Rhizopus stolonifer on plum tomatoes. This is a very fast acting type of decay affecting post harvest tomatoes. R. stolonifer grows on bread and some fruit. Photo © Frank Segarra. Used with permission.

Fungus Among Us

The Science of Air: Activity 9

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BioEd Online

Fungus Among Us

This activity's objectives are aligned with the National Science Education Standards, specifically those related to Science as Inquiry and Physical Science. It allows the teacher to estimate students' prior knowledge of science related to air, gases, breathing and respiration, indoor air, and environmental health. The unit uses "indoor air" a theme to engage students in learning about their immediate environments, and how their own health is influenced by their surroundings.

Concept

- Fungi grow from spores.
- Fungi spores are present almost everywhere.
- Molds and other fungi grow in damp places.

Reference

Moreno N., B. Tharp, and J. Dresden. (2011). *The Science of Air Teacher's Guide.* Third edition. Baylor College of Medicine. ISBN: 978-1-888997-74-3. Development of this student activity was supported, in part, by grant numbers R25 ES06932 and R2510698 from the National Institute of Environmental Health Sciences of the National Institutes of Health to Baylor College of Medicine.

Image Reference

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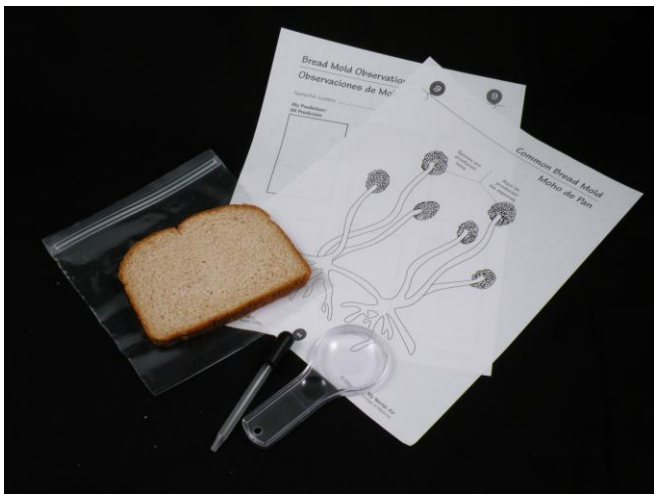
Key Words
lesson, slides, teaching slides, lesson demonstration, science, life science, environment, air, air quality, fungi, fungus, mold, bread mold, R. stolonifer, Rhizopus, decay, pollution, pollutant,

Materials



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Materials

Teacher Materials

•Transparency or slide of “Common Bread Mold” page

Materials per Student Group

• Piece of old bread (See “Setup”)
• Pipette or dropper
• Microscope (optional)

Materials per Student

• Clear re-sealable plastic bag (4 in. x 6 in.), or a small jar or plastic container
• Hand lens (magnifier)
• Disposable plastic gloves (optional)
• Copies of “Bread Mold Observations” page

Setup

A day or two before you plan to begin this activity, ask each student or group of students to bring a piece of bread to class (bakery-type or “natural” bread containing no preservatives works best). As an alternative, you can bake bread or have students bake bread at home with parental supervision.

If you do not wish to grow bread mold in the classroom, pure cultures can be purchased from scientific supply companies.

Safety: While the common molds that grow on bread are generally harmless, some students may be allergic to the spores that are produced. Therefore, have your students observe the molds without opening the sealable bags or other containers in which they have been grown. Wear disposable plastic gloves if you plan to handle mold samples for demonstration purposes. Pour diluted chlorine bleach (10%) into the bags containing mold samples before disposing of the bags.

Reference

Moreno, N., B. Tharp, and J. Dresden, J. (2010). *The Science of Air Teacher's Guide,* Third edition. Baylor College of Medicine. Development of this activity was funded, in part, from the National Institute of Environmental Health Sciences of the National Institutes of Health, grant numbers R25 ES10698, R25 ES10698S, and R25 ES06932.

Image Reference

Photo by Christopher Burnett © Baylor College of Medicine.

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Science Safety Considerations

Safety first! Students always must think about safety when conducting science investigations. This slide may be used to review safety with your class prior to beginning the activity.

Also, keep the following points in mind.

