

Moldy Bread



Topic

Conditions favoring mold growth

Introduction

Estimating the age of items found at a crime scene is an important part of any investigation. For example, how long has a sandwich found at the scene been there? Microbes such as bacteria and fungi cause the decay of organic substances (e.g., wood, leather, straw, and food) in different ways and at different rates, depending on temperature and humidity. In this experiment, you will observe and record the effect of temperature and humidity on the decay process in bread.

Time required

45 minutes on day 1, then 10 minutes every few days for two weeks

Materials

4 slices of bread taken from a previously unopened loaf
4 clear zippered plastic bags (18 × 20 cm) (clean and unused)
marker pen
magnifying glass
eyedropper
access to a refrigerator
about 10 ml tap water
pencil

Safety note

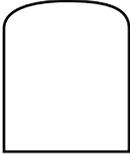
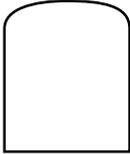
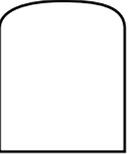
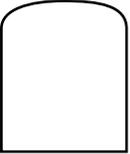
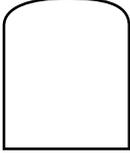
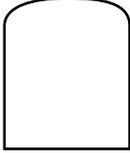
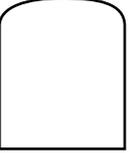
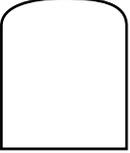
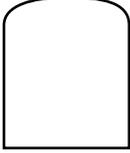
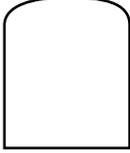
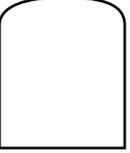
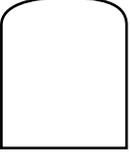
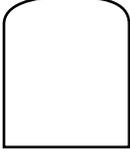
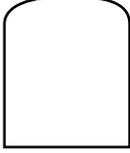
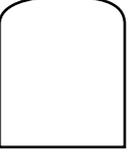
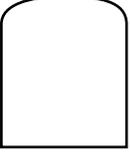
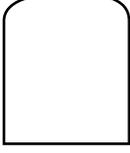
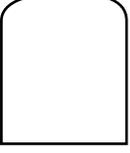
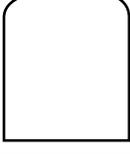
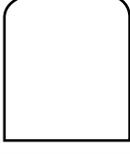
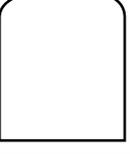
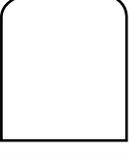
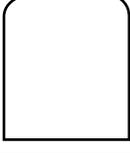
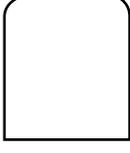
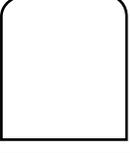
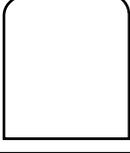
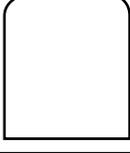
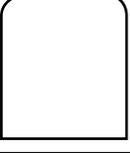


Do not open the bags at the end of the experiment. Dispose of the bags carefully in a trash bag or bin after wrapping them in another plastic bag. Try not to inhale any of the mold. Those students allergic to mold should not perform the experiment.

