

Dental health and acid science experiment

BEFORE YOU START: Ensure no children have an allergy to eggs as they may handle them as part of the experiment.

THE INVESTIGATION: ‘What is the effect of sugar and acid on tooth enamel?’

EXPERIMENT CHECKLIST

- 3 Eggs
- White vinegar
- 1 can cola soft drink
- Water
- Fluoride mouth wash – Fluoride is not an added ingredient in all commercially available mouthwashes. Look for sodium fluoride in the ingredients panel.
- 3 Glass or plastic cups (must be able to see through the cup)
- Summary worksheet

WHY EGGS? The eggs act as a model for teeth. Eggshells are made up almost entirely of calcium carbonate and like enamel, protect the softer parts inside.

Action: Discuss tooth enamel with the students.

WHY VINEGAR?

The vinegar represents acid in our mouth. Vinegar is made up of approximately 4% acetic acid.

Action: Explain how acid forms in our mouth.

- *A build-up of germs (bacteria) in our mouth leads to plaque formation.*
- *When we eat and drink sugary foods and drinks, the bacteria in the plaque feeds on the sugars to make acids.*

THE EXPERIMENT

1. Place one egg in each glass. Cover the first egg in water, the second in fluoride mouthwash and cover the third egg in cola.



2. Allow the eggs to sit in the liquids overnight.
3. Remove the eggs from the liquids and examine the eggshells.

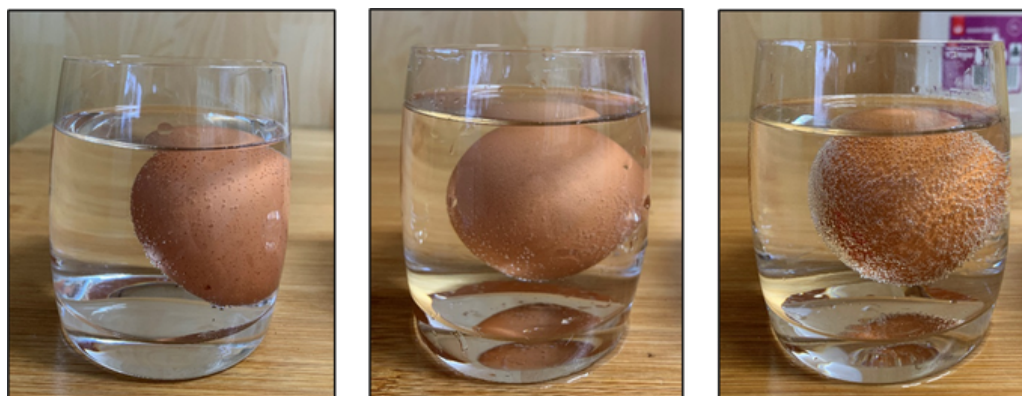
Questions for students

How has the cola caused changes to the eggshells compared to the water and fluoride mouthwash? What is the difference between the look and feel of the eggs? Use this comparison to prompt a discussion regarding the staining and damage that drinks, like cola, can cause to teeth.

4. Empty and rinse the cups with water. Place the eggs back into their respective cups.
5. Fill the cups with white vinegar until the eggs are completely covered. Observe the immediate reactions.

Questions for students

Compare the immediate reactions between the eggs. Is there a difference in reactions (see page 3) and can you explain why these exist? This creates an opportunity to discuss the importance of fluorides (water and toothpaste) in protecting our teeth.



Water

Fluoride mouthwash

Cola

The water egg The acetic acid in the vinegar will react with the calcium carbonate eggshell. Soon carbon dioxide gas bubbles will form on the outside of the egg.

The fluoride egg No reaction or a much more limited reaction should take place than the water egg. This is because the fluoride has strengthened the eggshell in the same way that it strengthens our teeth. Fluoride helps to protect our teeth from acids that can cause tooth decay.

The cola egg The acetic acid in the vinegar will react with the calcium carbonate eggshell. Soon carbon dioxide gas bubbles will form on the outside of the egg. As seen above, the reaction is greater than that for the egg soaked in water.

EXTRA OPTIONAL STEP

6. Leave the eggs in the vinegar for a further three days. After this time, the eggshells should be mostly or totally dissolved leaving the soft egg covered only by the membrane.

Questions for students

Have the shells disappeared from all three eggs the same? Why does this occur and how is does this compare to our teeth? (see page 4)

How does this compare to teeth? The acidic vinegar breaks down the eggshell just as acids produced by decay-causing bacteria within the mouth can break down tooth enamel.

If the eggs were to be removed from the vinegar soon after being placed in the acid, the damage to the eggshells would stop. By leaving the eggs to be exposed to acid for a prolonged period, this causes the shells to dissolve. This is a metaphor for our teeth. If teeth are repeatedly exposed to acids, this leads to attacks over and over, increasing the chance that tooth decay will progress to form a cavity that may require a filling.

FURTHER EXPERIMENT

Add in other drinks to the experiment, such as plain milk, 100% fruit juice, cordial and/or energy drinks. Compare these drink options to look at which are tooth-friendly.

This can kick-start the conversation about tooth-friendly drink options and the importance of making healthy choices.

EXPECTED RESULT

Water and milk will not breakdown the eggs (our teeth) and therefore are healthy, tooth-friendly drinks. Fruit juice, cordial, energy drinks and soft drink have a low pH making them acidic. This can cause some softening to the outer eggshell and may cause staining or discolouration. Other than water and milk, each liquid has the potential to cause tooth decay if consumed too often.

Dental health and acid worksheet

Are there any changes to the eggshells after soaking overnight?

Cola: _____

Water: _____

Mouthwash: _____

After placing the eggs in the vinegar, what changes can you see?

Cola: _____

Water: _____

Mouthwash: _____

After leaving the eggs in the vinegar for 3 days, how to they look and feel?

Cola: _____

Water: _____

Mouthwash: _____

How does this experiment relate to the health of our teeth?

Cola: _____

Water: _____

Mouthwash: _____
