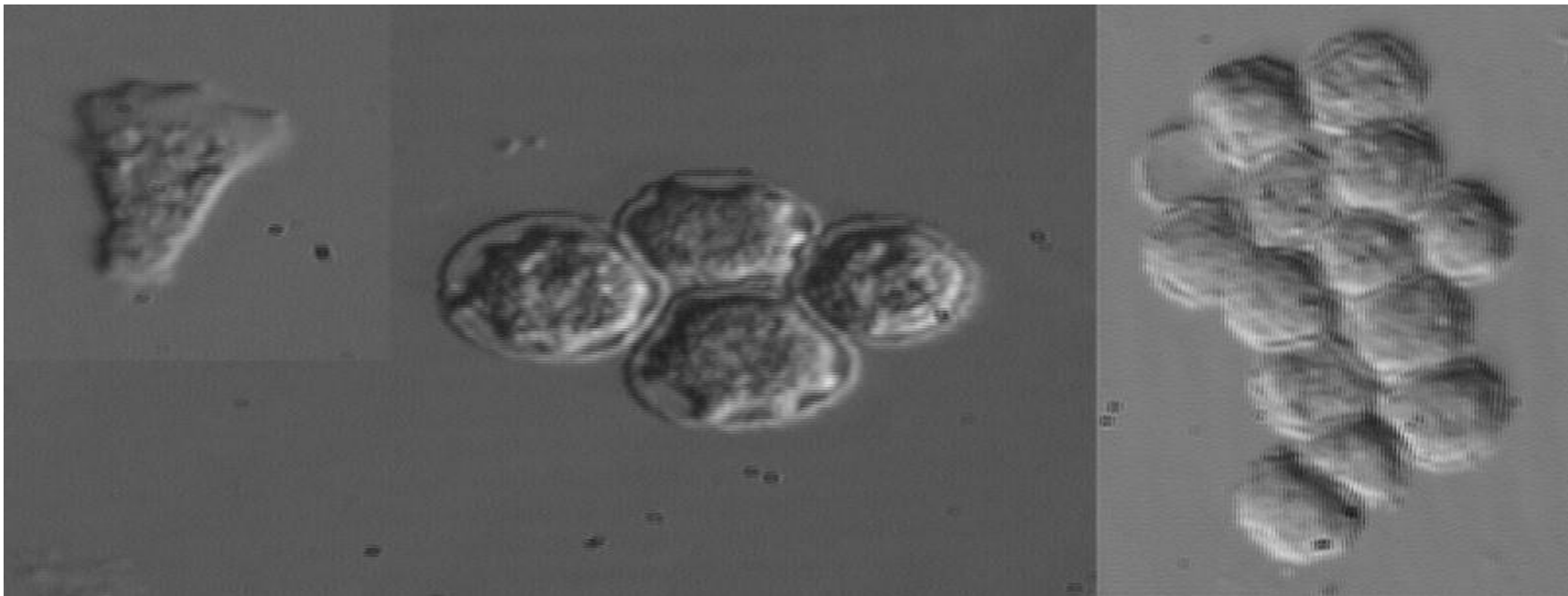
**Amoeba**



# *Acanthamoeba* spp.

At least 5 species of *Acanthamoeba* have been identified in human tissues, this is one of the most common amebas in soil and freshwater.

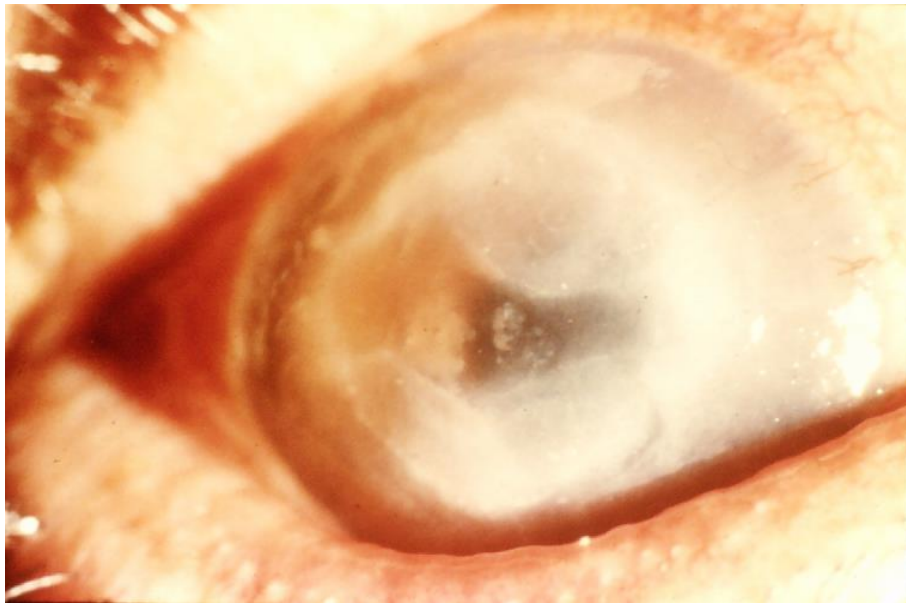
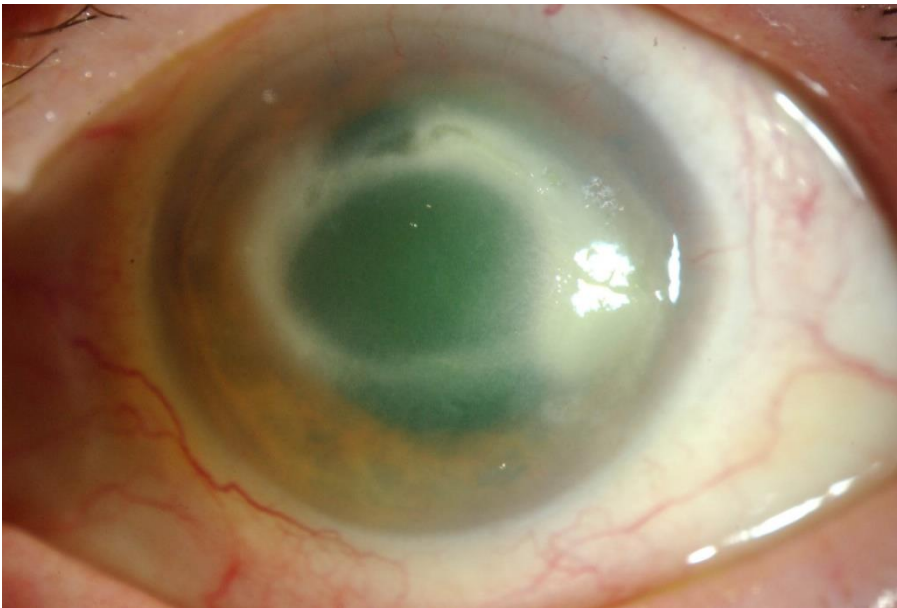
There are two forms were trophozoites (amoeboid forms) and cyst.



