

# THE YEAST OF OUR WORRIES



Have you ever been to a hospital? Did you notice the smell? Hospitals go to great lengths to create a germ-free environment. Can you think of some things that may prevent microbe growth?

## Goal

To investigate strategies for reducing microbial growth.

## Activity Time

60 minutes

## Time to Get Ready

10 minutes

## What You Need

Have the following for each team of 2 or 3:

- 3 clear cups or glasses
- 1 measuring teaspoon
- 1 thermometer (°C)
- 3 teaspoons of rapid-rise yeast
- 6 teaspoons of sugar
- 1 eye dropper
- warm water (40°C)
- 1 roll of masking tape
- 1 spoon or stirring rod
- 1 pen or pencil
- household products such as mouthwash, soap, detergent, hydrogen peroxide, cola, toothpaste
- 1 overhead projector or heating pad (optional)

## Getting Ready

Be sure all the glasses are clean and oil-free. Set up a glass of warm water, sugar, and yeast 20 to 30 minutes before you speak to the group. Show this to participants when you start your presentation.

## Useful Information

Yeast are single-celled fungi. They reproduce by budding or producing spores, and can live in a variety of habitats. Yeast are found on plant leaves, flowers, and skin, and in soil, saltwater, and the intestines of warm-blooded animals. In some conditions, they multiply quickly. Other conditions

prevent them from reproducing at all. Although some yeast are useful, other microbes are harmful. Consequently, we often try to rid areas of microbes. In hospitals, homes, and even on our skin, we use things to prevent the growth of microbes.

## Suggestions to Modify the Activity for Those Who Are Exceptional

Specific modifications for this activity are found here. For common considerations when modifying activities for exceptional participants, see page V of the **Introduction**.

### Blind or Visually Impaired

- Allow participants, where possible, to touch and smell the household products for a better understanding of the variable. This will provide them with information that will allow the development of independent hypotheses and conclusions.
- Use small pieces of tape to mark the increase in the height of the layer of foam produced by the yeast solution introduced at the beginning of the activity.
- Construct a tactile diagram of "yeast budding."
- Mark glasses with the names and the test solutions used in braille or large print.

### Deaf or Hard-of-Hearing

- See the **General Modifications** for *Blind or Visually Impaired* listed in the **Introduction**, page V.

### Mobility Impaired

- See the **General Modifications** for *Mobility Impaired* listed in the **Introduction**, page V.

### Physically Impaired

- See the **General Modifications** for *Physically Impaired* listed in the **Introduction**, page V.

### Cognitively Impaired

- See the **General Modifications** for *Cognitively Impaired* listed in the **Introduction**, page V.



## For More Information

Brehm, M.A., et al. (1996). Determining differences in efficacy of two disinfectants using T-tests. *The American Biology Teacher*, 58(2), 111-113.

Finer, K.R. (1997). Evaluation of natural compounds for antimicrobial activity in the introductory microbiology laboratory. *The American Biology Teacher*, 59(1), 44-47.

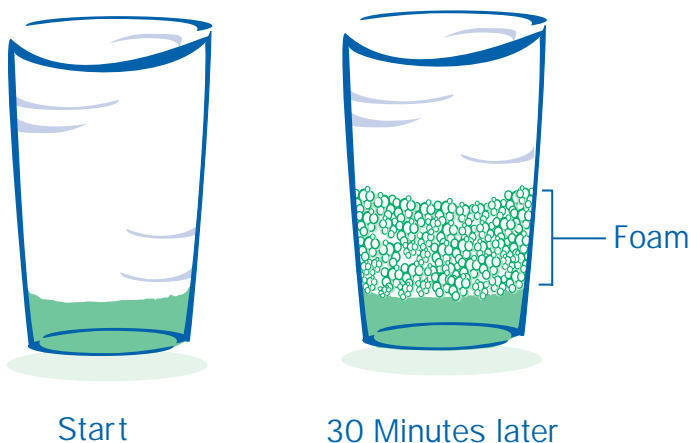
Freeman, B.A. (1985). *Textbook of Microbiology*. Philadelphia, PA: W.B. Saunders Company.

Pelczar, M.J., Chan, E.C.S. & Krieg, N.R. (1993). *Microbiology: Concepts and Applications*. New York: McGraw Hill, Inc.

Rainis, K.G. & Russell, B.J. (1996). *Guide to Microlife*. Danbury, CT: Grolier Publishing.

