FUNGI outline—CHAPTER 21

==**Characteristics**

*Fungi are NOT plants
*Nonphotosynthetic
*Eukaryotes
*Nonmotile
*Most are **saprobes** (live on dead organisms)
*Important decomposers and recyclers of nutrients in the environment
*Most are **multicellular**, except **unicellular yeast**
*Lack true roots, stems, or leaves
*Cell walls are made of **chitin** (complex polysaccharide)
*Body is called the **thallus**
*Grow as microscopic tubes or filaments called **hyphae**
*Some fungi are internal or external **parasites**
*A few fungi act like **predators** and capture prey like roundworms
Example—fungi feeding on a nematode (roundworm)
*Some are **edible** while others are **poisonous**
***Produce both sexual and asexual **spores**—come in various shapes
*Classified by their sexual reproductive structures

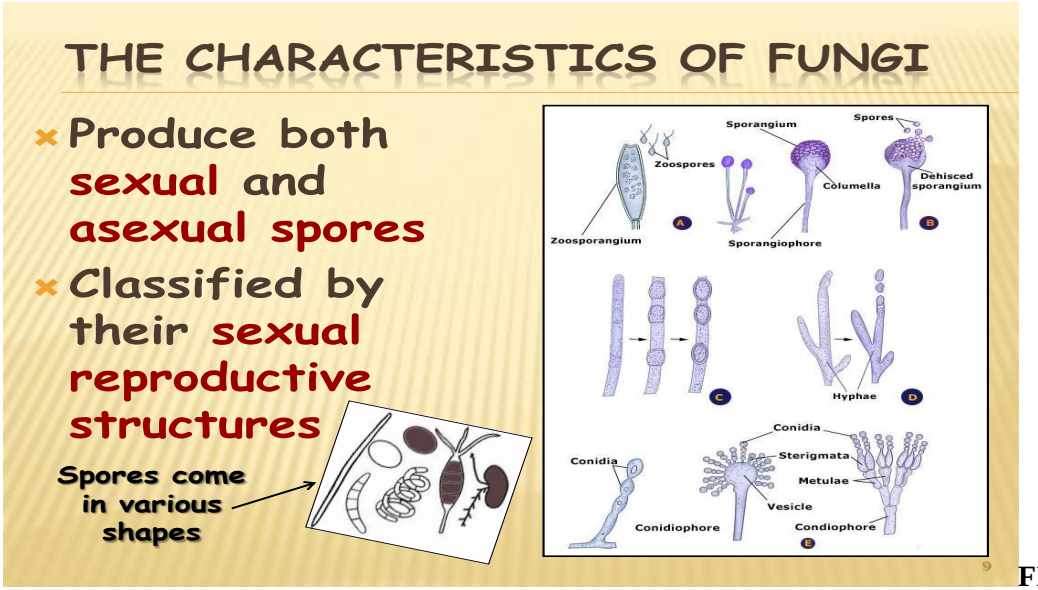


FIG 21-2, pg 527

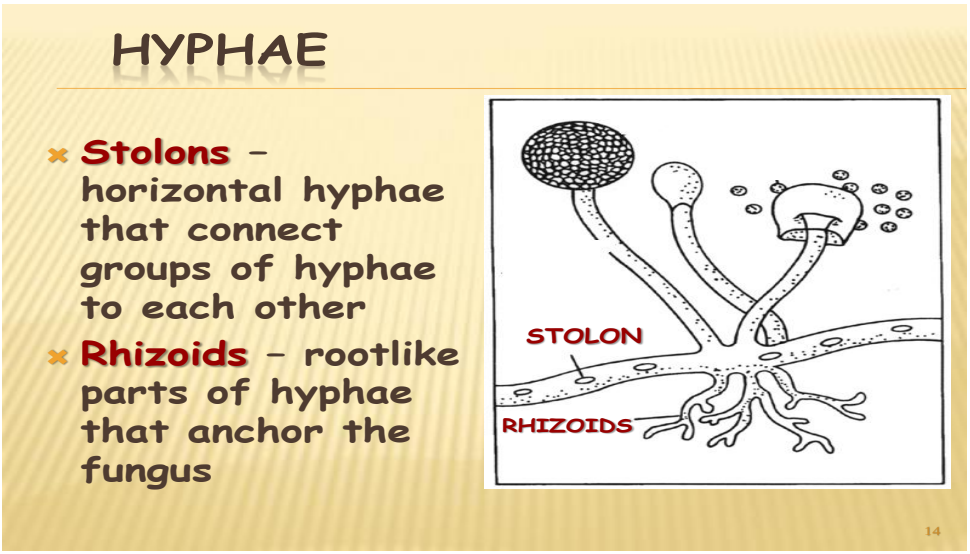
*Grow best in warm, moist environments
*Mycology is the study of fungi
*Mycologists study fungi
*A fungicide is a chemical used to kill fungi
*Fungi include puffballs, yeasts, mushrooms, toadstools, rusts, smuts, ringworm, and molds
*The antibiotic penicillin is made by the *Penicillium* mold

