Chapter 10 - Phylum Ciliophora

Taxonomy

Phylum Ciliophora

Class Litostomatea
Order Vestibuliferida
Genus *Balantidium*

Class Oligohymenophorea
Order Hymenostomatida
Genus *Ichthyophthirius*

Phylum Ciliophora

- Possess cilia simple cilia or compound ciliary organelles during some part of their life cycle
- Most species have 2 kinds of nuclei: macronuclei and micronuclei
- Some members of the phylum engage in sexual reproduction, involving conjugation, autogamy, and ctyogamy
- Most ciliates are free-living; however, a few groups are commensals or parasitic
- Important taxonomic criteria for members of this group include: structure of the cortex and arrangement of kinetosomes

Order Vestibuliferida

- Members of the Order Vestibuliferida typically have cilia uniformly distributed over the body
- All members of the order have a densely ciliated vestibulum near the apex of the cell
- **Vestibulum (peristome)** is a depression or invaginated area that leads directly to the cytosome; it is lined with cilia

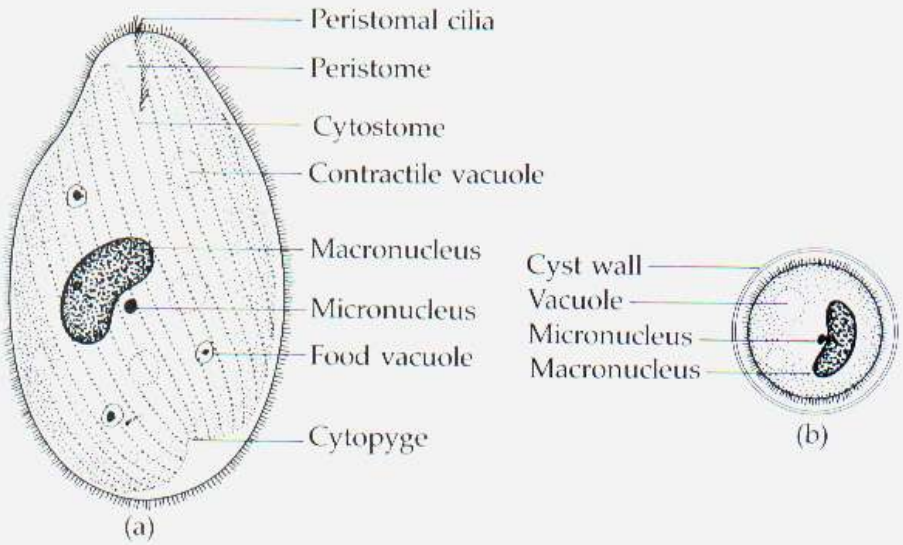


Figure 4–11
***Balantidium coli*, an intestinal parasite of pigs, monkeys, and humans.**
(a) Trophozoite. (b) Cyst.

Family Balantidiidae

- Family Balantidiidae, which includes only one genus and species (*Balantidium coli*) are found in the intestinal tract of arthropods and some vertebrates, including mammals
- Pathogens of humans, pigs and monkeys

Balantidium coli

Morphology

- Conspicuous vestibulum leads into a large cytostome; opposite of which lies a cytopyge
- Coarse cilia line the peristomal area
- Macronucleus is typically elongate and kidney-shaped; micronucleus is spherical
- 2 prominent contractile vacuoles, indicating osmoregulation
- Food vacuoles in the cytoplasm contain debris, bacteria, RBCs, and fragments of host epithelium

