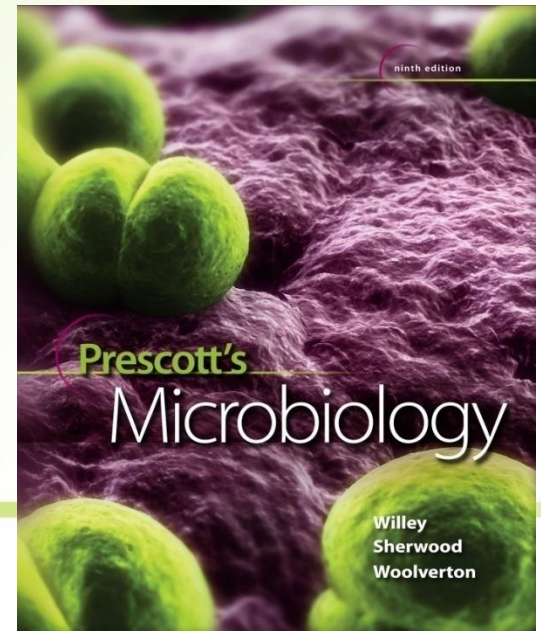


25

The Protists



The Protists

- Eukaryotes with the taxonomic classification in flux
- Kingdom Protists is artificial grouping of over 65,000 different single-celled life forms
- A polyphyletic collection of organisms
- Most are unicellular
- Lack the level of tissue organization present in higher eukaryotes

Distribution of Protists

- Grow in a wide variety of moist habitats
- Most are free living
- Chemoorganotrophic forms play role in recycling nitrogen and phosphorus
- Terrestrial and planktonic forms
- Parasitic forms cause disease in humans and domesticated أليف animals

Nutrition in Protists

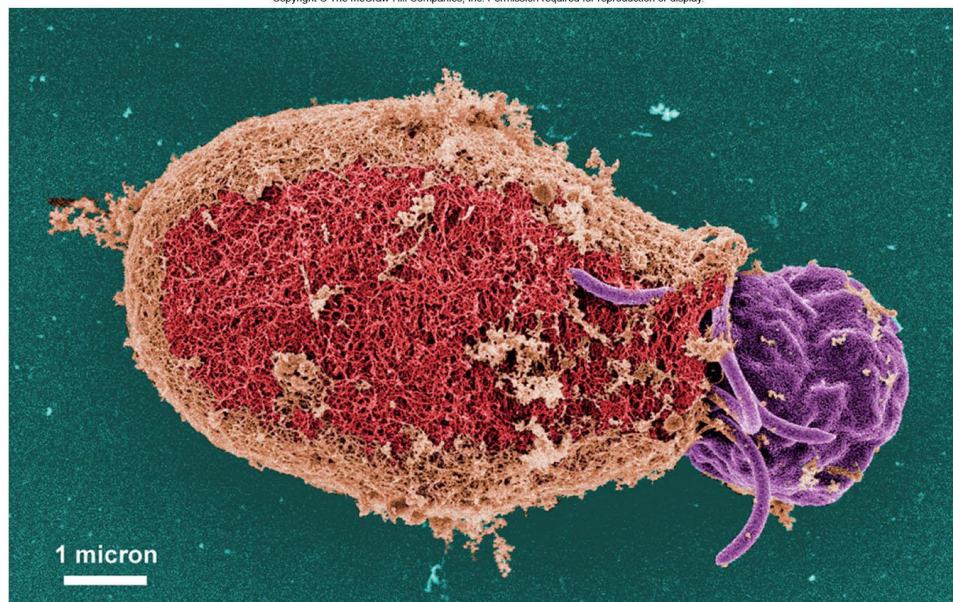
- Protozoa are chemoheterotrophic protists
 - saprophytes – nutrients obtained from dead organic matter through enzymatic degradation
 - osmotrophy – absorb soluble products
 - holozoic nutrition – solid nutrients acquired by phagocytosis
- Photoautotrophic protists
 - strict aerobes, use photosystems I and II for oxygenic photosynthesis
- Mixotrophic protists
 - use organic and inorganic carbon compounds simultaneously