==**Vegetative Structure—non-reproductive**

=Hyphae

*Tubular shape
***ONE continuous cell**
*Filled with cytoplasm and nuclei
***Multinucleate**
*Hard cell wall of **chitin** also in insect exoskeletons
***Stolons**—horizontal hyphae that connect groups of hyphae to each other

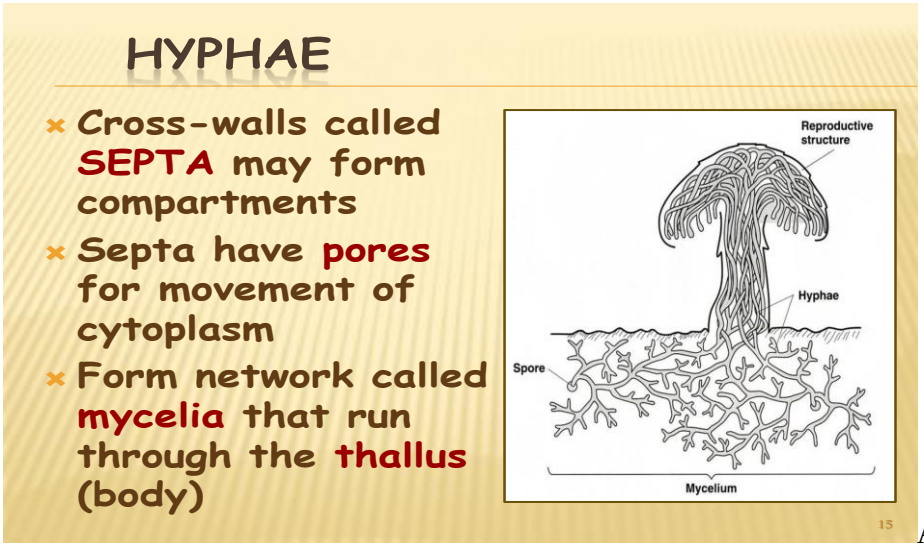
*__Rhizoids__—rootlike parts of hyphae that anchor the fungus



*Cross-walls called **septa** may form compartments

*Septa have **pores** for movement of cytoplasm

*Form network called **mycelia** that run through the thallus (body)



