FUNGI

Objectives

1. List at least six identifying characteristics of fungi.
2. Differentiate the major taxa of fungi.
3. Differentiate sporangiospores, conidia, zygospores, ascospores, basidiospores, and zoospores.
4. Describe the associations between fungi and plants.

Outline

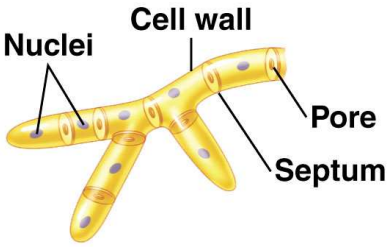
A. Characteristics
    1. Life Cycle
B. Major Taxa
    1. Nucleariidae (sister taxon)
    2. Microsporidia
    3. Chytridiomycota
    4. Zygomycota
    5. Glomeromycota
    6. Ascomycota
    7. Basidiomycota
    8. Deuteromycota
C. Ecological Niches
    1. Decomposers
    2. Plant – Fungal Symbioses
        a. Mycorrhizae
        b. Lichens
        c. Endophytes
    3. Parasites

A. Characteristics

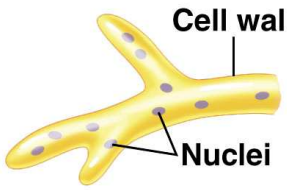
- All Eukaryotes
    - No plastids or chlorophyll
- All Chemoheterotrophs
    - Absorb organic nutrients
- Cell walls made of chitin

- Nearly all produce spores
    - both sexual and asexual
- Often contain more than one nucleus
    - Dikaryon
- Two body shapes
    - Yeast
    - Mycelial
        - Made of hyphae (sing. hypha)
        - Separated by septa (sing. septum)
        - Coenocytic
            - nuclei can move between cells
        - Anastomosis (Plasmogamy)

