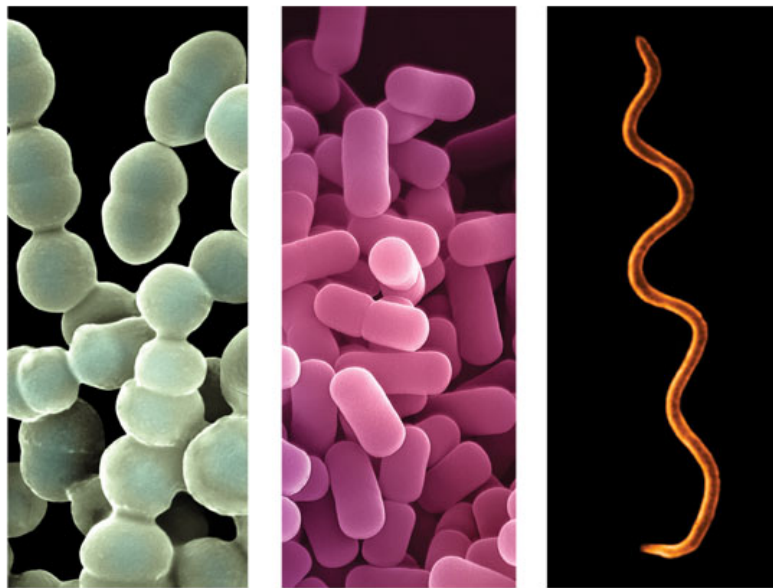


Kingdom Monera

Monerans are the oldest and most abundant living organisms known to date. They include all bacterial types and some photosynthetic and chemosynthetic organisms.

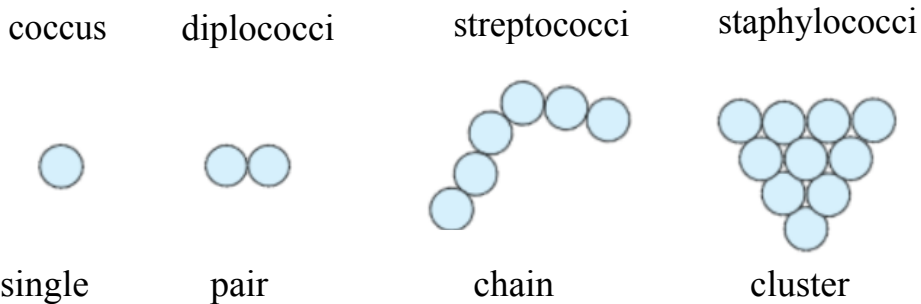
Most bacteria have one of three basic shapes:

1. cocci (singular: coccus) -> spherical
2. bacilli (singular: bacillus) -> rod-shaped
3. spirilla (singular: spirillus) -> spiral



(a) Spherical (cocci) (b) Rod-shaped (bacilli) (c) Spiral

Arrangement of Cocci



coccus- Streptococcus pyogenes caused rheumatic fever and most strep throat infections

Staphylococcus aureus- normally a harmless occupant of a persons skin is a major cause of infections in burn units and other hospital based infections

Neisseria gonorrhoea- causes gonorrhoea

Bacillus

Bacillus anthracis- causes anthrax a potentially fatal disease

Clostridium botulinum- causes botulism in incorrectly canned food

Clostridium tetani- causes tetanus or lockjaw

Clostridium perfringens- causes gas gangrene

Spirillum

Most spirillum are harmless...with one notable exception:

