Life in the alimentary tract

• Most parasitized microhabitat.
  - Natural source of entry: through ingestion, although not all intestinal parasites enter this way.
  - Natural point of egress: with faeces
  - Reduced efficacy of immune response
  - Rich in organic material
  - Blood vessels very close to surface.
  - Mucosal cells relatively unprotected.
Intestinal Protists

• Excavates: *Chilomastix*, *Retortamonas*, *Giardia*, *Hexamita*, *Trichomonas*, *Tritrichomonas*, *Pentatrichomonas* *, *Histomonas*, *Dientamoeba*.

• Chromalveolata (SAR): Opalinida. *Balantidium coli* *

• Amoebozoa: *Entamoeba* *
Intestinal parasites are specific to particular parts of the intestine and differ in how they use the host.

- **Trichomonas tenax**
- **Giardia**
- **Entamoeba**
- **Dientamoeba Pentatrichomonas Chilomastix**
**Giardia intestinalis**

= *G. duodenalis*, = *G. lamblia*

- Most common intestinal parasite of man.
Giardia background

- Phylum Retortamonadida; Order Diplomonadida.
- Usually basal position in Eukarya but evidence suggests secondary loss of endosymbiotic organelles.
- Many (40+) nominal species in mammals and birds, but probably only a few are valid: broad host distributions.
Giardia intestinalis

Trophozoite
Pear shaped with adhesive disc; 2 nuclei; 4 pr flagella

Cyst
Oval; 4 nuclei; flagellar primordia
Giardia: posterolateral and anterior beat with power stroke. Caudal region (behind adhesive disc) undulates associated with internal flagellar beating. In free swimming the cell spirals forward. As they approach an object they go planar and circle before settling.
Time-lapse imaging of the beating of the caudal region.
Beating pattern of the posterolateral flagella.
Beating pattern of the ventral flagella.
Giardia intestinalis

• Diagnosis: cysts in stool. PCR techniques in development.

• Treatment: metronidazole (Flagyl) or quinacrine
Antigenic variants

Outer surface dominated by small number of surface molecules which can shift during the course of infection.

• 2 hypotheses: (1) variant surface antigens (VSA) are a defence against host immune system. (2) VSA allow parasite to survive in different intestinal environments.
Epidemiology Of Giardia

• *Giardia* occurs in a wide variety of hosts: - is this a single species with broad host specificity or is it a complex of species each with more narrow host restrictions?

• Most recent evidence points to relatively few species with broad host distribution.
Chilomastix mesnili,
Retortamonas intestinalis

• Intestinal parasites of humans
• Probably commensal, feeding on intestinal microflora but causing no harm.
Retortamonas intestinalis

Tropics, SE Asia, Africa, S America
Commensal
Others species in Insects and Tetrapods
Fig. 3.—Schematic representations of (A) Retortamonas, (B) Hexamita, and (C) Giardia.
Fig. 2.—Phylogenetic relationships between retortamonads and diplomonads based on ssu rRNA sequences.


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Trichomonadida

• Free living or in alimentary tract of arthropods and vertebrates.
• 3 species infect humans:
  - *Pentatrichomonas hominis* - intestine
  - *Trichomonas tenax* - mouth
  - *Trichomonas vaginalis* - vagina, urethra
This phylogeny, based on ribosomal small subunit sequence suggests some free living forms (F) in group may be secondarily derived.
Trichomonas vaginalis

• Infection in women of reproductive years: about 1/3 asymptomatic. Symptoms include vaginitis with green frothy discharge, pain while urinating. But easily confused with other non gonococcal STDs. Males often asymptomatic carriers.

• Diagnosis: organism in vaginal secretions; culture broths add sensitivity.
Other Parabasalea of note

- *Dientamoeba fragilis*: Human intestine, may cause diarrhea.


- *Histomonas meleagrisidis*: part of a disease complex involving liver abcesses, diarrhea, droopiness and death. Transmitted by a nematode worm, *Heterakis gallinarum*
Figure 4. Hypothesized reconstruction of the Trichomonas-like infection of the oropharynx and mandible of MOR 980, commonly known as ‘Peck’s Rex’ (Figure 2G).

http://www.plosone.org/article/info:doi/10.1371/journal.pone.0007288
Naegleria fowleri, free living, opportunistic pathogen

Excavate: Phylum Percolozoa
Entamoeba

- No mitochondria, once thought part of an ancient eukaryote lineage. Evidence suggests that mitochondrion has been lost secondarily. Amoebozoa sister group to Animals/Fungi
Entamoebidae

• Parasites (often commensal) of intestinal tract of arthropods and vertebrates.
• Human parasites:  *E. histolytica*, *E. dispar*, *E. coli*. 
*Entamoeba histolytica* diagnosis: cysts in faeces

Treatment: Flagyl (metranidazole) or iodochlorhydroxyquinoline.

Can be resistant to cure so careful follow-up needed.
pathogenesis

- Attachment to target cell involves lectin (Gal/GalNAc)
- Cysteine proteases implicated: regulate apoptosis in animal cells.
- Also involved is a protein, AP-A, which forms a dimeric structure, the amoebapore; inserted into target cell membrane, depolarizes and lysed cell.