EXERCISE 8 Fungi Diversity

LABORATORY SKILLS:

Wet mount preparation. Stereomicroscopy and compound light microscope.

MATH FOR LIFE: *Available from the PSOH textbook website (www.thelifewire.com and the PSOH student CD packaged with the textbook)*

Topic 1: Units and Conversions

1.4 Units Raided to Powers

OBJECTIVES: After you have completed this exercise, you should be able to

1. describe the general characteristics of fungi.
2. describe the most common fungal mode of obtaining nutritional molecules.
3. describe the general characteristics of the four fungal phyla.

BEFORE COMING TO LAB

1. Read PSOH pages 604-608, *General Biology of the Fungi.*
2. Read the introduction to all of the lab activities.
3. Define each of the following terms in the first box. Use this lab manual, the PSOH glossary, and/or the flashcards on the student web site or CD. In the second box, use each term appropriately in a sentence in the second box.

1. fungi	
2. absorptive nutrition	
3. chitin	
4. yeast	

5. mycelium	
6. hyphae	
7. septa	
8. coenocytic	
9. haustoria	
10. lichens	
11. mycorrhizae	
12. sporangia	
13. conidia	

INTRODUCTION

Your instructor will show "The Biology of Fungi." While the video plays, answer the following questions.

1. Fungi grow as thread-like structures called _____.

2. Like plants and animals, fungi are _____.
3. In some species, the tubular hyphae are long and have many nuclei in one cell partition, a condition called _____
4. Fungi are _____ feeders.
5. _____ are the earliest of four main branches of fungi.
6. Chitrids are most closely related to _____ than plants.
7. Today, zygomycetes are some of nature's most important _____.
8. Yeast reproduce by _____ reproduction.
9. Many ascomycete fruiting bodies are _____ shaped.

INTRODUCTION

Fungi are unicellular (yeasts) or multicellular eukaryotic heterotrophs that have chitin, a polysaccharide, in their cell walls. Most fungi obtain nutrients by secreting digestive enzymes into their environment and reabsorbing the smaller molecules. This is an external digestion process called absorptive nutrition. Some fungi get their nutrients by digesting living host material (parasites), some digest dead organic material (saprobes), and others live in intimate beneficial associations with other organisms (mutualists). In this laboratory, you will examine yeast, representatives of three of the four fungal phyla, and lichens.

ACTIVITY 1 YEAST

PSOH p. 604, *Some fungi are unicellular*. Study Figure 31.2, p. 605 and read the figure legend. *Saccharomyces cerevisiae*, commonly called baker's yeast, is the most widely used model organism for studying eukaryotic cell processes.

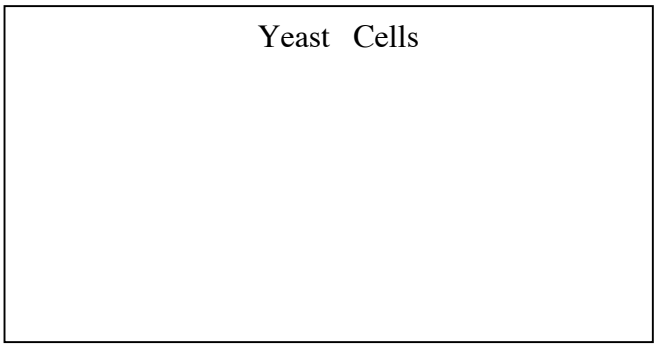
1. Are yeasts unicellular or multicellular? _____
2. Yeast might reproduce asexually by a process called budding. What kind of cell division accomplishes this form of asexual reproduction?

