

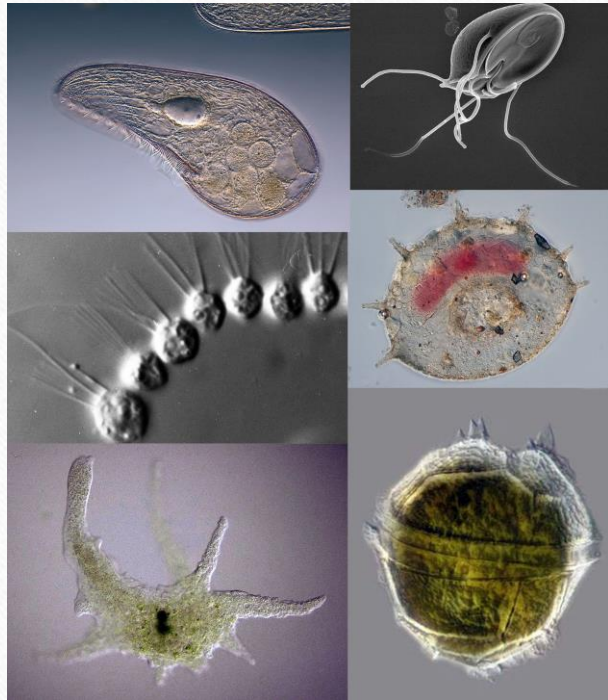
# Introduction to Medical Parasitology

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- Parasitology
  - Protozoa
  - Helminthes
  - Ectoparasites





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# Parasite

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- Is an organism that entirely depend on another organism ( host)
- Causing harm to its host
- Medical parasitology: “the study and medical implications of parasites that infect humans”
- Eukaryote: a cell with a well-defined chromosome in a membrane-bound nucleus. All parasitic organisms are eukaryotes

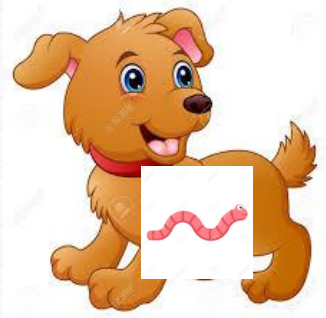


- An endoparasite: “a parasite that lives within another living organism” – e.g. malaria, Giardia
- An ectoparasite: “a parasite that lives on the external surface of another living organism” – e.g. lice, ticks
- Host: “the organism in, or on, which the parasite lives and causes harm”



- Parasites may be simple **unicellular protozoa** or complex multicellular **metazoan**
- **Protozoa: unicellular organisms, highly differentiated eukaryotic e.g. Plasmodium (malaria)**
- **Metazoa: multicellular organisms**
  1. Helminthes (macroscopic, multicellular worms possessing differentiated tissues and complex organ systems; they vary in length from more than 1 m to less than 1 mm.
  2. Arthropods (ectoparasites) ticks, lice, fleas





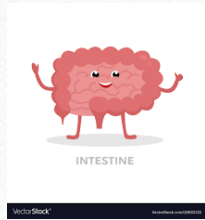
reservoir

Definitive host



adult

habitat

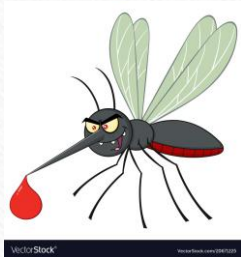


Infective stage



egg

diagnostic



vectors

intermediate



- Definitive host: “the organism in which the adult or sexually mature stage of the parasite lives”
- Intermediate host: “the organism in which the parasite lives during a period of its development only”
- Vector: “a living carrier (e.g. an arthropod) that transports a pathogenic organism from an infected to a non-infected host”. A typical example is the female *Anopheles* mosquito that transmits malaria

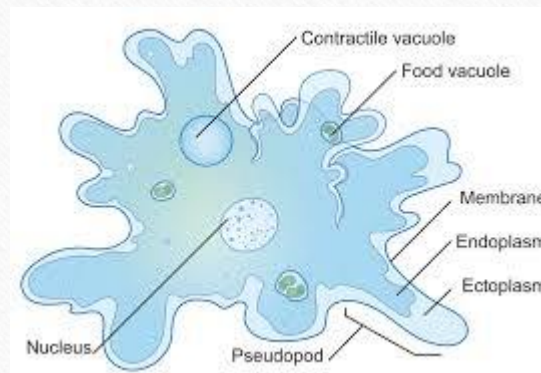




# protozoa

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- Unicellular
- Do not have cell wall
- Protoplasm (ectoplasm(cyst wall, eating, excretion) and endoplasm (food vacuoles, DNA))
- nucleus



