5 Lab Lessons About Sugar and Acid

Achieving optimal dental health requires equal parts of science and behavior. You may avoid eating too much candy and pop (that's the behavior part), but do you know exactly why (that's the science part)? The following hands-on experiments help students learn from seeing and doing.

The sugar and acid effect

The purpose of this activity is to help students understand how pop (both sugar pop and diet pop) affects their teeth.

Materials: Several small glass containers with covers, teeth (usually available from an oral surgeon, a general or pediatric dentist or from the students themselves), and a sampling of soft drinks (include a diet soda in your sample).

Instructions:

1. Using one container per brand, pour the pop into the glass containers. Place one tooth in each glass container. Spit in the pop to add the bacteria required for the decay process. Label with brand name and date and close the containers.
2. After about six weeks, the teeth placed in sugar pop will be stained, blackened, decayed or broken. If there were food particles on the teeth, there may be some fungus-like buildup. The teeth placed in diet pop may be white or chalky in appearance, the result of decalcification and loss of minerals (due to the acid attack). You should be able to take a dental scaler (or a knife) and scrape off some of the decalcified tooth enamel. Staining may also be evident.

Sugar pop: Discuss the ways in which sugar interacts with naturally occurring bacteria in the mouth to form an acid that attacks the teeth for about 20 minutes, and then stops. The 20-minute attack starts with the first exposure to sugar and lasts until 20 minutes after the last exposure to sugar. So if you sip a can of sugar pop for 30 minutes, the acid attack lasts for 50 minutes (or almost one full hour). Frequent exposure to sugar means frequent acid attacks. If you sip all day, you get decay.

Diet pop: Discuss the fact that diet pop is high in acid that attacks the teeth. Diet pop has pH levels that range from about 2.5 to 4.5. (Remember: The lower the number, the worse it is. As a point of comparison, water is neutral with a pH level of 7; the pH level of battery acid is 0.) The pH levels in your mouth drop after eating or drinking and take from one to two hours to return to normal. If you sip all day, you get decay.

Other discussion topics:

- Pop is basically sugar water. All calories in pop are from sugar. Pop has no nutritional value. There are about 10 tsp. of sugar in a single-serving, 12 oz. can of pop. You can demonstrate just how much sugar this is by scooping 10 tsp. of sugar into a zip-top bag in front of the students and then passing the bag around the room.
- Discuss marketing strategies of soda pop distributors: Are kids targeted? Schools are offered sweet financial deals for selling pop to students; container sizes are increasing just enough to encourage consumption of more pop as a single-serving; consumption patterns are increasing; etc.
- Sweet preferences develop early. Pop consumption has been linked to diabetes, obesity and osteoporosis.
- Both diet and regular pop replace more nutritious foods (often milk).
- The average teenage soft-drink drinker gets about 10 percent of his or her daily calories from pop.
- Discuss ways to reduce the risk of tooth decay.

Note: You may also wish to include apple juice as one of the tested liquids. Even though there are nutrients in juice, it has a high sugar content.

Acid test

The purpose of this activity is to illustrate how the acidity of the mouth changes before and after eating different foods.

Materials: Foods such as candy, cake, gum, cookies, apples, carrots, peanuts and popcorn and pH sensitive paper (litmus paper) that includes a 5.0-7.5 range.

Instructions: Have students test the acidity of their mouths with litmus paper before and after eating different foods. Check the pH every five minutes for one hour. Chart and compare the results. Discuss with the students the way plaque uses sugar to produce the acid that can decay teeth. Have the students identify which foods produce the greatest, as well as the least, amount of acid.

Plaque attack

The purpose of this activity is to illustrate the way plaque builds up in the mouth.

Materials: Sheep's blood agar plates and toothpicks.

Instructions: Divide the agar plates into four or six sections. Have each student initial his or her section on the edge of the plate. Give students toothpicks and instruct them to find plaque in their mouths. The students should gently rub the plaque on their section of the agar plate. Store plates in a warm, dark place for two days. The bacteria will start to show growth in two days and will continue to grow for one week.

Explain to the students that plaque is a sticky, invisible deposit that builds up on teeth every 24 hours. If plaque is not removed by proper brushing and flossing every day, teeth may decay and gum disease may result.

Hidden sugars

The purpose of this activity is to assist students in identifying hidden sugars by reading food labels.

Materials: Selected food containers with labels (bottles, boxes, bags, etc.).

Instructions: Have students circle sugars on several food labels. Be sure to include all forms of sugar (sucrose, dextrose, maltose, fructose, lactose, honey, molasses, etc.). Discuss surprising findings with the students, such as catsup, salad dressings and cereals. Explore with students how to minimize the effect of sugar on teeth.

Sugar surprise

The purpose of this activity is to create a visual impression for students about how much sugar is in some of their favorite non-diet sodas.

Materials: A variety of non-diet sodas in their original containers, a bag of confectioners sugar, measuring cups and spoons, large containers.

Instructions: Help students figure out how much sugar is in each beverage by reading the Nutrition Facts Panel. For example, a 12-ounce soda may list 48 grams of total carbohydrates. Take 48 and divide by 4 to get the number of teaspoons of sugar, which is 12. For larger bottles, multiply the number of teaspoons of sugar for one serving by the number of servings in the container. Use your measuring tools to place the equivalent amount of sugar for each soda in corresponding containers.