- Always follow your district school safety guidelines.
- Have a clear understanding of the investigation in advance. Practice any investigation with which you are not familiar before conducting it with the class.
- Make sure the appropriate safety equipment, such as safety goggles, is available.
- Continually monitor the area where the investigation is being conducted.

Caution: While the common molds that grow on bread are generally harmless, some students may be allergic to the spores that are produced. Therefore, have your students observe the molds without opening the sealable bags or other containers in which they have been grown. Wear disposable plastic gloves if you plan to handle mold samples for demonstration purposes. Pour diluted chlorine bleach (10%) into the bags containing mold samples before disposing of the bags.

References

1.Dean, R., M. Dean, and L. Motz. (2003). *Safety in the Elementary Science Classroom*. Arlington, VA: National Science Teachers Association.

2.Moreno N., B. Tharp, and J. Dresden. (2011). *The Science of Air Teacher's Guide.* Third edition. Baylor College of Medicine. ISBN: 978-1-888997-74-3. Development of this student activity was supported, in part, by grant numbers R25 ES06932 and R2510698 from the National Institute of Environmental Health Sciences of the National Institutes of Health to Baylor College of Medicine.

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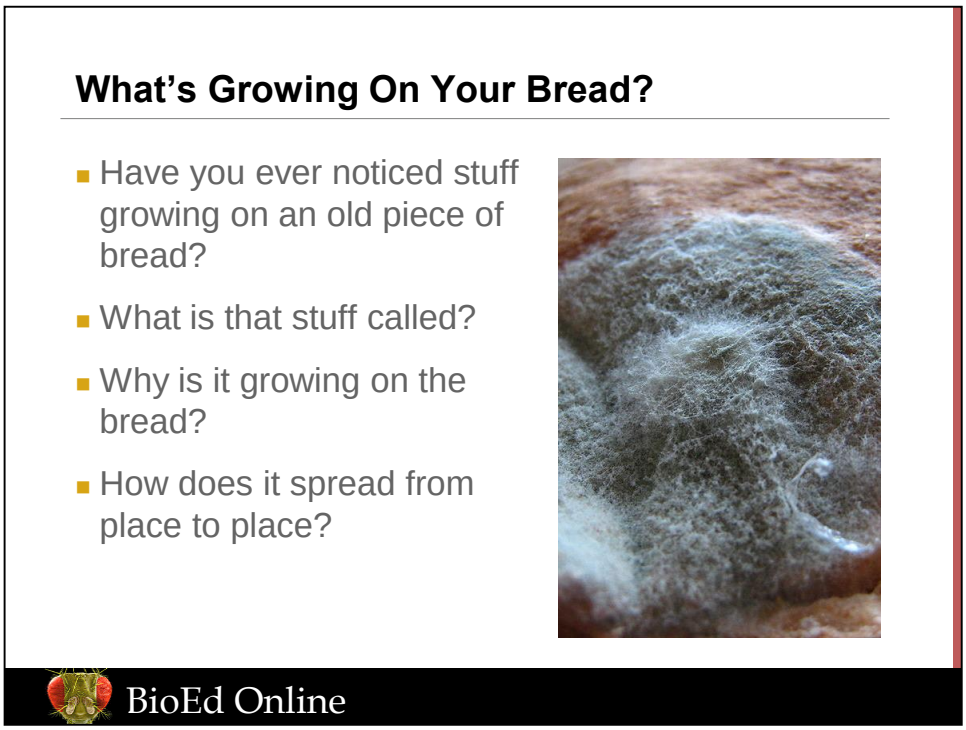

What's Growing On Your Bread?

To focus the students' attention, hold up a piece of bread. Ask students if they know who might use it for food. Prompt them to consider all possibilities (for example, humans, animals, mold, fungus).

Follow up by asking if students have ever seen a rotten apple, moldy slice of bread, etc. Ask, "Have you ever wondered what is growing on that old piece of bread?"

Point out that when something is rotting, other living things are using it for food. Ask, "How do you think these living things travel from place to place?" Remind students of the particles they observed in the activity, "Dust Catcher." Mention that some of the smallest particles in dust are produced by organisms specifically to be carried to other places.

Tell the students they will be observing some living things that spread in this way.