Free-living trophozoites and cysts occur in both the soil and freshwater.

## These species cause 2 pathological effects:

- 1) Over 100 cases of granulomatous amebic meningoencephalitis caused by *Acanthamoeba* have been documented.
- 2) Incriminated in a number of cases of inflammation and opacity of the cornea.



Most of these ocular infections were in contact lens wearers who used home-made saline.

## Symptoms

- Foreign body sensation, severe ocular pain, photophobia and blurred vision.
- Often pain is more severe than signs in early course of the disease.

## Management

- Early diagnosis a prognostic factor of a successful outcome.
- Topical anti-amoeba agents.
- Penetrating keratoplasty in a severe progressive keratitis

# *Entamoeba* species

There are six genera of parasitic *Entamoeba* :

Five in the intestinal tract and one in the buccal cavity, from them:

## **A. Intestinal commensals**

Ex. *Entamoeba coli* – *Endolimax nana*

*Iodamoeba butschlii* – *Dientamoeba fragilis*

## **B. Intestinal parasitic amoebae**

Ex. *Entamoeba histolytica*

## **C. Buccal commensals**

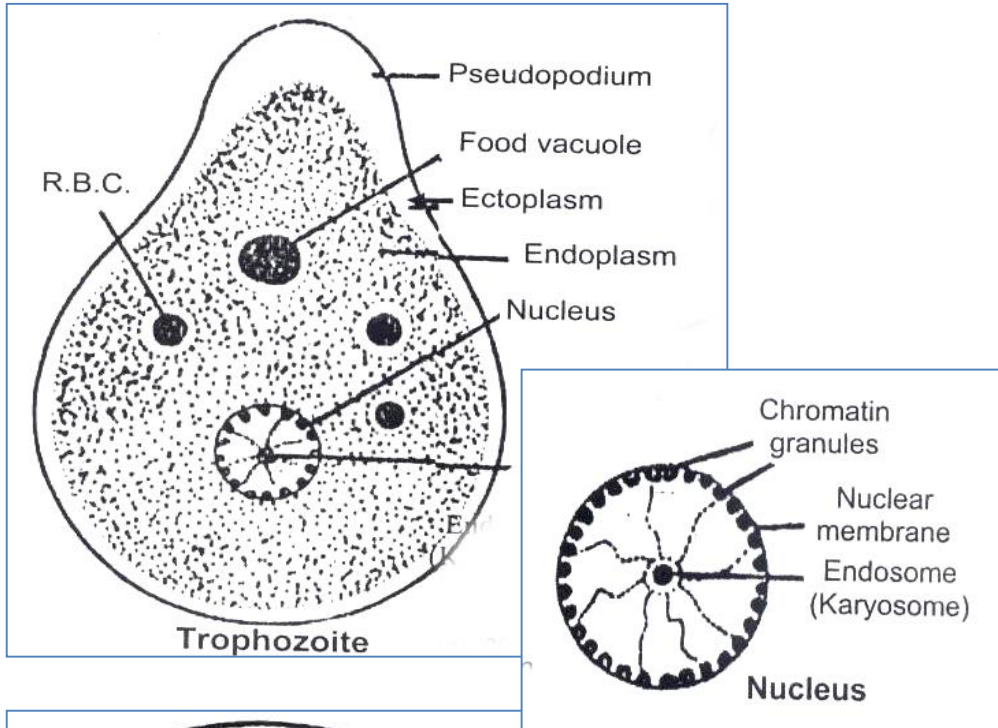
Ex. *Entamoeba gingivalis*

## Comparison between *Entamoeba histolytica* and *E. coli*

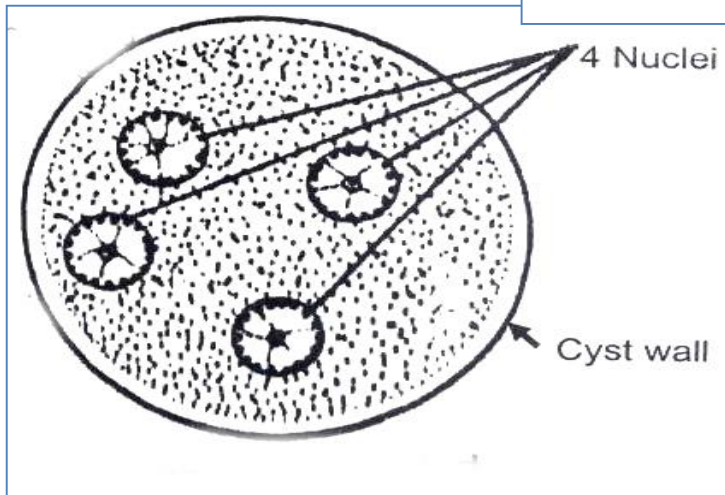
		<i>Entamoeba histolytica</i>	<i>Entamoeba coli</i>
<b>Habitat</b>		Lives in the wall of large intestine as a dangerous endoparasite since it feeds on the tissues and blood of its host causing the disease “amoebic dysentery”.	Lives in the lumen of large intestine as a commensal feeding on bacteria.
<b>Morphological stages</b>	<b>Trophozoite (Feeding stage)</b>	<ul style="list-style-type: none"> <li>- The ectoplasm and endoplasm are well differentiated.</li> <li>- With single large pseudopodium.</li> <li>- Nucleus with central karyosome.</li> <li>- Chromatin granules are regularly distributed on the inner nuclear membrane.</li> <li>- Food vacuoles contain RBCs.</li> </ul>	<ul style="list-style-type: none"> <li>- The ectoplasm and endoplasm are not clearly differentiated.</li> <li>- With two pseudopodia.</li> <li>- Nucleus with lateral karyosome.</li> <li>- Chromatin granules are irregularly distributed on the inner nuclear membrane.</li> <li>- Food vacuoles contain bacteria.</li> </ul>
	<b>Precyst</b>	<ul style="list-style-type: none"> <li>- Round or ovoid</li> <li>- Lack a cystic wall</li> <li>- Vacuoles containing glycogen and rod-like chromatoid bodies.</li> </ul>	
	<b>Cyst (Infective stage)</b>	Mature cyst with 4 nuclei.	Mature cyst with 8 nuclei.

