

## YEAST ON THE RISE

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**Purpose:** To investigate the variables that affect the energy and carbon dioxide production of yeast in bread dough.

**Background:** Yeasts are living organisms that require food, water and a warm place to grow. They break down sugars as a food source for their energy needs and produce carbon dioxide gas and ethanol as waste products. This process is called fermentation.

Fermentation is important in the production of many food products such as bread, yogurt, cheese, pickles and sauerkraut. When flour is mixed with water, sugar, and yeast, the yeast feed on the sugar. As the yeast release carbon dioxide and alcohol, the gas becomes trapped as bubbles in the dough, causing it to rise. When the bread is baked, the gas is vaporized, leaving a honeycomb texture.

**Materials:** flour, plastic cups, yeast, water, sugar, honey, jelly, EQUAL, Sweet 'N Low, straws, clothespins, scoopula, tray, metric ruler, marking pen.

### **Procedure:**

1. Divide your portion of flour into 4 equal mounds of 1/4 cup each. Designate the mounds as Control 1, 2, and 3. Measure 1 teaspoon of sugar and add it to Mound 1. Measure 2 teaspoons and add to Mound 2. Measure 3 teaspoons of sugar and add to Mound 3. Add no sugar to the Control Mound. Pour 1/4 package of yeast over each mound. While continuing to keep each mound separate, very slowly add warm water a teaspoon at a time and knead by hand until the mounds have doughy consistencies. The dough should not stick to the tray or your hands. If it is too sticky, add more flour. Form each mound into a ball.
2. Measure 3 cm from the end of a straw and mark it. Repeat the process with 11 more straws.
3. Working quickly, push 3 straws into the Control Mound, filling each with dough to the 3-cm mark. Label the straws as Control. Repeat the process for Mounds 1, 2 and 3.
4. remove the straws from the dough and pinch the ends of the straws to push the dough away from the ends. Place a clothespin perpendicular to the dough end of each straw. The clothespins should function as stands, holding the straws upright. Mark the new height of the dough on each straw.
5. After 10 minutes, measure and mark the heights of the dough in the straws. Calculate an average height for each mound. Repeat the process after 20 and 30 minutes. Graph your results.

6. While you are waiting for the dough to rise in your straws, repeat the procedure. This time instead of using sugar, use other sweeteners. Measure and mark the heights of the dough in the straws. Graph your results.

**Questions:**

1. Why do you use yeast to make bread?
2. Why does bread have bubbles in it?
3. What substance does the yeast need to produce the bubbles?
4. What substance(s) does yeast produce?
5. What were the results when you used other sweeteners?
6. Why did you get these results?

**Expansion:** How could you learn more about the metabolic activity of yeast? What procedures would you use? What would you measure? What if you changed the kind of flour? What if you left some ingredients out? What if you changed the temperature? Design an experiment with one independent variable, a control, and at least three replicates per treatment group.