

Clinical Parasitology

Tropical Medicine
International Health

www.medicine.mcgill.ca/tropmed

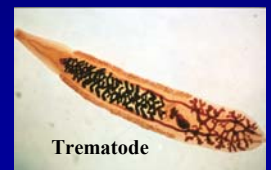
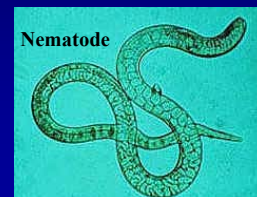
Parasitology ↔ Microbiology
Clinical parasitology → Clinical microbiology
Tropical Disease ↔ Infectious Disease
Epidemiology → Epidemiology
International Health ↔ Public Health

Institute of Parasitology, MacDonald Campus

McGill Centre for Tropical Disease, MGH

Department of Microbiology, Lyman Duff

International Health Office, Dept of Epidemiology



Kingdom Animalia

Taxonomy

Subkingdom Protozoa

Phylum Sarcomastigophora

Phylum Apicomplexa

Phylum Ciliophora

Phylum Microspora

Subkingdom Metazoa

Phylum Nematoda

Phylum Platyhelminthes

	INTESTINE	SYSTEMIC
Protozoa	<i>Entamoeba histolytica</i> <i>Giardia</i> <i>Isospora</i> <i>Cryptosporidium</i> <i>Cyclospora</i>	<i>Toxoplasma</i> malaria
Nematodes	<i>Strongyloides</i> <i>Ascaris</i> <i>Trichuris</i> hookworm pinworm	filaria <i>Toxocara</i>
Cestodes	tapeworms	hydatid cysts cysticercosis
Trematodes	intestinal flukes	<i>Schistosoma</i> liver flukes lung flukes

Intestinal protozoa

Taxonomy		
Kingdom	Animalia	
Subkingdom	Protozoa	
Phylum	Sarcomastigophora	
Subphylum	Sarcodina	Entamoeba
Subphylum	Mastigophora	Giardia
Phylum	Apicomplexa	malaria
Phylum	Ciliophora	Balantidium
Phylum	Microspora	microsporidium

Protozoa

..“eukaryote”..has genetic material encased in a nuclear membrane (unlike bacteria and viruses)

..classified traditionally by morphology (eg. organelles of locomotion), life cycle and mechanisms of reproduction etc.

Mastigophora: movement with flagella - e.g. Trichomonas, Giardia

Sarcodina: pseudopodia, e.g. Entamoeba histolytica

Apicomplexa: apical complex, no locomotor apparatus; sexual reproduction, e.g. cryptosporidium, malaria, toxoplasma

Ciliophora: movement with cilia, e.g. Balantidium.

INTESTINAL PROTOZOA	
Pathogenic	Commensal
<i>Entamoeba histolytica</i>	<i>Entamoeba hartmani</i>
<i>Balantidium coli</i>	<i>Entamoeba dispar</i>
<i>Giardia lamblia</i>	<i>Entamoeba coli</i>
<i>Dientamoeba fragilis</i>	<i>Endolimax nana</i>
<i>Cryptosporidium parvum</i>	<i>Iodamoeba bütschlii</i>
<i>Enterocytozoon bieneusi</i>	<i>Chilomastix mesnili</i>
<i>Septata intestinalis</i>	<i>Trichomonas hominis</i>
<i>Cyclospora cayetanensis</i>	<i>Blastocystis hominis</i>
<i>Isospora belli</i>	

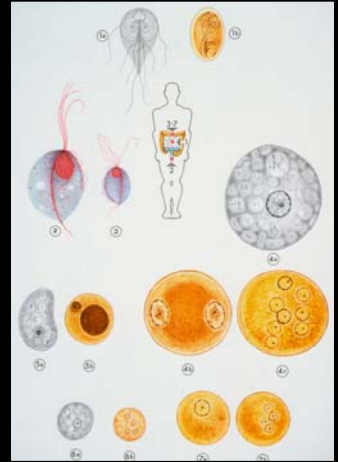
Trophozoite: any stage in a protozoan's life cycle which can ingest food. In practice also refers to the motile form.