*Entamoeba histolytica*

Trophozoite

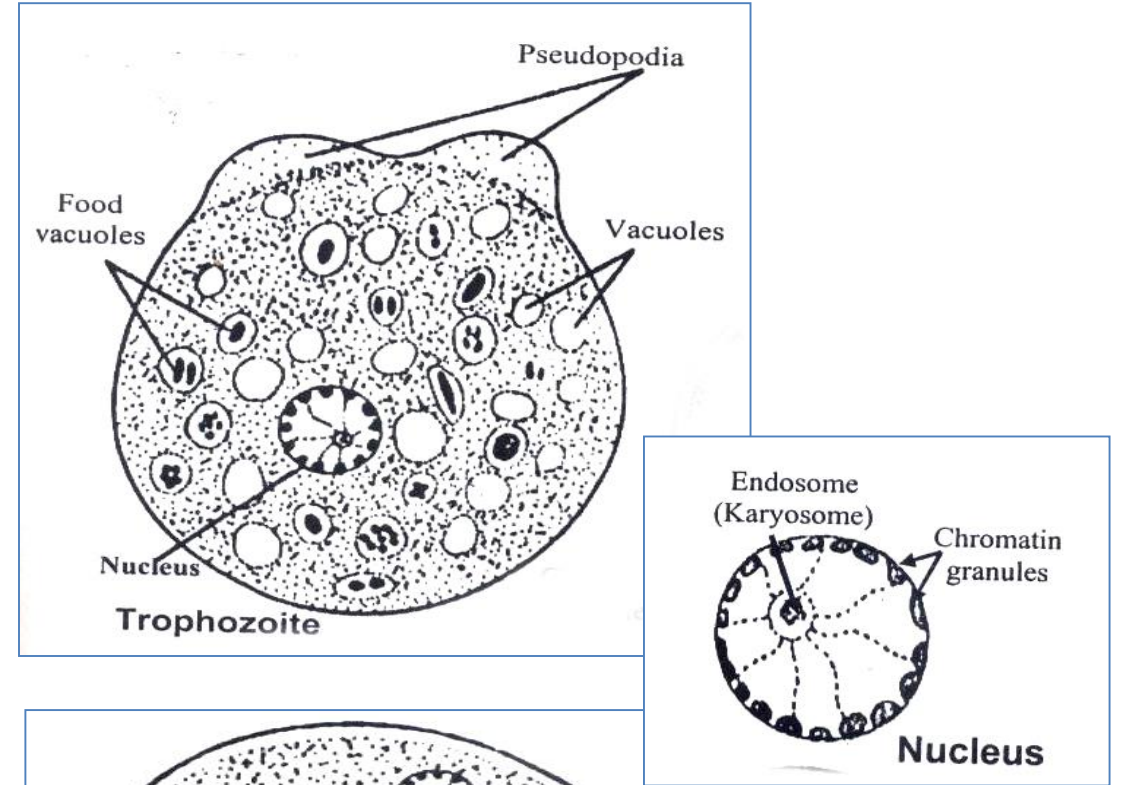


Cyst

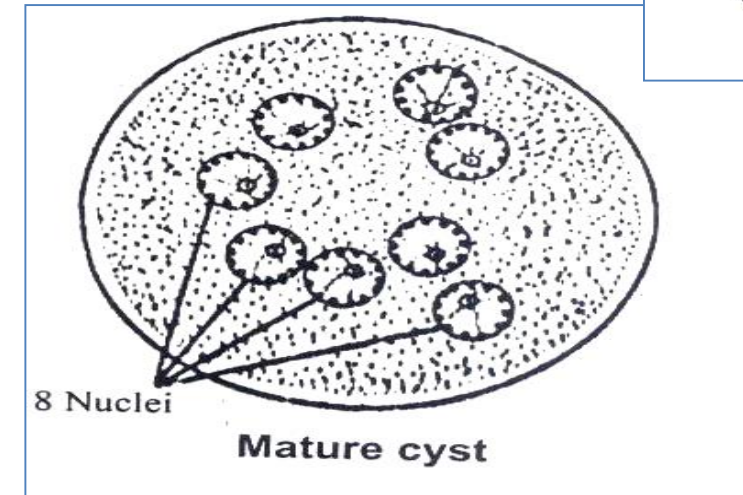


*Entamoeba coli*

Trophozoite

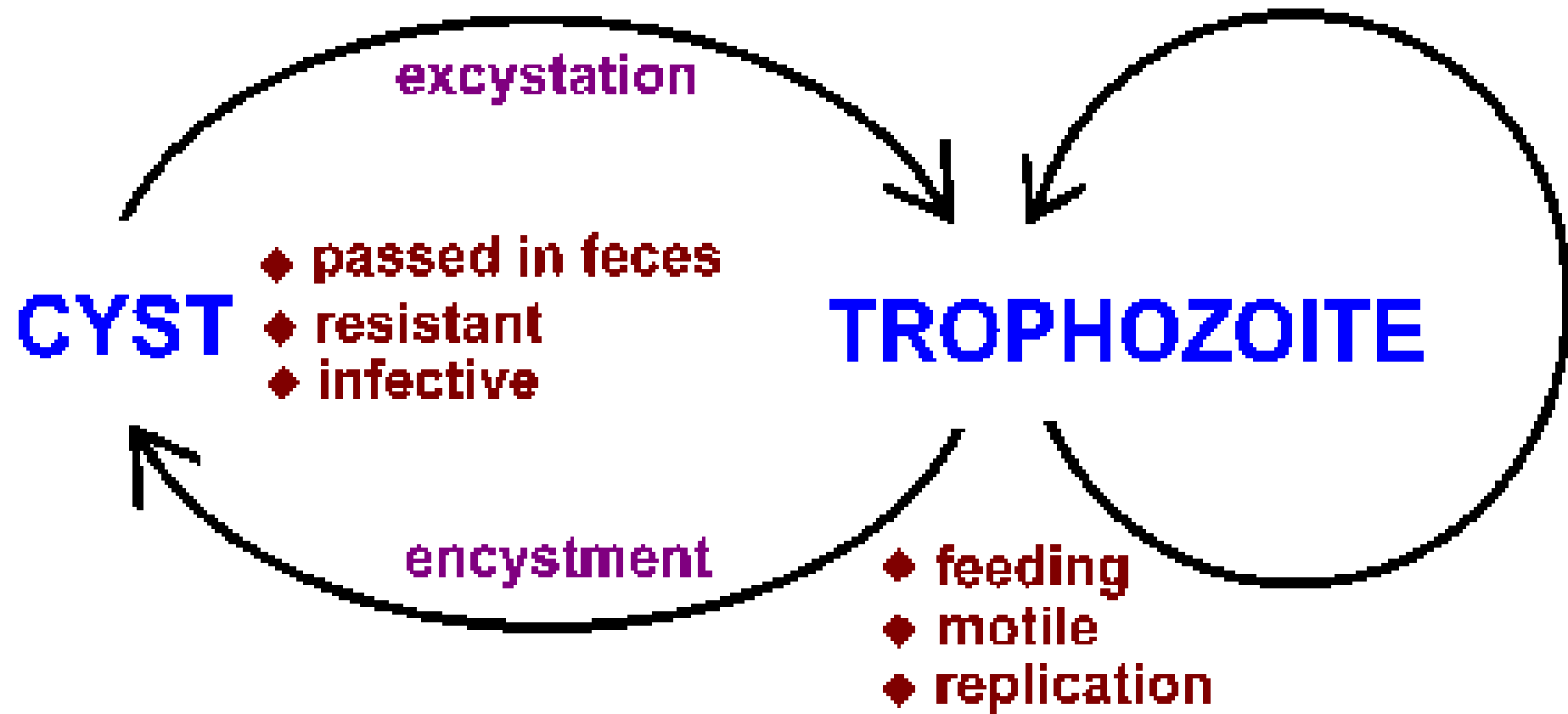


Cyst



## Life cycle of *E. histolytica*

### Typical Fecal-Oral Life Cycle

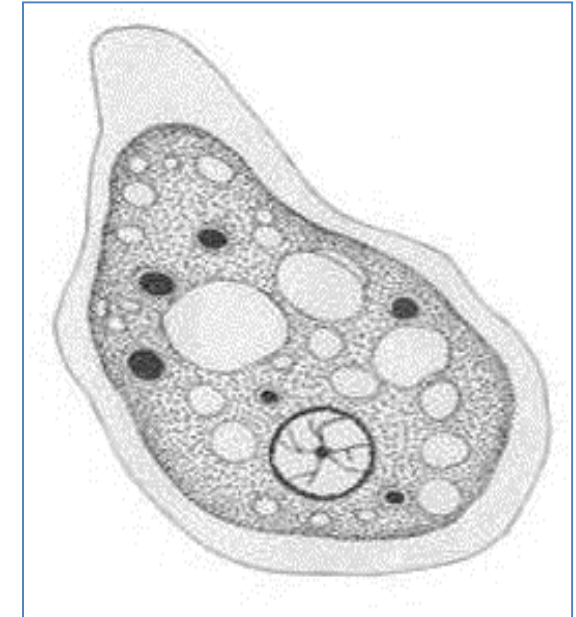




