Lecture 13: The Fungus Among Us

I. What are they?
   A. Fungi are _____________ organisms that grow best in dark, moist habitats.
   B. Once thought to be plants, they are now thought to be _____________.

C. They receive their energy from ________________ by secreting ________________ into the environment. Most Fungi are ________________, the organic matter from which they take their nutrients is ________________.

D. Include both the unicellular, non-filamentous ________________ and the multicellular, filamentous ________________.
   1. Yeasts are typically _______________________________ and are commonly found in nature on fruits and the leaves of trees.
   2. Molds are a diverse group ranging from small colonies on fruits and cheeses to large ____________________________.

Taken by Rachel in Minnesota along the Mississippi River

http://en.wikipedia.org/wiki/Fungus#Evolutionary_history
II. What is the structure of a fungus?
   A. The body of a fungus is called the ______________________.
   B. Molds are further characterized by long, branched filaments called
      ______________________

   The hyphae form a tangled web called ______________________

III. How do fungi reproduce?
   A. Yeast generally reproduce ____________________________

   B. Molds can reproduce either sexually or asexually.
      1. Asexual reproduction can occur either by central ____________
         of a parent cell to form two daughter cells or by ________________
         ____________________.
2. Sexual reproduction involves the __________________________
____________________ and generally includes the formation of a
_____________________________________
that can survive harsh
external conditions.

IV. How do fungi affect us?
A. ________________________
   1. Entire ecosystems would collapse without fungi decomposing dead
organisms, fallen leaves, feces, and other organic materials.
   2. Nitrogen and carbon wouldn’t be recycled for new generations of
life.

B. ________________________
   1. You’ve seen the evidence on your fruit and shower curtains.
   2. 10 to 50% of the world’s __________________________ is lost
to fungal attack every year.
   3. During the Revolutionary war, Britain ________________________
to fungal rot than enemy attack².

² msn Encyclopedia Encarta
C. Pathogenic Fungi
1. Many fungi are responsible for some well-known human diseases called ____________________________ (e.g., athlete’s foot and jock itch).
2. ____________________________________________ to fungal infection. There are 5,000 pathogens that affect garden plants, agricultural plants, and wild plants.

D. __________________________
1. Fungi have been consumed throughout human history. Some you might be familiar with are ____________________________, morel, cremini, chantarelle, shiitake, and oyster (sautéed with garlic and butter; delicious!)
2. Others are used in the production of ____________________________
   ____________________________________________________________.
3. *Penicillium roquefortii* and *P. camemberti* are responsible for the color, texture, and flavor of ____________________________

V. How are fungi classified?
We will look at six fungal divisions. Two more (*Urediniomycetes* and *Ustilaginomycetes*) are often classified as *Basidiomycota* and as such are not listed as separate divisions here. Fungal taxonomy is ever-changing. We will base our discussion largely on the classifications presented in the Prescott text.

A. __________________________
1. Very simple, ____________________________ fungi that live in freshwater, mud, soil, and sometimes the rumen.
2. Reproduce both sexually and asexually and spores are ____________________________ via a posterior flagellum.

B. __________________________
1. Members of this phylum have coenocytic hyphae and generally ____________________________ via sporangiospores.
2. Most bread molds are _____________________________. The common bread mold *Rhizopus stolonifer* is even used in some countries to ____________________________ such as tempeh and sufu.

C. __________________________
1. This group contains molds with ____________________________ such as lichens, morels, ____________________________, and cap fungi. Many yeasts are also classified into this division.
   a. *Letharia vulpina* (__________________________) grows on conifers. The Native Americans of California used Wolf Lichens for medicinal purposes and as arrow poison.

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3 Prescott Text (seventh edition) p. 630
4 Lichens of North America (Sharnoff et. al.) ISBN: 0-300-08249-5
b. Black Truffles (aka “Black Gold”)

1.) A culinary treasure, they are worth up to ____________

2.) Found mostly in France and northern Italy, farmers train pigs and dogs to ____________________________

3.) They have a complex flavor, often described as nutty, musky, cheesy, earthy, smokey, smooth....

4.) Napoleon was said to have used them as an __________________________, and they were forbidden to medieval nuns because of their naughty influences.

2. They are called sac fungi because their sexual spores are produced in a _______________________. They can also reproduce asexually via _____________________________.

3. Many members of this group are ____________________________, causing plant diseases such as Dutch Elm disease and Chestnut Blight as well as the human and animal disease, ________________.
   a. Ergotism is a toxic condition commonly accompanied by gangrene, nervous spasms, burning sensations, ____________________________, convulsions and temporary insanity.
   b. An epidemic of ergot in 943 A.D. ____________________________
   c. The widespread accusations of ____________________________ ________________ may have resulted from outbreaks of ergotism.
   d. The active ingredient of ergot is ________________.

D. ____________________________________________________________________________
   1. Members of this phylum have ____________________________ and possess a club-shaped structure called a ____________________________ that produces sexual spores called ____________________________.

5 http://www.businessweek.com/magazine/content/04_03/c3866097.htm
6 Prescott Text (seventh edition) p. 637
2. This group has many _______________ members (mushrooms and puffballs) and also includes shelf fungi. Also in this division are several _______________ such as *Amanita phalloides* (“Destroying Angel”).

Shelf fungi (taken by Rachel in England (summer 2006))

E. ______________________
Most are _______________ fungi that form a _______________ with the roots of plants.

1. Around _______________ have an association with mycorrhizae? “Plants don’t have roots, they have mycorrhizae!”
2. Mycorrhizae help _______________ throughout the soil, and draw up additional water and minerals.

F. ______________________
1. ____________________________ of fish, humans and insects.
2. ____________________________ such as mitochondria.
3. Spores germinate in response to host signals. A _______________ _______________ from the spore. This tube penetrates the host cell and allows the parasite to enter.

VI. To sum up:

A. Fungi are a diverse and vital group of organisms, crucial to life on earth.
B. The next time you eat a mushroom pizza, give a little thanks to the guys on top. And remember, mycology is better than yours!

Background information for writing this lecture was obtained largely from Prescott’s Microbiology (seventh edition). Other information was from: Campbell’s Biology, Nester’s Microbiology: A Human Perspective, Murray’s Manual of

⁷ Prescott Text (seventh edition) p. 697
Clinical Microbiology and Microsoft Encarta Encyclopedia
Visit the following web sites for pictures and more information:
www.ftns.wau.nl/imb/research/wrf.html
www.lichen.com/bigpix/Asarmentosa.html
athletesfoot.com/scalyfootpage.html
www.terra.hu/novkorny/pic/2/nm/amanpha2.jpg
www.ucmp.berkeley.edu/fungi/chytrids.html
www.wisc.edu/botany/fungi/oct99.html
www.mykoweb.com/photos/Puffball_(mgw-01).jpg
http://en.wikipedia.org/wiki/Fungus#Evolutionary_history