Cyst: the non motile form which is protected by a distinct membrane or cyst wall. This is an infective stage of the parasite.

Excystation: the process of emergence of the trophozoite from the cyst (vs. encystation)

Pseudopod: literally means false foot; temporary cytoplasmic processes at the surface of the trophozoite

Intestinal protozoa

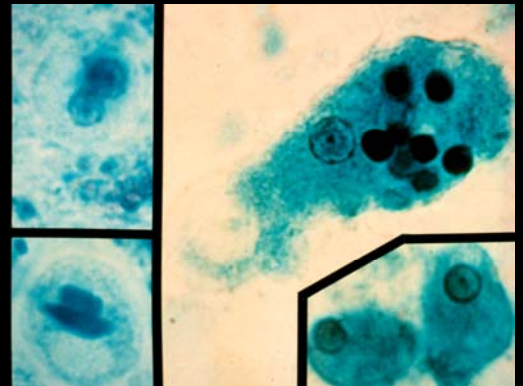


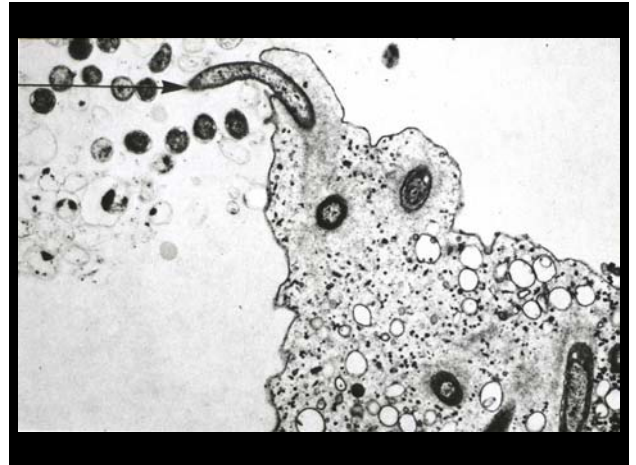
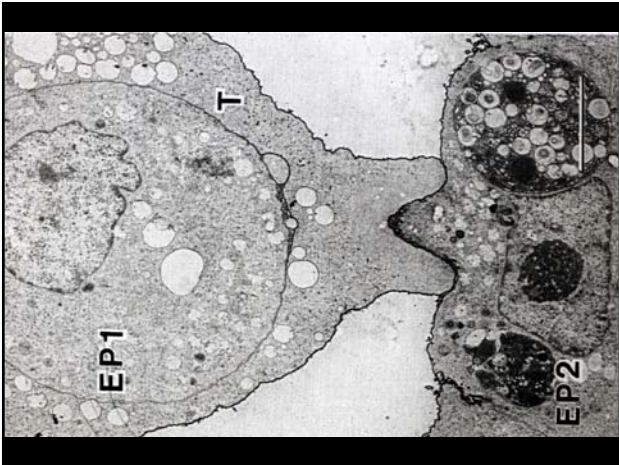
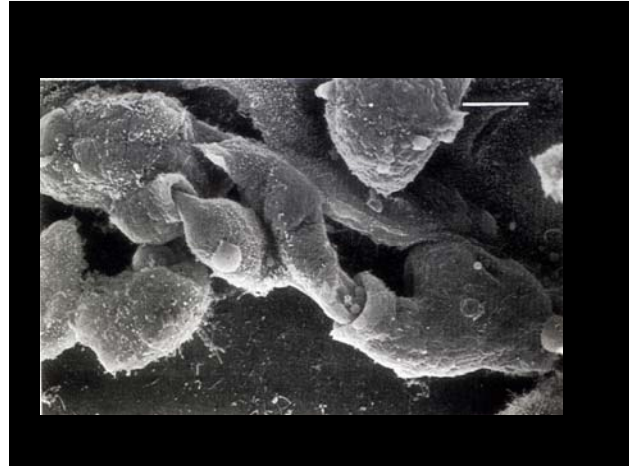
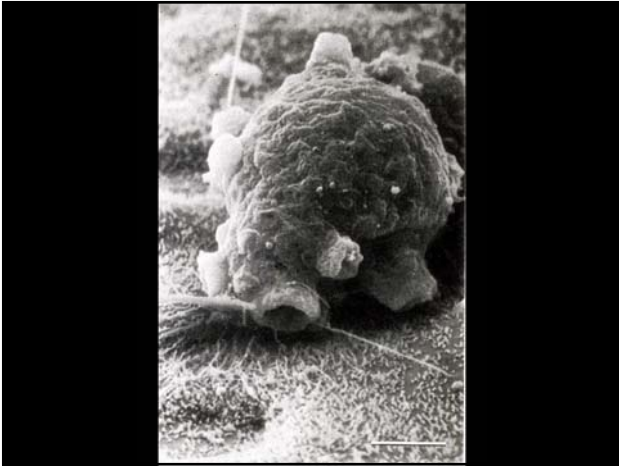
Entamoeba histolytica (amoebiasis)