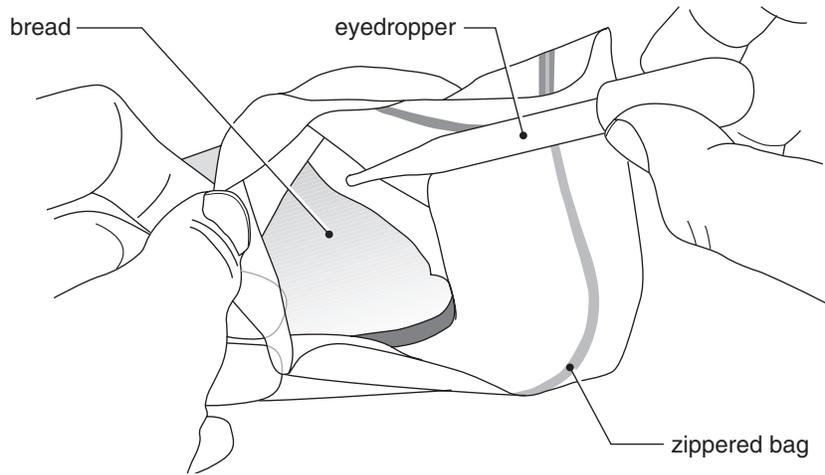
Procedure

1. Use the marker pen to label the bags A, B, C, and D. Place a slice of bread in each bag.
2. For bags A and B, press the sides of the seal together to seal each bag.
3. Use the eyedropper to drip about 5 ml of water onto the bread in bags C and D (see diagram 1 on page 6.05–3). Then press the sides of the seal together to seal these two bags.
4. Place bags A and C in a location where they can be undisturbed at room temperature. Place bags B and D in the refrigerator. The conditions for the experiment are summarized in Table 1 on page 6.06–3.
5. Observe the slices of bread every day or two for about two weeks. Do not unseal the bags. Indicate the size, shape, and color of any mold growth in data table A on the next page.

DATA TABLE A

Date	A	B	C	D
				
				
				
				
				
				
				
				
				

1



Making the bread moist

Table 1. *Experimental conditions*

Bag	State of bread	Storage temperature
A	Dry	Room temperature
B	Dry	Refrigerator
C	Moist	Room temperature
D	Moist	Refrigerator

Analysis

1. Look at your drawings in data table A and decide which conditions were most suitable for mold growth. Rank the conditions in data table B below in order of suitability for encouraging mold growth on a scale from 1 to 4 with 1 = best (i.e., most mold formed). If no mold forms on either slice stored in the refrigerator (B and D), rank them equal.
2. Summarize your findings by considering what conditions are most suitable for the growth of mold. Why do you think this is so?
3. Did all the mold patches look the same?

DATA TABLE B

Bag	Experimental conditions	Ranking
A	Warm and dry	
B	Cold and dry	
C	Warm and moist	
D	Cold and moist	

Want to know more?

1. Our data table looked like the one shown below.

DATA TABLE B		
Bag	Experimental conditions	Ranking
A	Warm and dry	2
B	Cold and dry	4
C	Warm and moist	1
D	Cold and moist	3

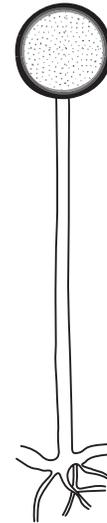
2. Molds need water to grow and grow best in warm conditions. Because they cannot control their own temperature, they need external warmth to grow.
3. Probably, a few very different molds were present. For example:
 - Blue–green patches surrounded by a white ring: this is probably a mold belonging to the genus *Penicillin*.
 - Blue–green patches with no white ring: these probably belong to the genus *Aspergillus*.
 - Black fuzzy strands sticking out from the slice of bread: these probably belong to the genus *Rhizopus*, and can be seen under a microscope*.

If you used more water to wet the bread than was recommended, you might see a wider range of molds, with some being yellow and orange in color.

*To do this, you will need two glass microscope slides, an eyedropper containing water, two wooden toothpicks, and a microscope with 100× magnification.

1. Place a drop of water on a microscope slide.

2. Remove a tiny sample from the fuzzy growth with one toothpick.
3. Ease the mold sample onto the water on the microscope slide using the second toothpick.
4. Cover the sample with the second microscope slide and place it under the microscope.
5. Adjust the focus. You should be able to see long strands with rounded ends as in the diagram opposite.



Rhizopus mold seen under the microscope

The Internet contains much information about fungi and molds. See for example:
<http://www.ucmp.berkeley.edu/fungi/fungisy.html>
http://www.botany.utoronto.ca/ResearchLabs/MallochLab/Malloch/Moulds/ID_Plate_I.html
http://wehomeinspect.com/Types_of_Mold.htm

Special Safety Note To Experimenters

Each experiment includes any special safety precautions that are relevant to that particular project. These do not include all of the basic safety precautions that are necessary whenever you are working on a scientific experiment. For this reason, it is absolutely essential that you read, copy, and remain mindful of the General Safety Precautions that follow this note. Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. There will be no time after the fact to protect yourself. Be prepared for unexpected dangers by following basic safety guidelines the entire time you are performing the experiment, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual experiments. We made this choice for one reason: We want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical to your safety.

