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## Dental Decay

# Can the acid in drinks really weaken your teeth?

**BEST FOR GRADES**

4-6

**ESTIMATED TIME**

20-30 Minute Set Up, 5 Days to See Results

## You Will Need

- ☐ One cup of water
- ☐ Other types of drinks (e.g., orange juice, milk, soda, sports drinks, etc. . . You will need at least 1 cup of each drink you are testing.)
- ☐ pH test strips (You can purchase online from <http://goo.gl/UjJ8uN> or <http://goo.gl/EZ5NFy>)
- ☐ Clear cups or glasses (You will need one glass for each drink you would like to test.)
- ☐ A sharp tool (like the tip of a pair of tweezers)
- ☐ Animal teeth (e.g., shark teeth fragments can be purchased online from <https://goo.gl/XyhCPI>) OR hollowed out white eggshells. You will need one tooth or eggshell for each drink you would like to test.

*(If you are unsure how to hollow out an eggshell, there are many videos online that can show you how! Just be sure to proceed with caution and have a responsible adult help you!)*

## Directions

1. Ask student to create a testable question  
*Example: Do acidic drinks weaken the surface of teeth more quickly than less acidic drinks?*
2. Measure out 1 cup of each type of drink and pour each into its own cup. Make sure to include one cup with water (This will be your “control” that you will compare the other liquids to.)
3. Dip one pH test strip into each liquid and lay on a flat, dry surface. Use the key provided with your pH strip package to interpret the pH result for each liquid and record it.
4. Put one animal tooth or eggshell into each cup. Let them sit at room temperature for five days. (If using eggshells, check your eggshells periodically to observe any effects each liquid is having on the eggshells and record.)
5. After five days, take out the tooth or eggshell from each cup and make observations about its color and texture. Compare each experimental eggshell to the “control” eggshell that was just soaked in water.
6. If using teeth, carefully using a sharp tool, try to scratch the enamel off of each tooth. What do you observe?
7. Record your observations and any conclusions you make about how the acidity of drinks changes how those drinks affect teeth.



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## Dental Decay

# Discovery Questions & Keywords

## Discovery Questions

### Beginning the Experiment

What is pH?

Which liquid in this experiment do you expect to be the most acidic?

Why can eggshells be used instead of teeth in this experiment?

### During the Experiment

How does the color of the pH strip indicator change when I test liquids of different acidity levels?

Why is it important to have a “control” tooth/eggshell soaking in water?

### After the Experiment

Which liquid weakened the tooth enamel/eggshell the most?

Which liquid had the least effect on the enamel?

The video suggests drinking water after drinking acidic drinks and then waiting an hour to brush your teeth. Why do you think we have to wait an hour?

## Keywords

### Acid

An acid is a chemical species that donates hydrogen ions. The higher the concentration of hydrogen ions produced by an acid, the higher its acidity and the lower the pH of the solution.

### Decay

A disorder resulting in the breakdown and dissolving of tooth enamel.

### Enamel

Enamel is the hardest substance in your whole body, and it covers and protects your teeth.

### pH Level

pH stands for power of hydrogen, which is a measurement of the hydrogen ion concentration in the body. The total pH scale ranges from 0 to 14, with 7 considered to be neutral. A pH less than 7 is said to be acidic and solutions with a pH greater than 7 are basic or alkaline



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# Can the acid in drinks really weaken your teeth?

## How does it work?

Constant exposure to acidic drinks strips the enamel (the hard, protective layer of a tooth.) When tooth enamel is exposed to acidic beverages, it softens and loses some of its mineral content.

Saliva will help neutralize the acid, restore the mouth's natural pH balance, and slowly harden the tooth enamel again. However, because the tooth's recovery process is slow, if the acid exposure happens frequently, the tooth enamel does not have the chance to repair. This can cause tooth sensitivity and lead to the need for dental treatment to protect the tooth and the dentin underneath.



## Dental Decay

# Discovery question answer key for parents and teachers.

### Beginning the Experiment

What is pH?

Scientists use something called a pH scale to measure how acidic or basic a liquid is. pH stands for power of hydrogen, which is a measurement of the hydrogen ion concentration in a solution. The total pH scale ranges from 0 to 14, with 7 considered to be neutral. A pH less than 7 is said to be acidic and the closer the pH is to 0 the more acidic it is. Solutions with a pH greater than 7 are basic, or alkaline, and the closer the pH is to 14 the more basic it is.

Which liquid in this experiment do you expect to be the most acidic?

*This depends on the liquids chosen for the experiment. Remember, the closer a liquid's pH is to 0, the more acidic it is!*

Why can eggshells be used instead of teeth in this experiment?

*Both eggshells and tooth enamel are made of calcium compounds that react similarly to acid. If white eggshells are used, color change observations can also still be made in this experiment.*

### During the Experiment

How does the color of the pH strip indicator change when I test liquids of different acidity levels?

*This depends on the type of pH test strip you use. The key provided with your*

*pH test strips will tell you what colors to expect for different levels of acidity.*

Why is it important to have a "control" tooth/eggshell soaking in water?

*Comparing the teeth/eggshells soaked in the different liquids to a "control" tooth/eggshell soaked in water gives you a more accurate baseline. This way you can figure out whether what you are observing comes from the fact that the tooth/eggshell was soaked in a liquid or whether it is actually something about the liquid that causes what you are seeing.*

### After the Experiment

Which liquid weakened the tooth enamel/eggshell the most?

*Depends on the liquids used. Generally, the more acidic liquid should cause the most weakening of the tooth enamel.*

Which liquid had the least effect on the enamel?

*Depends on the experiment.*

The video suggests drinking water after drinking acidic drinks and then waiting an hour to brush your teeth. Why do you think we have to wait an hour?

*Brushing too soon after eating or drinking acidic things can damage the enamel in its weakened state.*