Unit: 5.1 Name:

Section Title: Overview of Fungi

Latin Root Word:

Review of Old Information: Over the course of the 4th Quarter we are studying the six living kingdoms. Previously we have covered Kingdom Archaebacteria, Eubacteria, and Protista.

New Information: Section 4 examines the relationship between fungal structure and function at the microscopic and macroscopic level. During most of the life cycle of a fungus, its cells are similar and able to meet the their own needs for survival. Fungi differ from other organisms in several ways, including in structure, in method of reproduction, and in method of obtaining nutrients.

PPT. Notes

Basic Characteristics and Terminology:

Common" Examples:

1.Molds: tangled masses of _____ of cells; grow on foods like breads and oranges.

2.Yeasts: _____ organisms; colonies resemble bacteria; make breads rise.

Basic Structures:

Pg. 543

Characteristics: The study of fungi is known as_____. The cell structure of fungi is different from Kingdoms Archaebacteria and Eubacteria because they are considered _____cells. Fungi range in size from microscopic _____ to the largest organism in the world known as _____which occupies 861,000 ft sq. Filaments of fungi are known as _____. The cell walls of hyphae contain _____which distinguishes fungus from plants which have cellulose in their cell walls. A mat of hyphae is known as a _____. They hyphae that commonly grow on bread and fruit form _____. Cross sections that divide the hyphae are known as _____. Hyphae without the cross sections are known as _____. Hyphae increase in length by _____ growth and division at the tip. Several species of fungi are able to change their form in response to a changing environment. The ability to change form is known as _____, and is shown in the species _____ _____, which normally grows as a _____ but changes into unicellular yeast upon entering the human body.

PPT. Notes

<u>Feeding in Fungi:</u>

-Nonphotosynthetic

-"_____"-Most saprophytic

-Secrete _____ _____ as hyphae grow and encounter new organic matter.

- Unlike other organisms, _____ nutrients BEFORE _____ them

<u>Asexual Reproduction:</u>

<u>Asexual Reproduction</u>: Produce and release thousands of genetically identical haploid _____.

<u>Types of Asexual Spores/Reproduction</u>:

1._____: made inside <u>sporangium</u> of <u>sporangiophores</u>; Ex. *Rhizopus* (bread fungus)

2._____: spores formed without protection of enclosing sac; Ex. *Penicillium*

3._____: cells from septate hyphae dry and shatter to act as spores; Ex. Athlete's foot

4._____: part of cell "pinches" off to produce small offspring cells; Ex. Yeast

Sexual Reproduction

1.Occur in "_____" and "_____" mating pairs (NOT male and female)

2. _____ fuse in opposites of same species

3.Exchange _____ material

4.Specialized structures form that produce and scatter genetically diverse spores.

Pg. 543

Feeding: Fungi are non-photosynthetic multicellular _____, which are mostly saprophytic (feed on dead or decaying matter). When hyphae encounter organic matter they secrete digestive enzymes and then absorb the _____ _____. Based on their feeding behavior we classify fungi as (autotrophs, decomposers, heterotrophs). Unlike other organisms fungi digest (breakdown) their food before ingesting them.

Word Bank: *Armillaria*, mycelium, septa, hyphae, mycelia, coenocytic, cellular, digested nutrients, dimorphism, yeast, eukaryotic, *Histoplasma capsulatum*, mycology, heterotrophs, chitin

Activity I: Simple Organisms in Action

1. What characteristics do fungi share with plants?

2. What characteristics do fungi share with animals?

3. What are the three main types of fungi?

4. What are hyphae?

5. How do most fungi reproduce?

6. What is the mold *Penicillium notatum* known for?

7. What are some examples of sac fungi?

8. What are some uses of sac fungi?

9. Why are club fungi given that name?

10. What are the fruiting bodies of club fungi commonly known as?

11. How large can the fungus *Marasmius oreades* grow?

12. How do fungi get their nourishment? How is that different from animals?

13. What do the eating habits of fungi have to do with their role as Earth's decomposers?

Activity II:

Review Questions from Notes

1. _____All fungi are
    a. multicellular and prokaryotic
    b. prokaryotic and photosynthetic
    c. eukaryotic and nonphotosynthetic
    d. unicellular and photosynthetic