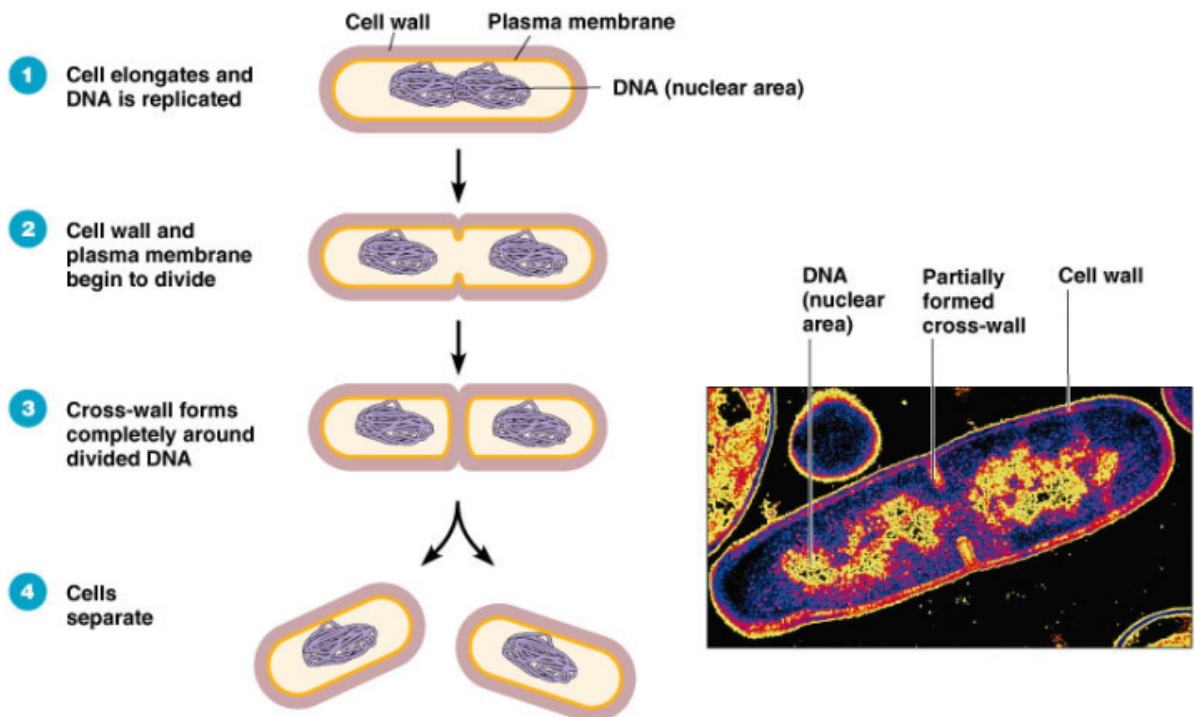
Treponema pallidum- causes syphilis

Bacteria can be grouped according to respiration.

1. obligate aerobes - bacteria that require oxygen for respiration
(*Mycobacterium tuberculosis*)
2. obligate anaerobes - bacteria that conduct respiration processes
in the absence of oxygen
3. facultative anaerobes - bacteria that can survive with or without
oxygen
- majority of bacteria fit into this group

Biology 112
Monerans - Reproduction

1. binary fission (splitting in two) - asexual reproduction



(a) A diagram of the sequence of cell division.

(b) A thin section of a cell of *Bacillus licheniformis* starting to divide.

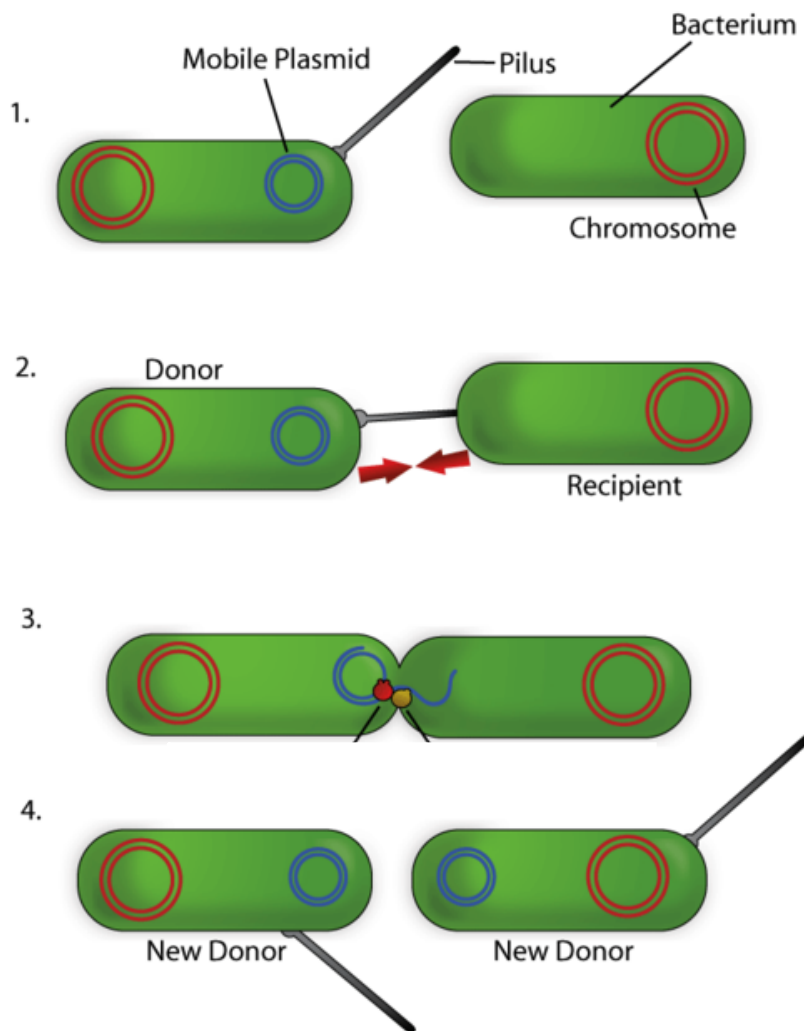
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<http://www.youtube.com/watch?v=J6akNYlkehY>

2. conjugation- "sexual reproduction"