Subphylum sarcodina



Entamoeba histolytica trophozoite with ingested RBCs





Epidemiology of *Entamoeba histolytica*

Man the only source (not a zoonosis)

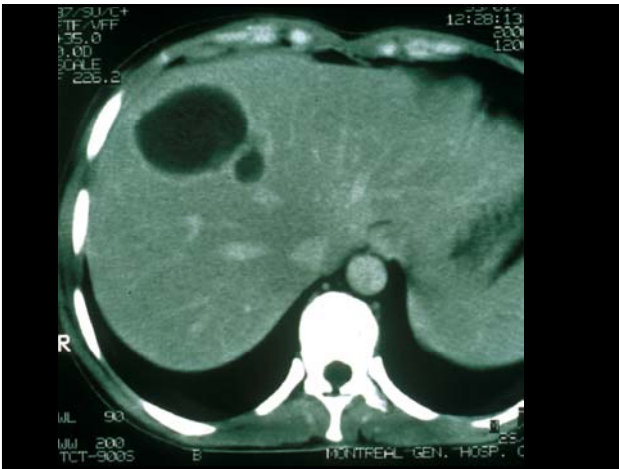
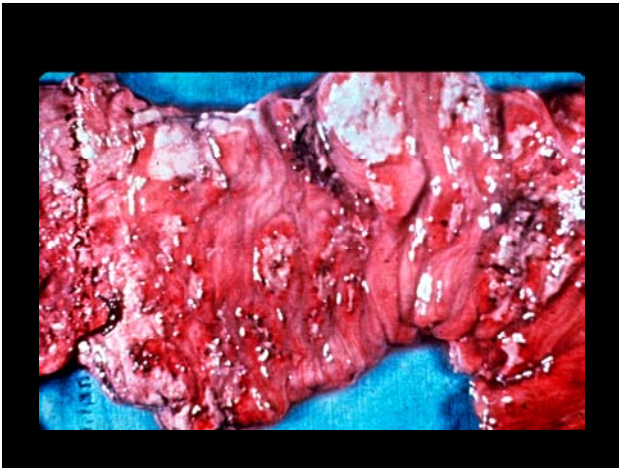
Fecal-oral transmission

Our understanding is in transition
because of mis-identified cases.

