lesson G

Protists and Fungi

Standard 6-2.9: Explain how disease-causing fungi can affect plants.

Before You Read

Think about the places that you have seen mushrooms growing. What do those places have in common?

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What You'll Learn

- the characteristics of fungi
- how to classify fungi
- how to distinguish imperfect fungi from all other fungi

Read to Learn

Mark the Text

Identify Main Ideas Read each of the question heads. As you read the paragraphs related to each head, underline the answer to the question.

What are fungi?

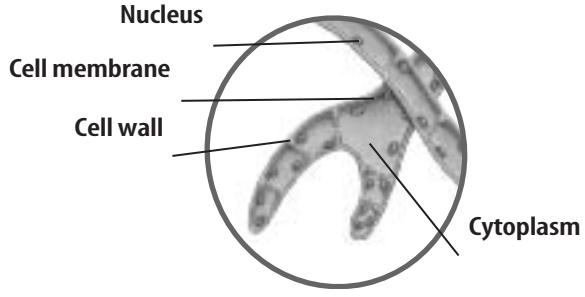
Mushrooms are common fungi. The yeasts used to make some breads and cheeses are a type of fungus. Fungus may grow on a loaf of bread or on your shower curtain.

How did fungi evolve?

Some fossils of fungi have been found, but they do not help scientists determine how fungi are related to other organisms. Some scientists hypothesize that fungi share an ancestor with ancient, flagellated protists and slime molds. Other scientists hypothesize that their ancestor was a green or red alga.

What are hyphae?

Most species of fungi are many-celled. The body of a fungus usually is made up of many-celled threadlike tubes called **hyphae** (HI fee). The figure below shows the inside structure of hyphae.



Picture This

1. **Infer** How do you know these hyphae are made up of many cells?

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How do most fungi get food?

Hyphae produce enzymes that help break down food that the fungus absorbs from another organism. Most fungi are **saprophytes** (SAP ruh fites), meaning they get food by absorbing dead or decaying tissues of other organisms.

Reading Check

2. **Identify** What is a saprophyte?

What characteristics do fungi share?

Some fungi grow anchored in soil and have a cell wall around each cell. Fungi do not have specialized tissues and organs such as leaves and roots. Fungi do not have chlorophyll and do not make their own food. Fungi grow best in warm, damp areas, such as tropical forests or between toes.

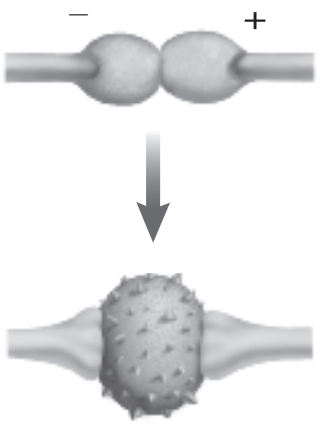
How do fungi reproduce?

Fungi reproduce both asexually and sexually. For both types of reproduction, fungi produce spores. A **spore** is a waterproof reproductive cell that can grow into a new organism. In asexual reproduction, the cells divide to produce spores. These spores grow into new fungi that are genetically identical to the fungus from which the spores came.

Fungi are not identified as either male or female. For sexual reproduction to take place, the hyphae of two genetically different fungi of the same species grow close together. If the hyphae join, a reproductive structure, such as the one in the figure below, forms. Meiosis, or cell division that produces sex cells, results in spores that will grow into new fungi. These fungi are genetically different from either of the two fungi whose hyphae joined together.

Picture This

3. **Identify** Circle the reproductive structure formed when two genetically different fungi reproduce.



How are fungi classified?

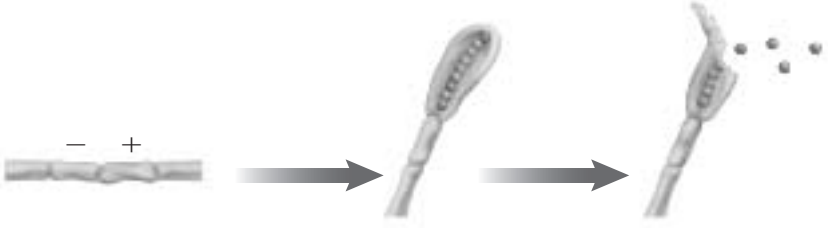
Fungi are classified into three main groups. The groups are identified by the type of structure formed when the hyphae join together.

