# Grow yeast- Sugar Fermentation

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## Overview

Students will learn about yeast and how it is used to make bread rise. They will learn about the process of sugar fermentation. This process will be implemented by placing yeast in three different environments to grow.

| Learning Objectives | Logistics |
| --- | --- |
| By the end of this experiment, students will be able to:<br>1. Identify the fungal species of yeast used to make bread.<br>2. Hypothesize what environment yeast grows in.<br>3. Observe which environment is best for growing yeast.<br>4. Analyze how yeast ferments sugar to produce carbon dioxide gas. | **STEAM Subjects:**<br>Science (Chemistry) and Art<br>**Science Vocabulary:**<br>Fungi, fermentation, cells, species, gas<br>**Time:**<br>● 5 min prep<br>● 5-10 min to observe |

| Materials & Equipment | |
| --- | --- |
| **Materials Per Person:**<br>● 3 Clear plastic cups or any clear cup<br>● 2 teaspoons sugar (1 sugar packet)<br>● Water (warm)<br>● 3 packages instant dry yeast<br>● Spoon for mixing<br>● Marker<br>● Masking tape or post-it notes | **Optional Materials for demonstration:**<br>● Clear plastic drinking bottle<br>● Latex balloon |

## Experimental Methods

**Sugar Fermentation**

1. First label the clear plastic cups 1-3 with the masking tape (or post-it note) and marker.
    a. Label #1: Water + yeast + sugar
    b. Label #2: Water + yeast
    c. Label #3: Yeast
2. Predict which cup the yeast will rise in, #1, #2, or #3?
3. In cup #1:
    a. Warm-up ¼ cup of water (or obtain warm water from the sink).
    b. Mix one packet of instant dry yeast.
    c. Add 1 packet of sugar.
4. In cup #2:
    a. Warm-up ¼ cup of water (or obtain warm water from the sink).
    b. Mix in one packet of instant dry yeast.
5. In cup #3:
    a. Place one packet of instant dry yeast in the cup.

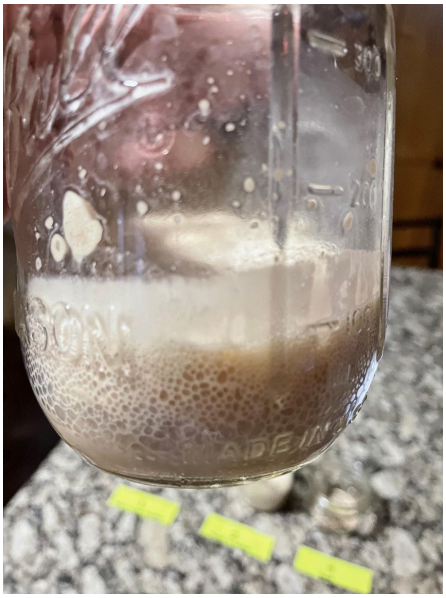

6. Record observations.
7. Watch your yeast grow!

**The project was adapted from reference #1**

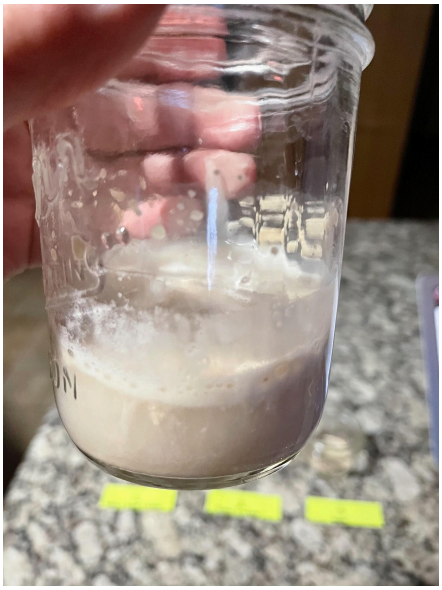
## Expected Experimental Results

When the yeast is prepared correctly in a warm environment and with sugar, the yeast should activate. So yeast cells will multiply, making the mixture double in size and bubble up, these bubbles are of carbon dioxide gas.

Cup #1: Sugar + yeast



Cup #2: No sugar to activate yeast. No Bubbles.



## Optional Demonstration

1. **What is yeast?** Show an image or video on the definition and uses of yeast.
2. **Sugar fermentation:**
    a. Show pictures or videos.
3. **Demonstrate anaerobic respiration in yeast:**
    a. Blow up a balloon with warm water, yeast, and sugar in a clear drinking bottle.

## Deep Thinking Questions

1. How does yeast make bread rise?
2. What would happen if we added salt instead of sugar to the warm water and yeast mixture?
3. Why is sugar needed for yeast to expand?
4. Why does yeast need to be placed in a warm environment?

## Chemistry & Society

**Science Explanation**

1. How does yeast make bread rise?
   During the sugar fermentation process, yeast breaks down sugar to use as energy. While the yeast breaks down the sugar, it produces carbon dioxide gas. For example, when you drink soda, the sugar from the soda gives you energy. The soda also has carbon dioxide that makes you burp. Carbon dioxide is the waste product. For yeast, this waste product is what makes bread expand. (2)
2. What would happen if we added salt instead of sugar to the yeast mixture?
   Yeast uses energy obtained from sugar in order to grow. Salt on the other hand regulates yeast activity. Therefore, adding too much salt can slow down and/or kill the yeast cells. (3)
3. Why does yeast need to be placed in a warm environment? The yeast used in baking is a single-celled fungus, *Saccharomyces Cerevisiae,* that is made up of living eukaryotic microbes. Its cells only function at certain temperatures between 86℉ to 95℉. If the temperature is too high or too low, it can damage the yeast and the cells die. (4)

**Society**

There are many types of yeast. For example, baker's yeast is the most common and it allows us to make bread. There are others that are used to keep our body healthy by helping our digestive system absorb essential vitamins and nutrients, which will then improve our immune system (5). Some are now even used in scientific research to learn about human genetics (6). Therefore, yeast is important and beneficial to humans.

## Extras

**Suggested Viewing:**
Yeast and Gluten
Anaerobic respiration

## References


1. Growing Yeast
2. Yeast
3. Effects of Salt
4. Yeast and Temperature
5. Uses of yeast
6. Common uses of Yeast


## Special Thanks to Our Funding


California State University

INSTRUCTIONALLY RELATED ACTIVITIES

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