

# This Is the Yeast of Our Problems!

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Extension 

4-H STEM

Science, Technology, Engineering & Math

Did you ever wonder about why bread rises, or why some breads are flat, or dense, and others breads are fluffy?

## Let's see if we can figure that out!

What you need to gather:

- 7 fresh yeast packets
- 1 permanent marker
- 1 small sheet of wax paper
- 1 set of measuring spoons
- 1 piece of paper
- 6 empty 20oz water bottles
- 1 pencil
- 6 teaspoons of sugar
- 1 hand lens (or dissecting microscope)
- 1 thermometer (40-120°F)
- 1 cup measuring cup
- 6 large party balloons
- 6 cups of water
- 1 cloth/plastic tape measure
- 2 different color pencils

### Activity 1: What is yeast anyway?

- Open and pour a packet of yeast on the wax paper.
- With the hand lens, examine the yeast. Describe and draw the yeast. Is it alive or not alive?
- Dip your finger into some water, and let a drop drip onto some of the yeast.
- Examine with your hand lens and describe and draw the yeast. Is it alive or not alive?

Yeast is alive. It is a fungus, in the same group as mushrooms and mold. One pound of yeast contains over 3 trillion cells! Cells perform all kinds of chemical reactions, and we are going to look at how food and temperature will change the rate of the reactions.

### Activity 2: Does Temperature Matter?

- Turn on the cold water until it is as cold as possible.
- Using the cold water tap, measure 1 cup of water.
- Take the temperature of the water, and on the 1st water bottle, write the temperature on it.
- Pour the water into that bottle.
- Measure 1 cup of water of cold tap water.
- Take the temperature of the cold water, and write the temperature and "+ Sugar" on the 2nd water bottle.
- Turn on the hot and cold water, and let it warm up. Adjust the water so that it is comfortable to touch.
- Measure 1 cup of water of lukewarm water.
- Take the temperature of the water, and write that temperature on the 3rd empty water bottle.
- Measure 1 cup of water of lukewarm water.
- Take the temperature of the water, and write that temperature and "+ Sugar" on the 4th water bottle.

- Turn on just the hot water, and let the water become as hot as possible. Be careful not to hurt yourself.
- Measure 1 cup of water of hot water.
- Take the temperature of the water, and write that temperature on the 5th empty water bottle.
- Measure 1 cup of water of hot tap water.
- Take the temperature of the water, and write that temperature and "+ Sugar" on the 6th water bottle.
- Add 1 teaspoon of sugar to the cold water "+ Sugar," 1 teaspoon of sugar to the lukewarm water "+ Sugar," and 1 teaspoon of sugar to the hot water "+ Sugar" water bottles.
- Cover the tops of those bottles, and shake until the sugar is dissolved.
- Write your guess to which balloon will fill the most.
- Open and pour one packet of yeast into bottle #1, cover the top with the balloon (making sure it is a nice tight fit), and shake to dissolve the yeast.
- Repeat adding the yeast and covering the top with the balloon for each of the other 5 bottles.
- Write your observations, measure the diameter of each balloon with the cloth tape measure and record.
- Every 10 minutes for 1 hour, write your observations and record the diameter of each balloon.
- Which balloon filled up the most? Which filled up the least? Was your guess right?
- Make a graph of your results (you can get free graph paper from the internet). The x axis is time and the y axis is temperature. Use two different color pencils, one for water and the other for sugar water.
- Write what you learned.

Source: <http://www.newton.dep.anl.gov/askasci/mole00/mole00195.htm>

#### Colorado State University

Dr. Eric Ross is an Assistant Professor at CSU. He uses yeast to study a variety of human disease, including Parkinson's, Alzheimer's, and Mad Cow disease. Each of these diseases is associated with the formation of large protein deposits, called amyloid. Similar deposits are found in yeast infected with prions (infectious proteins). Because of the ease of working with yeast, yeast prions provide a useful system to better understand, and potentially treat, these terrible diseases.



If you liked these experiments, 4-H has other activities that use yeast. Check out the Breads and Baking projects you can do on page 35 at: [http://www.colorado4h.org/project\\_resources/projectsselectguide\\_www.pdf](http://www.colorado4h.org/project_resources/projectsselectguide_www.pdf)  
Colorado State University Extension 4-H programs are available to all without discrimination.