2. _____Unlike animals, fungi
    a. ingest their nutrients before digesting them
    b. secrete enzymes and then absorb the digested nutrients through their cell wall.
    c. Have cell walls made of cellulose without chitin
    d. Do not store energy in the form of glycogen

3. _____Which of the following is not an asexual reproductive structure of a fungus?
    a. Septum
    b. Sporangium
    c. Conidiophore
    d. Sporangiospore

4. _____What is the name of the fungus that happens to be the LARGEST organism in the world?
a. Armillaria b. Candida c. Microsporum. d. Trychophyton

5. _____ Unlike animals and some protists, fungi
a. ingest their nutrients before digesting them.

b. secrete enzymes and then absorb the digested nutrients through the cell wall.

c. have cell walls made of cellulose without chitin.

d. do not store energy in the form of glycogen.

6. _____Which of the following best describes how fungi feed?

a. saprophytic c. nonphotosynthetic

b. digestion BEFORE ingestion d. ALL of the above

7. _____Biologist think that the first fungi on earth arose from
    a. prokaryotes
    b. algae
    c. plants
    d. animals

8. _____A mycelium is an interwoven mat of
    a. spores
    b. septa
    c. hyphae
    d. conidia

Unit: 5.2 Name:

Section Title: Fungi and Humans

Latin Root Word:

Review of Old Information: N/A

New Information:

Human Fungi Interactions

Fungi and Human Disease

<u>Mold Spores</u>:_____

<u>Fungal Skin Infections</u>: _____

<u>Other Fungal Illnesses</u>:

1._____: caused by *H. capsulatum, P. brasiliensis, C. immitis, B. dermatittidis.*

2._____: caused by *Amanita* mushrooms

3._____: caused by <u>aflatoxins</u> produced by *Aspergillus.* Found in contaminated peanuts and corn.

Fungi in Industry

_____- used in penicillin.

_____-used in cephalosporin antibiotics.

_____- used in cortisone.

_____- yeast used to develop Hepatitis B vaccine.

_____- also used to produce ethanol.

Fungi and Food Industries

Produce _____(used in soft drinks and candies)

Produces _____(fed to chickens to harden eggshells).

Fungi and Human Disease: pg. 550

Fungi can sometimes attack the tissues of living plants and animals and cause disease. Fungi are a concern because they not only attack living organisms but also our _____ sources, making fungi competitors with humans for _____. Fungi has the ability to infect humans through their _____, _____, and _____. Two skin infections caused by fungi are known as _____ and _____ _____. _____aquired it name because the appearance of a ring on the skin due to the fungal infection resembles a worm. _____ _____ occurs on the foot and between the toes. Athletes foot is acquired through contact with _____ _____ and/or contaminated floors. Yeast infections are a result of the fungal pathogen _____ _____, which is found in the mouth, and in the intestine. Mild to serious allergies can be triggered by fungi. _____ _____ can become airborne and inhaled, triggering an allergic reaction. Respriatory illness can result from the dimorphic fungi _____ _____. The illness resembles tuberculosis and can spread to multiple _____. Outside the body *H. capsulatum* grow as a _____, but upon entering the human body the fungi become _____. Symptoms of Histoplasmosis are _____, chills, headache, body aches, chest pains, and nonproductive cough. The *Amanita sp.* of mushroom can become extremely dangerous if ingested and can cause destruction of the _____. Liver cancer can result form the fungi _____ which is found in contaminated peanuts and corn.

Word Bank: food, nutrients, skin, hair, nails, unicellular, liver, *Candida albicans*, mold spores, skin leisons, *Histoplasma capsulatum*, organs, mold, ringworm, fever, athletes foot, *Aspergillus*

Not all fungi are harmful and are in fact used in nonfood industries. For example, _____ species and _____ species are used as antibiotics to fight bacteria infections. Cortisone, which is used to reduce joint swelling for individuals with arthritis, is made with the specific

chemicals produced from the fungi _____. Yeast cells have been used to develop a

_____ ___ vaccine and is used to produce _____, used in the automobile fuel

gasohol.