# Symptoms

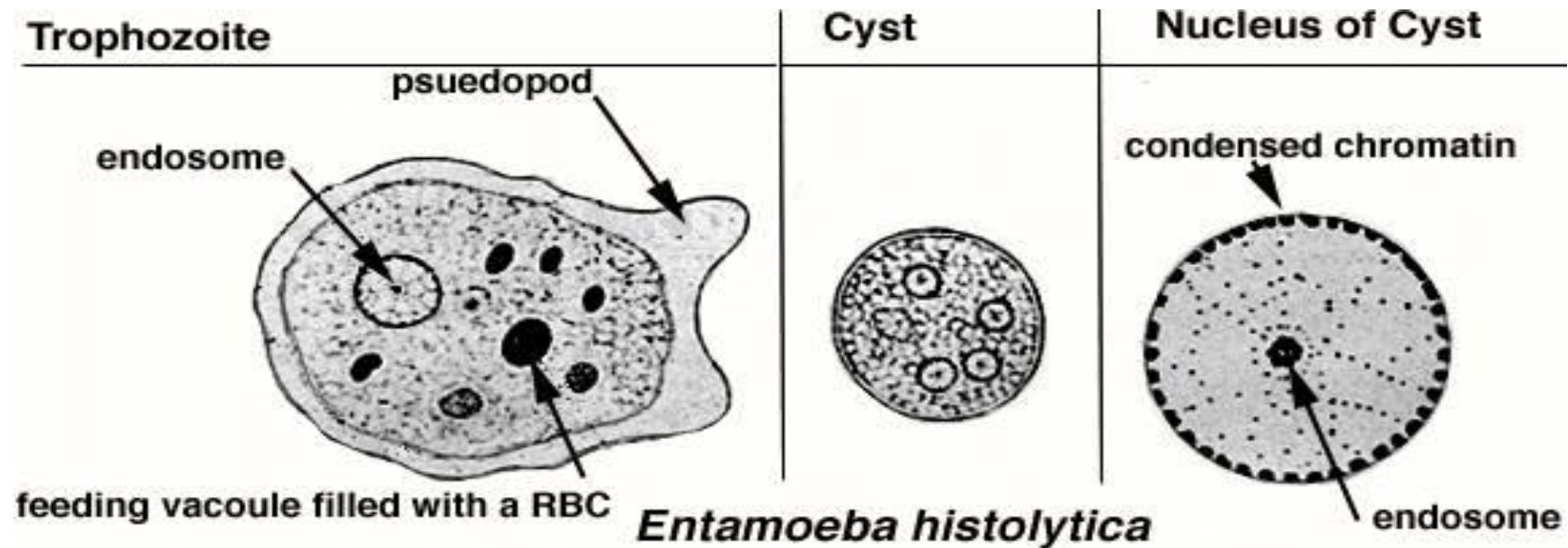
## □ Symptoms can include:

- Fulminating dysentery
- Bloody diarrhea
- Weight loss
- Fatigue
- Abdominal pain.
- The amoeba can 'bore' into the intestinal wall, causing lesions, may reach the blood stream, and can reach different vital organs of the human body such as liver causing liver abscess.