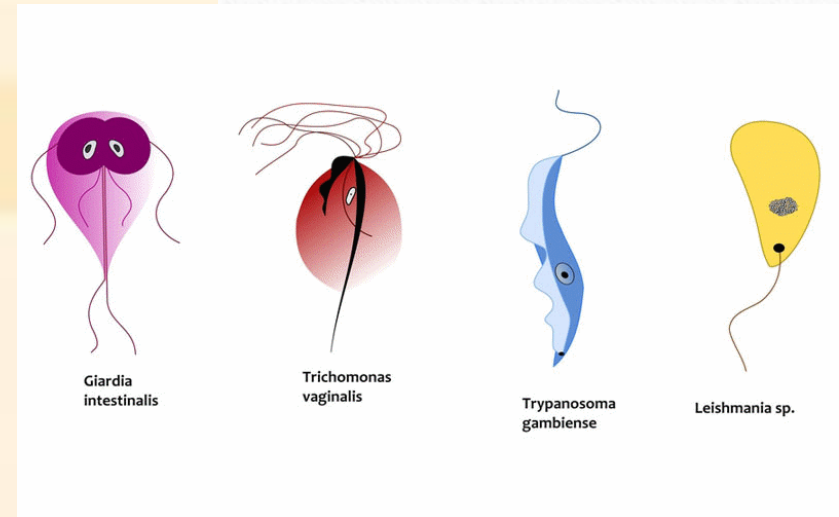
# Locomotion

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- Single celled animal-like microbes most having some form of motility
  - Amoebae (pseudopodia) cytoplasmic projection
  - Flagella (flagellates)
  - Cilia(ciliates)
  - Apicomplexa (sporozoa)



Protozoan/Disease*	Organ/System Primarily Affected**
<b>Amoeboid Protozoa</b>	
Amebiasis: <i>Entamoeba histolytica</i>	Gastrointestinal tract
Brain infection: <i>Naegleria</i> , <i>Acanthamoeba</i>	Nervous system
<b>Ciliated Protozoa</b>	
Balantidiosis: <i>Balantidium coli</i>	Gastrointestinal tract
<b>Flagellated Protozoa</b>	
Giardiasis: <i>Giardia lamblia</i>	Gastrointestinal tract
Trichomoniasis: <i>Trichomonas vaginalis</i>	Urogenital tract
<b>Hemoflagellates</b>	
Trypanosomiasis: <i>Trypanosoma brucei</i> , <i>T. cruzi</i>	Nervous system
Leishmaniasis: <i>Leishmania donovani</i> , <i>L. tropica</i> , <i>L. brasiliensis</i>	Skin
<b>Apicomplexan Protozoa</b>	
Malaria: <i>Plasmodium vivax</i> , <i>P. falciparum</i> , <i>P. malariae</i>	Cardiovascular system
Toxoplasmosis: <i>Toxoplasma gondii</i>	Nervous system
Cryptosporidiosis: <i>Cryptosporidium</i>	Gastrointestinal tract
Isosporosis: <i>Cystoisospora belli</i>	Gastrointestinal tract
Cyclosporiasis: <i>Cyclospora cayentanensis</i>	Gastrointestinal tract



# Entamoeba

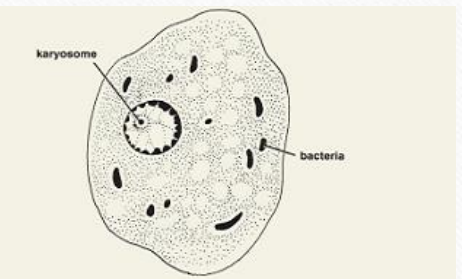
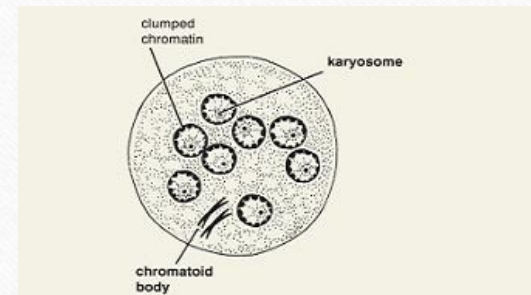
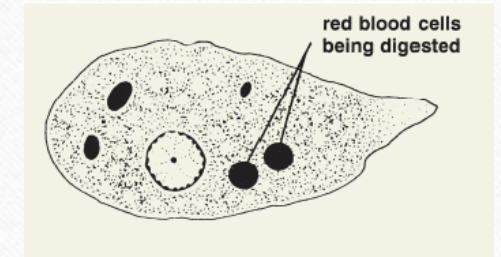
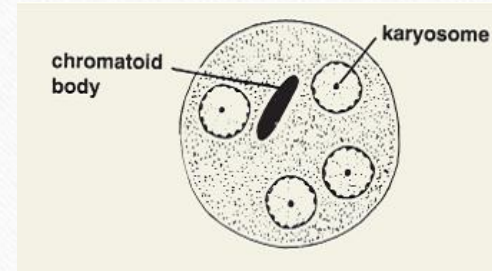
- Constantly change in shape

