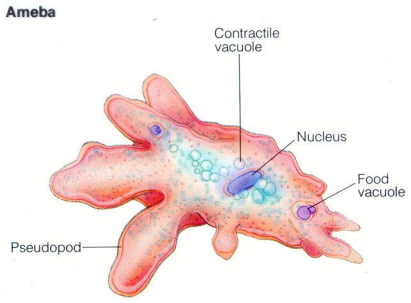
Lecture Note Handout – Chapter 9

Chap 9: Protista & Fungi,

I. Kingdom: Protista - diatoms, dinoflagelates, paramecium, ameba, most algae

A. What are they?

1. "**Junk drawer**" kingdom – a little bit of everything
2. Single cellular to multi-cellular and over 300 ft long
3. All are **Eukaryotes**, autotrophs and heterotrophs
4. All live in moist surroundings
5. Divided into three categories: **Animal-like, Plant-like and Fungus-like**



B. **Animal-like Protists**: **Protozoans** – 4 types based on the way they move

1. Phylum Sarcodina: Ameba (microscopic size)

a. Structure

i. **Pseudopod** – "false foot"- cell membrane bulges and cytoplasm flows and fills causing the organism to move

ii. **Contractile vacuole** – used to remove excess water

iii. Nucleus

iv. **Food vacuole**: food is surrounded and the "food" is engulfed by pseudopods

v. **Endoplasm**- thick cytoplasm that fills the cell

vi. **Ectoplasm**- thin layer of cytoplasm just inside the cell membrane

b. **Reproduction**- Asexual binary fission resulting in genetically identical daughters

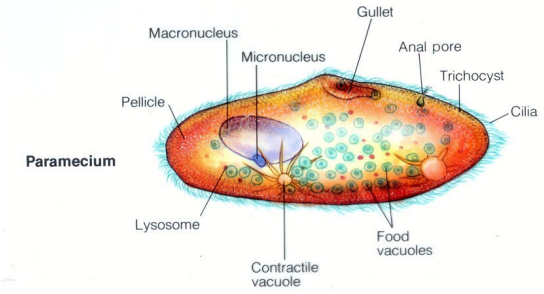
2. **Phylum Ciliophora**: Paramecium- "cilia bearing" (microscopic size)

a. Structure

i. **Cilia-** short hair-like projections usually covering organism used for movement

ii. **Pellicle –** quilt-like cell membrane and underlying structures

iii. **Trichocysts-** tiny flask-like spines used for protection



iv. **Micronucleus and Macronucleus-** two types of nuclei used in "sexual" reproduction

v. **Anal Pore-** area on cell membrane where used up food vacuole is discharged into the environment

vi. **Contractile vacuole-** removes excess water from the cell

vii. **Oral Groove** – Opening that collects food stuffs "baseball glove"

viii. **Gullet –** Location food enters the cell "Throat"

ix. **Mouth pore:** top of gullet connecting outside and inside

b. Reproduction

i. Asexual- **binary fission**

ii. Sexual – **Conjunction**- not a true "sexual" reproduction because no new organism is formed. A multi step process: 1)Two organisms join side by side. 2)The Macronucleus of each paramecium dissolves 3) The micronuclei of each undergo meiosis resulting in 4 haploid bodies. Three of these dissolve away leaving only one haploid body from the micronuclei. 4) the

haploid body divides into two haploid bodies. 5) One of these bodies from each paramecium migrate across to the other and then combines with the remaining haploid body forming a new micronucleus. 6)The parameciums disconnect 7) This new micronucleus has info to build a new macronucleus which will then control cell functions in the paramecium. * No "new" offspring are produced, only genetic material has been exchanged.

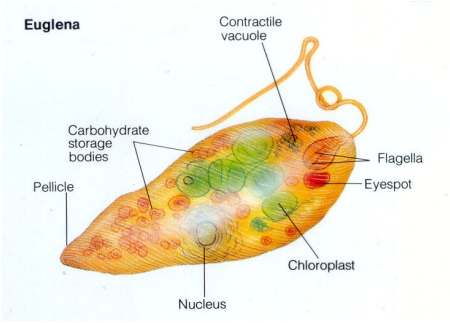
3. **Phylum Sporoza**: example: *Plasmodium* sp.These critters are nonmobile, all are **Parasitic** (lives in or on a host and causes damage to the host) and cause harm to its host. They all reproduce w/ spores. The example given is the Sporozoan that causes Malaria in Humans. The organism has a two part life cycle requiring a mosquito as a host and then from the mosquito it infects and grows in humans.
4. **Phylum Zoomastigina** – common name of this phylum are the "flagellates" because they all move w/ the use of flagella. And example is *Giardia* sp. which lives in contaminated streams and rivers, once ingested by humans it attaches to the intestinal walls and grows, causing intestinal cramping, fever and other flu like symptoms,

C. Fungus-like protist

1. Similar to Fungus, have cell wall, reproduce w/ spores; however, they are mobile during some part of their life cycle while true fungus cannot.
2. Example are the slim molds- they live on dead decaying material in moist areas and are able to move w/ pseudopods – similar to the way ameba moves.

