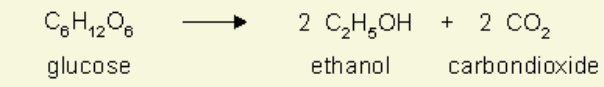
University of Florida Science Outreach Program

Blow Up a Balloon with Cellular Respiration

Introduction: Yeasts are unicellular microorganisms of the fungi kingdom. They are facultative anaerobe, which means that they can respire or ferment depending upon environmental conditions. In the presence of oxygen, respiration takes place (aerobic respiration). Without oxygen present, fermentation occurs (anaerobic respiration). Both processes require sugar to produce cellular energy. Here is the chemical reaction of fermentation, which produces ethanol and carbon dioxide as metabolic waste products.



Objective: In this lab, students will use the respination powers of yeast to blow balloons. This activity will reinforce the basic principles of respiration as a fundamental metabolic process for living organisms using yeast as a model. It will also explore how humans use this biological knowledge in everyday life.

Material:

- balloons
- narrow funnel
- 1 tablespoon (15mL) active dry yeast
- 1 teaspoon (5 mL) sugar
- measuring spoons
- measuring cup
- warm water
- ruler

Safety:

- Remind students there is NO eating or drinking in the lab.
- Students must not attempt to inflate the balloons with their mouths, especially after it is filled with the reacting agents.

Procedure:

1. Place the bottom of a funnel into the opening of the balloon. You may need to stretch the opening of the balloon a little bit so that it fits.
2. Have a carefully supervised student pour the yeast and the sugar into the balloon through the funnel. Then fill the measuring cup with warm water from the sink and carefully pour

the water into the balloon.
3. Remove the funnel from the opening of the balloon. Tie a knot in the balloon to keep the water-and-yeast mixture inside. Measure your balloon.
4. Place the balloon in a warm place and wait. Measure your balloon again.
5. Now sit back and wait as the balloon gets bigger and bigger.

Discussion:

1. What are the reactants in the observed reaction?
2. What are the products?
3. What is the purpose of warm water?
4. Why is respiration important for living organisms?
5. How do people use the respiration powers of yeast? Or more specifically, what things can you make with yeast?

The yeast uses the sugar and warm water to grow. Warm water provides heat to the yeast reaction and accelerates it. As yeast grows it expands and gets bubbly. By being "bubbly" the yeast gives off carbon dioxide, the same gas that your body produces when you breathe, and the gas inflates the balloon. The yeast also produces ethanol. Respiration provides organisms with the energy to do cellular work that helps them grow, function, and live. People use yeast to bake because during fermentation carbon dioxide forms bubbles in the dough and expand it. Since baking is done at high temperatures, yeast ultimately dies and nearly all the ethanol evaporates. Ethanol fermentation is used to produce alcoholic beverages. People also use yeast fermentation to make ethanol for fuel.

Source: -Modified version of an education.com website activity, entitled "Experiment with Balloon Science!"