Seen in travellers, Saskatchewan native population

AMOEBIASIS

- 1) asymptomatic carrier state
- 2) acute amoebic dysentery
- 3) amoebic liver abscess
- 4) amoeboma



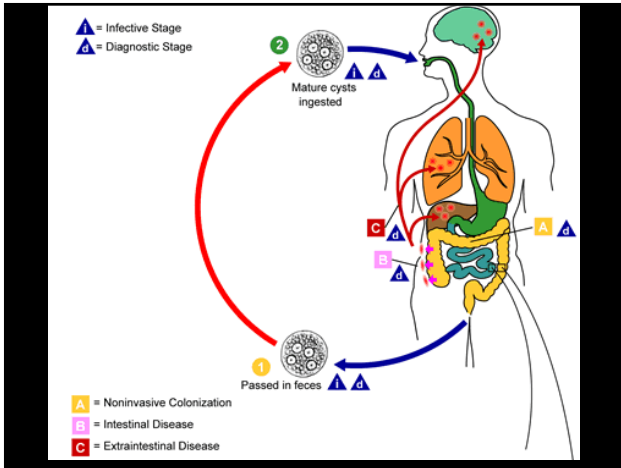
AMOEBIC LIVER ABSCESS

Presentation

1. persisting fever
2. RUQ or epigastric pain and/or shoulder pain
3. rarely diarrhea

Diagnosis

1. ultrasound
2. raised WBC
3. serology
4. aspirate microscopy
5. response to metronidazole 750 t.i.d.

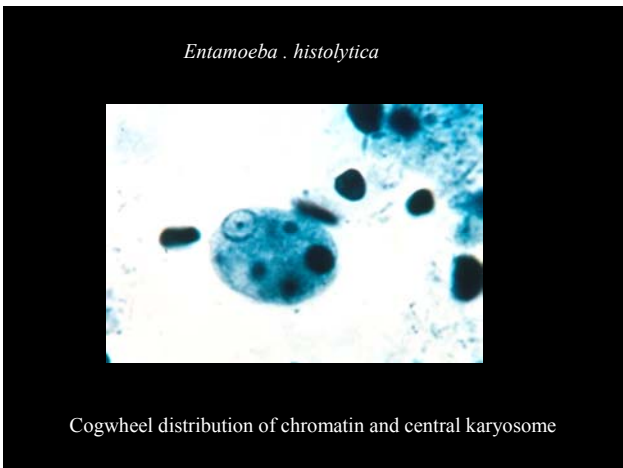
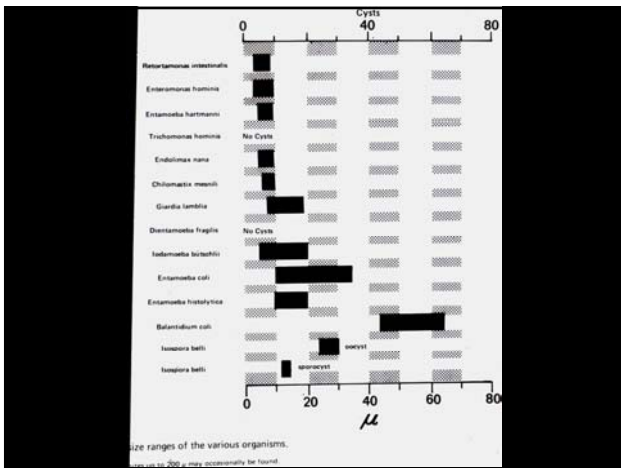
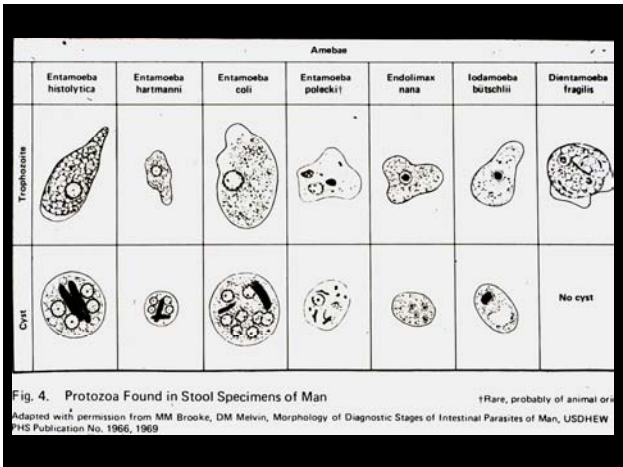