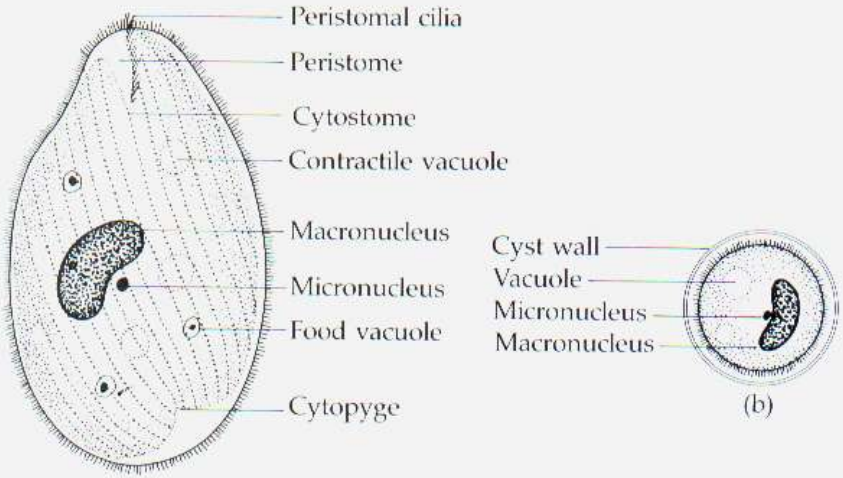


Figure 4–11
Balantidium coli, an intestinal parasite of pigs, monkeys, and humans.
(a) Trophozoite. (b) Cyst.

Life Cycle

- Both a motile trophozoite and a cyst stage occur
- The trophozoite inhabits the cecum and colon of humans and is the largest known protozoan parasite of humans
- The cyst wall is very thick and possibly consists of 2 membranes
- Transmission from one host to another is accomplished via the cyst
- Encystation usually occurs in the large intestine but may also occur outside the body of the host
- Cysts are common in the feces of the infected host
- Infection occurs when contaminated food or water is ingested
- Excystation occurs in the small intestine

Epidemology

- Balantidiosis is most often found in tropical regions throughout the world
- It is not a common human disease; the infection rate is less than 1%
- The parasite is nonpathogenic in pigs and is much more prevalent (20-100%) among these hosts
- Pigs are a good source of infection for humans in areas where they share habitation

Symptomatology

- Trophozoites primarily resides in the cecal area and throughout the large intestine
- Also thrive in the small intestine, an area rich in starch, but do not invade the intestinal mucosa
- Proclivity for starch may be the reason for the trophozoite's invasive character once it becomes established in the human cecal region, a region low in starch content
- Interestingly, in the pig's intestine, where starch is more abundant, the organism remains in the lumen
- Trophozoites presumably secrete proteolytic enzymes that act upon the mucosal epithelium, facilitating tissue invasion
- Results from infection range from asymptomatic to severe
- Parasitic invasion of the mucosal lining is followed by hemorrhaging and ulceration - **balantidine dysentery**

Diagnosis

- Examination of stool samples, looking for trophozoites and cysts
- Trophozoites are readily identified because of their large size and the fact that *B. coli* is the only ciliate that parasitizes humans
- The infection may disappear spontaneously or the host may become asymptomatic, with the host remaining as a carrier
- Several drugs that are taken orally are known to eliminate the infection

Order Hymenostamatida

- Buccal cavity has a well defined oral ciliary apparatus; buccal cavity on the ventral surface
- Members of this group are heavily ciliated; cilia uniform

Family Ichthyophthiriidae

- The family has one genus that contains two species; we will discuss only one, *Ichthyophthirius multifiliis*
- *I. multifiliis* is a relatively common parasite of FW aquarium fish and fish farms

