

Lab 7: Antimicrobial Agents (20 points)

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?

Objectives:

- To investigate strategies for reducing microbial growth
- To investigate how household reagents effect the growth of yeast, a member of the Fungi kingdom.
- To make hypotheses and state whether the experimental data support the hypotheses.

What to do:

- Read *Useful information* and instructions carefully and answer questions
- Set aside 10 minutes to get ready and 60 minutes to do the activity

What you need :

- 5 clear cups or glasses (Be sure all glasses are clean and oil-free)
- 1 measuring teaspoon or tablespoon
- 5 teaspoons of rapid-rise yeast
- 12 teaspoons of sugar
- Warm water (40 °C, warm to the touch)
- Masking tape
- 1 spoon
- 1 pen or pencil
- Household products such as mouthwash, hand-soap, detergent, hydrogen peroxide, cola, toothpaste, bleach, household cleaners; essential oils such as sage, rosemary, juniper, or others.
- Ruler
- 1 thermometer (°C) (strongly recommended but not required)
- 1 reading lamp or heating pad (optional)

Safety Notes:

- Wash hands at the beginning and end of the activity.
- Yeast solutions may be washed down the sink at the conclusion of the activity.

Useful Information:

Yeasts are single-celled fungi; they are not bacteria. Yeasts are eukaryotes and reproduce by budding or producing spores, and can live in a variety of habitats. Yeasts 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 yeasts 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. For this activity, we will use a common yeast (baker's) as an example of a microorganism, and foam produced as a coarse measure of the activity and growth of yeast.

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.

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

What to Do:

1. Select 4 of YOUR household products to use as test solutions and record them at #1 on the submission sheet.
2. Set your 5 glasses out on the table in front of you. Answer question #2 NOW, BEFORE you do the following steps.
3. Use masking tape to label one glass as control, and the other with the names of the test solutions you will use.
4. Fill each glass 1/2 – 1 cup of warm water (40°C). Be sure that you use the same amount in each glass.
5. Add 2 teaspoons of sugar to each and stir to dissolve.

6. Add 1 teaspoon of yeast to each glass and gently stir (See Figure 1.).

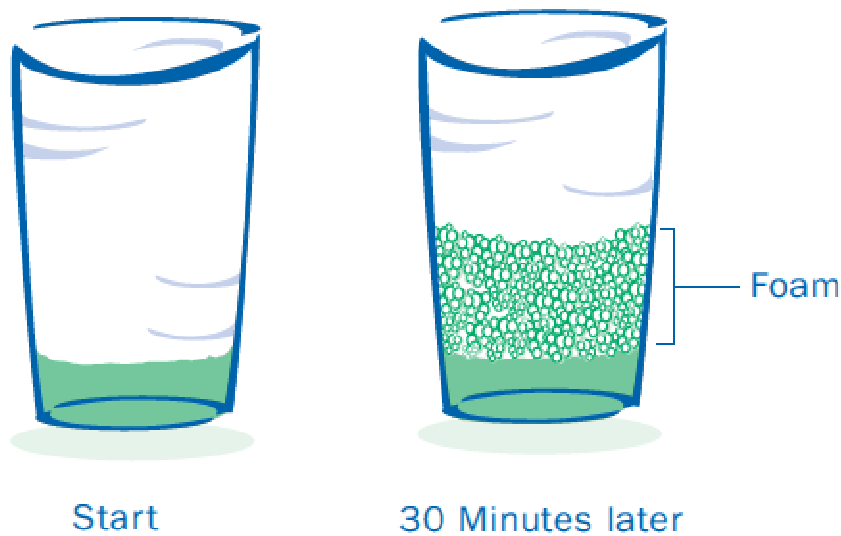


Figure 1. Setup of water, sugar, and yeast solution.
After 30 minutes, a layer of foam appears above the solution.

7. **In general, the more foam indicates more yeast activity, and more yeast activity indicates more yeast.** You can quantify (convert to numbers) yeast growth by measuring the height of the foam column.
8. Add 1 tablespoon of test solution to each of the numbered glasses, unless you are using bleach or essential oils. Use 1 teaspoon of bleach or about 5 drops of an essential oil. For the control glass, add 1 tablespoon of water. Place them in a warm area of the room. The warmer it is, the faster the yeast will grow. A heating pad or reading lamp works well for this purpose (See Figure 2).
9. Examine the glasses at 10 minutes, 20 minutes, 30 minutes, and 1 hour. Measure and record the height of the foam on the data chart (#3) on the submission form.
10. At the end of 1 hour, line up the glasses in the order of the height of the foam and complete the questions on the submission form.

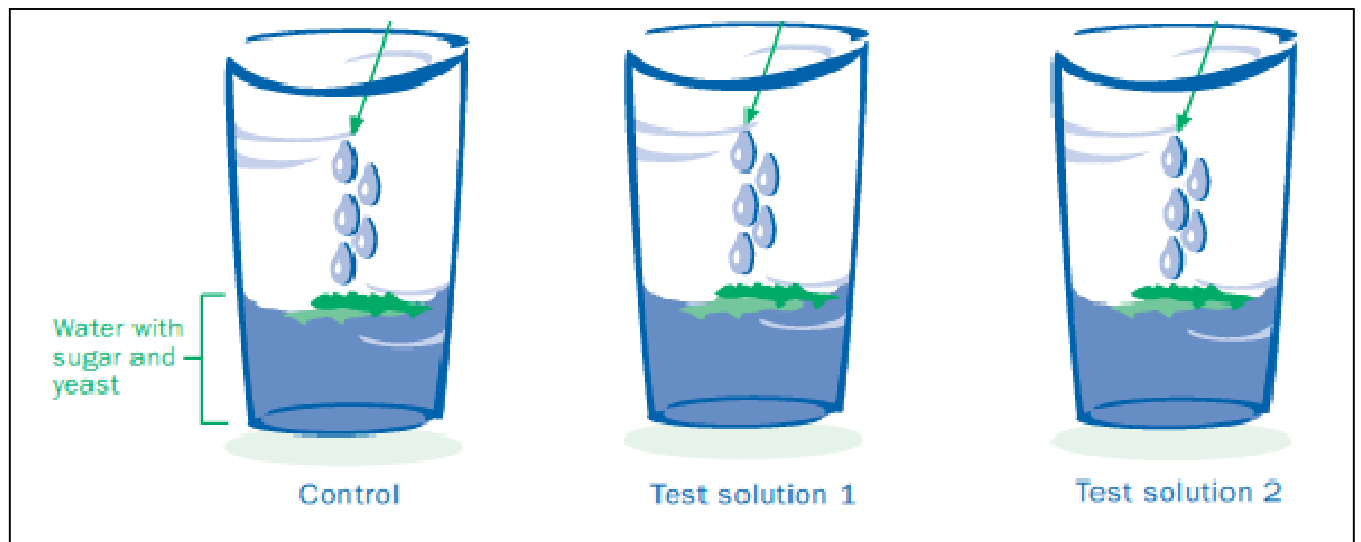


Figure 2. Typical setup of control, test solutions, sugar, yeast, and water.