## How to Start the Activity

- Show participants pictures of yeast. Explain that they are living things. Discuss the things yeast might need to survive.
- Make sure that the participants have a basic understanding of the importance of including a control group in an experiment.
- Hold up the yeast, sugar, warm water solution that you set up earlier. Point out the layer of foam at the top. See Figure 1. Explain that in general, the more foam, the more yeast activity, and the more yeast activity, the more yeast. Demonstrate how to measure the height of the foam column.



**Figure 1. Setup of water, sugar, and yeast solution.** After 30 minutes, a layer of foam appears above the solution.

- Explain that similar yeast activity occurs during bread baking and brewing. The honeycomb texture in bread is caused by the yeast activity.

## Let's Make a Hypothesis

Discuss the following questions to help guide the participants to make hypotheses.

- If the yeast had been prevented from growing, what would have happened to the foam?
- What substances could you use to try to stop yeast growth?
- How would you design an experiment to stop yeast growth?

## What the Data Mean

- In general, more foam indicates yeast activity, and more yeast activity indicates more yeast.



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## Questions to Think About

Yeast are unicellular organisms. They reproduce through budding and spores. In some conditions, they multiply rapidly. Other conditions prevent them from reproducing at all. For this activity, we will use yeast as an example of a microorganism, and foam produced as a coarse measure of the activity and growth of yeast.

## Safety Notes

- No running or playing with the lab equipment.
- If participants bring their own test materials, make sure they are not hazardous or illegal.
- Wash hands at the beginning and end of the activity.
- Yeast solutions may be flushed down a toilet at the conclusion of the activity.
- Do not put objects or hands in your mouth while conducting the activity.

## What to Do

1. Select 2 of the household products to use as test solutions. Set your 3 glasses out on the table in front of you. Use masking tape to label one as control, and the other with the names of the test solutions you will use. Fill each glass 1/3 full of warm water (40°C). Add 2 teaspoons of sugar to each and stir to dissolve. Add 1 teaspoon of yeast to each glass and gently stir.

2. Add 5 drops of test solution to each of the numbered glasses. For the control glass, add 5 drops of water. Place them in a warm area of the room. The warmer it is, the faster the yeast will grow. An overhead projector or a heating pad works well for this purpose. See Figure 1.

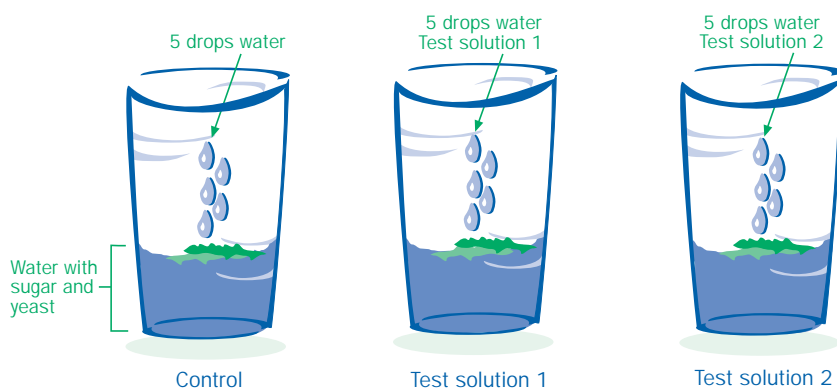


Figure 1. Possible student setup.

3. Examine the glasses every 10 minutes for 30 minutes. Measure and record the height of the layer of foam. At 30 minutes, line up the glasses in order of foam height. Which substances were most effective in limiting the growth of yeast? Which substances did not limit the growth of yeast? How do you account for the differences in the amount of foam produced? Was your hypothesis correct? Construct a bar graph of your results.

4. What questions come from your results? To what other topics is this activity related? What did you learn from this activity? How does this activity relate to your life? What factors influence populations of microorganisms?

5. Do you think the substances killed all the yeast in the containers? How could you test to see if any yeast survived in the experimental group? Why do some yeast survive and some die? Why are differences in the yeast important for its survival as a species? What questions about yeast might be tested?

## What Did You Find Out By Doing the Activity?

Before doing "The Yeast of Our Worries," did you know:

- that a lot of microbes are found in hospitals?
- how hospitals may try to eliminate harmful microbes?
- the effect that microbes have on other organisms, such as humans?

From this activity, did you discover:

- different methods used to prevent the growth of harmful microbes?
- how microbes reproduce?
- how the number of microbes on an object can be determined?
- if you can guarantee that the objects you come in contact with are microbe-free?
- any personal measures that you can take to reduce the number of microbes that may affect your health?