Ichthyophthirius multifiliis

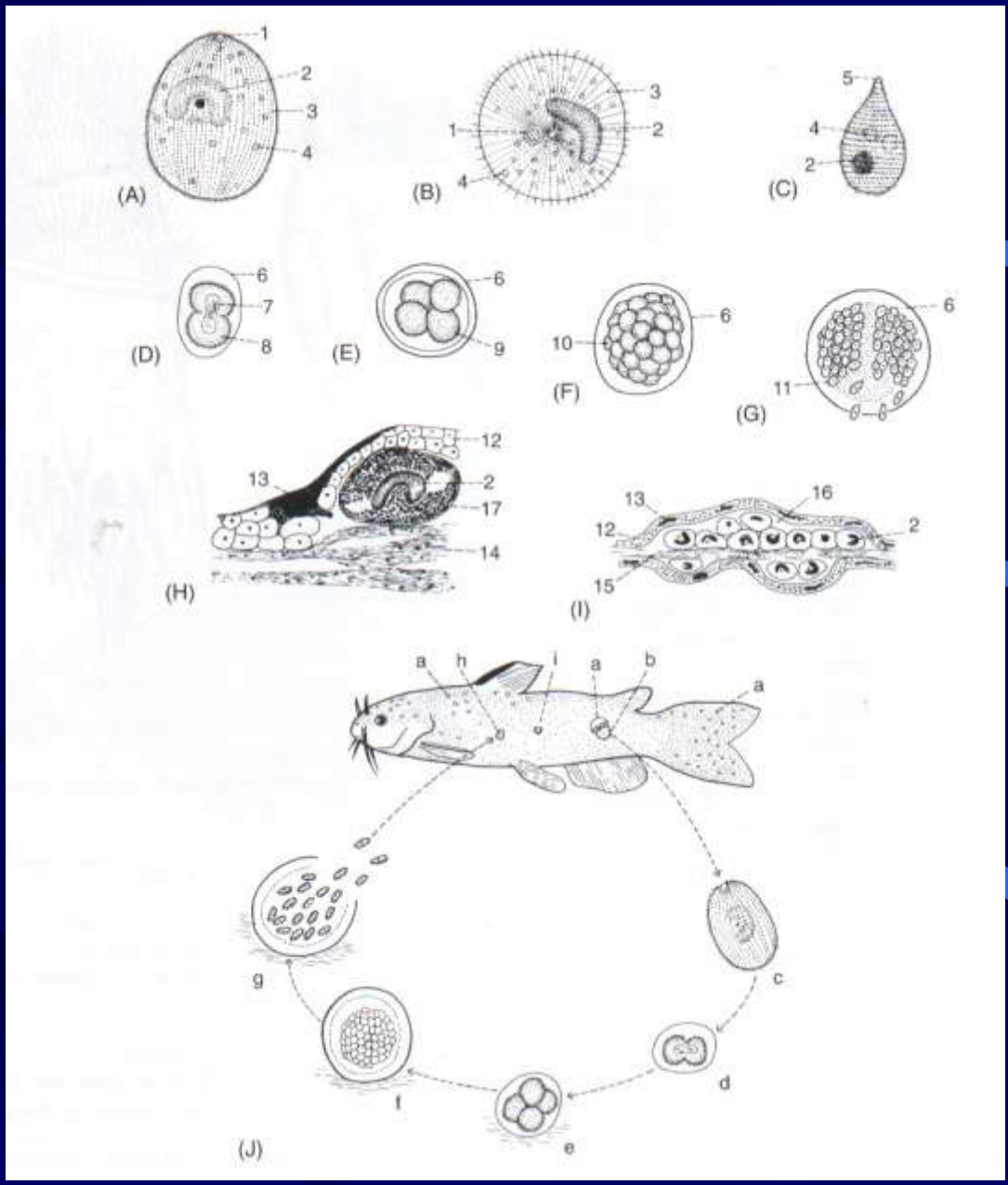
Morphology

- Large horseshoe shaped macronucleus that encircles a smaller micronucleus
- May have several contractile vacuoles
- Cytopyge found at the posterior end