Mycelium



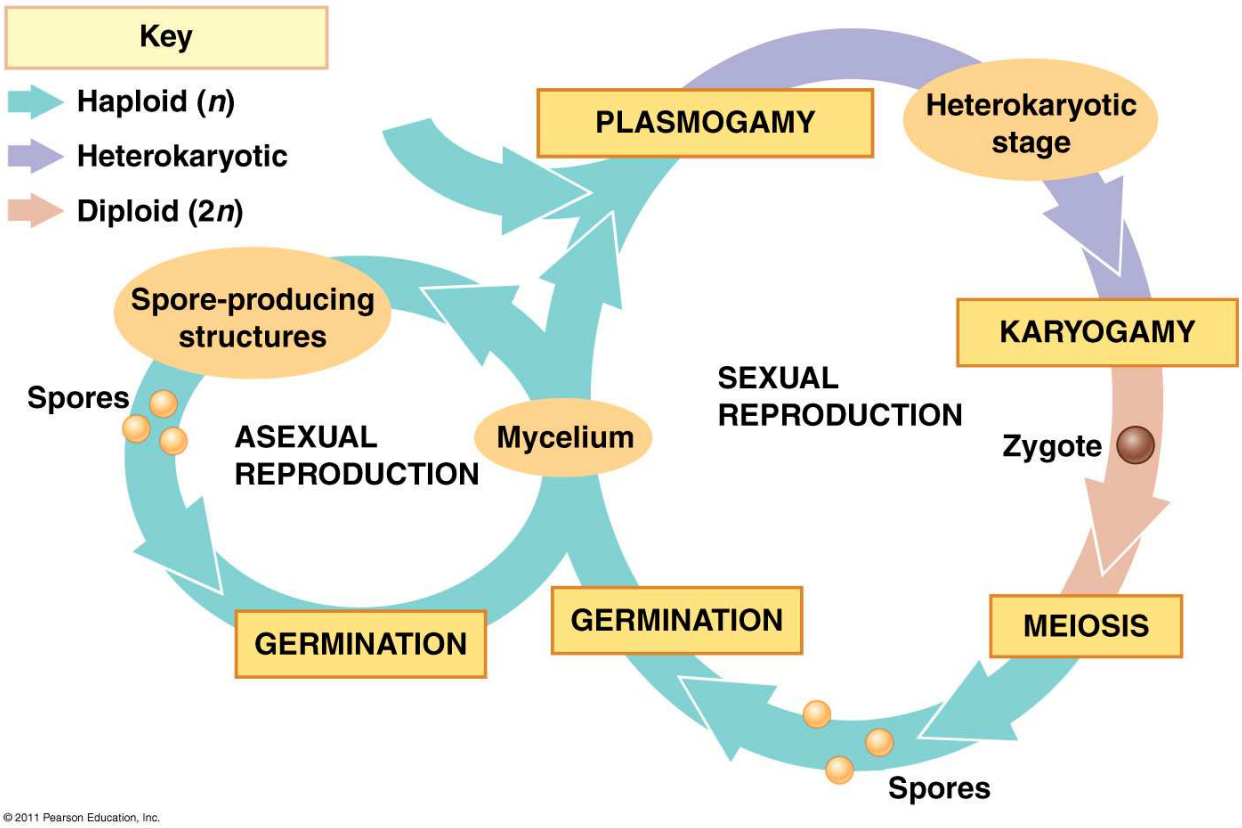
(a) Septate hypha



(b) Coenocytic hypha

- Size
  - Yeast: 5 um diameter
  - Largest: greater than 40 acres
    - Single mycelium in northern WI
    - Largest organism on earth?

1. Life Cycle



- Monokaryon

  - haploid (n)

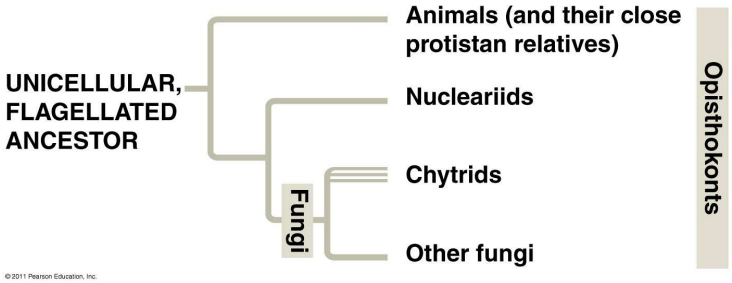
  - reproduce by asexual spores
    - Sporangiospores

    - Conidia (sing. conidium)

- Plasmogamy
    - Dikaryon (n+n)
    - Heterokaryon
- Karyogamy
    - Diploid (2n)
    - Meiosis
    - reproduce by sexual spores (n)
        - Zygospores
        - Ascospores
        - Basidiospores

B. Major Taxa

Unikonta – Opisthokonta

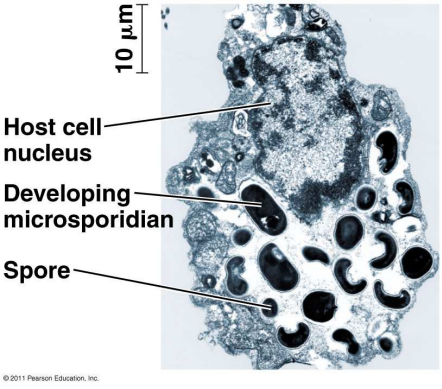


1. Nucleariidae

- Sister taxon of fungi
- Unicellular
- Flagellated predatory amoebas

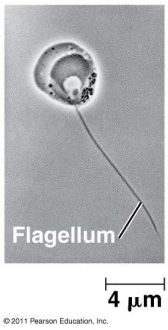
2. Microsporidia

- Unicellular parasites
- create small spores
- lack classic mitochondria

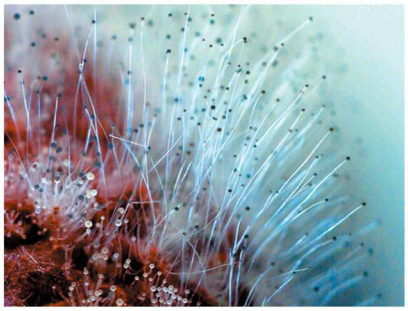


3. Chytridiomycota

- Unicellular or colonial
- Zoospores



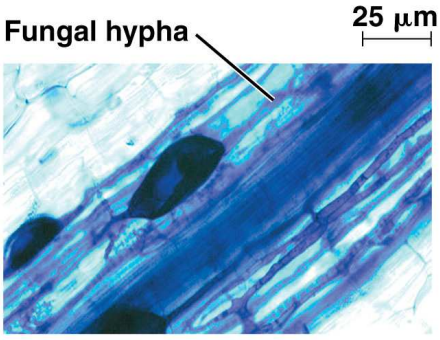
4. Zygomycota



Zygomycetes (1,000 species)