Word Bank: *Penicillium, Cephalosporium*, *Rhizopus,* Hepatits B, ethanol

Activity:

In this lab you will be examining several eukaryotic organisms of medical and/or commercial importance. Recall that eukaryotic organisms are divided into four kingdoms: animalia, plantae, fungi, and protista. You will view slides from all kingdoms, with the exception of the plant kingdom. We will also be looking at human blood smears in this lab and doing blood typing.

Exercise 1: Kingdom Fungi

Fungi are non-motile organism that secrete exoenzymes into the environment, and then absorb the digested materials. They can either obtain their nutrients by decomposing dead organic matter (**saprophytes**) or living plants, animals, or humans (**parasites**).

The life cycle of a fungus usually involves both a sexual and an asexual form. Gametes (sexual reproduction) are produced by **gametangia**, while spores (asexual reproduction) are produced by **sporangia**.

You will focus on several multicellular, filamentous molds including *Rhizopus, Aspergillus,* and *Penicillium.* The individual filaments in these fungi are called **hyphae**, and are collectively termed mycelium. **Rhizoids** anchor the hyphae and the sporangia supporting sporangiophores.

Rhizopus

Rhizopus is a fast-growing species of fungus that darkens with age, giving it a "salt and pepper" appearance. Under the microscope, *Rhizopus* can be identified by its large, circular sporangia. The sporangium is supported by a hemispherical columella.

Rhizopus stolonifer is a common bread mold. Other species of *Rhizopus*, including, *R. arrhizus*, are responsible for zygomycosis, a potentially fatal infection. Infection occurs when spores are inhaled and delivered to the tissues by the blood. This may result in necrosis in diabetic and immunocompromised patients.

Aspergillus

Aspergillus is a common environmental fungus. Species of *Aspergillus* can be found in a variety of colors, ranging from yellow to green to brown, and sometimes black. *Aspergillus* forms distinctive chains of spores at the end of hyphae, called **conidia**.

Some species of *Aspergillus* cause an opportunistic infection called aspergillosis. Symptoms of aspergillosis vary based on conditions of exposure. Pulmonary aspergillosis colonizes bronchial

tissue that has been damaged by conditions such as tuberculosis. Allergic aspergillosis causes asthma-like symptoms in individuals sensitized to the spores. Invasive aspergillosis results in necrotizing pneumonia and may spread to other organs.

Penicillium

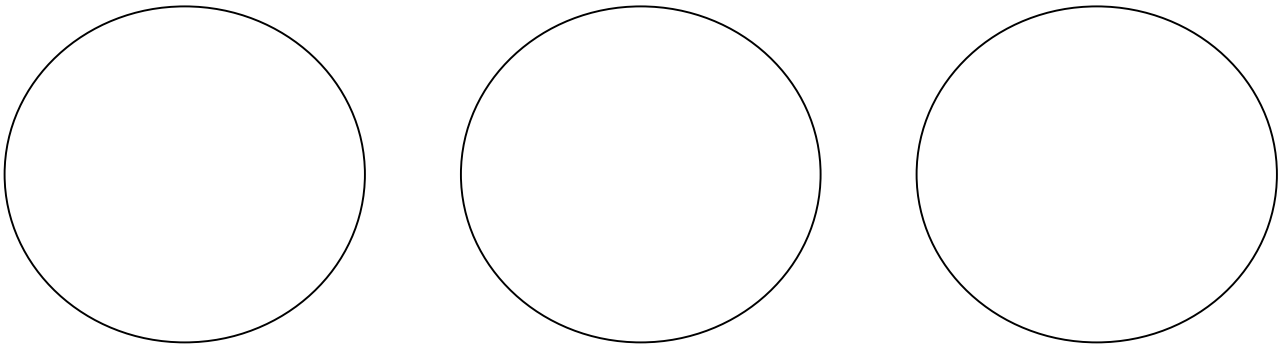
Penicillium is also a common environmental fungus. Green, powdery colonies that radiate to a white apron characterize *Penicillium* when viewed on a plate or other surface. The colonies are a lighter color on the opposite surface. When viewing microscopically, brush-shaped conidiophores are observed.

While *Penicillium* may cause an infection known as penicilliosis, it is better known for the production of the antibiotic penicillin. *Penicillium* is also used as the fermenting agent in the production of cheese.

Objective: To identify each of these fungi based on their appearance and be able to associate each with its medical/commercial importance.