Life Cycle

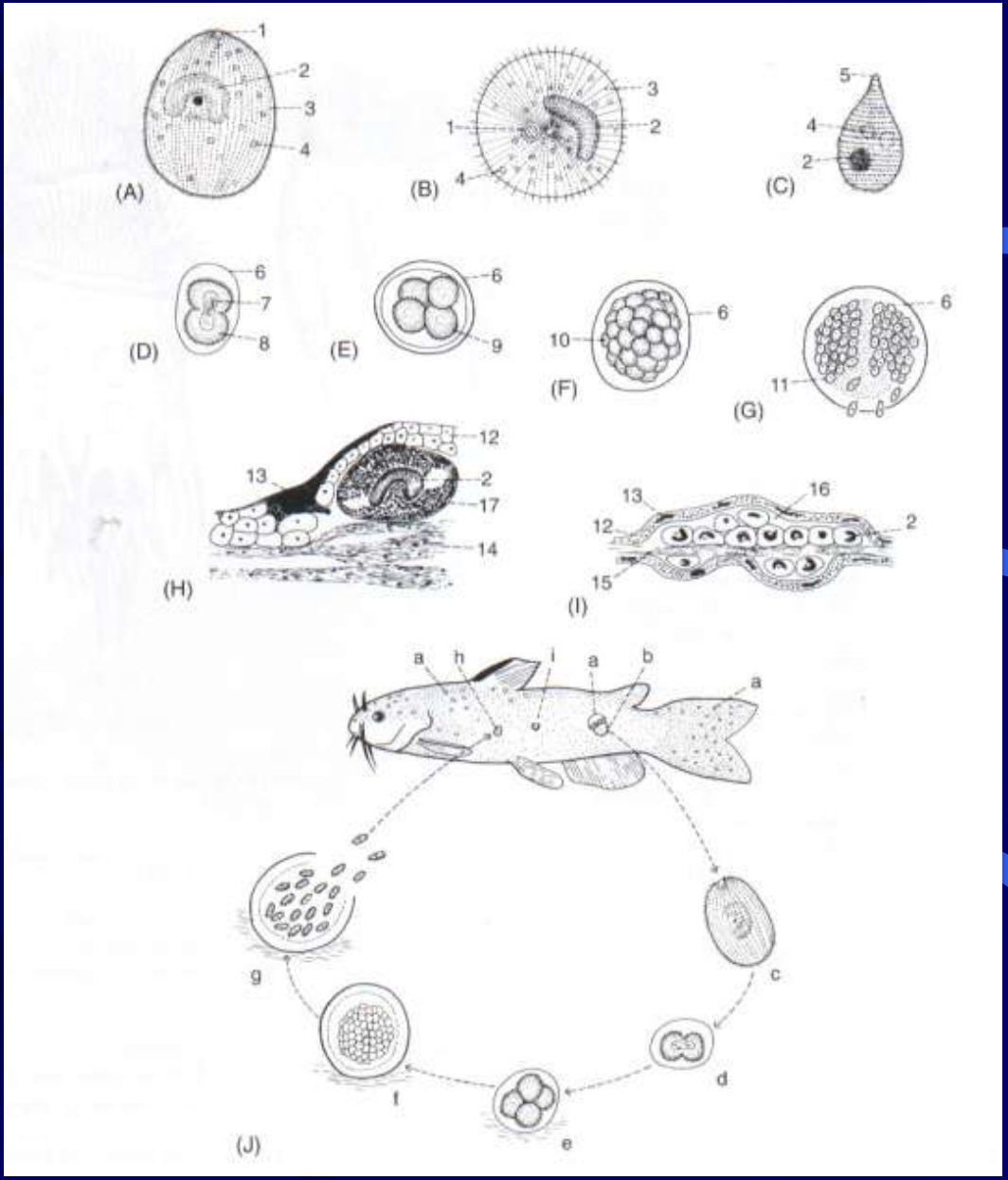
- Attacks the epidermis, cornea and gill filaments of FW fishes
- The mature trophozoites form pustules in the skin of their hosts
- When the pustules rupture, they are released and usually settle on vegetation or the bottom sediments

