FEBRUARY IS NATIONAL CHILDREN'S DENTAL HEALTH MONTH

First Impressions S.C.
PEDIATRIC DENTISTRY & ORTHODONTICS

DECAY LAB

1. ASK A QUESTION.

2. RESEARCH.

3. FORM A HYPOTHESIS.

Before

After

4. EXPERIMENT.

5. ANALYZE THE RESULTS.

6. DRAW A CONCLUSION.

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It may seem like an odd pairing – teeth and eggs – but this is a great project to demonstrate the effectiveness of good oral hygiene! The hard shell of a hard-boiled egg serves as the hard protective layer of enamel on our teeth. This interactive experiment shows the damaging effects acidic foods and drinks can have on the enamel of our teeth, breaking down the mineral barrier and completely eroding the layer over time. Kids will also see the importance of a proactive and protective layer of fluoridated toothpaste to protect our teeth's enamel.

MATERIALS NEEDED:

- Hard-boiled white eggs
- Fluoride toothpaste
- Toothbrush
- Vinegar
- Bonus: any other acidic liquids or beverages you'd like to try (ex: juice, sports drink, soda)
- Containers large enough to hold eggs fully submerged in liquid (mason jars work great, or even standard cups – transparent containers are helpful to watch the process evolve)

SET-UP:

- Have your child complete the Scientific Method Worksheet before you begin, and ask them to continue recording observations and updates as they work on the project.
- To begin, have an adult hard-boil a dozen eggs (you'll use leftovers in the stain lab, as well!).
- Once cooled, take one egg and completely cover it in a thick protective layer of fluoridated toothpaste. Let this protected egg sit for about four days, and lightly rinse off any residual toothpaste (making sure not to scrub everything off – just the thick layer!). This egg demonstrates a tooth that has been well-protected by good brushing habits.
- Fill two containers with vinegar, deep enough to completely submerge your egg.
- Place one non-toothpaste covered hard-boiled egg in a container of vinegar.
- Place your toothpaste-covered egg into a separate container of vinegar.
- Now the waiting and observing begins! After 12 hours, you can ask your kids to check the eggs by gently pulling them out of the vinegar to observe and record their findings. Have them gently tap on the shell and notice any differences.
- Once observations are complete, place the eggs back in the vinegar containers to continue soaking. We found success in soaking eggs for 24 - 48 hours for the most dramatic effects.
- Continue to allow your kids to gently remove the eggs from the vinegar solution to make and record observations.
- After about 48 hours, you should really notice a difference in the eggshells! The unprotected egg should now feel soft as the shell has completely eroded away in the acidic vinegar bath. The egg should even bounce off the counter, if you'd like to really impress your kids!
- The protected toothpaste-covered eggshell should remain intact with a hard, protective barrier around the egg. It should feel hard to the tap, and should not be able to bounce without cracking the shell. This is because the fluoride layer has done it's job to strengthen the eggshells (tooth enamel) and protect it from the damaging acid exposure.

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GUIDED OBSERVATIONS:

Eggshells contain calcium carbonate, which reacts with an acid in vinegar called acetic acid. The acetic acid breaks up the calcium and carbonate, dissolving the shell. While the calcium floats away, the carbonate reacts with the acetic acid to create carbon dioxide. This is why you see bubbles on and around the eggs.

VARIATIONS OF THE DECAY LAB:

What would happen if you used a different acidic drink instead of vinegar; perhaps orange juice, lemonade, or even a sports drink would have a similar effect? Do you think the eggshell would erode the same way? Can toothpaste protect an eggshell from all acidic materials?

-> Test your hypotheses by filling your containers with different sugary and acidic beverages, and setting up the same experiment by submerging one protected egg and one non-protected egg in the same solution. Compare the results over time, and see which produces the worst outcome for the egg (our teeth).

THE SCIENCE BEHIND THE EGGSPERIMENT:

The composition of an eggshell is very similar to that of the enamel on our teeth. Both are produced as hard protective layers that can also become brittle under different circumstances; they are both made of similar materials (calcium carbonate and calcium phosphate); and both will react to chemical exposure in similar ways.

In this experiment, we demonstrate the damage created on the enamel of our teeth by continuous exposure to acid. Of course none of us (…well, most of us) are sipping vinegar or continuously drinking strongly acidic drinks as replicated in this experiment, but that's not the only source of acid in our mouths! **Did you know:** sugary beverages stick to the surface of our teeth, and the bacteria formed starts to break down that sugar into acid (which is the damaging exposure we replicate in this experiment). When the enamel of our teeth are exposed to acidic beverages – or the acid generated by sugar exposure – it softens and even begins to lose some of its minerality (strength). And while it's true that the saliva our mouths produce is meant to neutralize the acid in our mouths and restore our natural pH balances (slowly hardening the tooth enamel again), constant and frequent exposure to this sugar/acid bath does not allow for this repair process to occur. What does that mean? Tooth sensitivity is a very common outcome of this process, and of course the development of dental cavities.