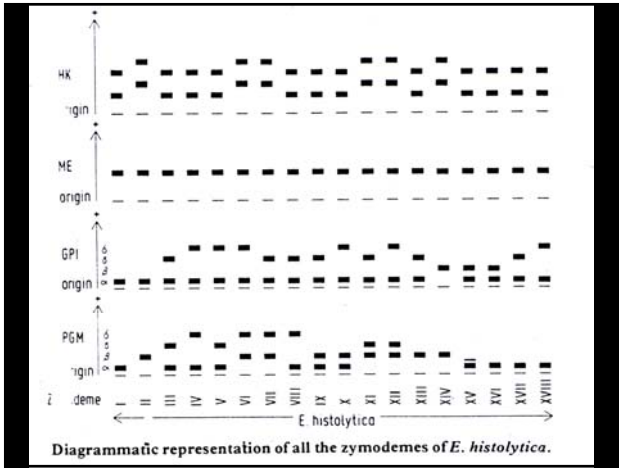
Laboratory problems

1. sensitivity
2. specificity

Sequential Stool Examination for *E. histolytica*

	1	2	3	4	5
direct	13	25	34	43	50 %
direct and concentration	21	38	51	61	69 %
direct, concentration and stain	41	65	79	88	93 %





Entamoeba histolytica/dispar

E. histolytica E. dispar
(antigen capture, PCR, culture and zymodemes)

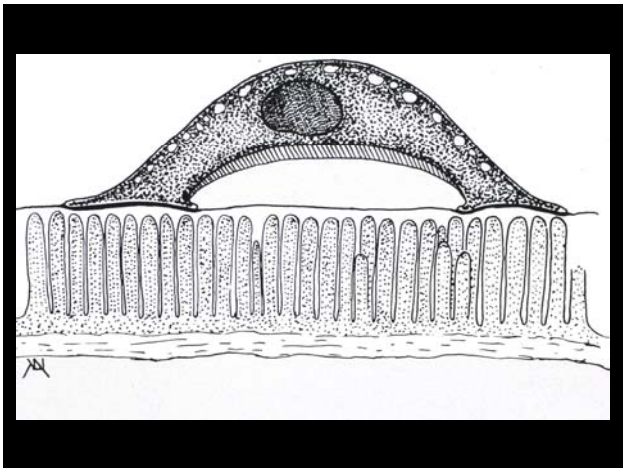
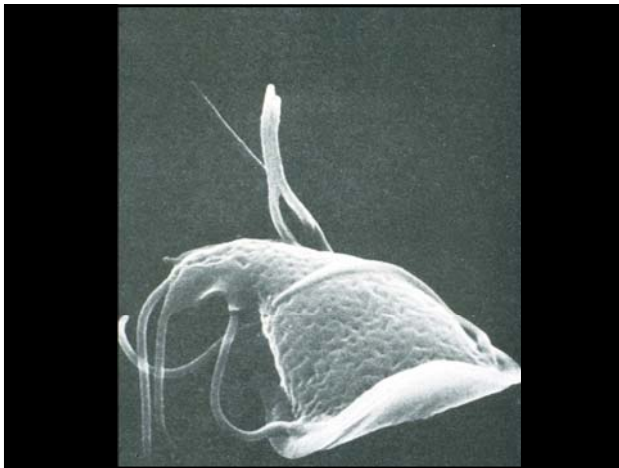
Drugs for Entamoeba histolytica