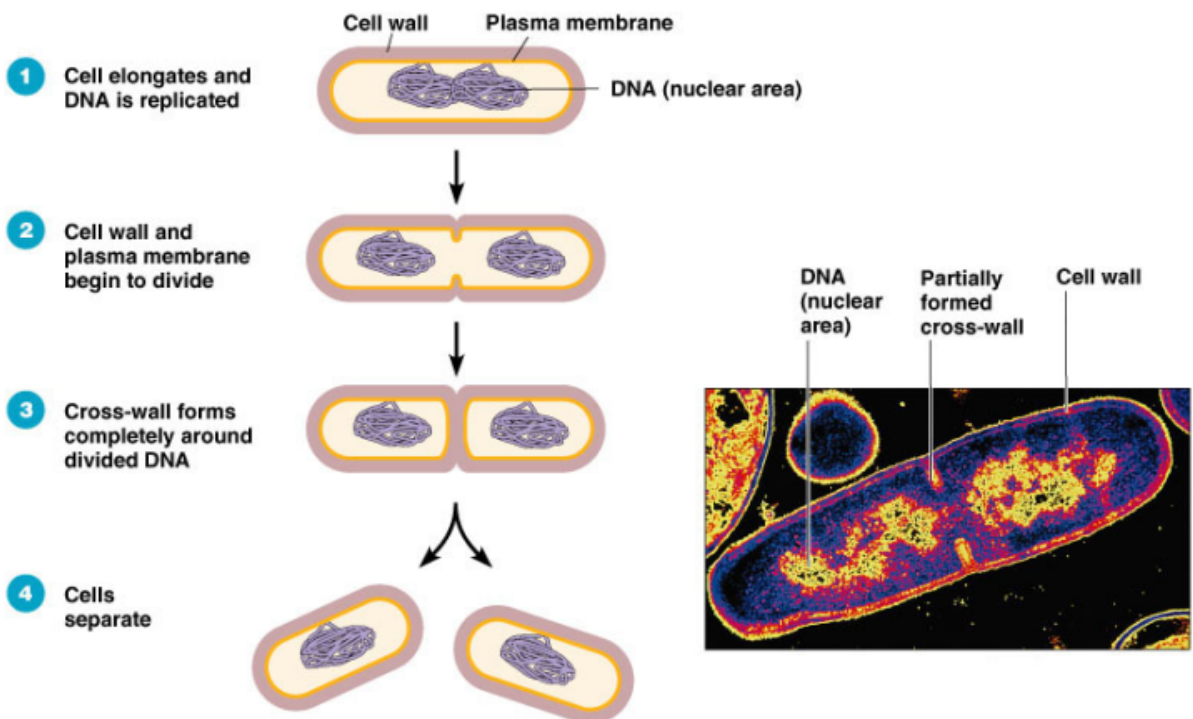
pilus - cytoplasmic bridge

plasmid - small ring of genetic material



Bacteria can be grouped according to reproduction and growth.

1. binary fission (splitting in two) - asexual reproduction



(a) A diagram of the sequence of cell division.

(b) A thin section of a cell of *Bacillus licheniformis* starting to divide.

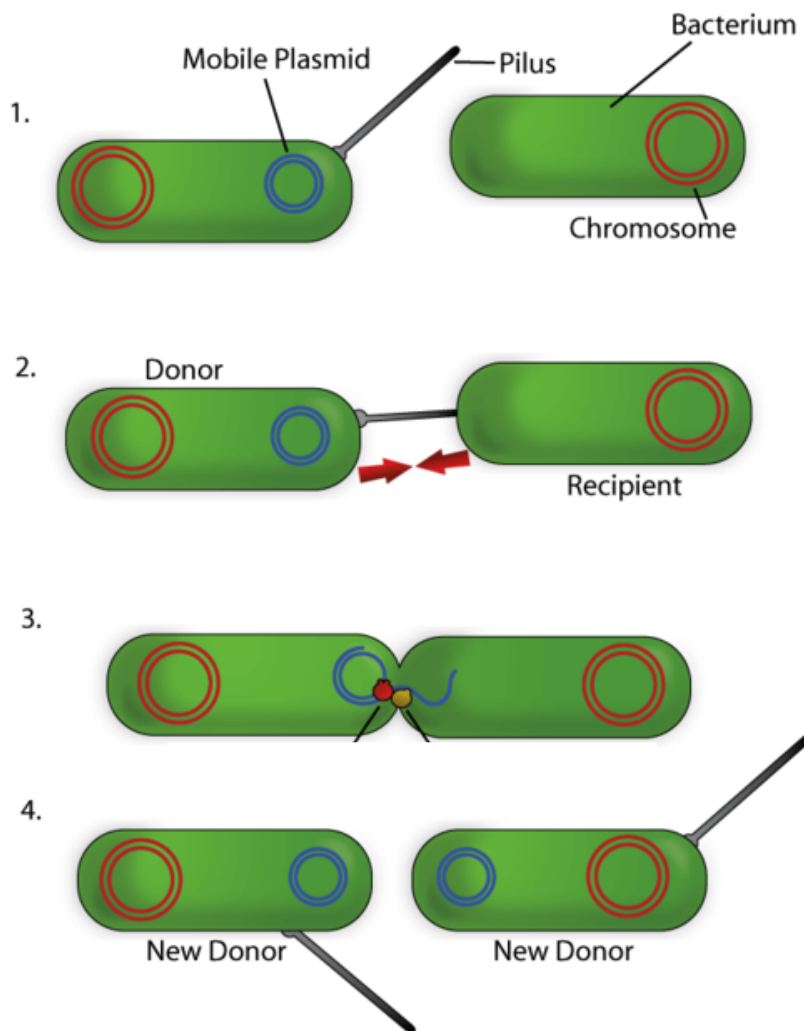
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<http://www.youtube.com/watch?v=J6akNYlkehY>

2. conjugation- "sexual reproduction"

pilus - cytoplasmic bridge

plasmid - small ring of genetic material



Mitosis - Page 246

Meiosis - Page 276

Case Study
Following an Infection
(Nelson, page 430, C18)

