

XVI. The Ciliophora (Chapter 10) 2009

A. Characteristics

1. Locomotion by CILIA (CILIUM = eyelash).
 - a. Hair-like projections
 - (1) Central shaft (= axoneme)
 - (2) KINETOSOME or BASAL BODY controls beating
 - b. Some groups lose cilia in some stages of life-cycle
2. Dikaryotic (= 2 nuclei)
 - a. Nuclei rather than cilia distinguish ciliates from other protozoans
 - b. MACRONUCLEUS
 - (1) Sausage-shaped
 - (2) Regulates cell metabolism
 - c. MICRONUCLEUS
 - (1) Small
 - (2) Involved in sexual recombination during conjugation
3. Digestion
 - a. Most ingest food through a CYTOSTOME
 - b. Cytostome may be within a depression (mouth equivalent)
 - (1) PERISTOME
 - (2) Buccal cavity
 - c. Ingested items are digested in FOOD VACUOLES
 - d. Waste eliminated through CYTOPYGE (anus equivalent)
4. CONTRACTILE VACUOLE
 - a. Expels water (Urinary system equivalent)
 - b. May be more than 1
5. Reproduction
 - a. Asexual
 - (1) Most common
 - (2) Binary fission

Picture Slide: Asexual reproduction in a free-living ciliate

- b. Sexual
 - (1) CONJUGATION
 - (2) Two ciliates exchange micronuclei

B. Important symbiotic ciliates

1. Ciliates in ruminants (Fig. 10.5)
 - a. In rumen & reticulum of cattle and other ungulates (Not in carnivorous mammals)
 - b. Some are the most complicated protozoans known
 - c. Enzyme, cellulase, is absent in all vertebrate digestive systems
 - d. Participate in digestion (= fermentation) of cellulose
 - (1) Role NOT essential to host survival
 - (2) Fermentation of cellulose will continue to be performed by symbiotic bacteria
 - (3) Defaunated ruminates do NOT grow as fast untreated controls

Picture Slide: The Ruminant Stomach; Four specialized compartments enable ruminants to digest and subsist on protein-poor plant material; Purves, *et al.*, 2001, *Life The Science of Biology*, 6th ed., W.H. Freeman & Co., p. 902

Picture Slide: Ruminant Ciliate Symbionts; Fig. 10.5, p. 177

2. *Balantidium coli* (pp 176-77)
 - a. World-wide distribution
 - b. Only ciliate parasitic in humans
 - c. Pigs may be a more ancient host
 - d. BALANTADIASIS
 - (1) Pathogenic
 - (2) As with amebic dysentery, cells invade mucosal layer of large intestine causing ulcers

Picture Slides: *Balantidium coli* trophozoite;
<http://www.soton.ac.uk/~ceb/Diagnosis/Vol2.htm>

- (3) Ciliates secrete enzyme HYALURONIDASE which breaks down extracellular matrix of connective tissue
- (4) Often associated with the whipworm, *Trichiuris trichiura*

Data Slide: Outbreak of Balantidiasis following a Typhoon on the Island of Truk; It is thought that pig feces contaminated the drinking water following the typhoon; Smyth, J.D, 1994, *Introduction Animal Parasitology*, 3th ed., Cambridge Univ. Press, p. 151

3. *Ichthyophthirius coli* (Figs. 10-6 & 10.7, pp 179-180)
 - a. "Ich"
 - b. Commonly infect freshwater fish in aquaria
 - c. Will kill fish by interfering with osmoregulation and gill function

Picture Slide: Life-cycle of the ciliate, *Ichthyophthirius*; Smyth, J.D, 1994, *Introduction Animal Parasitology*, 3th ed., Cambridge Univ. Press, p. 150

Data Slide: Effect of temperature on asexual reproduction of *Ichthyophthiriu*; Smyth, J.D, 1994, *Introduction Animal Parasitology*, 3th ed., Cambridge Univ. Press, p. 150.

4. Ciliates on crustaceans
 - a. Some species located ON host
 - (1) Form LORICA (*i.e.* house)
 - (2) Catch excess food of host and/or small plankton
 - b. Other species located IN exoskeleton
 - (1) Burrow into exoskeleton
 - (2) Consume inner layer of exoskeleton (Evolutionary transition stage between ecto- & endo- parasite?)

Picture Slide: Leg of grass shrimp showing heavy ciliate infestation in the exoskeleton; Overstreet, 1978, *Marine Maladies?* MASGP-78-021

Picture Slide: The ciliate, *Lagenopryx*, is found in the exoskeleton of grass shrimp and feeds on phytoplankton and scraps of host food; Overstreet, 1978, *Marine Maladies?* MASGP-78-021