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Image Reference

Photo courtesy of Ciar, released into the Public Domain.
http://commons.wikimedia.org/wiki/File:Moldy_old_bread.JPG

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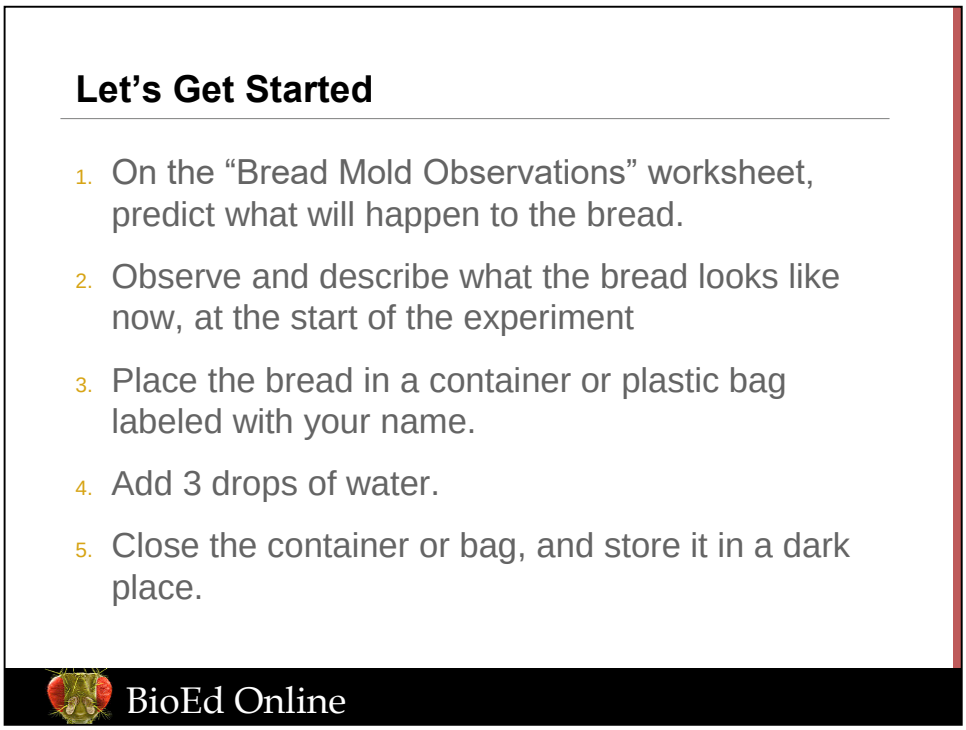

Let's Get Started

In this activity, students will observe bread mold and other kinds of common fungi. They will discover that molds and other fungi grow in damp, dark places. Students will make predictions and observations, record qualitative data, and draw conclusions based on their investigation.

Have the Materials Managers pick up materials for all members of their groups. Have each student write his or her name on a piece of tape, and then label his or her container with the tape.

Direct students to examine their bread with a magnifying glass, and to draw or describe what they predict will happen to the bread in the first space on the Bread Mold Observations sheet. In the second space, have students draw or describe the bread as it appears at the beginning of the investigation.

Students then should place their bread samples into their containers and add a few drops of water. Store the containers in a dark corner or cupboard. Students should not open the containers once they have set up their cultures.

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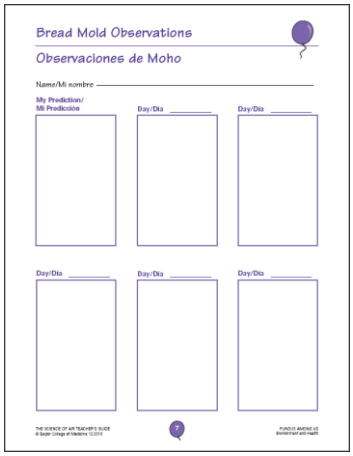
Let's Continue

1. Using a magnifying glass, observe your bread every day, or every other day, for the next 3–7 days.
2. Do not open the container.
3. Record your observations on the "Bread Mold Observations" worksheet.


Bread Mold Observations
Observaciones de Moho
Name/Mi nombre
My Prediction/
Mi Predicción
Day/Día
Day/Día
Day/Día
Day/Día
Day/Día
Day/Día

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Let's Continue

For the next 3–7 days, have students observe their cultures (with and without a hand lens) at 1- or 2-day intervals. Do not allow students to open the containers in which molds are growing. NOTE: Some breads may grow mold in as little as 24 hours; others may require 7 days or more.