## 1. Intestinal

- Pathogenic *E. histolytica*
- No pathogenic (*E. coli* (>4 nuclei in the cyst))

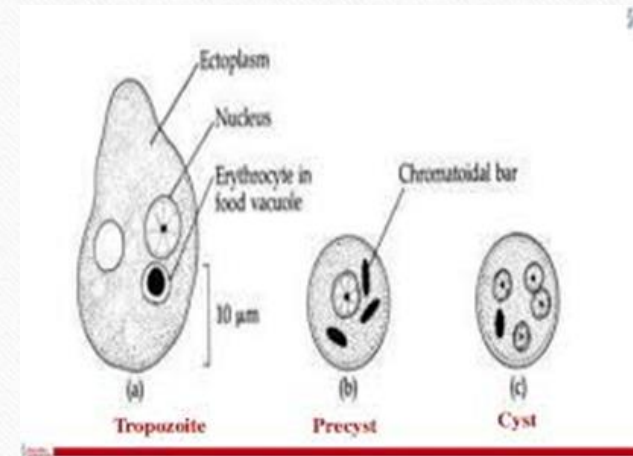
## 2. Free living

- Feco-oral rout

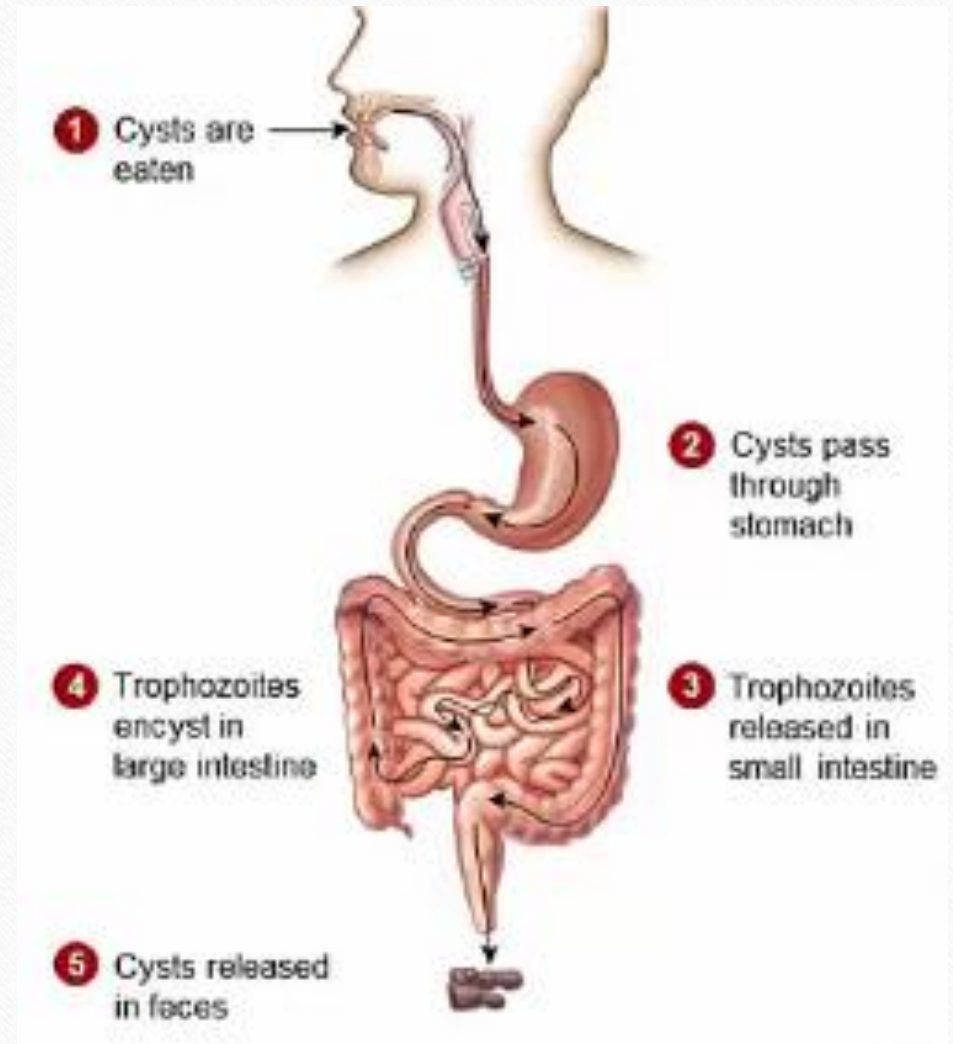


# E hostylitica

- Habitat
  - Mucosa and submucosa of large intestine
- 3 stage
  - Trophozoite
  - Precyst : intermediate stage between Trophozoite and cyst
  - Cyst