D. Plant-Like Protists

1. Several types but all are unicellular and live in water or very moist areas, most are mobile and most are autotrophs w/ chlorophyll
   a. Phylum Euglenophyta : example is Euglena (microscopic size)
      i. Structures
         - Pellicle
         - Contractile vacuole
         - Nucleus
         - Two flagella, one small and one long
         - Chloroplasts
         - Carbohydrate storage vacuoles
         - Eyespot- sensitive to light and dark but can't "see"



      ii. Phylum Pyrrophyta – the dinoflagellates cause Red Tide and luminescent
      iii. Phylum Chrysophyta – the diatoms, have tiny shells of silica (glass)
      iv. The true Algaes – Red, Green and Brown Algaes
         - Include the giant kelp – a seaweed that grows to be over 300 feet in length!! Structures include holdfast (root-like ball), stalk (trunk), blade (leaf). The kelp floats to the surface to receive sunlight for photosynthesis by the gas filled sacs (bladder) growing at the base of each blade

II. Kingdom: Fungi – water molds, bread molds, Sac fungi, yeasts, mushrooms and *Penicillium* sp. The principle role of Fungus in the environment is to decompose and recycle organic material. Found in most environs on the planet. Usually require moist, dark and warm habitats. Yeast undergo **Fermentation**- a process that releases energy and whose products are carbon dioxide and alcohol. (Yeast is used to make beer and other alcoholic beverages).

A. Characteristics:

1. Eukaryotic heterotrophs
2. Many are Saprophytes or parasites
3. Most are Multicellular however yeast are unicellular
4. Most are immobile
5. Cell Wall present and composed of Chitin (except Oomycota)
6. Sexual and asexual reproduction present

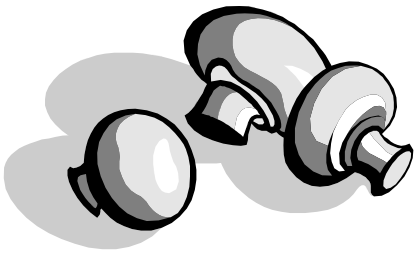
B. Structure

1. **Mycelium**: Thick masses of hyphae
2. **Hyphae**- individual branching threadlike tubes that make up bodies of Multicellular fungi
    a. Loosely tangled hyphae – fuzzy mold
    b. Tightly packed hyphae– mushrooms
3. Heterotrophs: grow hyphae into food source, secrete digestive enzymes and absorb nourishment
4. Reproduction:
    a. **Sexual**:
        i. **Gametangia**: the hyphae of two fungi meet and form swollen haploid tips that eventually fuse to form a gamete, the **zygospore**
        ii.
    b. **Asexual**:
        i. **Sporangia** produce spores. **Spores:** are tiny lightweight structures usually dispersed by the wind. **Sporangia** are located at the tops of specialized hyphae called **Sporangiophores**.
        ii. **Conidia** produce spores in specialized hyphae called **Conidiophores**
        iii. yeast reproduce by **budding**

C. Classification: 5 phyla based on shape of fruiting body (spore producing structure) and the ability to reproduce sexually or asexually

1. Phylum **Oomycota** – Protist like fungi –water molds: the white fungus that attack aquarium fishes. Can produce flagellated spores and in 1845 the Irish potato blight fungus caused the starvation of over 1 million Irish and Europeans by destroying the potato plant and the potato itself.
2. Phylum **Zygomycota** – Thread-like fungi, Common bread molds, produce **Rhizoids**-rootlike hyphae anchor the fungus, **Stolons**- Stemlike hyphae and thickwalled zygotes called **zygospores**.
3. Phylum **Ascomycota** – includes yeast and Sac Fungi: Dutch Elm Disease fungus, the largest phylum of the Fungi with over 30,000 species
4. Phylum **Basidiomycota** – Club Fungi, the mushrooms: most complex lifecycle of the Fungi. Spores produced in a **basidium**
5. Phylum **Deuteromycota** – The Imperfect Fungi, *Penicillium* sp., athlete's Foot Fungus, Ringworm, Reproduction only by asexual means. Sexual reproduction has never been observed

D. **Lichens - Symbiotic** relationship (a relationship where both organisms benefit from the relationship) certain fungus have with a green algae. Very slow growing, very resistant to drought. Lichens are often the first organisms in a long succession of species. To occupy a barren environment. The algae carry out photosynthesis providing the fungus w/ organic nutrients and the fungus provide the algae w/ water and minerals and a substrate to grow on.



The Five Phyla of the Fungi Kingdom

Phylum	Common Phylum Name	Examples	Characteristics	Sexual Reproduction	Asexual Reproduction
Oomycota	Water molds	Fish fungus, potato blight fungus	Cell wall made of **cellulose**, closely related to plantlike protist	Fusion of gametes in **gametangia** result in **oospores**	Produce motile spores w/ flagella in the **sporangiophores**
Zygomycota	Common molds	Black bread mold, mold on cheese	**Chitin** cell wall, Produce **Rhizoids** and **stolons**,	Fusion of gametes in **gametangia** result in **zygospores**	Unflagellated spores produced in **sporangiophores**
Ascomycota	Sac Fungi	Yeast, truffles, Dutch Elm Disease fungus	Largest of the fungi phyla, **Chitin** cell wall	sexual reproductive structure is the **ascus**	Spores called **Condia** form on **Condiophores**
Basidiomycota	Club Fungi	Mushrooms, Toadstools, puffballs, rust, bracket fungi	**Chitin** cell wall , Cap, **basidia** found on the gills, stipe, , rhizoids	Most elaborate life cycle of the fungi, sexual reproductive structure is the **basidia,** each basidia will produce 4 spores	Spores called **Condia** form on **Condiophores**
Deuteromycota	Imperfect Fungi	*Penicillium* sp. , ringworm, athlete's foot fungus	**Chitin** cell wall, "junk drawer" phylum of the fungi	**Do not** undergo sexual reproduction	Spores called **Condia** form on **Condiophores**

III.