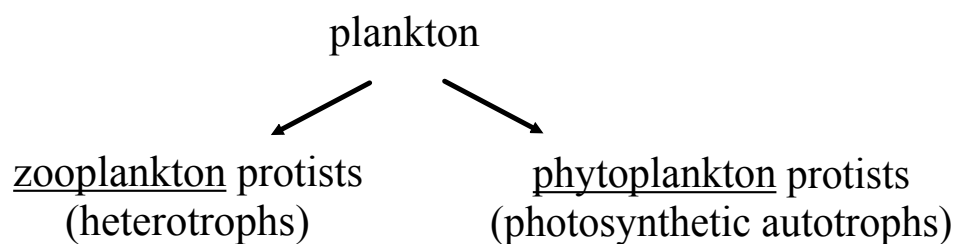
Kingdom Protista

"Catch-All Kingdom"

Protists demonstrate an important evolutionary advancement - a discrete, membrane-bound nucleus (ie/ eukaryotic).

Protists contain organelles such as ribosomes, mitochondria and lysosomes.

Plankton, tiny floating organisms that include protists, are important producers and consumers in aquatic food chains.



Protist Diversity ✓

There are three distinct groups of protists.

1. Plant-like Protists ✓

Plant-like protists are autotrophic. They can be unicellular, multicellular or live in colonies.

They can live in soil, on the bark of trees, in fresh water and in salt water. They are very important because they produce a lot of oxygen and form the base of aquatic food chains.

The plant-like protists are divided into four basic groups: **euglenoids, dinoflagellates, diatoms** and **algae**.

Euglenoids

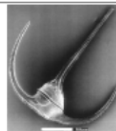
- **Autotrophs** when sunny
- **Heterotrophs** when dark
- **Unicellular**
- Found mostly in fresh water
- Some have **flagellum**



flagella = tiny whiplike structures used in movement and feeding (flagellum is the singular form)

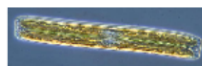
Dinoflagellates

- **Unicellular**
- Covered by stiff plates
- Have two **flagella**
- May glow in the dark
- Found in ocean



Diatoms

- **Unicellular**
- Glasslike cell walls
 - Used in toothpastes, scouring products, and as filters



Green Algae	Red Algae	Brown Algae
<ul style="list-style-type: none"> • Are green in color • Mostly unicellular, but some form colonies, and a few are multicellular • Live in fresh water, salt water, and a few live on land 	<ul style="list-style-type: none"> • Multicellular • Commonly called sea weed • Live in deep salt water • Are used by humans to help make ice cream and hair conditioner • Are eaten in some Asian cultures 	<ul style="list-style-type: none"> • Multicellular • Commonly called sea weed • Have large leaf-like structures called blades • Have air-filled sacs called air bladders • Have root-like structure called holdfast • Live in salt water • Are used by humans to help make pudding and salad dressing



2. Animal-like Protists

These organisms are known as protozoans and are heterotrophic.

Holozoic protists engulf bacteria and other microbes for food.

Saprozoic protists absorb predigested material through the cell membrane. Protozoans can be either free-living or parasitic.

Reproduction is usually asexual, by fission. Some may reproduce sexually, which involves the fusion of gametes and the formation of a zygote.

Protists with Pseudopods	Protists with Cilia
These protists move by extending their bodies forward and then pulling the rest of their bodies forward as well (<u>check it out</u>). <u>The finger-like structures that they project forward are called pseudopods.</u> <u>The pseudopods are also used to trap food.</u>	<u>These protists move by beating tiny hair-like structures called cilia.</u> <u>The cilia act as tiny oars that allows the protist to move through its watery environment (check it out).</u> <u>The cilia also help the protists capture food.</u>
The <u>ameba</u> is an example of this type of animal-like protist.	The <u>paramecium</u> is an example of this type of animal-like protist.
	

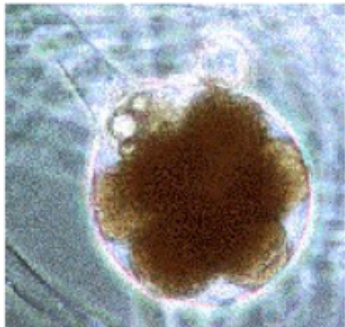

Protists with Flagella	Others
These protists move by beating their long whiplike structures called <u>flagella</u> . These protists can have one or more <u>flagella</u> that help them move. Many of these protists live in the bodies of other organisms. Sometimes, they help their host, while at other times they harm their host.	These protists are characterized mainly by the way they live. <u>All of these protists are parasites.</u> Many of these protists cause diseases such as <u>malaria</u> .
The <u>Giardia</u> is an example of this type of animal-like protist.	The <u>Plasmodium</u> is an example of this type of animal-like protist.

<http://www.youtube.com/watch?v=QGA6hMysTA&feature=related>

http://www.youtube.com/watch?v=7pR7TNzJ_pA&feature=related

3. Fungus-like Protists

These protists are heterotrophs with cell walls. They reproduce by forming spores. All are able to move at some point in their lives. There are three types: **water molds**, **downy mildews** and **slime molds**.