3. Examine a prepared slide of yeast budding with your compound light microscope. "Saccharomyces Budding" should be on the label.
4. Find the beaker or flask marked "yeast cell suspension" on your table. This is a mixture of *S. cerevisiae* (baker's yeast) and water. Make a wet mount using this yeast cell suspension by following these directions:
   a. Place a drop of distilled water onto a clean a glass slide.
   b. Add a tiny sample of yeast from the "yeast cell suspension" to your drop of water. Mix well. Note: If you add too many yeast cells your wet mount will be too thick to see individual cells.
   c. Cover the water/yeast cell drop with a cover glass using standard procedures.
   d. View the slide with your compound light microscope using standard microscopy procedures.

   Ask your instructor for help if you cannot see individual cells.

4. Using your colored pencils, draw what you see.

Yeast Cells

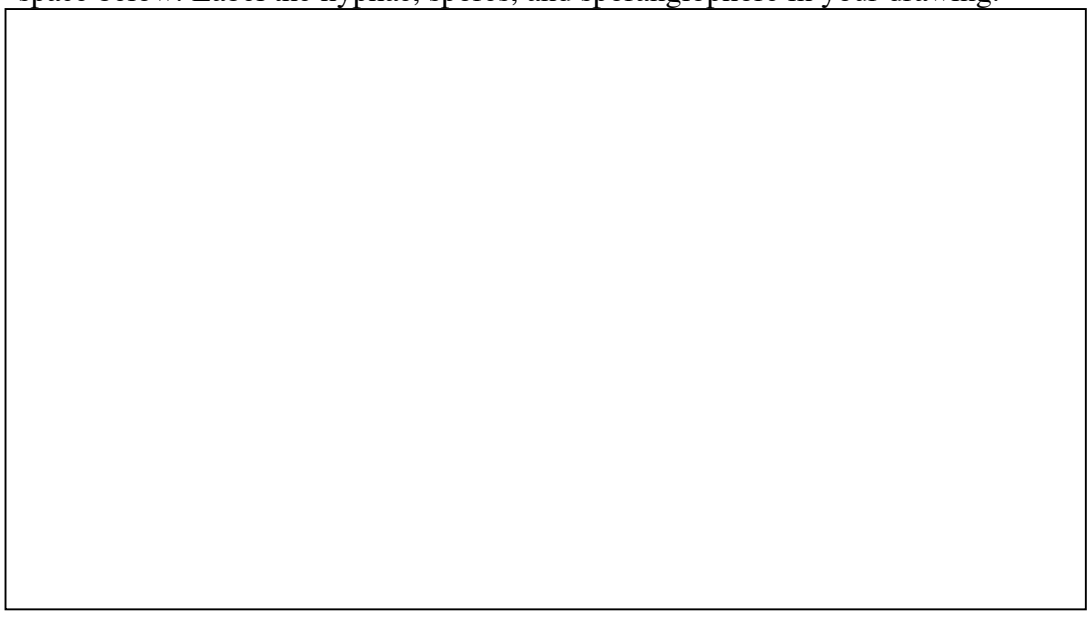


5. The total magnification of the image of the yeast cells produced by your light microscope is _____.

ACTIVITY 2 ZYGOMYCETE PHYLUM

Read PSOH pp. 609, *Zygomycetes reproduce sexually by fusion of two gametangia*. Study Figures 31.8 on p. 609 and 31.9 on p. 610, which shows the zygomocycete sexual life cycle diagram. These fungi can also reproduce asexually by spore production. *Rhizopus stolonifer*, the black bread mold, is the representative organism for this phylum.

1. Find the demonstration Petri dish containing *Rhizopus stolonifer*. DO NOT OPEN THE DISH. Using a stereomicroscope, examine the contents of the dish.
2. Look at Figure 31.9 on p. 610. Study the micrograph labeled (a). Do you see any structures like this in your sample? _____
3. Draw or trace the fruiting body of the black bread mold as seen in Fig. 31.9(a) in the space below. Label the hyphae, spores, and sporangiophore in your drawing.