Also, FIG 21-2 p 528 in book

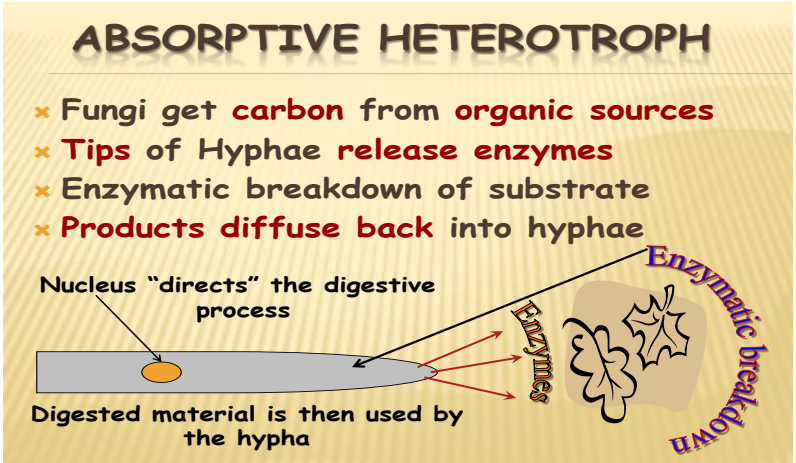
==**Absorptive heterotroph**

*Fungi get carbon from organic sources

*Tips of hyphae release enzymes

*Enzymatic breakdown of substrate

*Products diffuse back into hyphae



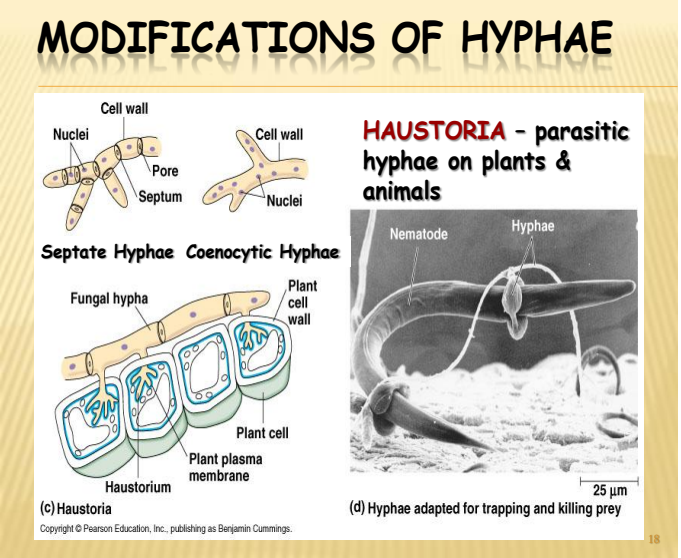
==**Modifications of Hyphae**

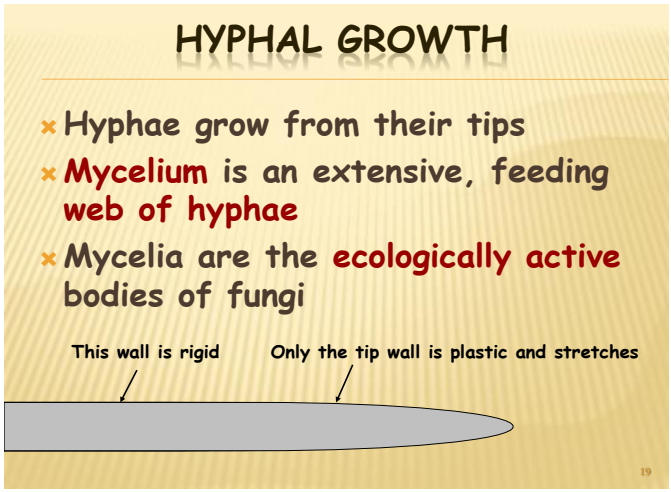
*Structure of hypahe—Page 527 FIG 21-1 in book

*Fungi may be classified based on cell division (with or without cytokinesis)

*Aseptate or coenocytic (without septa)

*Septate (with septa)





==**Reproductive Structures—asexual and sexual spores**

=Reproduction

*Most fungi reproduce **asexually** and **sexually** by spores

*ASEXUAL reproduction is **most common** method and produces **genetically identical** organisms

*Fungi reproduces SEXUALLY when **conditions are poor and nutrients scarce**

=Spores

*Spores are an **adaptation** to life on land

*Ensure that the species will disperse to new locations

*Each spore contains a **reproductive cell** that forms a new organism

***Nonmotile**

*Dispersed by **wind**

==**Sexual reproduction**

*Used when **environmental conditions are poor (lack of nutrients, space, moisture…)**

***No** male or female fungi

*Some fungi show **dimorphism**

*May grow as mycelia or a yeast-like state (filament at 25C and round at 37C)

*Haploid **1n hyphae** from **2 mating types** (= and --) FUSE (fertilization)

*Forms a hyphae with **2 nuclei** that becomes a ZYGOTE

*The zygote divides to make a **SPORE**

==**Asexual reproduction**

=Three types of asexual reproduction

*Fragmentation—part of the mycelium becomes separated and begins a life of its own