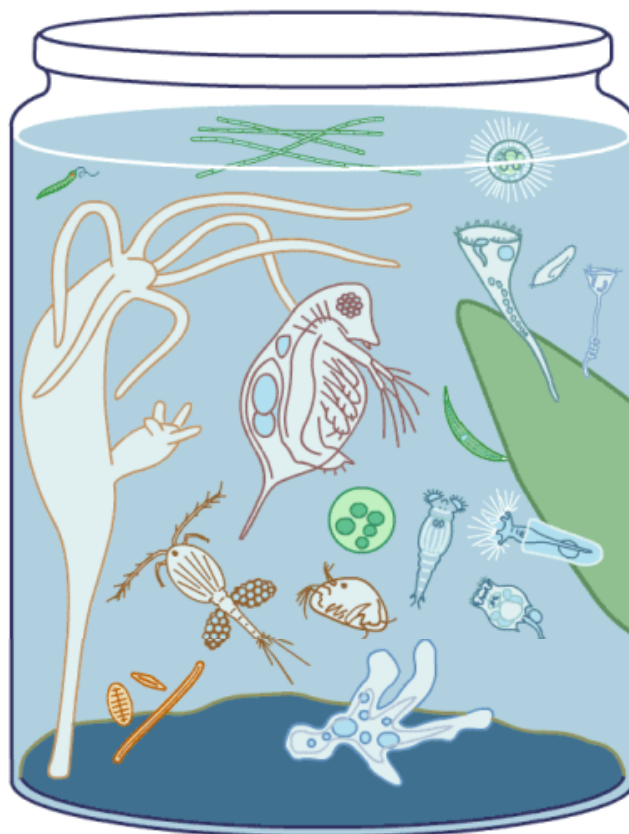
Water Molds	Downy Mildews
<ul style="list-style-type: none"> • Live in water or moist environments • Look like tiny threads with a fuzzy covering • Attack food such as potatoes, cabbage, and corn and can destroy whole crops 	
	

Slime Molds
<ul style="list-style-type: none"> • Live in moist soil and on decaying plants and trees • Very colorful • Move by forming <u>pseudopods</u> • Feed on <u>bacteria</u> and other <u>microorganisms</u>.



Pond Dip

<http://www.microscopy-uk.org.uk/index.html?http://www.microscopy-uk.org.uk/ponddip/index.html>



Kingdom Fungi

Chapter 21 - Fungi

Page 526

Fungi are eukaryotic heterotrophs that have cell walls.

The cell walls of fungi are made up of chitin, a complex carbohydrate that is also found in the external skeletons of insects.

Fungi digest food outside of their bodies and then absorb it.

Some absorb nutrients from decaying matter in the soil. Others live as parasites, absorbing nutrients from the bodies of their hosts.

Structure of Fungi

Page 527

Except for yeasts, all fungi are multicellular. Multicellular fungi are composed of thin filaments called hyphae (plural: hypha). Each hypha is one cell thick. In some fungi, cross walls divide the hyphae into cells containing one or two nuclei. In the cross walls, there are tiny openings through which the cytoplasm and nuclei can move.

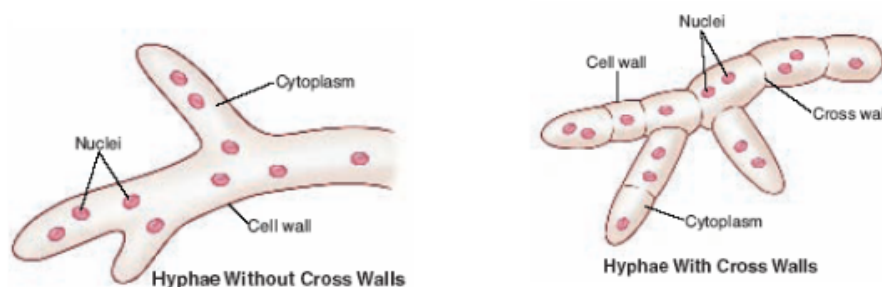
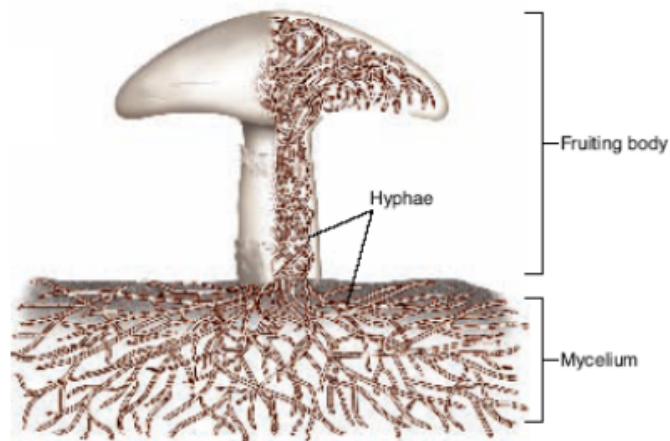


Figure 21-1
Page 527

The bodies of multicellular fungi are composed of many hyphae tangled together into a thick mass called a mycelium (plural: mycelia).

A fruiting body is a reproductive structure growing from the mycelium.

[Figure 21-2
Page 528]



Reproduction in Fungi

Page 528

Most fungi reproduce both asexually and sexually.