Have students record their observations on their data sheets. When all or most cultures have visible molds (some breads treated with preservatives may not grow mold within the time allowed), have students make and record their final observations.

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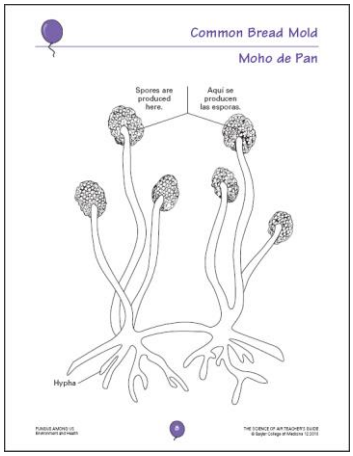
Let's Talk About It

- How many kinds of molds are on the bread samples?
- What color is the bread mold?
- What shape is the bread mold?
- Does the mold cover the entire piece of bread?



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Let's Talk About It

In this activity, students allow mold and fungi to grow on slices of bread. Students may see bread mold (*Rhizopus stolonifer*), greenish colonies of *Penicillium* (the fungus that produces the antibiotic known as Penicillin), and/or other related fungi.

As a class, decide how many different kinds of mold are present on the bread samples. Have students list the characteristics they use to tell different molds apart. Prompt them to think about whether certain molds seem more likely to grow on certain types of bread.

One of the kinds of fungus that will be present is bread mold, which consists of dark gray threads that form a loose, tangled mat that may reach a centimeter in thickness. Find several samples of bread mold among the class's cultures, and give each group a container in which bread mold is present. NOTE: Students should not open the containers.

Have the students use magnifying glasses to observe the bread mold inside their containers. They will be able to see individual mold threads, with small dark dots at the ends. The dots are the spore-producing parts of the fungus. (The actual spores are very tiny.)

If you have access to microscopes, have students observe a few strands of the bread

mold under a microscope (place the mold samples on a slide using forceps or tweezers). Students will be able to see the tubular structure of the filaments (hyphae), the round dark heads that produce spores, and, depending on the magnification, some of the tiny, round spores. Focus students' attention on the "Common Bread Mold" worksheet to help them clarify the bread mold structures.

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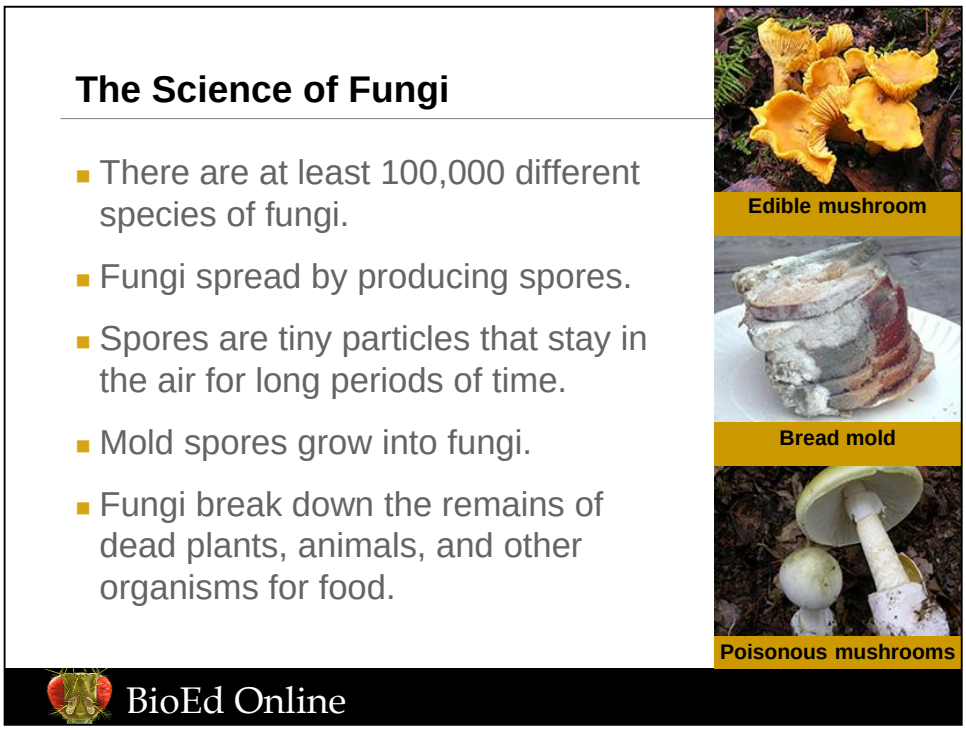

The Science of Fungi

Students observed the following properties of fungi in this activity. Members of the Fungus Kingdom, particularly molds, can contribute to indoor air pollution.