Encystment and Excystment

- Encystment
 - protists simplify in structure and become dormant (cyst) with a cell wall and very low metabolic activity
 - protects against environmental changes
 - can assist in nuclear reorganization/reproduction
 - serve as a means of host to host transfer for parasitic species

Encystment and Excystment

- Excystment
 - A return to favorable conditions may stimulate a cyst form to return to its original state
 - In parasitic protists, this may occur following ingestion of a cyst by a new host organism



CDC/ Dr. Stan Erlandsen

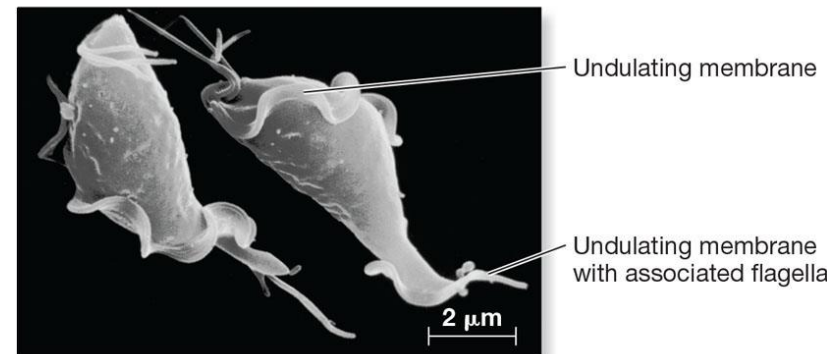
- Microaerophilic protist
 - epidemic diarrhea from contaminated water
 - members are flagellated and lack mitochondria
 - *Giardia* have mitosomes (mitochondria-like double-membrane bounded organelles)
- Most are harmless symbionts with the following exceptions
 - *Giardia* – causes diarrhea
 - *Hexamida salmonis* – fish parasite
 - *H. meleagridis* – turkey pathogen

Fornicata

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(a) *Giardia intestinalis*



(b) *Trichomonas vaginalis*

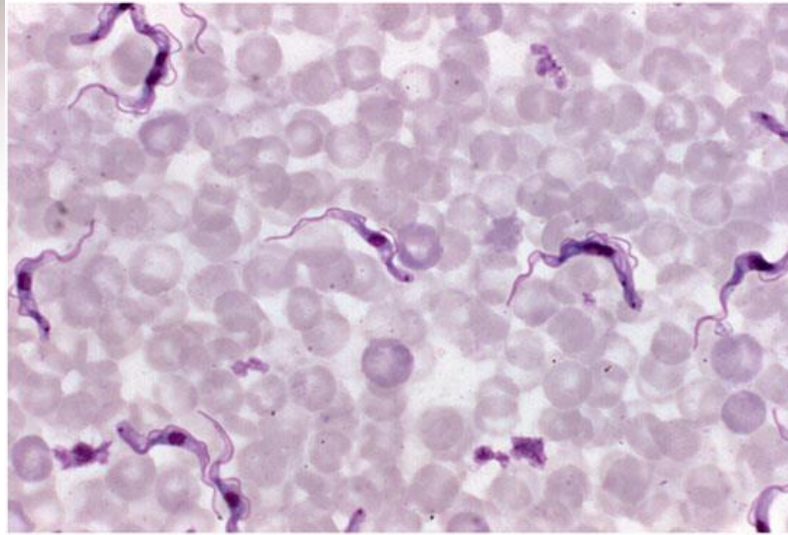
a: © Jerome Paulin/Visuals Unlimited; b: © David Phillips/Mediscan Visuals Unlimited

Pathogenic Trichomonads

- *Trichomonas foetus*
 - spontaneous abortion in cattle
- *Dientamoeba fragilis*
 - diarrhea in humans
- *Trichomonas vaginalis*
 - trichomoniasis sexually transmitted infection in humans
 - 7 million cases in U.S.
 - 180 million worldwide

Pathogenic *Euglenozoa*

- Trypanosomes
 - parasites of plants and animals
 - leishmaniasis
 - caused by members of genus *Leishmania*
 - includes systemic and skin/membrane damage
 - *Trypanosoma cruzi*
 - causes Chagas' disease
 - transmitted by “kissing bugs”
 - causes damage to nervous system
 - *T. gambiense* and *T. rhodesiense*
 - cause African sleeping sickness