Asexual Reproduction

Asexual reproduction can occur when cells or hyphae break off from a fungus and begin to grow on their own.

Some fungi produce spores, reproductive cells that are capable of growing into a new organism.

In some fungi, spores are produced in structures called sporangia (singular: sporangium). They are found at the tips of specialized hyphae called sporangiophores.



Sexual Reproduction

Sexual reproduction usually involves two different mating types. One mating type is called "+" (plus) and the other is called "-" (minus). When hyphae of opposite mating types meet, they fuse, bringing plus and minus nuclei together.

How Fungi Spread

Page 529

Many fungi produce dry, almost weightless spores that scatter easily in the wind. On a clear day, a few liters of fresh air may contain hundreds of spores from many species of fungi.



Other fungi are specialized to lure animals which disperse fungal spores over long distances.

- Stinkhorns smell like rotting meat which attracts flies. When the flies land on the stinkhorns, they ingest the sticky, smelly fluid on the surface of the fungus. The spore-containing fluid will pass unharmed out of the flies' digestive system, depositing spores over many kilometers.



Star Stinkhorn Fungi

Classification of Fungi ✓

Page 530-536

The kingdom Fungi has over 100,000 species. Fungi are classified according to their structure and method of reproduction. The methods by which the fungi reproduce are unlike those of any other kingdom.

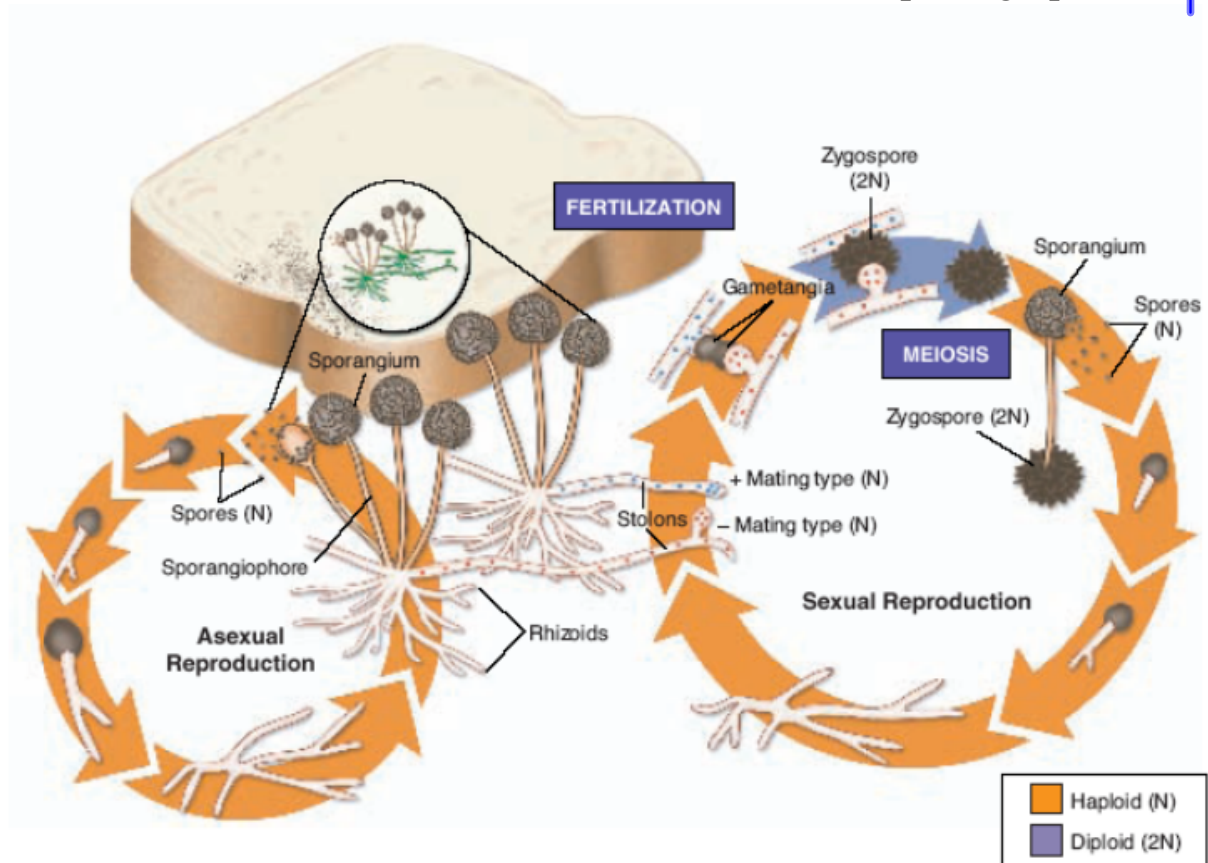
The four main groups of fungi are:

1. the common molds (Zygomycota)
2. the sac fungi (Ascomycota)
3. the club fungi (Basidiomycota)
4. the imperfect fungi (Deuteromycota)

The Common Molds ✓

The familiar molds that grow on meat, cheese and bread are members of the phylum Zygomycota, also called zygomycetes.

Black bread mold, *Rhizopus stolonifer*, is a familiar zygomycete. Rootlike hyphae that penetrate the bread's surface are called rhizoids. Stemlike hyphae that run along the surface of the bread are stolons. Hyphae that push up into the air are sporangiophores.