- **Fungi grow from spores.** Fungi spread by producing spores, tiny particles that can remain suspended in the air for long periods of time. The powdery appearance and bright colors of many kinds of mold actually are caused by the spores they have produced.
- **Fungal spores are present almost everywhere.** Fungi are members of the Fungus Kingdom and are found almost everywhere. Along with some bacteria and other organisms, fungi are the decomposers of our world. They break down the remains of dead plants, animals, and other living things in order to obtain the energy they need to grow and reproduce.
- **Molds and other fungi grow in damp places.** Fungi grow especially well in damp places and can attack cloth, paint, paper, leather, insulation on cables, and even photographic film. Inside buildings, fungi can grow in damp places, such as basements, shower curtains, food storage areas, and window air conditioning units.

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Image Reference

1. *Amanita phalloides* (bottom: highly poisonous, also known as Death Cap; A. phalloides, also called toadstools, has been involved in the majority of human deaths from mushroom poisoning.) © Archenzo, CC-BY-SA 3.0. http://en.wikipedia.org/wiki/Amanita_phalloides#mediaviewer/File:Amanita_phalloides_1.JPG
2. *Chanterelle cantharellus* mushroom (top: edible) © Strobilomyces, CC-BY-SA 3.0. http://commons.wikimedia.org/wiki/File:Chanterelle_Cantharellus_cibarius.jpg
3. *Rhizopus nigricans* mold (middle: found on spoiled food; more than 50 species with some harmful to human health), courtesy of Maestrosync, released into the Public Domain. http://commons.wikimedia.org/wiki/File:Mouldy_bread_alt.jpg

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Extensions

- Where can we find molds and fungi in the natural world?
- Can you name a fungus we eat?
- What would happen if there were no fungi?
- What can we do in our homes to reduce or eliminate mold growth?
- Are fungi used as sources of antibiotics and medicines?

Reishi mushroom

Yeast

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Extensions

1.Encourage students to suggest variations of the investigation. For example, challenge them to invent names for the different kinds of molds they grew. Have them create a reference key to help identify each one. Stimulate a discussion about where we can find molds in our everyday lives. Ask students, *Where can we find molds and fungi in the natural world?* and *Can you name a fungus that we eat?* Tell students that bread is made with the fungus, yeast, as leavening. Emphasize that fungi are essential to life on Earth. Ask, *What would happen if there were no fungi?* Tell students that fungi are essential for the continuous recycling of nutrients into the soil and the release of carbon dioxide into the air. Fungi also are sources of some antibiotics and other medicines. For example, Cyclosporin, a "wonder drug" developed in 1979, is derived from a fungus that lives in soil. It is prescribed to organ transplant patients, so that their immune systems will not attack and destroy the new organ tissue.

2.Lead a class discussion of the role that molds play in causing indoor air pollution. You may wish to refer to the story, *Mr. Slaptail's Secret*, in which Rosie, one of the characters, is allergic to mold spores.

3.If desired, make one or more kinds of bread with your students. Try using a recipe that uses baking soda for leavening and compare the results with a recipe that uses yeast (a fungus). Mention that, in both cases, the bubbles in the dough are caused by carbon dioxide gas that is released into the dough. (See *The Science of Air Teacher's Guide* for recipes.)

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Image References

1.Ganoderma lucidum (bottom: Reishi mushroom, used for over 2,000 years in Chinese medicine) © Eric Steinert, CC-BY-SA 2.5.
http://commons.wikimedia.org/wiki/File:Ganoderma_lucidum_01.jpg

2.Saccharomyces cerevisiae (top: bakers yeast) courtesy of Masur, released into the Public Domain. http://en.wikipedia.org/wiki/File:S_cerevisiae_under_DIC_microscopy.jpg

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