



High Touch High Tech®

Science Experiences That Come To You

Apple Oxidation

Ingredients & Supplies:

- 2 Apples
- 1 knife (ask an adult for help)
- Pastry brush or small paintbrush
- 3 oz. cups
- Stopwatch or clock
- Paper plate

(At least 2 of the following acidic liquids)

- Lemon juice
- Lime juice
- Cider vinegar
- Lemon-lime soda
- Citrus juice

Instructions:

Fall is the time of year to enjoy fresh apples right off the tree! What is your favorite apple? Is it red, green, yellow or a blend of colors? Apples taste wonderful when fresh and crispy. However, if you leave it sitting on the counter too long, it will get brown and mushy. Why does this happen? You are about to find out what causes this and how to prevent it using common materials found in your kitchen.

To start this experiment, you need at least 2 apples. Ask an adult to cut 1 apple into several slices. Pour the acidic liquids into different cups.

Brush each slice of apple with a different acidic liquid. Remember which liquid you used on each slice! Lay the apple slices on your paper plate. Be sure to leave 2 slices untreated (no acid.) This will be your constant.

Look at the clock or set your stopwatch. Your experiment is now working! Watch the apples to see which slices turn brown first. How long does it take? Which acid prevents the apple from turning brown? How quickly do your 2 untreated apples oxidize?

Next, you will use your second apple. Ask an adult to cut your second apple into slices. This time, you will not brush the apple slices with the acid. Instead, you will submerge 1 slice into each acid. Leave it in the acid for 1 minute. Put 1 slice into plain water for 1 minute. This will be your constant.

Remove the apples and put them on the paper plate. Look at the clock or start your stopwatch. Notice how quickly or slowly the apples oxidize. Did this method work better? Which apple slices are turning brown? Which acid works the best?

Why do you think one method is better than the other for preventing the chemical process called oxidation? Which apple slice looks the tastiest?



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What is the difference between the acids that you used? The lemon and lime juice has a stronger acidity than the lemon-lime soda. However, cider vinegar is very acidic, too. Did the lemon juice work better than the vinegar?

Brushing or dipping apple slices with citrus juice or cider vinegar is a great way to prevent oxidation. Next time you are enjoying an apple, remember how to save it for later!

The Science Behind It:

As apples age, they release electrons to the oxygen molecules in the surrounding air. This is a chemical process called *oxidation*. The apple flesh turns brown as it oxidizes. This is similar to metal when it comes in contact with oxygen. The metal turns a reddish-brown color, which is rust.

To prevent this chemical reaction, you need an acid. Lemon juice, cider vinegar, lime juice, even lemon-lime soda are all great liquids to use. Each of these liquids contains acids.

Have you heard the advice “An apple a day keeps the doctor away?” Well, this is great advice! Just like other fruits and vegetables, apples contain many healthy vitamins and minerals to keep your body strong.

In fact, apples contain substances called *antioxidants* that help prevent the harmful effects of oxidation on human tissue. Antioxidants are key to protecting and nourishing our hearts. One of the antioxidants found in apples is Vitamin C. Be sure to eat the peel because most of its antioxidants are found in the skin of the apple!

Apples also contain pectin, a soluble fiber. Pectin helps lower blood cholesterol. The fiber in apples also creates a “full” sensation after eating it. Therefore, people may not eat as much if apples are part of their diet.

Apples are great for breakfast, snack, and lunch! Maybe you can even eat one for dessert! The nutrition contained in apples may really keep the doctor away!

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