▲ **Figure 21-5** 🍄 Zygomycetes have life cycles that include a zygospore. During sexual reproduction in the bread mold *Rhizopus stolonifer*, hyphae from two different mating types form gametangia. The gametangia fuse, and zygotes form within a zygospore. The zygospore develops a thick wall and can remain dormant for long periods. The zygospore eventually germinates, and a sporangium emerges. The sporangium reproduces asexually by releasing haploid spores produced by meiosis.

Page 531

The Sac Fungi

Sac fungi, also known as ascomycetes, belong to the phylum Ascomycota. The phylum Ascomycota is named for the ascus, a reproductive structure that contains spores.

▼ **Figure 21-6** These cup fungi are members of the phylum Ascomycota. In cup fungi, asci lie on the interior surface of the cup. At maturity, the spore-filled asci burst, releasing the spores into the air.

Page 532



nm.17

The Club Fungi

Club fungi, also known as basidiomycetes, belong to the phylum Basidiomycota. The phylum gets its name from a specialized reproductive structure that resembles a club. The spore-bearing structure is called the basidium (plural: basidia).

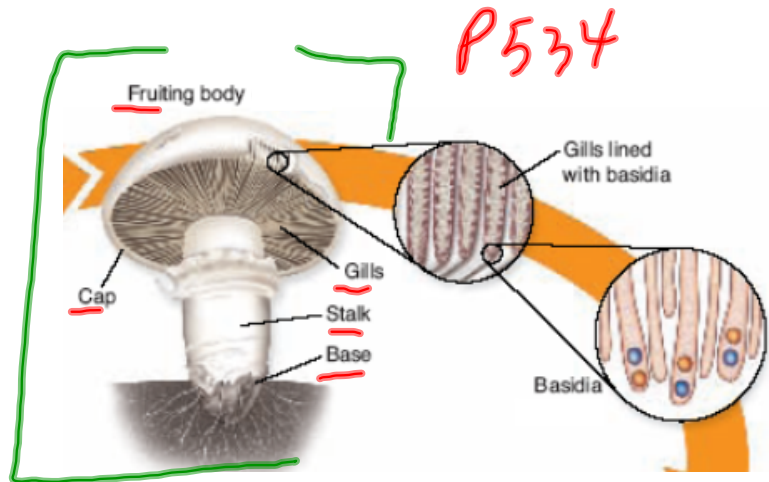


FIGURE 21-9 DIVERSITY OF CLUB FUNGI

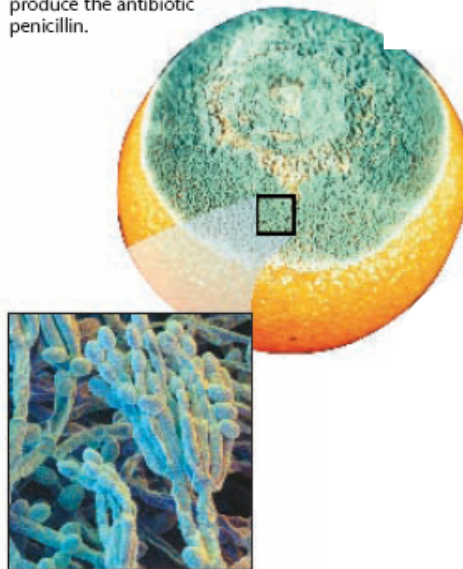


The Imperfect Fungi

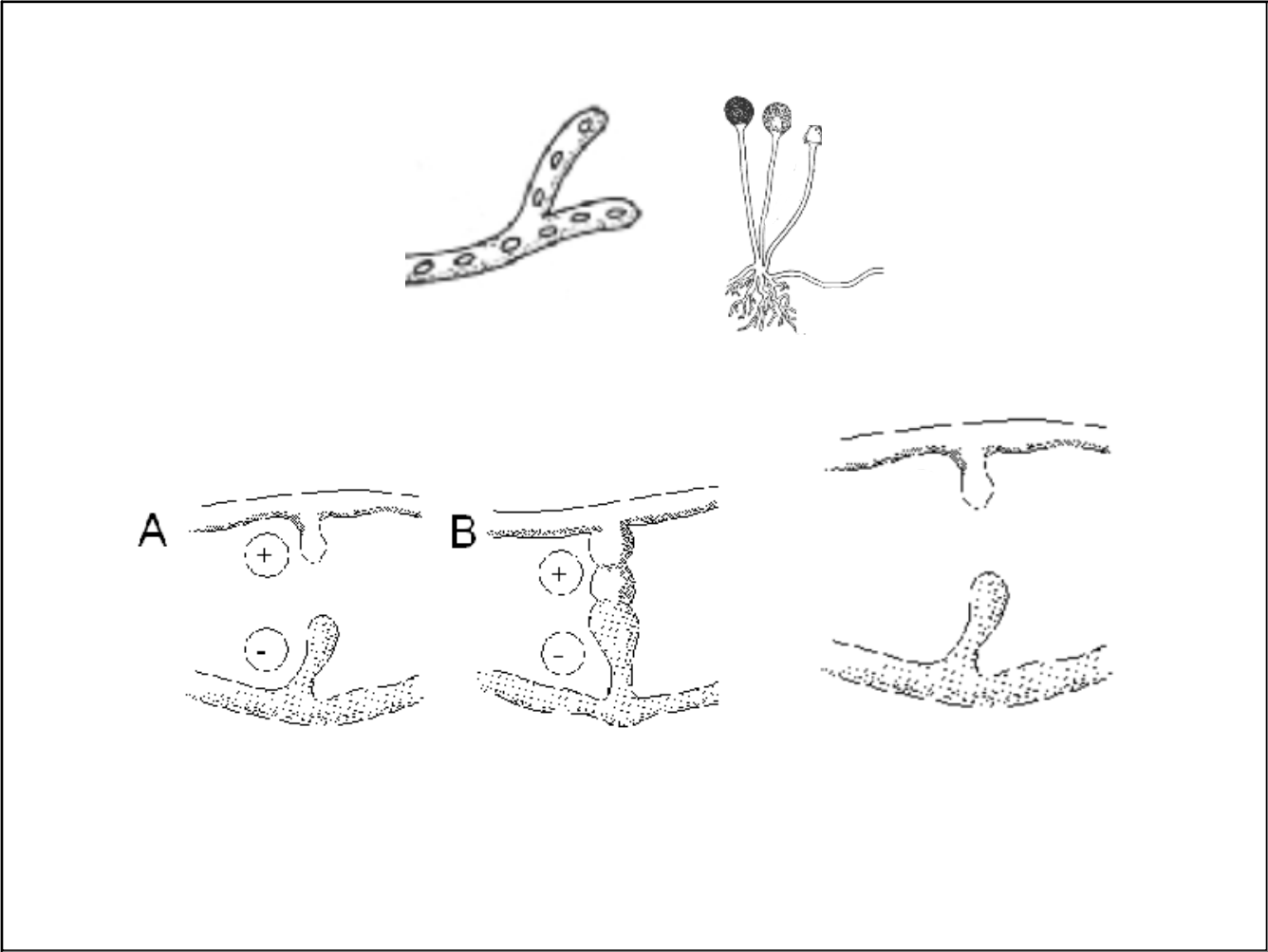
The phylum Deuteromycota consists of fungi that cannot be placed into other phyla because researchers have never been able to observe a sexual phase in their life cycles.

The species *Penicillium notatum* is a mold that frequently grows on fruit and is the source of the antibiotic penicillin.

Figure 21-10 The phylum Deuteromycota is made up of fungi that cannot be classified in any other phylum. Under the microscope, the brushlike clusters of many small, spherical conidia characterize *Penicillium notatum*. This organism was the first of the *Penicillium* fungi used to produce the antibiotic penicillin.



(magnification: 930×)



Biology 112
What Do You Know?
Protists and Fungi

Name - _____ Date - _____

1. What evolutionary advancement did protists demonstrate?
2. What do you know about zooplankton protists?
3. a) What are the four groups of plant-like protists?
b) What term is used to represent animal-like protists?
c) Name three structures that animal-like protists use to move from one location to another.
4. What are three types of fungus-like protists?
5. Of what complex carbohydrate are the cell walls of fungus made?