4. Obtain a prepared slide of *Rhizopus* sp. sporangia. Use your light microscope to

examine the specimen on the slide. Can you see spores? _____

5. What is the total magnification of the specimen you see with your microscope? _____

ACTIVITY 3 ASCOMYCETE PHYLUM

Read PSOH pp. 609-612, *The sexual reproductive structures of ascoymcetes is an ascus*. *Neurospora crassa, Penicillium spp., and Aspergillus spp*. are the representative organisms for this phylum.

1. What is the common name for fungi of this phylum? _____
2. Find the demonstration Petri dish containing *Neurospora crassa*. DO NOT OPEN THE DISH. Using a stereomicroscope, examine the contents of the dish.
3. Find the demonstration Petri dish containing *Penicillium sp*. DO NOT OPEN THE DISH. Using a stereomicroscope, examine the contents of the dish.
4. Obtain a prepared slide of *Penicillium* sp. Use your light microscope to examine the specimen on the slide. Can you see spores? _____
5. What antibiotic is produced by some of the *Penicillium* spp? _____
6. Obtain a prepared slide of *Aspergillus* sp. sporangia. Use your light microscope to examine the specimen on the slide. Can you see spores? _____
7. What is the common name for members of this genus? ___brown molds_____
8. 2. Find the demonstration Petri dish containing *Aspergillus sp*. DO NOT OPEN THE DISH. Using a stereomicroscope, examine the contents of the dish.

ACTIVITY 4 BASIDIOMYCETE PHYLUM

Read PSOH pp. 612-614, *The sexual reproductive structure of basidiomycetes is a basidium*. *Schizophyllum commune* and mushrooms available from the grocery store are the representative organisms for this phylum.

1. What is the common name for fungi classified in this phylum? _____

Refer to Figure 31.15 in PSOH on p. 614 as you examine mushrooms.

2. Observe the cap of the basidiocarp with a stereomicroscope. Focus on the gills.
3. Using a scalpel or razor blade, make the thinnest longitudinal slice possible through the cap of the basidiocarp. Try to cut just one gill from the cap.
4. Make a wet mount with the thin slice of the gill.
5. Observe your wet mount with the compound light microscope.
6. Can you locate the basidiospores on the edge of the gills? _____
7. Can you see individual basidiospores floating in the water? _____
8. Show your instructor your results. You might be asked to show your results to other students in the class.
9. Find the demonstration Petri dish containing *Schizophyllum commune*. DO NOT OPEN THE DISH. Using a stereomicroscope, examine the contents of the dish.

ACTIVITY 5 LICHENS

Lichens demonstrate mutualistic relationships between a fungal species and photosynthetic microorganisms. Read *Lichens can grow where plants cannot* in PSOH pp. 616-617.

1. Make a very thin slice of a lichen sample.
2. Make a wet mount if the sample.
3. Look for the photosynthetic microorganisms (green) using your compound light microscope.
4. Look for the fungal hyphae (non-green threads).
5. Show your results to your instructor.
6. Now obtain a prepared slide of a lichen specimen. Can you see both the fungal and photosynthetic organisms in the lichen?
7. Do you think this specimen in the prepared slide has been artificially stained? _____ Explain. _____

Exercise 8 Post-Lab Questions and Connections

1. Fungi are heterotrophic organisms. Explain what this means.

2. Most fungi obtain their "food" by absorptive nutrition. Explain what this means.

Using the information on PSOH p. 604, define the following terms:
3. Saprobe

4. parasite

5. mutualist

Using the information on PSOH p. 604, answer the following questions.
6. Chitin is a _____ molecule.

7. List and name the most distinguishing feature of the four phyla in the Fungi Kingdom.
   1.

   2.

   3.

   4.

8. Unicellular fungi are all called _____.

Next Week's Quiz Study Guide:
1. Be able to describe the general characteristics of fungi.
2. Be able to answer questions that are similar to the post-lab questions.
4. Be able to define and use the terms listed at the beginning of this lab exercise.
5. Be able work conversion problems similar to those in Topic 1.4, ***MATH FOR LIFE***.