*Budding—a small cell forms and gets pinched off as it grows to full size

--used by yeast

*Asexual spores—production of spores by a single mycelium

=Reproduce by spores

*Spores may be formed:

Directly on hyphae

Inside sporangia

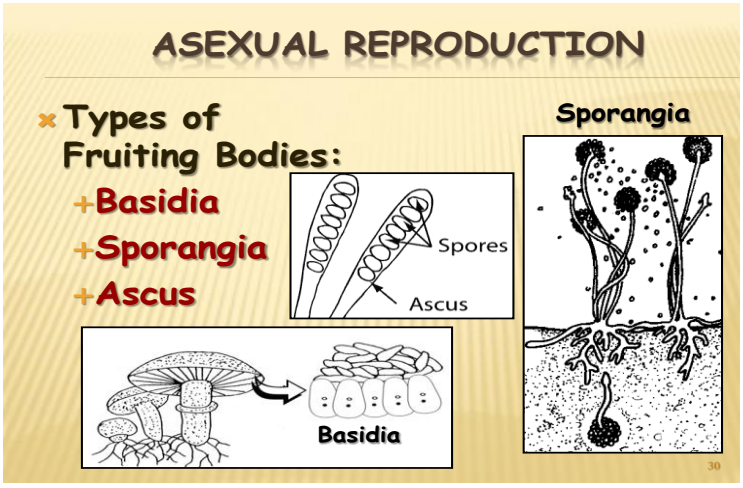
On fruiting bodies

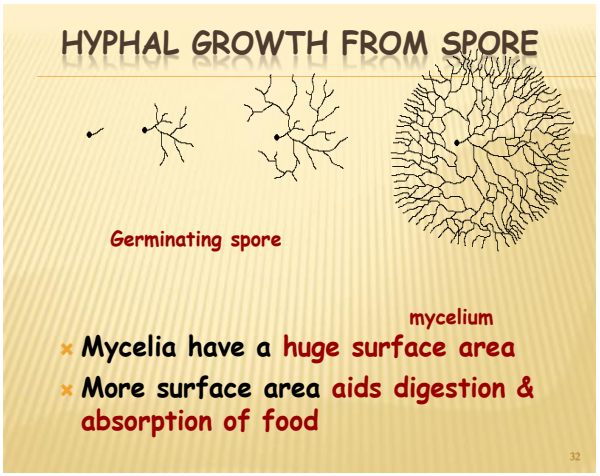
=Asexual reproduction

***Fruiting bodies** are modified hyphae that make **asexual spores**

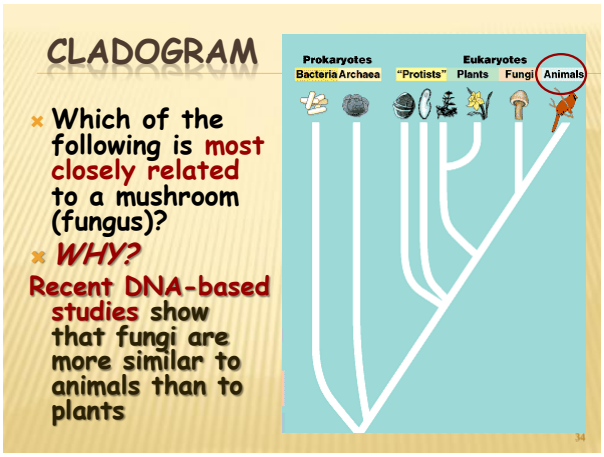
*An upright **stalk** that called the **sporangiospore** supports the **spore case** or sporangium

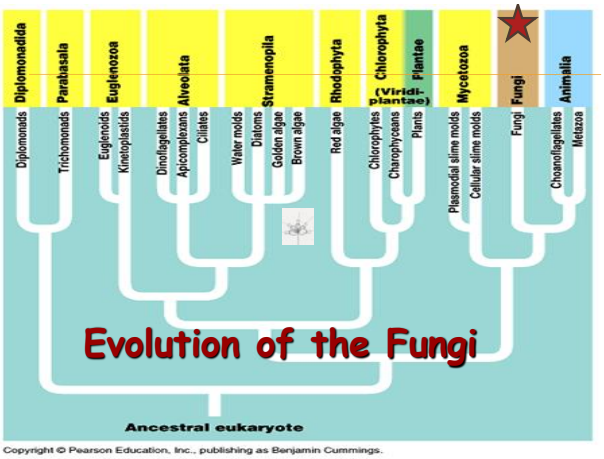
Also, p 531 FIG 21-5





==**Evolution of fungi**





==It's all about the spores!