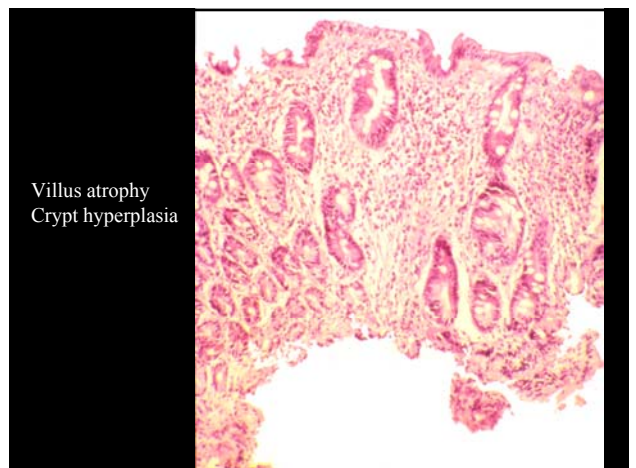
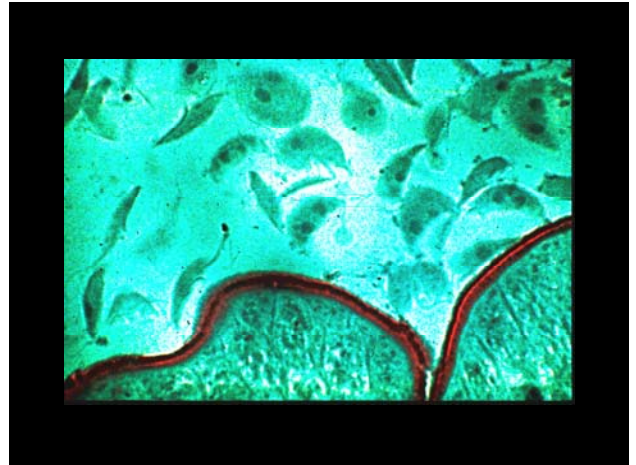
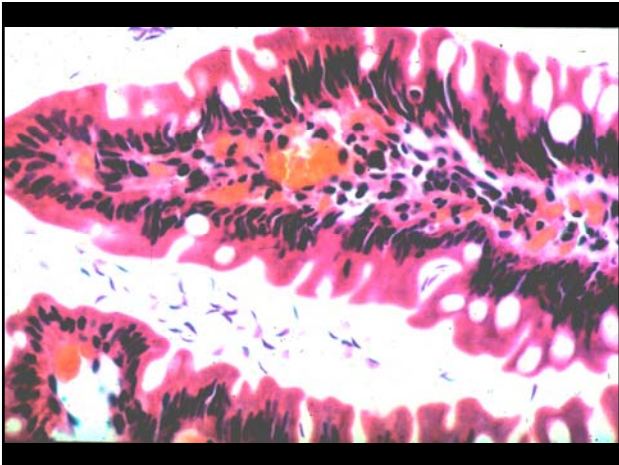
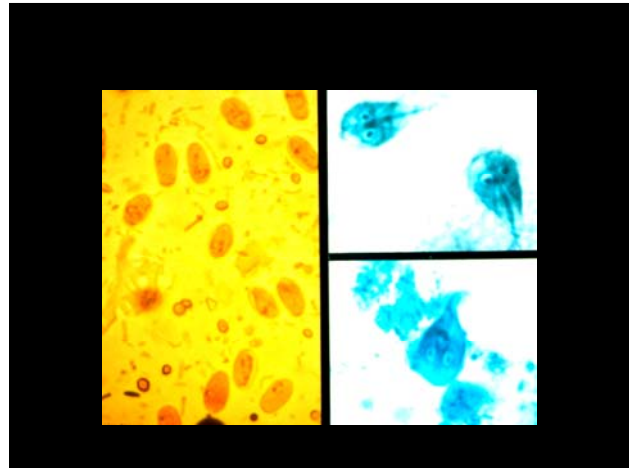
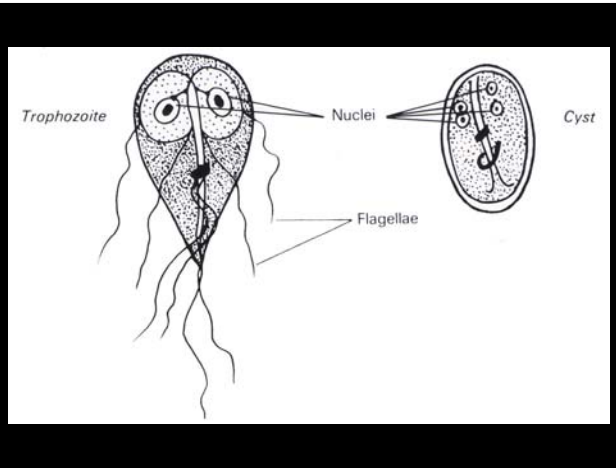
Tissue: ..metronidazole, tinidazole, secnidazole, ornidazole
 ..emetine
 ..dehydroemetine
 ..chloroquine