# Diagnosis

- ❑ Both **cysts** and **trophozoites** can be found in the feces (diagnostic stages).
- ❑ **Trophozoites** may be seen in a **fresh** fecal smear and cysts in an ordinary stool sample.



# Prevention & Control

- Safe drinking water (boiling or filtration)
- Prevention of contamination of foods
- Health education (washing hands, cleaning of uncooked fruits and vegetables)
- Control of flies and cockroaches

## Subphylum Mastigophora (Flagellates)

- ❑ **Mastigophore** includes intestinal, genitourinary flagellates, blood flagellates and tissue flagellates.
  1. **Intestinal flagellates** → *Giardia*
  2. **Genitourinary flagellates** → *Trichomonas*
  3. **The blood and tissue flagellates (Haemoflagellates):**
    - Extracellular flagellates → *Trypanosoma*
    - Endocellular flagellates → *Leishmania*
- ❑ They reproduce asexually by **binary fission**.
- ❑ They have one or more whip like **flagella** for locomotion at some stage of their life cycle. In some cases, there is the presence of undulating membrane (Ex. *Trypanosoma*).

## Subphylum: Mastigophora

### 1- Intestinal flagellates

#### Order Diplomonadida

...Diplomonadids are characterized by the occurrence of a symmetrically arranged double set of each group of organelles with 2 karyomastigonts (8 flagella and binucleated).

#### Family Hexamitidae

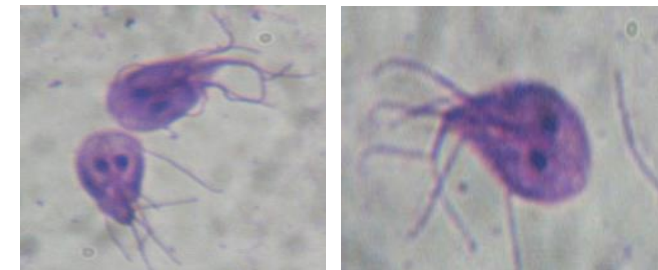
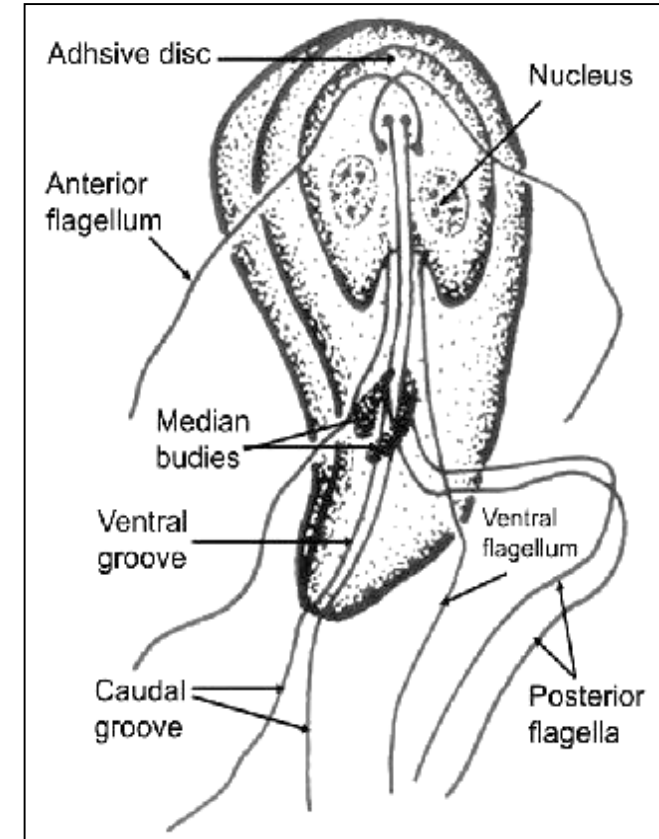
#### Subfamily *Giardiinae*

#### *Ex. Giardia intestinalis (G. lamblia)*

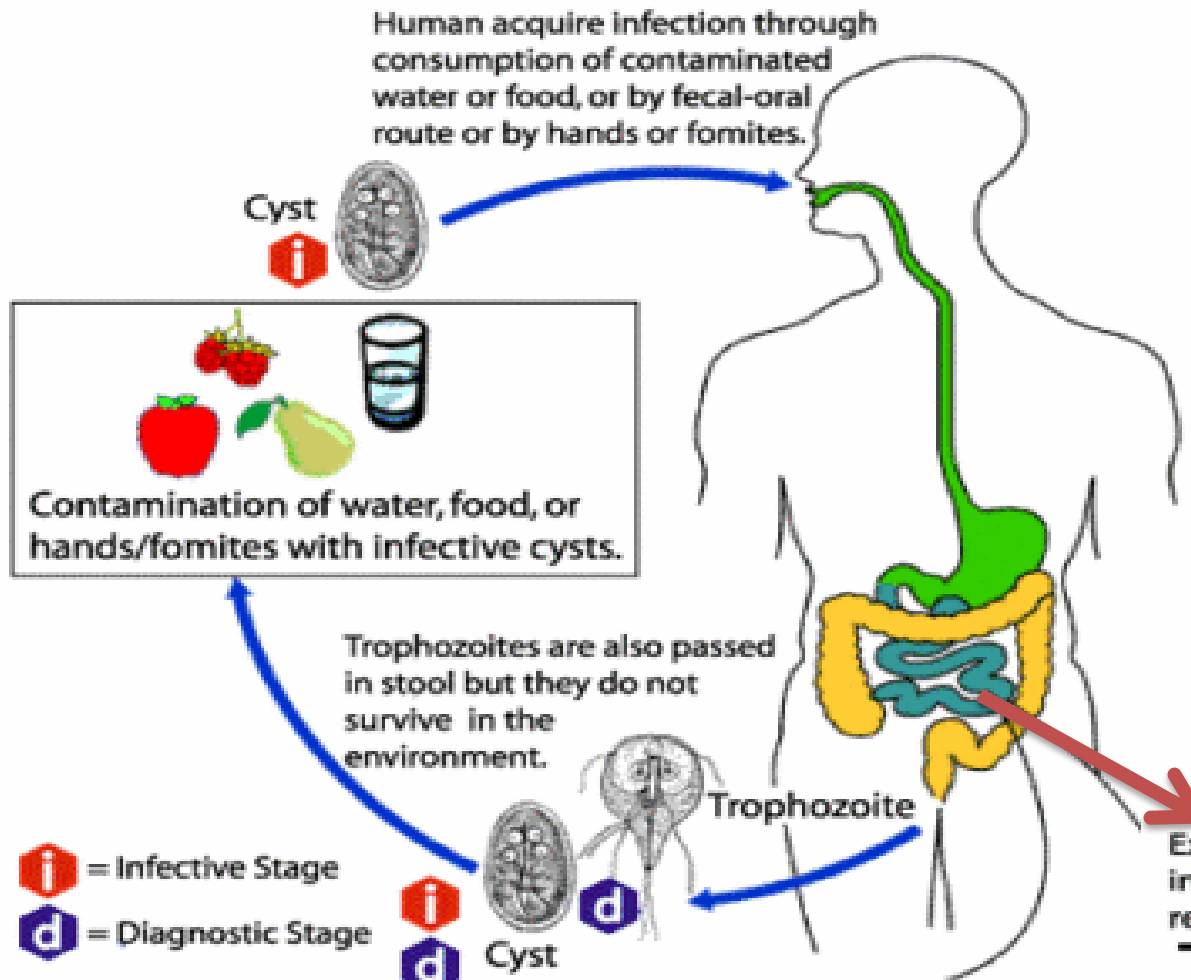
...It lives in the **lumen of the duodenum and ileum** of man, monkeys and pigs. It causes a gastroenteritis-type of disease called **giardiasis**.