*Fungi are classified by their reproductive structures and spores

*The reproductive structures are:

*Basidia—basidiomycota (basidiomycete—club fungi--mushroom)

*Sporangia—Zygosporangia (zygomycete—common mold ie bread mold)

*Ascus—Ascomycota (ascomycete—sac fungi, yeast)

*Spores are made of:

*Dehydrated cytoplasm

*Protective coat

*Haploid cell

*Wind, animals, water, and insects spread spores

*Spores germinates when they land on a moist surface (new hyphae form)

==**Major groups of Fungi**

*Within the past few years, several groups have been re-classified into the protists

*Two of these groups are slime molds and water molds

=Classification by nutrition

*Saprobes

*decomposers

*molds, mushrooms, etc.

*Parasites

*Harm host

*rusts and smuts (attack plants)

*Mutualists

*both benefit

*lichens

*Mycorrhizas

==**Major groups of fungi**

=Basidiomycota-club fungi (Life cycle--p 534 FIG 21-8 in book)

=Zygomycota-bread molds (Life cycle--p 531 FIG 21-5 in book)

=Chytridiomycota-chytrids

=AM fungi-mycorrhizas

=Ascomycota-sac fungi (Life cycle—p 533 FIG 21-7 in book)

=Lichens-Symbiosis (algae and fungi)—p 540 FIG 21-16 in book)

=Zygomycota

*Called the sporangium fungi

*Commonly called molds

*also called blights

*Hyphae have no cross walls (aseptate)

*grow repdily

*includes bread mold—*Rhizopus stolonifer*

*asexual reproductive structure called the sporangium a top sporangiospores make spores

