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What causes cavities?

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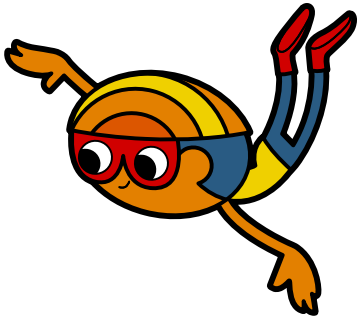
What causes cavities?

Egg shells as substitute for teeth



Research question

What causes cavities? Sugar? Not directly. There are bacteria in the mouth that convert sugar into acid. And acids are harmful to teeth. We want to test how, but because we don't want to destroy our teeth in the test, we need a substitute. In this experiment we are using eggshells. Like teeth, they contain calcium and are sensitive to acids.

So how do acids react with eggshells – our substitute for teeth?

You will need:

- Approx. 100 ml citric acid
- Approx. 25 g eggshells
- Rolling pin
- Freezer bag
- Accurate scale
- Measuring cup
- Funnel with coffee filter
- Spoon
- 3 empty jam jars
- Microwave oven

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How to do it

Step by step

Grind the eggshells

Put some eggshells into a freezer bag and crush the eggshells with the rolling pin. If you have a mortar and pestle, you can use that instead. The finer the powder, the better.

Weigh accurately

Weigh 20 g of crushed eggshells as accurately as possible in a jar on a scale. (= weight of eggshells before)

Add citric acid

Add 100 ml citric acid to the eggshells. You can use a measuring cup to measure the citric acid. Stir everything well and wait about 30 minutes.

What do you observe?

Filter

Pour the contents of your glass through a coffee filter into a second glass. Now the liquid should be separated from the solid.

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How to do it

Step by step

Weigh empty glass

Weigh a third empty glass on the scale and note the weight (=weight of the empty glass). Then place the coffee filter with the moist eggshells in the glass.

Dry eggshells and weigh again

Place the jar with the moist eggshells in a microwave and heat it for 5 minutes on a low to medium heat until it is completely dry. When everything has cooled down, weigh it again. Write down the weight (= weight of the glass with dried eggshell residue).

weight of the glass with dried eggshell residue) : _____ g	−	weight of the empty glass : _____ g	=	Weight of the dried eggshell residue afterwards: _____ g

weight of eggshells before : 20 g	−	Weight of the dried eggshell residue afterwards: _____ g	=	Weight loss due to the reaction with the acid _____ g

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Additional information

For parents and teachers

Context

In the Forscherwelt teaching units “Personal Care” and “Sustainability” we deal with the cause of cavities. Often the children have a misconception here. They think that sugar is directly responsible for tooth decay. But this is not the case. Bacteria in the mouth excrete acid as a metabolic product, which then damages the tooth enamel. Using eggshells as a substitute, we investigate what happens when acid attacks the teeth.

Eggshells as substitute for teeth

Acids attack the calcium-containing tooth enamel. Eggshells also contain an acid-sensitive, calcium-containing compound: calcium carbonate (lime). Therefore, eggshells are suitable as a model for teeth in this experiment. When acids such as citric acid or vinegar act on eggshells, they dissolve the calcium carbonate over time. This leads to a weight loss that can be measured.

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