...**Trophozoites** with ventral adhesive disc (not a "sucking" disc) which attaches the parasite to the intestinal mucosa of its host; 8 flagella, and 2 nuclei.

...Infection occurs by the ingestion of cysts in contaminated water and food, by the **fecal-oral route**.



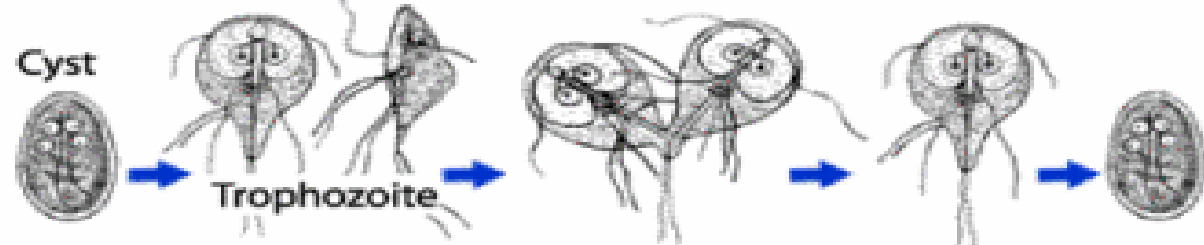
# Life cycle



## Intestinal phase

Excystation occurs in the small intestine. Two trophozoites are released from each cysts.

Excystation occurs as the parasites transit towards the colon. Cysts are resistant forms and are responsible for transmission.



The trophozoites multiply by longitudinal binary fission. They remain in the lumen of the proximal small bowel where they can be free or attached to the mucosa by a ventral suckina disk

## Symptoms

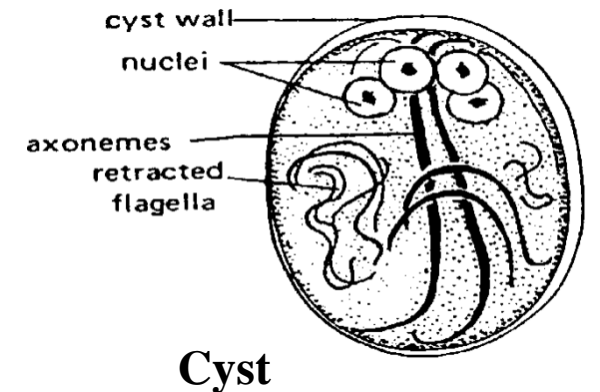
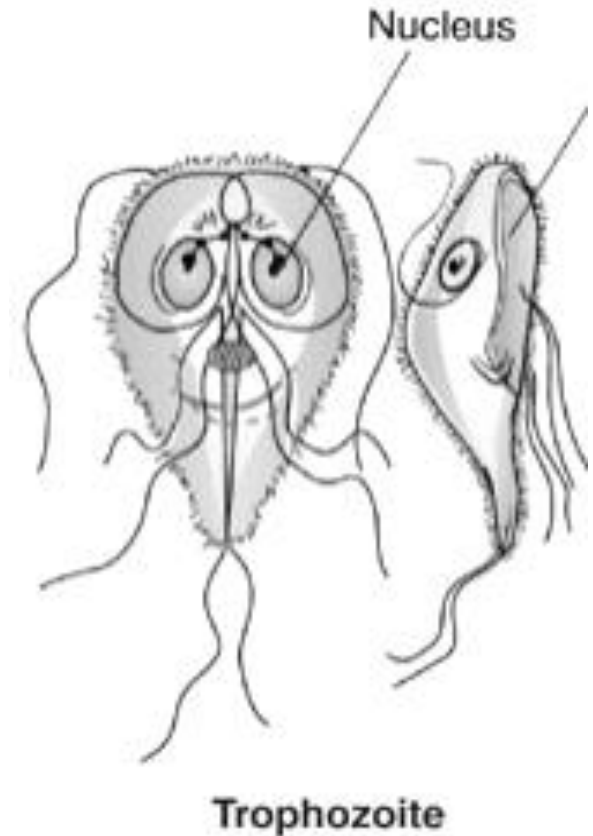
- Not bloody diarrhea
- Abdominal pain
- Weight loss
- Colonization of the gut results in inflammation and villous atrophy, reducing the gut's absorptive capability
- Deficiency of Vitamin B12
- Liver abscess

## Diagnosis

- Examination of diarrheal stool-trophozoite or cyst, or both.

## Prevention and Control

- Handwashing.
- Purification of public water supplies.
- Avoid uncooked foods that might have been grown, washed, or prepared with water that was potentially contaminated.



