Chapter 12 – The Eukaryotes: Fungi, Protozoa, and Helminths

Fungi
• ___________________ – the study of fungi
• Fungi important in food chain
  o Decompose dead plant matter
  o Recycle vital elements
• Used for food (mushrooms), produce food (bread) and drugs (alcohol and penicillin)
• All are ___________________
  o Most are _______________ or ______________ anaerobes
  o Few anaerobes known

Characteristics of fungi
• Multicellular fungi identified based on ____________________________
  o ___________ characteristics, ______________
• Classified into 3 groups:
  o ______________
  o ______________
  o ______________
• Molds and fleshy fungi
  o ___________ – body of fungus
    ▪ Consists of long filaments of cells joined together
    ▪ Filaments called hyphae (singular: hypha)
  o Hyphae grow by ____________________________
    ▪ Each part of hypha is _______________________
    ▪ Fragments that _______________ can form new hypha
  o ______________ hypha – portion of thallus that obtains nutrients
  o Most hyphae contain “_____________” - separates them into cell-like units
    ▪ Called “_____________ hyphae”
  o Few hyphae have ______________ – appear as long continuous cells with many nuclei
    ▪ Called “_____________ hyphae”
  o ______________ or ______________ hypha – portion concerned with reproduction
    ▪ Projects above the surface
  o ______________ – filamentous mass of fungi
• Yeasts
  o Nonfilamentous, _______________ fungi
    ▪ Typically spherical or oval
  o Budding yeasts divide unevenly
    ▪ Daughter cell (bud) is _______________ than parent cell
    ▪ Saccharomyces cerevisiae common budding yeast
  o Yeasts capable of _______________ growth
    ▪ Can use _______________ compound as final electron acceptor
    ▪ With oxygen produce CO₂ and water
    ▪ Without oxygen produce ethanol and CO₂
      • Important in food industry
• **Dimorphic fungi**
  o Exhibit two forms of growth
    ▪ Grow as either ______________ or ______________
  o In ______________, dimorphism is ______________-dependent
    ▪ ______________ – yeastlike
    ▪ ______________ – moldlike

*Life Cycle*
• Reproduction accomplished by forming ______________
  o Both ______________ and ______________
  o Spores detach from ______________
    o ______________ into new mold
  • Spores can survive for extended periods in ______________.
  o Not to the extreme like bacterial endospores
  • ______________ spores formed by fragmenting ______________
    o Germinated spores are ______________
  • Two types of asexual spores
    o ______________, conidium (pl, conidia)
      ▪ Spore ______________
      ▪ Spores produced in chain at end of “_______________”
    o Sporangiospore
      ▪ Formed within “_______________” or sac at end of an aerial hypha
        ▪ Hypha called “_______________”
      ▪ Can contain _______________ of sporangiospores
  • **Sexual** spores result from fusion of ______________
    o Requires _______________ of same species
    o Spores have genetic characteristics of _______________
  • Teleomorphs – produce both ______________ and _______________ spores
  • Anamorphs – produce only ________________ spores

*Nutritional Adaptations*
• Fungi are ______________
• Compete with ______________ for food
• Nutritional characteristics provide some advantages
  o Fungi can grow at ______________, too ______________ for most bacteria
  o Most fungi are more resistant to ______________ than bacteria
  o Fungi can grow on substances with low ______________, low ______________ content
  o Fungi are often capable of degrading ______________; lignin in wood
• Allows fungi to grow on bathroom walls, shoe leather, discarded newspapers

*Fungal Diseases*
• ______________ – a fungal infection
• Generally ______________ (long-lasting) because ______________
• Classified into 5 groups according to
• Degree of tissue involvement
• Mode of entry into host

• **Systemic mycoses**
  o Infections ___________ the body, many ____________
  o Route of entry is ________________
    ▪ Begin in ____________, spreads to other tissues

• **Subcutaneous mycoses**
  o Fungal infections ________________
  o Infection occurs by direct ________________ of spores ________________
  o Sporotrichosis is subcutaneous infection acquired by gardeners, farmers