Bowel lumen: ..paromomycin (Humatin)
 ..diodochlorhydroxyquin (Diodoquin)
 ..diloxanide furoate (Furamide)

Giardia lamblia

Subphylum mastigophora





Giardia epidemiology:

- faecal oral spread
- prevalence 3-5% in Canada; increased in travellers, backpackers, institutions, day care centres
- zoonosis - found in most mammals; esp. beaver ("beaver fever"), cattle, cats, dogs, etc.

GIARDIASIS

Symptoms

- diarrhea
- flatulence
- abdominal cramps
- decreased appetite
- ± weight loss
- ± nausea
- no fever

Signs

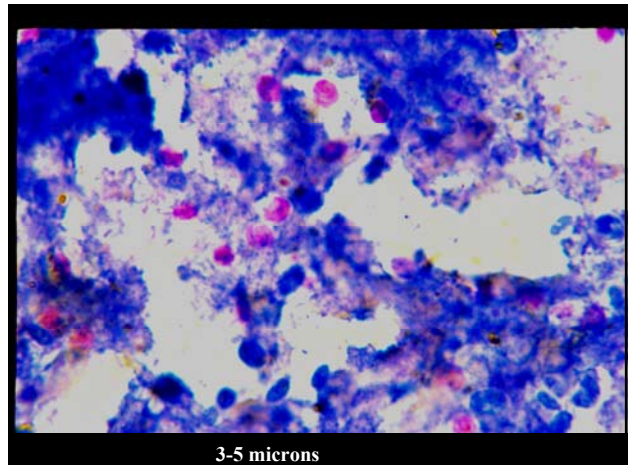
- mild abdominal tenderness

Laboratory

- no leukocytes in stool
- no mucous in stool
- giardia cysts intermittent in stool
- giardia cysts in duodenal aspirate