# Subphylum: Mastigophora

## 2- Genitourinary flagellates





## Order Trichomonadida

...They typically have **four to six flagella** at cell's apical pole, one of which is recurrent – that is, it runs along a surface wave, giving the aspect of an undulating membrane. Like other parabasalids they typically have an axostyle.

...With a parabasal apparatus (Golgi) and parabasal fibres.

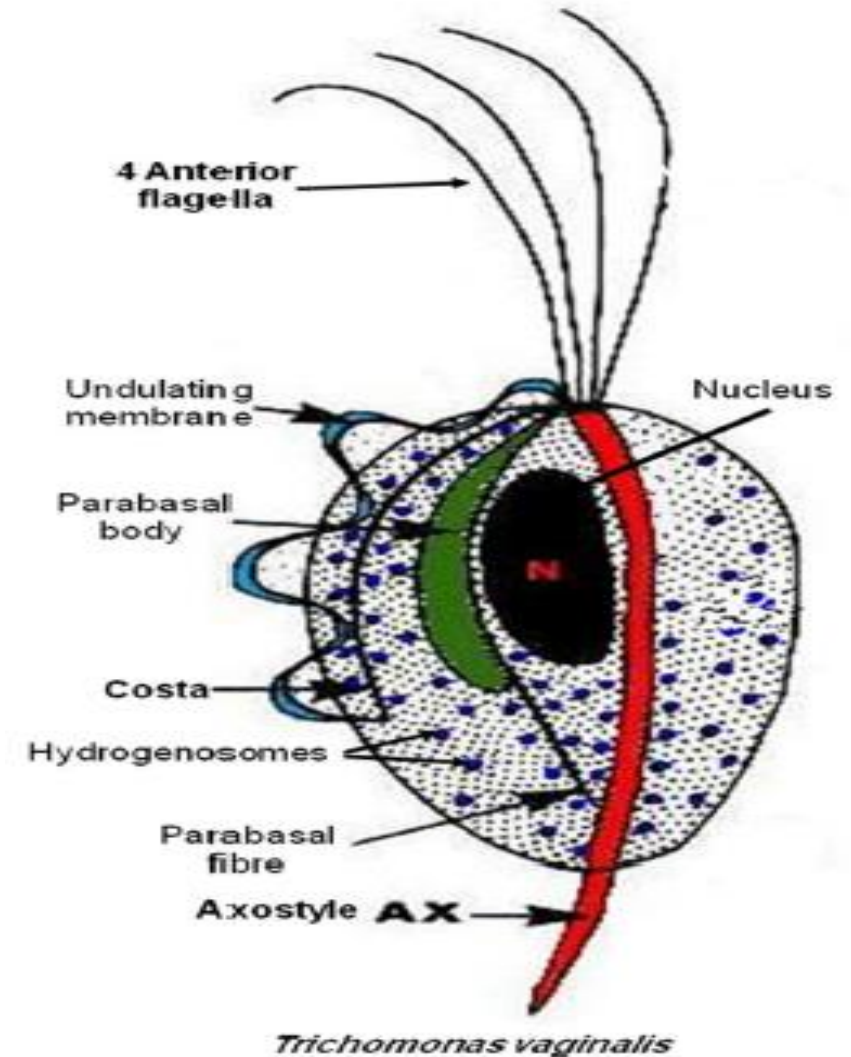
### Family Trichomonadidae

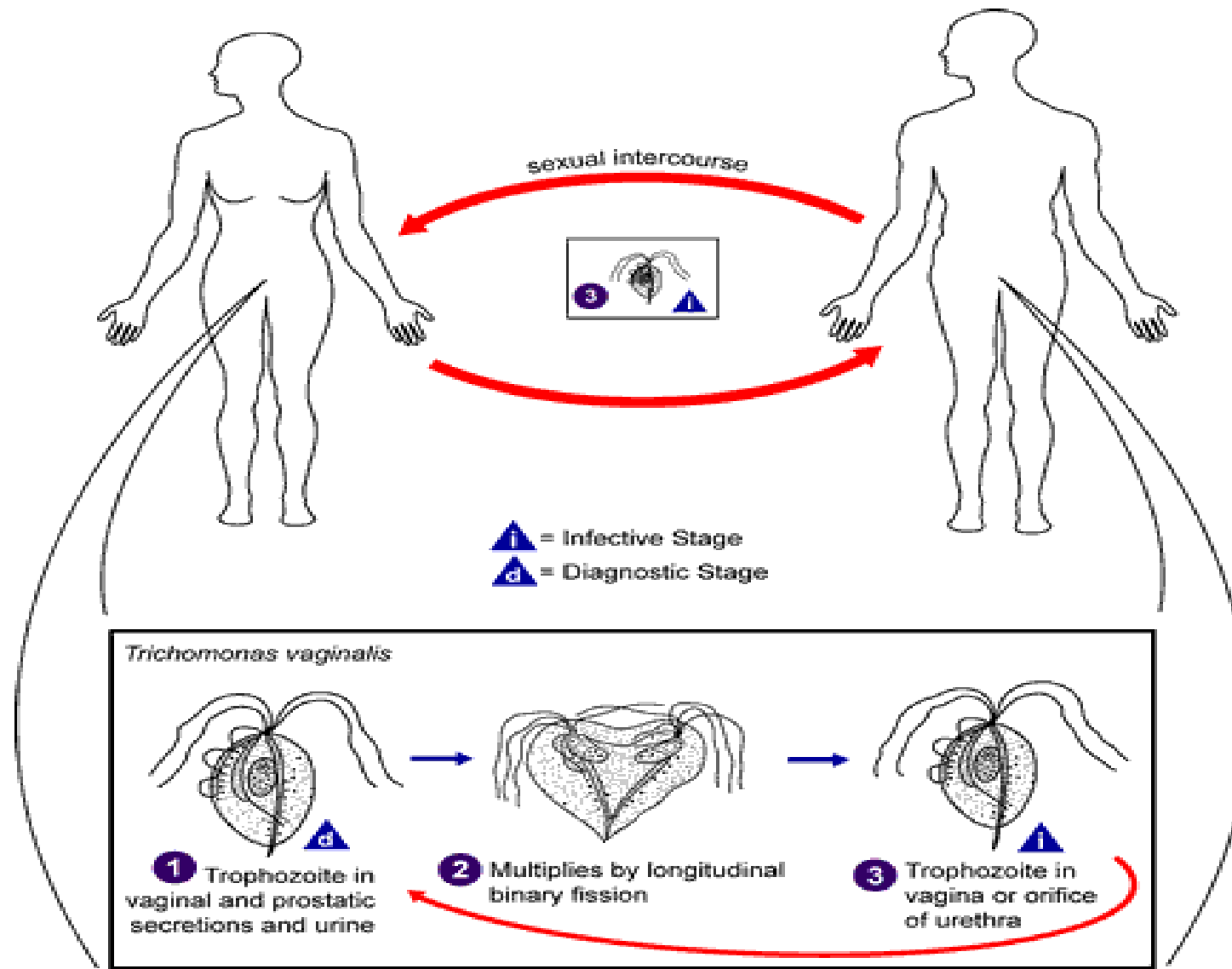
*EX. Trichomonas sp.*

...It is the causative agent of **trichomoniasis**.