Results:

1. Draw a sample of each organism



2. What is the medical/commercial importance of *Rhizopus*?

3. What is the medical/commercial importance of *Aspergillus*?

4. What is the medical/commercial importance of *Penicillium*?

Unit: 5.3 Name:

Section Title: Fungi Classification

Latin Root Word:

Review of Old Information:

1. _____Sniffling, sneezing, and respiratory distress may be symptoms of an allergic reaction to
   a. Corisone
   b. The *Amanita* mushroom
   c. the yeast *Candia albicans*
   d. mold spores

2. _____Which of the following is not a condition or disease that can be caused by fungi?
   a. Athletes foot
   b. Ringworm
   c. AIDS
   d. cancer

3. _____Fungal diseases that affect human internal organs are often caused by
   a. dimorphic fungi
   b. deuteromycetes
   c. truffles
   d. morels

4. _____Fungi of the genus Cephalosporium are used to produce
   a. mushrooms
   b. antibiotics
   c. cheese
   d. soy products

5. _____Which of the following is not a medically useful substance produced by a fungus?
   a. Penicillin
   b. Hepatitis B vaccine
   c. cortisone
   d. aflatoxin

New Information:

<u>Fungi Classification:</u>

Phylum Basidiomycota:

Activity: Mushroom Dissection Lab See Attached.

Unit: 5.4 Name:

Section Title: Fungi Classification

Latin Root Word:

Review of Old Information:

-An example of an organism in phylum Basidiomycota is...

-The reproductive structure found in phylum Basidiomycota is...

New Information:

Phylum Zygomycota

-Sexual Reproduction; _____
-Asexual Reproduction; _____
-Found in _____ _____

-_____ hyphae

-_____: _____ that _____ mold to _____ (*rhiza*- Greek for "root").

-_____: _____ grow _____ surface.

-Reproduce sexually using conjugation

Draw Diagram of Phylum Zygomycota from PPT.

Phylum Ascomycota

-Sexual Reproduction: _____
-75% of ALL fungi

-"Sac" Fungi- includes baker's _____, _____, and _____.

-Reproduction:
1._____ fuse to form _____ _____
2.Dikaryotic hyphae _____ with monokaryotic hyphae to form _____.
3.Meiosis and Mitosis in asci.
4.Ascospores develop and are released.

-_____: Female gam.

-_____: Male gam.

Special Types of Fungi

1.Deuteromycota: "fungi _____;" fungi without a _____ _____; most now classified in phylum _____.

2.Mycorrhiza: symbiotic association b/t fungi and _____ _____; provides phosphate to plant roots and receives sugar from photosynthesis of plants; many classified in phyla _____ and _____.

-Critical Role: _____

3.Lichens: symbiotic relationship b/t fungi and _____ or _____ _____; relationship decomposes rocks and helps produce soil; most classified in phylum _____.

Types of Lichens

-_____: grow on rocks and trees.

-_____: shrub-like

-_____: grow on soil surfaces.

Activity:

Fungi Classification: pg. 546

Phyla	Location	Example	Reproductive Structure
Zygomycota			
Basidiomycota			
Ascomycota			

1. The study of fungi is called
a. entomology. b. mycology. c. virology. d. botany.

2. All fungi are
a. multicellular and prokaryotic. c. eukaryotic and nonphotosynthetic.

b. prokaryotic and photosynthetic. d. unicellular and photosynthetic.

3. What is the name of the fungus that happens to be the LARGEST organism in the world?
a. *Armillaria* b. *Candida* c. *Microsporum*. d. *Trychophyton*

4. Unlike animals and some protists, fungi
a. ingest their nutrients before digesting them.

b. secrete enzymes and then absorb the digested nutrients through the cell wall.

c. have cell walls made of cellulose without chitin.

d. do not store energy in the form of glycogen.

5. Fragmentation is a form of asexual reproduction using _____ as spores to spread diseases like athlete's foot.

a. sporangiospores b. conidia c. septate hyphae cells d. buds

6. A mushroom is an example of a

a. rhizoid. b. ascogonium. c. zygosporangium. d. basidiocarp.

7. The name for the type of lichen that grows on rock and trees is called

a. foliose. b. fruticose. c. crustose. d. septate.