(a)



(b)

a: CDC/Dr. Mae Melvin; b: © Edward S. Ross

Trypanosomes

- Antigenic variation
 - thick glycoprotein layer coating cell wall surface which is changeable
 - enables the parasite's escape from the host immune system
 - no vaccines
 - new drugs may target flagellar axonemal proteins important for division

Super-Group *Amoebozoa*

- Amoeboid motility - use of pseudopodia for locomotion and feeding
 - terms for shape of pseudopods
 - lobopodia – rounded
 - filopodia – long and narrow
 - reticulopodia – form a netlike mesh
- Naked amoebae are surrounded only by a plasma membrane
- Testate amoebae
 - plasma membrane covered by material made by amoeba or obtained from the environment
- Reproduce by binary or multiple fission

Tubulinea

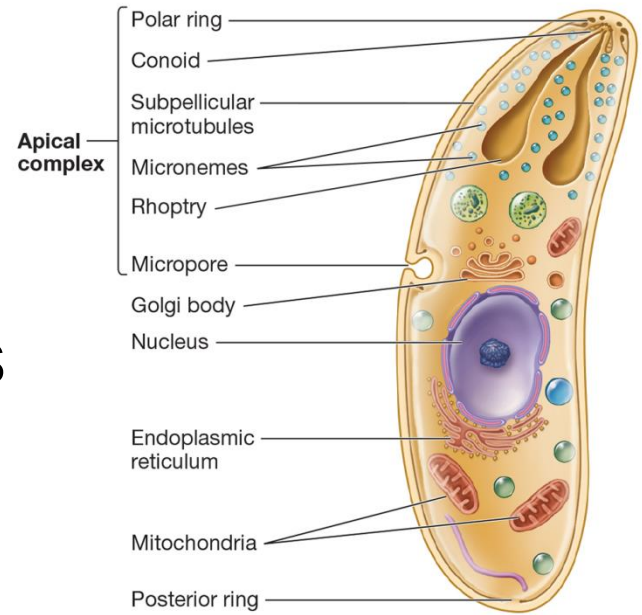
- Members inhabit moist environments
- Free-living, endosymbiotic, commensal and parasitic forms
- *Amoeba proteus*
 - present in this phylum
 - commonly used in student laboratories

Entamoebida

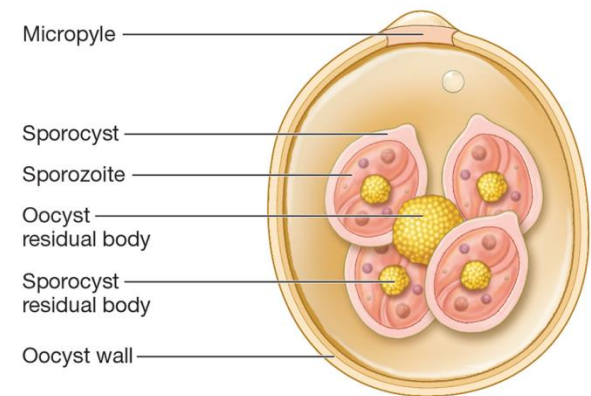
- Lack mitochondria, hydrogenosomes
 - may possess 20 mitochondrial proteins
- *Entamoeba histolytica*
 - causes amoebic dysentery
 - third leading cause of parasitic death worldwide
 - acquired by consuming *E. histolytica* cysts
 - may migrate to lungs, brain, liver, or skin

Apicomplexans

- Distinguished by the unipolar apical complex
- Parasitic with complex life cycles
 - life cycle has both sexual and asexual phases
 - clonal and sexual stages are haploid, except for zygotes
 - sporozoite is the motile, infective stage
- Most important member is *Plasmodium*, the cause of malaria



(a) Merozoite



(b) Oocyst

Other Pathogens...

- *Eimeria*
 - causative agent of cecal coccidiosis in chicken
- *Theilaria*
 - fatal fever in cattle
- *Toxoplasma*
 - cause of toxoplasmosis
- *Cryptosporidia*
 - cause of cryptosporidiosis