- Infective form mature **quadrinucleated cyst**
- Feco-oral route
- Cysts and arrive are swallowed and arrived the small intestine,
- Alkaline pH and digestive juice stimulate cyst to release 8 trophozoites
- Trophozoites attach, multiply, actively moved and feed
- Encystation in colon



## Trophozoite

- invasive form
- Passed only of patient with active dysentery
- Its size is 15-30  $\mu\text{m}$ .
- The cytoplasm has 2 zones
  - a hyaline outer margin (ectoplasm)
  - a granular inner region that may contain red blood cells ,food vacuoles (endoplasm).
- Single nucleus, spherical contain central dot (karyosome)
- It has pseudopodia: long finger like projection of endoplasm through ectoplasm
- Motile: active unidirectional progressive and purposeful movement



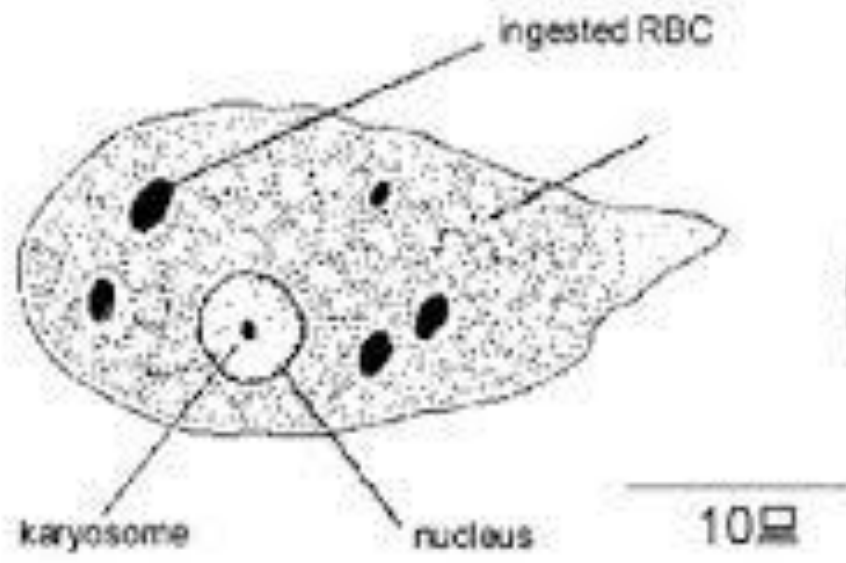
## Cyst

- Infective form found in formed stool
- Cysts are present in the lumen of the **colon** and in formed feces.
- Subspherical cysts of pathogenic amebas range from 10-20  $\mu\text{m}$ .
- Smaller cysts 10 -3.5 $\mu\text{m}$  are considered nonpathogenic (*E. hartmanni*).
- Cysts may contain 1-4 nuclei, a glycogen vacuole and **chromatoidal bodies** with characteristic rounded ends.
- Covered with smooth chitinous wall

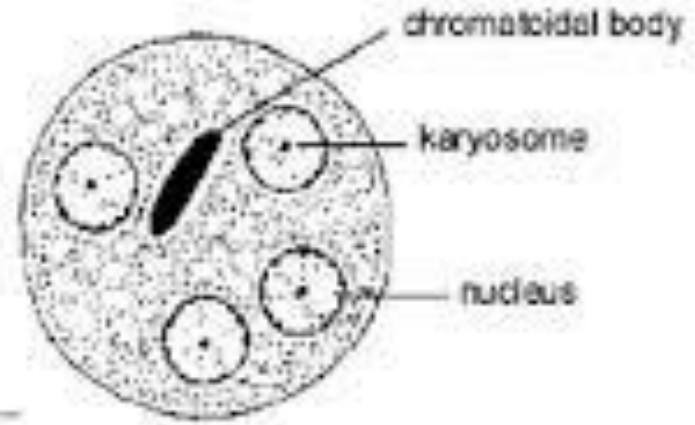




Trophozoite



Cyst



# Pathogeneses

- Colonize large intestine
- Adherence
- Invasion
  - Ulcerative lesion (flask shape: broad base and narrow neck)
  - Profuse bloody diarrhea (amoebic dysentery)
- Extraintestinal invasion



Source: Infect Med © 2002 Cillgott Publishing, Division of SCP Communications



# E. histolytica

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- Life threatening manifestation: hemorrhage, perforation, toxic megacolon, appendicitis, tumor like growth amoebomas
- May invade liver ( amoebic liver abscess) and lung ( pleuropulmonary amoebiasis....cerebral.. cardiac
- Tt: Metronidazole

Pos-sup surface of right lobe