8. A mycelium is an interwoven mat of

a. spores. b. septa. c. hyphae. d. conidia.

9. Which of the following best describes how fungi feed?

a. saprophytic c. nonphotosynthetic

b. digestion BEFORE ingestion d. ALL of the above

10. What is the name for the group known as "fungi imperfecti?"

a. Zygomycota b. Ascomycota c. Deuteromycota d. Basidiomycota

TRUE/FALSE:

11. A hyphae of fungus visible to the unaided eye is referred to as coenocytic.

12. Mycorrhizae and lichens are associations in which the fungus benefits and the other organism is harmed.

13. Conidia are spores that form without the protection of an enclosing sac.

14. Cellulose is the substance found in the cell walls of fungus cells.

15. Most biologists believe fungi, like other eukaryotes, evolved from prokaryotes through endosymbiosis.

Matching:

16. 25,000 known species; includes mushrooms, puff balls, and shelf fungi
17. Terrestrial fungi; found in rich soils; reproduce sexually using conjugation
18. 75% of all fungi; "Sac" fungi; includes baker's yeast, morels, and truffles

a) Phylum Zygomycota

b) Phylum Basidiomycota

c) Phylum Ascomycota

Matching:

19. Mild Allergies
20. Liver Cancer
21. Penicillin Antibiotics
22. Ethanol

a. *Penicllium*

b. Mold Spores

c. *Aspergillus* aflatoxins

d. Yeast

Unit: 5.5 Name:

Section Title: Kingdom Fungi Web Quest

Latin Root Word:

Review of Old Information: N/A

New Information: Kingdom Fungi Web Quest

In this Web Quest, the goal is to gain insight into the overall role fungi plays in relationship to other organisms. It is important that you follow the trail. This will aid you in realizing your goal to discover the good and evil roles fungi play in the survival and demise of humankind.

Type in the following link, read the information on the page and answer the questions on your paper.
Answer in complete sentences. http://www.ucmp.berkeley.edu/fungi/fungi.html

1. Name two ecological roles of fungi.

2. What are two fungi food sources?

3. Name and describe two fungal diseases.

Click on the following link, read the information on the page and answer the questions on your paper. Answer in complete sentences. http://www.ucmp.berkeley.edu/fungi/fungilh.html

7. Why are some fungi known as Imperfect?

8. What two organisms make up Mycorrhizae? Explain how each benefit from this relationship.

Click on the following link, read the information on the page and answer the questions on your paper. Answer in complete sentences. http://www.ucmp.berkeley.edu/fungi/fungimm.html

9. What makes up the cell walls of fungal cells?

10. This substance is classified as which type of organic compound (protein, carbohydrate, lipid or nucleic acid)?

Go to the following website: www.herbarium.usu.edu/fungi/funfacts/factindx.htm

- Click on "Fun Facts about Fungi"
- Click on "What's in a Name?"
- Click back and then click on **"Dispersal"**

1. Fungi are sessile. What does this mean?

2. Why do fungi have trouble dispersing their spores even though their spores are much lighter than plant seeds?

3. How does the giant puffball disperse its spores?

- Click on "**Gold in the Soil"**

4. What are truffles? Why are truffles such a treat? Why are they so expensive?

- Click **"Ultimate Treasure Hunt"**

5. Why are dogs preferred over pigs to hunt truffles?

- Click on **"Earth Stars"**

6. How do earth stars move?

- Click on **"Fungal Shotguns"**

7. Why does the fungus, ***Pilobolus*** shoot its spores away from the cow dung?

- Click on **"Fairy Rings"**

8. What are fairy rings?

- Click on **"Pitted Delights"**

9. What are morels? How are they different from truffles?

- Click on **"Penicillin: Miracle Drug"**

10. What organism does it originally come from (you can list the common or scientific name)?

11. Why were researchers intent on producing enough penicillin in 1941?

12. What is the problem with misusing antibiotics?

- Click on **"Lichens"**

13. What kind of symbiosis (partnership) is a lichen?

14. What 2 organisms make up the partnership in a lichen?
    a.

    b.

- Click on **"Launching Pads"**

15. What are mycorrhizae?

- Click on **"Ant Gardens"**

16. Why is the relationship between the ants and the fungus a mutualism?