...Polymorphic trichomonad flagellates with **four free anterior flagella and one recurrent or posterior flagellum** (not free) associated with an undulating membrane.

...Two species of *Trichomonas* occur in man, *Trichomonas tenax* (= *buccalis*) inhabits the buccal cavity and spreads through kissing, and *Trichomonas vaginalis* which inhabits the female genital tract and male urinogenital tract.



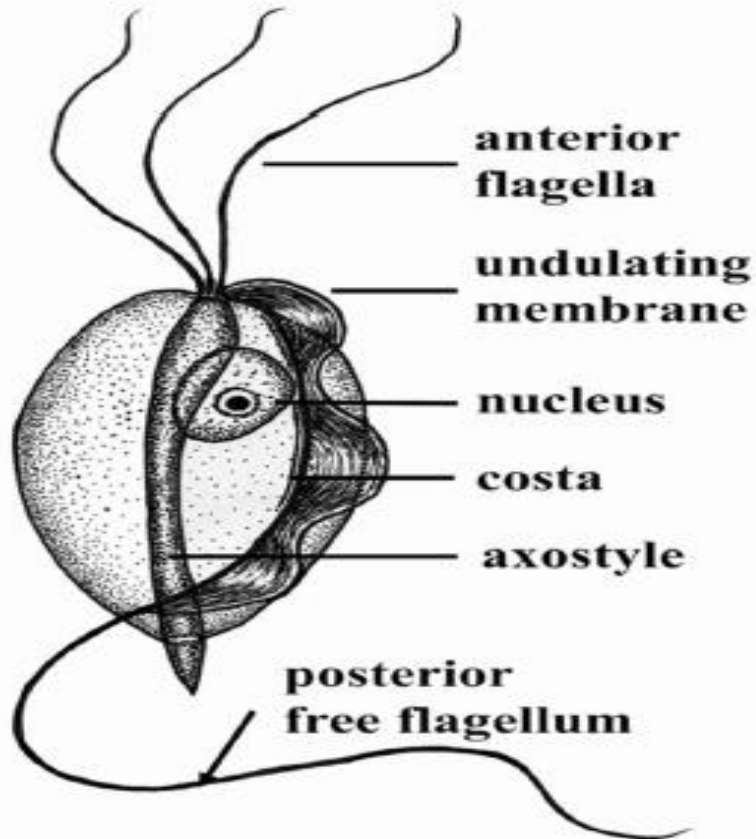


...*Trichomonas vaginalis* resides in the female lower genital tract and the male urethra and prostate, where it replicates by binary fission. The parasite does not appear to have a cyst form, and does not survive well in the external environment. *Trichomonas vaginalis* is transmitted among humans by sexual intercourse .

### *Ex. Tritrichomonas foetus*

...*Tritrichomonas foetus* is a microscopic single-celled flagellated protozoan parasite that has traditionally been identified as a cause of **reproductive disease in cattle and cows (infertility, abortion and endometritis)**.

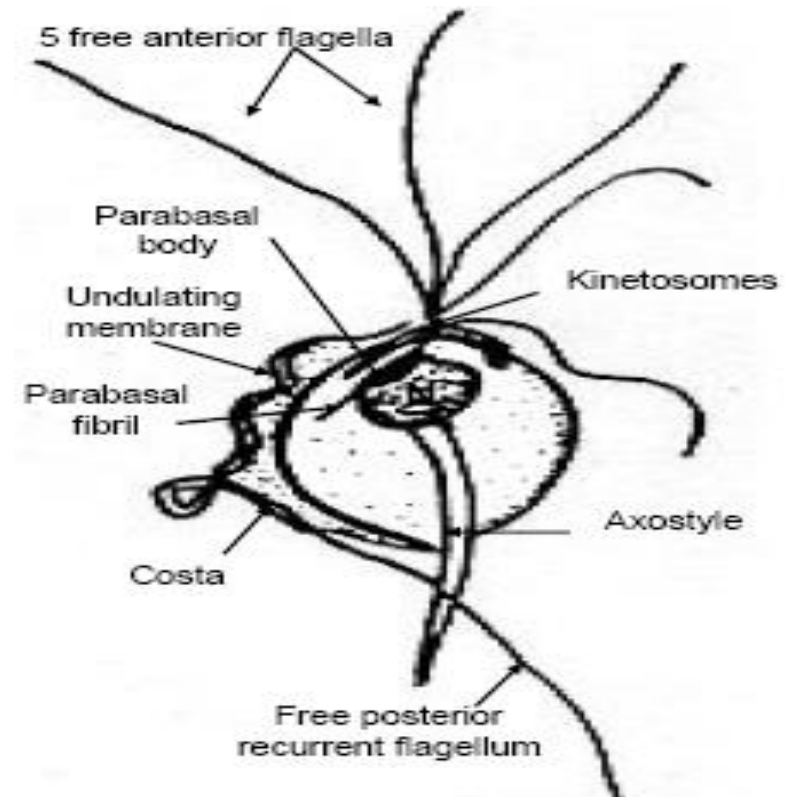
...It has **three free anterior flagella and one recurrent or posterior flagellum**



### *Ex. Pentatrichomonas hominis*

...Is a commensal parasitic **large intestinal** protozoa which has been reported in **cats** worldwide. It was considered the cause of **trichomonal diarrhea**. Infection occurs **orally** inoculated with trophozoites.

...It has **five free anterior flagella and one recurrent or posterior flagellum**



**Thank You**

