KINGDOM FUNGI

GENERAL

- Eukaryotic
- Structure
    - most are multicellular
        - hyphae – threadlike filaments
            - basic structural unit of a fungus
        - mycelium – network of hyphae
        - cell walls made of chitin
    - few unicellular species (i.e. yeasts)

- Heterotrophic
    - extracellular digestion; use enzymes
    - decomposers = saprophyte (live off dead things)
        "sapro" – dead in Latin
    - parasites = absorb nutrients from living cells of host
        - haustoria = specialized hyphae that penetrate & grow in the host cells
            * i.e. yeast infection
    - mutualism = help themselves and host
        * i.e.- roots of plants

- Reproduction
    - Asexual
        - fragmentation = pieces break off and form new whole fungi

- budding = mitosis causes a new individual to form; eventually it separates from the parent

- Sexual
  - Spores
  - produced by sporangia (sac in which spores are made)
    - often the only part of a fungus you can see

- Adaptations for survival
  - spores are very lightweight
  - huge numbers are produced from 1 parent
  - spread by many different ways (water, wind, birds, insects)

TYPES OF FUNGI

1. Phylum Zygomycota "Zygosporangia"
   - 1500 species
     * i.e. bread mold = *Rhizopus stolonifer*
   - mainly decomposers
   - both sexual and asexual stages of life cycle
     - asexual reproduction with spores
     - sexual reproduction with thick-walled spores
   - stolons = hyphae that grow horizontally along the surface of the food source

- rhizoids = hyphae that grow down (vertically) into the food source

* Forms zygospores = (sexual) thick-walled spores that are adapted to withstanding unfavorable conditions

2. Phylum Ascomycota "Sac Fungi"

- 30,000 species = largest group

*i.e. morels & truffles

*i.e. plant diseases = apple scab, Dutch elm disease

*i.e. animal diseases = yeast infection

- both sexual and asexual stages of life cycle
- ascus = sac-like structure in which sexual spores are produced

- ascospores = spores that develop in the ascus

- conidiophores = hyphae that rise up from the mycelium

- conidia = asexual spores that develop from the tips of conidiophores

- produce spores in groups of 8; are haploid

*Unicellular fungus = yeasts

- reproduce asexually by budding
- important for baking and brewing!

- also important in genetics; have large chromosomes

- vaccine for hepatitis B = splicing human genes w/yeast cells

3. Phylum Basidiomycota "Club Fungi"
   - 25,000 species = most familiar
     *i.e. pizza mushrooms
   - both sexual and asexual stages of life cycle
   - basidia = club-shaped hyphae in which sexual spores are produced
     - usually produces a short-lived reproductive structure
       i.e. mushroom cap and stalk
     - basidiospores = sexual spores produced by the basidia
     - produce spores in groups of 4; are diploid

4. Phylum Deuteromycota "Deuteromycetes"
   - 25,000 species = no known sexual stage in life cycle
     *i.e. *Penicillium* = antibiotics
   - only asexual reproduction; sexual cycle has not been observed by a mycologist
     -"myco" = fungus "ologist" = one who studies

- uses = making soy sauce; Penicillin; citric acid = gives soft drinks, candies, & jellies their tart flavor; and blue-veined cheeses

MUTUALISTIC RELATIONSHIPS WITH FUNGI

- both organisms benefit from the relationship

1. Mycorrhizae

- symbiotic relationship in which a fungus lives in close relationship w/roots

- fungal partner is usually a basidiomycetes; some are zygomycetes

- fungus increases the amt. of nutrients that move into the plant by increasing the absorbing surface of the plant's roots

*i.e. copper & phosphorous

- also may help maintain water in the soil around the plant

- fungus receives organic nutrients from the plant

*i.e. sugars and amino acids

- 80-90% of all plant species have mycorrhizae associated with their root systems

- relationship makes plants larger and more productive

- some plant species cannot survive w/o them!

*i.e. orchid seeds will not grow into a plant without a mychorrhizal fungus to provide them with H_2O & nutrients

2. Lichens

- 20,000 species of lichens
- symbiotic association b/w a fungus and a green algae
- fungal partner is usually an ascomycete
- fungus forms a tangled web of hyphae in which the algae grow
    - forms a spongy structure that looks like a one organism
- grow very slowly = very large lichens are thought to be thousands of years old!
- need only light, air, and minerals to grow
    - photosynthetic green algae provides itself and fungus w/food
    - fungus retains moisture and absorbs minerals
- can live in harsh & barren habitats
    - usually among the 1ST organisms to live in an area
    * i.e. arid deserts; on bare rocks in hot sun or bitter cold winds; just below timber line on mountain peaks; and in the arctic tundra

<u>FOSSILS</u>

- fossils show how fungi evolved
- fossils of fungi are rare b/c they're made of such soft material
- oldest fossils of fungi are 450-500 myo