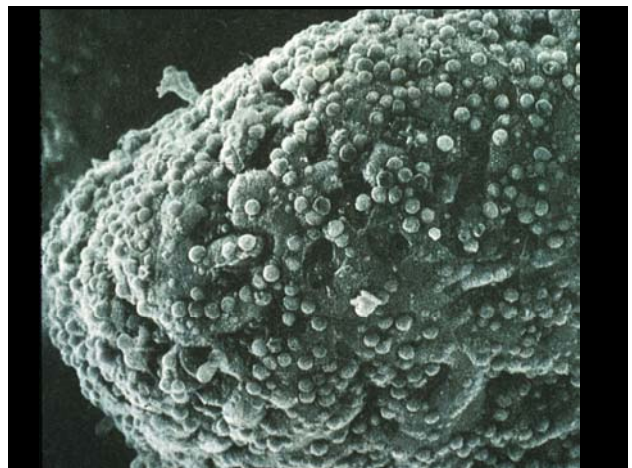
Cryptosporidium parvum

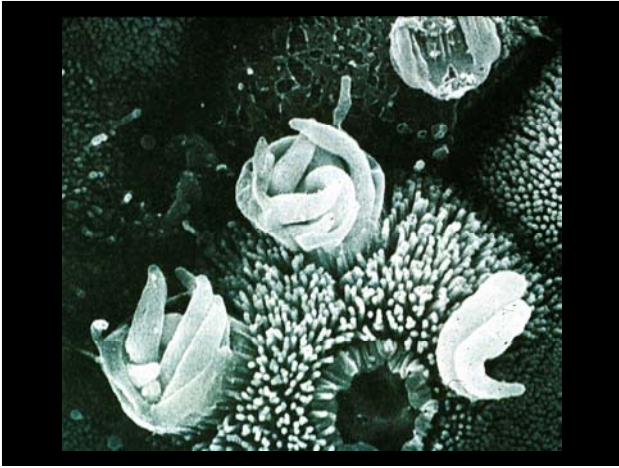
Phylum apicomplexa



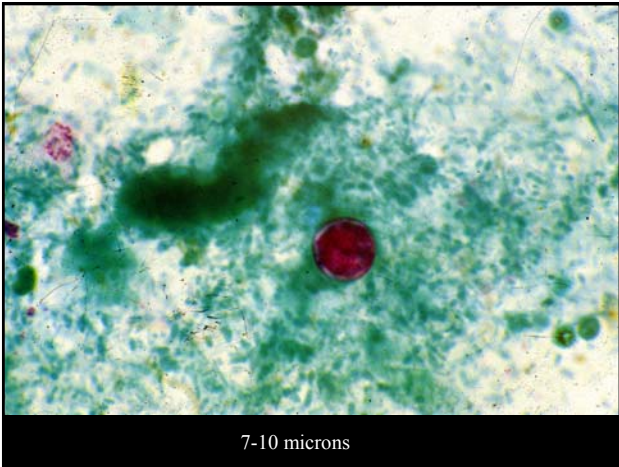
CRYPTOSPORIDIUM

- Epidemiology:**
- bovine reservoir
 - epidemic contamination of municipal water
- Biology:**
- lives in small intestine epithelial cell membrane
 - Apicomplexa life cycle
- Clinical:**
- diarrhea 2-3 weeks (chronic in AIDS)
 - cholecystitis





Cyclospora cayetanensis



Cyclospora cayetanensis

Taxonomy: Apicomplexa

Epidemiology: in travellers to tropics (Nepal, Americas)
: raspberries from Guatemala

Biology: lives in small intestine epithelial cells

Clinical: prolonged diarrhea (2-6 wks)

Treatment: Septra

Treatment of intestinal protozoa

Entamoeba histolytica	metronidazole diloxanide furoate diodohydroxyquinoline
Giardia	metronidazole atabrine
Cryptosporidium	nil
Cyclospora	Septra

- INTESTINAL PROTOZOA STAINS**
- Hematoxylin** - *E. histolytica*, *Giardia*, *D. fragilis*, *Isospora*
 - Modified Ziehl-Neelsen** - *Cryptosporidium*, *Cyclospora*
 - Trichrome** - *Microsporidium*

Trichomonas vaginalis

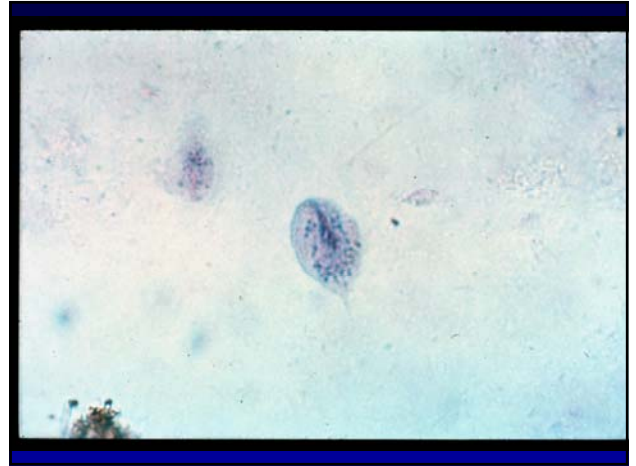
Taxonomy: Mastigophora

Epidemiology: reservoir is human urogenital tract

Biology: causes inflammation of vaginal and urethral epithelium

Clinical: vaginal discharge

Treatment: metronidazole



Your present understanding

commensalism
zoonosis

Your future challenges

1. Host immunological reaction to protozoa
2. The protozoan's host immune avoidance
3. Laboratory diagnostic tools PCR, antigen capture, proteomics
4. Orphan drugs
5. Lack of *Cryptosporidium* treatment