6. Multicellular fungi are composed of thin filaments. What are the thin filaments called?
7. Where would you find the mycelium of a fungus?
8. Male and female are not terms used with fungus. What terms are used?
9. What are the four main groups of fungi? Use the common names.
10. What are the differences between the rhizoids, stolons and sporangiophores of black bread mold?
11. What is the reproductive structure of the sac fungi called?
12. What is the spore-bearing structure of the club fungi called?
13. Why haven't the imperfect fungi been placed in another phyla?

Biology 112
What Do You Know?
Protists and Fungi

Name - _____ Date - _____

1. What evolutionary advancement did protists demonstrate?

They had a membrane-bound nucleus.

2. What do you know about zooplankton protists?

They are tiny, floating heterotrophic protists.

3. a) What are the four groups of plant-like protists?

They are the euglenoids, dinoflagellates, diatoms and algae.

- c) What term is used to represent animal-like protists?

The term is protozoan.

- d) Name three structures that animal-like protists use to move from one location to another.

Three structures are pseudopods, cilia and flagella.

4. What are three types of fungus-like protists?

The three types are water molds, downy mildews and slime molds.

5. Of what complex carbohydrate are the cell walls of fungus made?

The cell walls are made of chitin.

6. Multicellular fungi are composed of thin filaments. What are the thin filaments called?

They are called hyphae.

7. Where would you find the mycelium of a fungus?

It is underground.

8. Male and female are not terms used with fungus. What terms are used?

Mating types "+" and "-" are used.

9. What are the four main groups of fungi? Use the common names.

They are the common molds, the sac fungi, the club fungi and the imperfect fungi.

10. What are the differences between the rhizoids, stolons and sporangiophores of black bread mold?

Rhizoids are root-like hyphae that penetrate the bread's surface, stolons are stemlike hyphae that run along the surface of the bread and sporangiophores are hyphae that push up into the air.

11. What is the reproductive structure of the sac fungi called?

The reproductive structure is called the ascus.

12. What is the spore-bearing structure of the club fungi called?

It is called the basidium.

13. Why haven't the imperfect fungi been placed in another phyla?

Researchers haven't been able to observe the sexual phase in their life cycles.