• **Dermatomycoses, cutaneous mycoses**
  o Infect only ________________, ________________, and ________________
  o Secrete ________________, degrades keratin in hair, skin
  o Transmitted by ________________
    ▪ Barber shop (infected hairs), shower room floors, ringworm

• **Superficial mycoses**
  o Localized along ________________, ________________ skin cells
    ▪ ________________ is invaded
    ▪ Patients often ________________ of infection

• **Opportunistic pathogen**
  o Generally ________________ in normal habitat
  o Becomes ________________ in ________________ host
    ▪ Under treatments with antibiotics, suppressed immune system, lung disease
  o *Pneumocystis* pathogen of immunocompromised patients
    ▪ Most common life threatening infection among ____________ patients
  o *Stachybotrys* can grow on water-damaged walls of homes
    ▪ Toxic spores can cause pulmonary hemorrhage in infants

**Economic effects of fungi**

• **Fungi in biotechnology**
  o *S. cerevisiae* for bread, wine, hepatitis B vaccine
  o *Trichoderma* produces cellulase, clears fruit juice
  o *Taxomyces* produces anticancer drug taxol

• **Fungi in pest control**
  o *Entomophaga* kills gypsy moths that destroy trees
  o 25 to 50% of harvested fruits and vegetables ruined by fungi
    ▪ Chemical fungicides cannot be used due to safety, health concerns
    ▪ *Candida oleophila* can prevent undesirable fungal growth

• **Harmful effects of fungi**
  o Mold spoilage of foods very common
  o *Cryphonectria parasitica* destroyed spreading chestnut tree in US
  o *Ceratocystis ulmi* devastated US elm (tree) population

**PROTOZOA**

**Characteristics of protozoa**

• ________________
• Inhabit ________________ and ________________
- ______________ – feeding and growing stage
- Relatively few cause disease
  - But diseases are significant

**Life cycle**
- Reproduce ______________ by fission, budding or schizogony
- ______________ – multiple fission, nucleus divides many times before cell division
- Some protozoa reproduce sexually by “______________”
  - Different from bacterial conjugation
  - Fusion of ____________, ___________ fuse
  - Cells separate
- ______________ – formation of a _________________ called a ______________
  - Occurs when food, moisture, oxygen ________________
  - Parasites can survive ________________
- Mostly ________________
  - Some capable of anaerobic growth
- All live in areas with large supply of ________________

**Malaria**
- ______________ – causative agent of malaria
- *Anopheles* mosquito is _______________ host - ________________
- Human is ______________ host – ________________ reproduction
- Cysts are excreted in feces of cats
- Humans get infected by:
  - ______________ from cat feces
  - Eating cysts from ________________
- Cats get infected by ________________

**Toxoplasmosis**
- ______________ - causative agent of toxoplasmosis
- Felines are ______________
- Humans, other animals are ________________
- Especially harmful to ________________ ➔ can cause ________________

**HELMINTHSES**
Characteristics of helminthes
- _______________ eukaryotic animals
- Parasitic helminths have characteristics that differ from free-living helminths
  - Lack ______________ system
  - Reduced ______________ system
  - Reduced or absent ______________
  - Complex ______________ system
- Two groups of helminths
  - Platyhelminths and Nematodes

**Types of helminths**
- Platyhelminths
The _____________________ \( \rightarrow \) flukes and tapeworms

- **Nematodes**
  - The _____________________

- **Two modes of transmission**
  - Eating of ________________, ________________
    - Excreted in _____________________
  - Eating of _____________________
    - From ________________________________

- **Paragonimiasis**
  - ________________ are definitive hosts
    - Parasite lives in __________, excreted in __________
  - ________________ are intermediate hosts
  - Humans infected by ________________ from mollusks

- **Rat lungworm disease**
  - ________________ are definitive hosts
    - Parasite lives in __________, excreted in __________
  - ________________ are intermediate hosts
  - Humans get infected by eating ______________________________
  - Humans are “______________” or “______________” hosts
    - Can be ________________
    - Not ________________