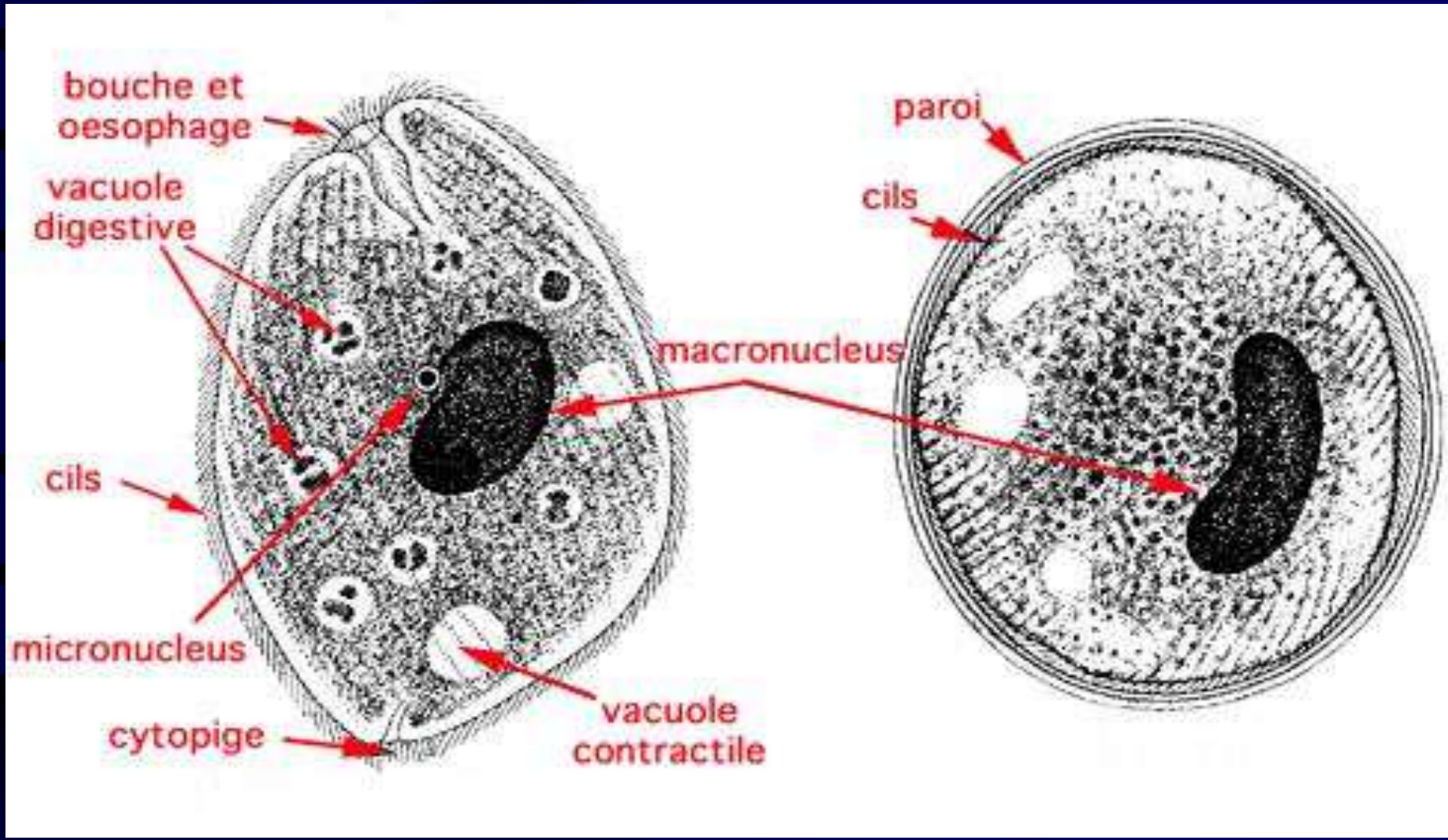
Trophozoite under the epidermis



Life cycle cont.

- Each trophozoite t then forms a gelatinous cyst and undergoes asexual reproduction producing up to 1000 infective cells
- The daughter trophozoites **(tomites)** represent the infective stage of the life cycle
- It uses a long filament that emerges from a conical depression in the pellicle to burrow into the host's skin
- At this time it becomes a trophozoite and begins to ingest host tissue; pustules form to complete the life cycle





• Treatment of aquarium fish can involve dilute concentrations of formaldehyde or methylene blue