Club Fungi

Mushrooms, such as those shown above, are examples of club fungi. The mushroom is the reproductive structure of the fungus. Most of the fungus grows as hyphae in the soil or on the surface of its food source. The spores of club fungi are produced in a club-shaped structure called a **basidium** (buh SIH dee uhm) (plural, *basidia*).

Sac Fungi

This varied group of fungi includes yeasts, molds, and truffles. There are more than 30,000 different species of sac fungi. The spores of sac fungi are produced in a little, saclike structure called an **ascus** (AS kus), as shown in the figure below.

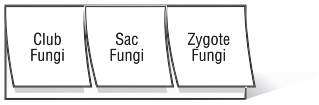


Two hyphal cells fuse. **Ascospores form from fused nuclei that undergo meiosis.** **An ascus opens to release ascospores.**

Although most fungi are many-celled, yeasts are one-celled organisms. Yeasts reproduce sexually by forming spores like other fungi. Yeasts reproduce asexually by **budding,** in which a new organism forms on the side of the parent organism. The two organisms are genetically identical.

FOLDABLES™

Describe Make a three-tab Foldable, as shown below. Describe each of the three main groups of fungi.



Picture This

4. **Identify** Highlight the ascus in the figure.

Picture This

5. **Describe** what happens to the spores when a sporangium splits open.

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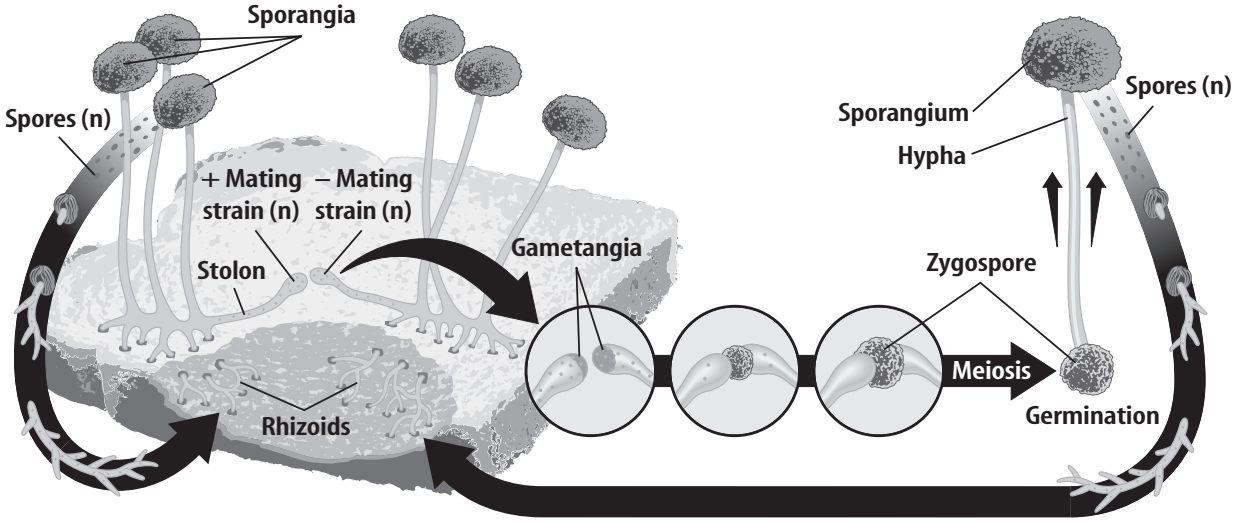
Zygote Fungi and Other Fungi

Black molds that you might see growing on old bread or old fruit are a type of zygospore fungus. Zygospore fungi produce spores in a round spore case called a **sporangium** (spuh RAN jee uhm) (plural, *sporangia*). Sporangia form on the tips of some hyphae. When a sporangium splits open, hundreds of spores are released into the air, as shown in the figure below. Each spore that lands on a warm, moist surface will grow and reproduce if it has a food source.