*rhizoids anchor the mold and release digestive enzymes and absorb food

*stolons connect the fruiting bodies

*sexual spores are produced by conjugation when (+) hyphae and (-) hyphae fuse

*sexual spores are called ZYGOSPORES

*zygospores can endure harsh environments until conditions improve

=Basidiomycota

*called club fungi

*includes

*mushrooms

*Toadstools

*Bracket and shelf fungi

*Puffballs

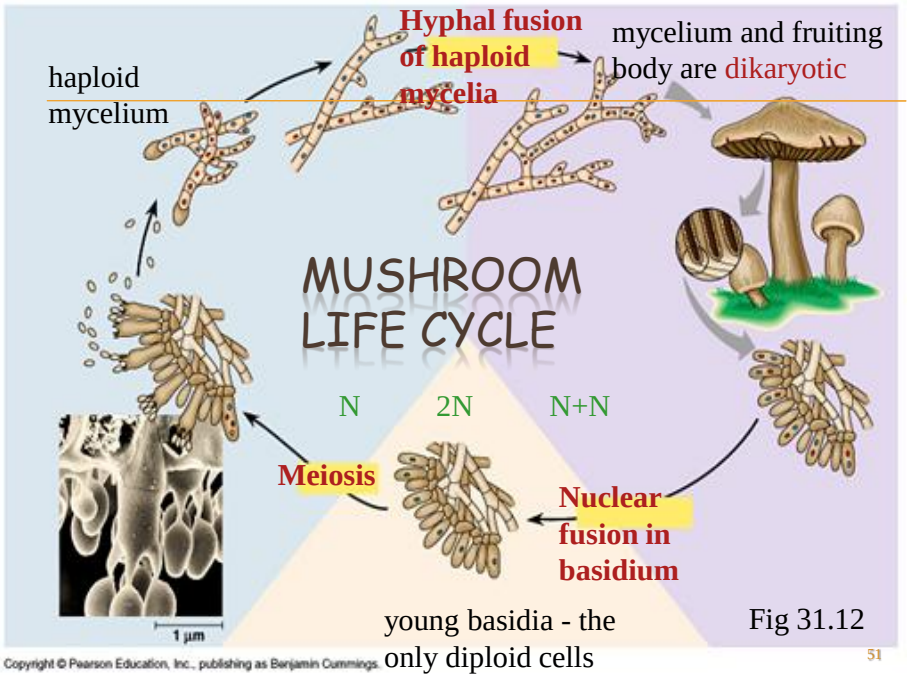
*Stinkhorns

*Rusts and smuts

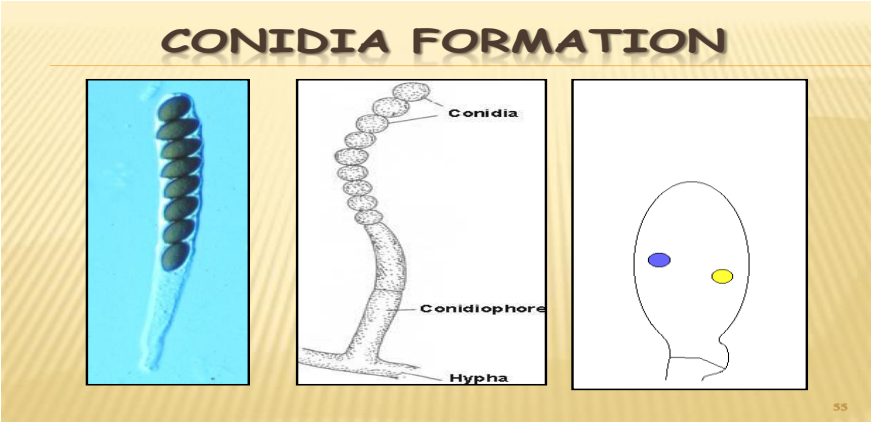
*uses for basidiomycota

*Some are used as food (mushrooms)
*others damage crops (rusts and smuts)

*characteristics of club fungi
*Seldom reproduce asexually
*The visible mushroom is a fruiting body
*Basidiocarp (fruiting body) is made of a stalk called the STIPE and a flattened CAP with gills called BASIDIA underneath
*annulus is a skirt-like ring around some stipes
*vegetative structures found below ground



=Ascomycota
*Characteristics
*called sac fungi
*includes
Cup fungi
Morels
Truffels
Yeasts
Mildews
*may be plant parasites (Dutch elm disease and Chestnut blight)
*reproduce sexually and asexually
*Ascus—sac that makes ascospres in sexual reproduction
*specialized hyphae known as ascocarps contain the asci (plural of ascus)
*yeasts reproduce asexually by budding (buds break off to make more yeast cells)
*asexual spores called conidia form on the tips of special hyphae called conidiophores



*Uses of ascomycetes
*truffles and morels are good examples of edible ascomycetes
*Penicillium mold makes the antibiotic penicillin
*some ascomycetes also gives flavor to certain cheeses
*Saccharomyces cervesiae (yeast) is used to make bread rise and to ferment beer and wine

=Chytridiomycota
*called chytrids
*produce motile spores
*mostly saprobes and parasites in aquatic habitats
*biodegrade and recycle nutrients

=**Mycorrhiza**
*fungus associated with plant roots
*mutualism between
*Fungus (nutrient and water uptake for plant)
*plant (carbohydrate for fungus)
*several kinds
*zygomycota—hyphae invade root cells
*ascomycota and basidiomycota—hyphae invade root but don't penetrate cells
*extremely important ecologically
*Agriculture

=**Lichens**—FIG 21-16 p 540 in book
*mutualism between:
*Fungus (structure)
*Algae or cyanobacteria (provides food)
*lichens act like biomonitors
*thalli act like sponges
*some species more sensitive than others to pollutants
*which species are present can indicate air quality
*most resistant species can also be analyzed for pollutants
*three forms
*crustose—flat
*foliose—resemble leaves
*fruticose—grow upright
*Pioneer species in primary succession