Experiment

Perform an experiment that illustrates how acids produced by bacteria act on teeth and how you can protect teeth from their negative effects.

Experiment: How do acids affect enamel? Instructions

The aim of the experiment is to show the difference between an eggshell protected by fluoride, which is more resistant to the action of acid (vinegar), and an eggshell that is not protected in any way. It will clearly illustrate the processes going on in the oral cavity (mouth) – bacteria produce acids there, which act on teeth. Eggshell is constructed of calcareous substances, which react to fluoride in a similar way to teeth.

Materials:

- Marker pen
- Several hard-boiled eggs - 1 for each group
- 200 ml white vinegar
- Paper towel
- Transparent plastic cup or jar or glass – 1 for each group
- Toothpaste with high fluoride content (perfect) or regular toothpaste with fluoride (good enough)
- Toothbrush for each group

Instructions:

Prepare eggs **2-3 days before class.**

You can watch two videos beforehand: the first shows what happens to an egg treated with vinegar, the second – the experimental procedure.

https://www.youtube.com/watch?v=R2r-iRLDo-Q

https://www.youtube.com/watch?v=H5pP2aWGFyM

In class:

1. Give each group one egg.
2. Ask them to smear toothpaste (using a toothbrush) onto the half of the egg marked with an X. Leave the second half uncoated.
3. Give out transparent plastic cups (jars/glasses) filled with vinegar (approx. 200 ml) and water to groups.
4. After 2-3 min, students wipe the toothpaste off with paper towels.
5. Students put the egg into the cup, immersing it fully in the liquid. They observe what happens to the egg – they look carefully at both halves of the egg and observe the differences.

Conclusions:

Ask students what has happened to the eggs and what conclusions they have drawn from the experiment. Tell them that you prepared the eggs earlier and that they were exposed to the action of the fluoride for longer – this resulted in the differences in the reaction with the acid being more clearly visible.

After talking with students, summarize and explain the meaning of the experiment.

1. The experiment shows how toothpaste can protect teeth from acids generated from food remains and what happens when teeth aren't protected in this way.
2. The fluorinated (coated with toothpaste) part of the shell generates less bubbles than the non-fluorinated part, or else the appearance of the bubbles is delayed.
3. The effect is greater the longer the shell has been exposed to the action of fluoride and the stronger the fluoride preparations used. There would be no effects following a one-time, several minute exposure to fluoride – they would not be noticeable either on the shell or in the oral cavity (which is why it was necessary to prepare the eggs a few days earlier).
4. It thus follows that in order for fluoride to act effectively on your teeth, you should use toothpaste every day.

Observing

Students learn about the structure of a tooth by observing objects resembling various layers of the tooth.

The tooth is composed of dental pulp in the center, followed by, in turn, a layer of dentin and a layer of enamel.
Enamel is the hardest layer of the tooth and indeed the hardest tissue of the whole body – it's harder than bone! Enamel doesn't grow – when we lose it, it's for ever – it won't grow back! The hardness of the enamel allows teeth to fulfil their function – breaking food into smaller pieces. Enamel is both rigid and fragile – it breaks off more easily than it wipes off.

Dentin is a tissue that transfers external biting loads from the enamel. It is less mineralized than enamel, and softer and more flexible. It has a non-uniform surface and contains channels (dentinal tubules) enabling stimuli to be sensed. Dentin is very sensitive – it reacts with pain to changes in temperature. It has the ability to repair itself thanks to the presence of the dental pulp (dentin grows inwards towards the center of the tooth).

Dental pulp – possesses nerves with endings that link to the dentinal tubules. These nerves enable teeth to feel. The pulp rebuilds dentin in the event of caries and nourishes the tooth. It's very soft – it resembles jelly.

Root – the root of the tooth lies firmly in a socket (alveolus) and is covered with cement (cementum) – a hard tooth tissue, but less mineralized than dentin.

Answers – objects that resemble different tooth layers:
enamel – cup/ceramic tile
dentin – sponge
pulp – jelly beans