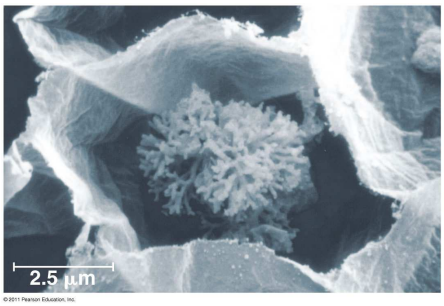
- Aseptate
- Nuclei fuse to form zygote
  - No dikaryotic stage
  - Zygospore
    - Only diploid cell in life cycle
- Sporangiospore
  - Asexual spores formed internally

5. Glomeromycota



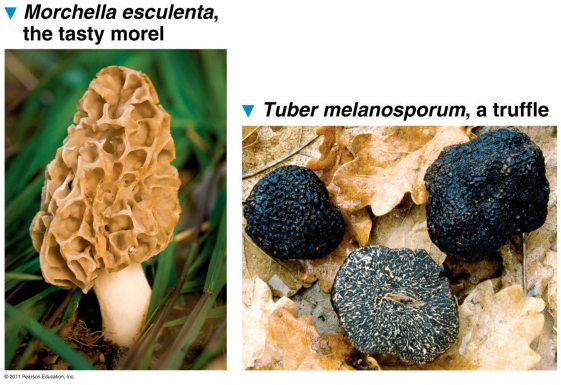
Glomeromycetes (160 species)

- vesicular-arbuscular mycorrhizae
  - symbionts of ~90% of land plants
- haustoria (sing. haustorium)



6. Ascomycota

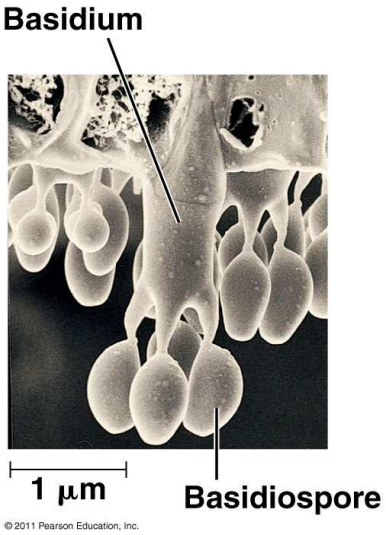
- Cup fungi



- unicellular or multicellular
    - septate if multicellular
- Can be monokaryotic or dikaryotic
- Conidia
    - Asexual spores formed externally
- Ascospores
    - Sexually spores produced internally
        - Immediately after meiosis
    - Ascus
    - Ascocarp
- Largest group of fungi
    - Includes most yeasts

7. Basidiomycota

- Club fungi
    - Includes most mushrooms
        - Most of fungus is underground
- multicellular septate mycelium
- Most reproduce only sexually
- Basidiospores
    - Sexual spores produced externally
        - Immediately after meiosis
    - Basidium
    - Basidiocarp



8. Deuteromycota

- Fungi Imperfecti
    - Not a true taxon

- No sexual stage
    - Reproduce only with conidia

- Most molds

C. Ecological Niches

1. Decomposers

- Can digest almost anything
    - leaf matter, tree trunks
        - cellulose and lignin

2. Plant – Fungal Symbioses

- Mutualism with nearly all plants

- Parasitic with nearly all plants

a. Mycorrhizae

- Live in/on roots
- Exchange nutrients for sugar

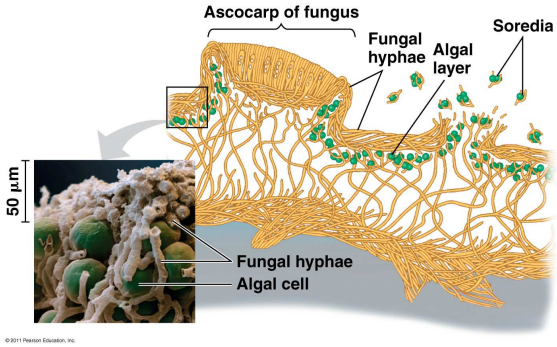
- Endomycorrhizae
  - Fungus penetrates into plant cells

- Ectomycorrhizae
  - Fungus sheathes root

b. Lichens

- Symbiosis between algae and fungi
  - Algae grow inside fungus

- Few nutritional requirements
- Exchange nutrients for food/protection



- Can live in harshest environments
  - First colonizers at barren site

- Very sensitive to pollution

- Fungus usually an ascomycete

- Reproduce by soredia
  - Carry fungus but not always alga

c. Endophytes

- Live in stems, leaves, and seeds

- Exchange protective toxins for sugar

3. Parasites

- Another symbiosis

- Cause damage in exchange for food
    - Increases fitness of parasite
    - Decreases fitness of host

- Common pathogen of plants

- Not as common in animals