Reading Check

6. **Explain** Why are some fungi called "imperfect"?

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What are imperfect fungi?

Some fungi either never reproduce sexually or never have been seen reproducing sexually. They usually are called imperfect fungi because there is no evidence that their life cycle has a sexual reproduction stage.

Some scientists classify *Penicillium* as an imperfect fungi. Other scientists classify it as a sac fungi because of the type of spores it produces during asexual reproduction.

Lichens

A **lichen** (LI kun) is an organism made up of a fungus and either a green alga or a cyanobacterium. These two organisms have a relationship that benefits both of them. The alga or cyanobacterium lives among the threadlike strands of the fungus. The fungus gets food made by the green algae or cyanobacterium. The green alga or cyanobacterium gets a moist, protected place to live.

Importance of Fungi

Mushrooms, one type of fungi, are an important food crop. However, some wild mushrooms are poisonous and should never be eaten.

Fungi are used to make some cheeses and breads. Yeasts use sugar for energy and produce alcohol and carbon dioxide as waste products. The carbon dioxide causes bread dough to rise.

What problems do fungi cause in plants and animals?

Many fungi cause disease in plants and animals. Many sac fungi damage or destroy plant crops. Diseases caused by sac fungi include Dutch elm disease and apple scab. Smuts and rust are club fungi. They damage billions of dollars worth of food crops each year.

Ringworm and athlete's foot are skin infections caused by species of imperfect fungi. Some respiratory infections are caused by inhaling fungi or their spores.

How are fungi helpful to animals and humans?

Some fungi naturally produce antibiotics (an ti bi AH tihks) to help keep bacteria from growing near them. The antibiotic penicillin is produced by the imperfect fungi *Penicillium. Penicillium* is grown commercially, and the antibiotic is sold to help humans and other animals fight infections caused by bacteria. The drug cyclosporine comes from a fungus. Cyclosporine helps fight the body's rejection of transplanted organs.

There are many more examples of breakthroughs in medicine as a result of studying fungi. Scientists worldwide continue to study fungi to find more useful drugs.

Why are fungi called nature's recyclers?

Fungi's most important role is as decomposers. Fungi break down, or decompose, organic material such as food scraps and dead plants and animals. As these materials decompose, they release chemicals into the soil, where plants can reuse them. Fungi, along with bacteria, are nature's recyclers. They keep Earth from becoming buried under mountains of organic wastes.

Think it Over

7. **List** one problem that fungi cause and one benefit that they provide.

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After You Read

Mini Glossary

ascus (AS kus): little saclike reproductive structures in which sac fungi produce spores

basidium (buh SIH dee uhm): club-shaped reproductive structures in which club fungi produce spores

budding: form of asexual reproduction in which a new, genetically identical organism forms on the side of the parent organism

hyphae (HI fee): many-celled, threadlike tubes that form the body of a fungus

lichen (LI kun): an organism made up of a fungus and either a green alga or a cyanobacterium

mycorrhizae (mi kuh RI zee): a network of hyphae and roots that helps plants absorb more of certain nutrients from the soil

saprophyte (SAP ruh fite): organism that gets food by absorbing dead and rotting tissues of other organisms

sporangium (spuh RAN jee uhm): round spore case of a zygospore fungus

spore: a waterproof reproductive cell of a fungus that can grow into a new organism

1. Review the terms and their definitions above. Fill in the table below with the term from the Mini Glossary that describes the reproductive structure of each type of fungus.

Club Fungi	Sac Fungi	Zygote Fungi

2. Select one of the question headings from this lesson and write it below. Then write an answer to the question on the lines that follow.

Write your question here.

3. How did underlining the answers to the question heads help you learn about fungi?

End of Lesson

ScienceOnline Visit **glencoe.com** to access your textbook, interactive games, and projects to help you learn more about fungi.