One further note: The book assumes that you will read the safety precautions that follow, as well as those in the box within each experiment you are preparing to perform, and that you will remember them. Except in rare instances, the general precautions listed below will not be repeated in the procedure itself. It is up to you to use your good judgment and pay attention when performing potentially dangerous parts of the procedure. Just because the book does not say **BE CAREFUL WITH HOT LIQUIDS** or **DON'T CUT YOURSELF WITH THE KNIFE** does not mean that you should be careless when boiling water or cutting a section of a stem for microscope work. It does mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, wait to perform it until you find out from a qualified adult that it is safe.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking unnecessary risks can be avoided by practicing safety procedures and being alert while conducting experiments. Be sure to check the individual experiments in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone.

PREPARING:

- Clear all surfaces before beginning experiments
- Read the instructions before you start
- Know the hazards of the experiments and anticipate dangers

PROTECTING YOURSELF:

- Follow the directions step-by-step; only do one experiment at a time
- Locate exits, fire blanket and extinguisher, gas and electricity shut-offs, eyewash, and first-aid kit
- Make sure there is adequate ventilation
- Act sensibly at all times
- Wear an apron and safety glasses
- Do not wear open shoes, loose clothing, or loose hair
- Keep floor and workspace neat, clean, and dry
- Clean up spills immediately, being careful to follow the recommended procedure for dealing with the spilt substance
- Never eat, drink, or smoke in the laboratory or workspace
- Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult

USING EQUIPMENT WITH CARE:

- Set up apparatus far from the edge of the desk
- Use knives and other sharp or pointed instruments with caution
- Pull plugs, not cords, when removing electrical plugs

- Don't use your mouth to pipette liquids; use a suction bulb
- Check glassware is clean and dry before use
- Check glassware for scratches, cracks, and sharp edges
- Report broken glassware immediately so that it can be cleaned up by a responsible person
- Do not use reflected sunlight to illuminate your microscope
- Use only low voltage and current materials such as lantern batteries
- Be careful when using stepstools, chairs, and ladders

USING CHEMICALS AND BIOLOGICAL MATERIALS:

- Never taste or inhale chemicals
- Label all bottles and apparatus containing chemicals
- Read labels carefully
- Avoid chemical contact with skin and eyes (wear safety glasses, lab apron, and gloves)
- Do not touch chemical solutions
- Wash hands before and after using solutions
- Wipe up spills thoroughly
- Use sterile procedures when handling even common and harmless microorganisms
- Avoid contact with human blood
- Treat all living organisms with appropriate respect

HEATING SUBSTANCES:

- Wear safety glasses, apron, and gloves when boiling water
- Keep your face away from test tubes and beakers
- Use test tubes, beakers, and other glassware made of Pyrex™ or borosilicate glass
- Use alcohol-filled thermometers (do not use mercury-filled thermometers)
- Never leave apparatus unattended
- Use safety tongs and heat-resistant mittens
- If your laboratory does not have heat-proof workbenches, put your Bunsen burner on a heat-proof mat before lighting it
- Take care when lighting your Bunsen burner; use a Bunsen burner lighter in preference to wooden matches
- Turn off hot plates, Bunsen burners, and gas when you are done
- Keep flammable substances away from heat
- Keep sheets of paper and other flammable objects away from your Bunsen burner
- Have a fire extinguisher on hand

FIELDWORK:

- Be aware of environmental dangers (e.g., do not carry out fieldwork near dangerous roads, cliffs, or water)
- Remember that strong sunlight can be dangerous – pack sunscreen and a good supply of drinking water if you will be outside all day
- Never carry out fieldwork in areas where you cannot find your way to safety easily and quickly and never wander off on your own in search of new areas to study

FINISHING UP:

- Clean your work area and glassware (follow any instructions given by a supervising adult)
- Be careful not to return chemicals or contaminated reagents to the wrong containers
- Don't dispose of materials in the sink unless instructed to do so
- Wash your hands
- Clean up all residues and put in proper containers for disposal
- Dispose of all chemicals according to all local, state, and federal laws
- Dispose of all microbiological cultures by treatment with an appropriate disinfectant

BE SAFETY CONSCIOUS AT ALL TIMES